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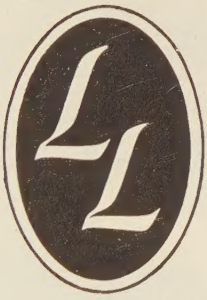

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Some North American Game Fishes

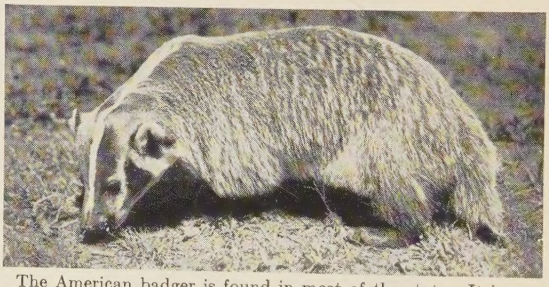
The skunk inhabits North, Central, and South America in several forms. This little spotted skunk is found in the northwestern states. Skunk pelts make excellent garments. Stripes are usually removed.

The raccoon makes its home in trees and hunts its food at night. It extends over the entire United States and into Alaska.

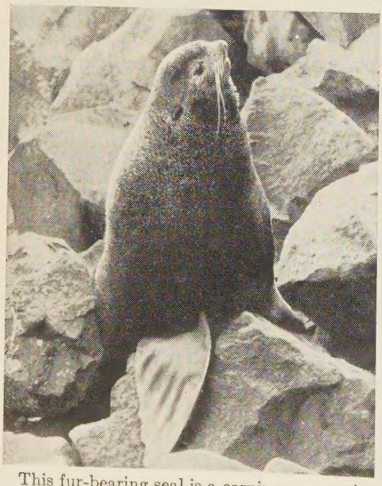
FUR-BEARING ANIMALS

The valuable silver fox of North America actually is a black fox sprinkled with white.

The opossum is about the size of a house cat, has a long prehensile tail and is much at home in the trees. It is a marsupial.



The American badger is found in most of the states. It is nocturnal in habit and feeds on small animals, insects, eggs, and fruit.



This fur-bearing seal is a carnivorous marine mammal very highly valued for commercial fur.

The mink is one of the most valued fur-bearing animals. It is found in North America, living on the banks of streams and lakes.

Photos by U. S. Fish and Wildlife Service

Sea Devil (*Mobulidæ*). A family of fishes which embraces the largest and most powerful of the rays. According to Risso, some reach a width of 20 feet and a weight of 1200 pounds. The sea devils differ from all other rays in having, on the upper part of the head a pair of fins which stand up like ears or horns. It is said that a sea devil, when harpooned, will drag a boat with great swiftness. Although of terrifying appearance, all sea devils have small teeth their tails have no spines and hence they are comparatively harmless.

The Manta (*Manta birostris*), of tropical America, is a species of sea devil greatly feared by pearl fishermen, but Jordan states that it rarely devours anything larger than the pearl oyster which it seeks in common with the fishermen. Another species of sea devil (*M. hamiltonia*) occurs in the Gulf of California.

Sea Horse (*Hippocampus hudsonius*). An interesting little pipefish, about 4 inches long, found on the Atlantic coast from Cape Cod to Florida. It has a head and neck somewhat resembling those of a horse, and a finless, prehensile tail with which it clings to seaweed and is sometimes carried far out to sea. The body is incased in a more or less spiny shell which is composed of bony rings. The brood pouch, in which the male carries the eggs until they are hatched and the young partly grown, is situated on the breast.

Seal. The true seals are marine carnivorous mammals constituting the family *Phocidæ*. They have no external ears; and this, in addition to the fact that the construction of their limbs does not permit of their using those organs on land, at once distinguishes them from the allied family of eared seals, or sea lions. The head is very round, and the eyes are large and expressive. In swimming, the true seals seldom use their forefeet, while the eared seals use them as powerful sweeps.

There are some 15 species about equally divided between the northern and the southern hemisphere. Among these are the harbor seal, the harp seal, or Greenland seal, the ringed seal, the hooded seal, the monk seal, and the ribbon seal. They inhabit the coastal waters of temperate and cold regions, feeding on fish and other marine animals.

Seals are much hunted on account of their skins, their fur, and the oil which they yield. To the inhabitants of the polar regions they afford food, clothing, and fuel. The Eskimos show great skill in harpooning seals from their kayaks, or skin-covered boats. See *Fur Seal* and *Sea Lion*.

Sea Lion. A group of marine mammals constituting the family *Otariidæ*. They differ from the true seals in having external ears and limbs adapted for locomotion on land. There are about 10 species. While mostly antarctic, three types occur in the North Pacific, including the well-known sea lions of the California coast and the valuable fur seals of Alaskan waters.

The Steller sea lion (*Eumetopias stelleri*) is the more conspicuous of the two animals which have made the seal rocks of San Francisco famous. It is found in a few widely scattered localities from Santa Cruz, California, to Bering strait. This large animal attains a length of 11 feet, stands 6 feet high, and is estimated to weigh upwards of 1400 pounds. While the fur is inferior, its skin, flesh, and oil are much used by the natives of the Aleutian islands.

The California sea lion (*Zalophus californianus*) inhabits nearly the entire coast of California, Lower California, the Farallons, Santa Catalina, and other coastal islands. It attains a length of 7 feet and a weight of 450 pounds. In the water it is very active, and it climbs rocks and cliffs with surprising agility. It never roars like the Steller sea lion, but keeps up an incessant honking bark or growl. In captivity, it thrives in fresh water, is remarkably docile and intelligent, and is capable of being trained to go through surprising performances. The hair of this species is short, coarse, and valueless as fur.

The so-called fur seal (*Callorhinus*), which yields the costly seal fur of commerce, belongs to this family. See *Fur Seal, Seal.*

Sea Serpents. Circumstantial reports of the appearance of these fictitious monsters have been made since ancient times. All accounts agree that they are of prodigious size and swim with a wavy up-and-down motion, instead of the undulating sideways motion of ordinary serpents. The earliest one reported in America was at Cape Arm, Massachusetts, in 1638.

Sea Snakes (*Hydrophinæ*). A numerous group of strictly marine serpents, with deep, flattened bodies and strongly compressed tails, inhabiting the tropical Indo-Pacific ocean. They bring forth their young alive, subsist almost entirely on small fish, and sometimes attain a length of 12 feet, or only a fraction of the length of the fabled sea serpents. While all are exceedingly poisonous, they are very shy, fleeing from danger at the least alarm, so that fatalities from their bites are rare.

Sea Turtles (*Chelonidæ* and *Sphargidæ*). The largest living turtles, distinguished from all others by their seal-like flippers. None of the sea turtles can withdraw the head inside the shell. They are wholly adapted for marine life, feeding chiefly on fish, crustaceans, and mollusks, and coming ashore only at breeding season. Their eggs are laid in the sand, sometimes in hundreds in a single excavation, and left to hatch by the heat of the sun. Only five species are known, widely distributed in warm seas.

The Leatherback, or Trunk Turtle (*Sphargis coriacea*), differs from all other turtles in having seven lengthwise ridges on the carapace, which is covered with a soft, leathery integument saturated with oil. It is the largest known turtle, sometimes reaching 8 feet in length and weighing 800 to 1200 pounds. Its flesh, which has an unpleasant taste and is reputed to cause sickness, is but rarely eaten for food. The leatherback occurs in Atlantic waters, and breeds on the Dry Tortugas, the Bahamas, and other warm coasts.

The Loggerhead (*Thalassochelys caretta*), which sometimes weighs 450 pounds, breeds upon the Florida coast and wanders northward to Massachusetts. The female sometimes lays 1000 eggs. While taken chiefly for oil, its flesh is sometimes sold in the markets.

The Green Turtle (*Chelone mydas*) is the most highly prized food turtle, especially for making soups. It occurs in warm seas throughout the world. It is sometimes 4 feet long and weighs 500 pounds, but most market specimens range from 50 to 70 pounds. Unlike other sea turtles, the green turtle is herbivorous, living almost entirely on the roots of the eelgrass or turtle grass, which grows in shallow waters.

The Hawksbill (*Chelone imbricata*), the smallest of the sea turtles, rarely 2½ feet long, is distinguished by its sharply curved beak. It occurs from North Carolina to Brazil and furnishes the valuable tortoise shell of commerce, used in making combs and various ornaments. See *Turtle.*

Secretary Bird (*Serpentarius secretarius*). A large, somewhat cranelike bird of prey, closely allied to the vultures, native of South Africa. It stands about 4 feet high and has bluish gray plumage, with various black markings above and below. From a fancied resemblance of its erectile crest to the pen behind the ear of a clerk, it received the name secretary bird. It feeds on reptiles of all kinds, boldly attacking and dispatching the most venomous, either by stunning them by vigorous blows of its knobbed wings or by seizing them in its powerful feet and flying so high that they are killed when let fall. While protected by law as a destroyer of noxious vermin and often tamed as a

protector of poultry, the secretary bird, if not well fed, will help itself to chickens and other young fowls.

Shad (*Alosa sapidissima*). The finest food fish of the herring family, ranking next to the cod and the salmon in economic importance. It is an ocean fish found from Florida to Newfoundland, going up rivers in early spring to spawn. It attains a length of 25 to 30 inches, and a weight of 4 pounds. Many streams are annually restocked by the bureau of fisheries. The shad has been successfully introduced on the Pacific coast, where it is now found in the markets. See *Herring*.

Shark (*Squali*). A group of large, powerful fishes, chiefly marine, with a more or less cylindrical body and a cartilaginous skeleton. The gill slits open on the sides of the neck, and the mouth is on the underside of the head at some distance behind the end of the snout. Consequently, sharks often turn upon their backs to seize their prey. Most sharks have very numerous and exceedingly sharp teeth, often with sawlike edges. The teeth of others are mill-like, tubercular plates for crushing shells. Many sharks bring forth their young alive, the eggs hatching within the body. Others lay leathery eggs of various unusual shapes, some being spirally twisted or coiled.

There are about 150 species, found in all seas, but most abundant in the tropics, varying in size from small dogfish, barely a foot long, to the great basking sharks, sometimes 50 feet long, of enormous girth and weight. Many are very destructive to other fishes, and several of the larger forms are dangerous to man. Among the most important types are the cow sharks, bullhead sharks, dog sharks, tiger sharks, mackerel sharks, threshers, basking sharks, cat sharks, hammerhead sharks, and dogfishes.

Few sharks are of economic value, though some yield an inferior oil, and the rough skin of others, called shagreen, is used in polishing wood. Dried shark fins are commercially important in India and China. The flesh of various species is wholesome and edible, and is increasingly used for food. See *Basking Shark*, *Hammerhead Shark*, *Whale Shark*.

Sheatfish (*Siluris glanis*). A huge, Old World catfish, sometimes weighing 300 to 400 pounds, abundant in the Danube. Next to the sturgeon it is the largest river fish in Europe. See *Catfish*.

Sheep (*Ovis*). Hollow-horned ruminants of the ox family, closely related to the goats. All wild sheep inhabit mountains or high table-lands of the northern hemisphere. There are about 12 species, among which are the European mouflon, the African aoudad, the Asian argali, the Punjab wild sheep, and the North American bighorn.

The original wild species, from which the domesticated sheep has been derived, is unknown. However, the domestic sheep is most closely related to the mouflon (*O. musimon*) of Sardinia, to the Armenian wild sheep (*O. gmelini*), and to the oorial (*O. vignei*), of central Asia.

Since prehistoric times the domestic sheep has been reared in Asia and Europe for its flesh, milk, wool, and skin. The ancient Lake Dwellers of Switzerland used the sheep; it is mentioned throughout the Bible, and in the earliest Greek and Roman writings. The Latin word *pecus*, meaning cattle, whence the word *pecunia*, meaning wealth, was applied especially to sheep. Now widely diffused throughout both hemispheres, the sheep has become the world's chief fiber-producing animal. Of the various domesticated animals of the ox family, the sheep is the least intelligent, although it is remarkably mild, gentle, and inoffensive in disposition. The sheep is a thrifty feeder, subsisting where cattle and horses cannot obtain sufficient pasturage. The male sheep is called a ram, the female, a ewe, and the young, a lamb. A group or herd of sheep is most commonly called a flock.

Centuries of breeding have produced numerous breeds of sheep which are grouped as short-wooled, medium-wooled, and long-wooled. The Spanish Merinos are typical of the first class, the Southdown and Shropshire of the second, and the Leicester, Lincoln, and Cotswold of the last. While some breeds are successfully grown in moist climates, such as that of England, sheep are best adapted to dry, cool regions. They thrive upon the scanty vegetation of semideserts, where they often pasture for days without water. The chief wool-growing countries are Australia, Russia, the United States, and Argentina. In the United States, California, Texas, Wyoming, Utah, and Montana usually lead in production.

Besides wool, meat, and leather, which are the principal sheep products, the entrails, when dried and twisted, form the so-called catgut used for violin strings, the fat yields tallow, and the milk, in some countries, is made into cheese. In the mountain regions of India, sheep are employed to a limited extent as beasts of burden.

Shrews (*Soricidæ*). Very small, mouselike, insectivorous mammals, with long, pointed muzzles, soft fur, and ratlike feet. They constitute the most numerous family belonging to the order *Insectivora*. There are more than 125 species, widely distributed throughout the world, some of which are the smallest known mammals. Nearly all are nocturnal and burrowing in habit, living chiefly upon insects, worms, and small mollusks. The common shrew (*Sorex personatus*), found from Massachusetts to Alaska and south to North Carolina, is one of the smallest of American shrews. It is only $2\frac{3}{4}$ inches long, chestnut brown in color, with a short tail and large ears. Some 35 other species occur in various parts of North America. See *Insectivora*, *Moles*.

Shrike. The shrikes belong to a numerous family of perching birds (*Laniidæ*). Although displaying some powers of song, they have strong hooked beaks and predacious habits like those of the true birds of prey. There are about 200 species, mostly confined to the Old World, only 2 of which occur in the United States and Canada.

The northern shrike, or butcher bird (*Lanius borealis*), 10 inches long, with gray, black, and white plumage, breeds in the far North and winters in the northern United States. Like other shrikes, it is noted for its habit of impaling insects, mice, and small birds upon thorns, leaving them to be eaten later. It feeds chiefly upon mice, noxious insects, and, in winter, upon English sparrows. The slightly smaller loggerhead shrike (*L. ludovicianus*), of the southeastern United States, and its western varieties, the white-rumped, California, and island shrikes, are very similar in color and habits.

Shrimp (*Crangon*). A small, slender, long-tailed crustacean, closely allied to the crawfish and prawns. The common shrimp (*C. vulgaris*), about 2 inches long, greenish gray, spotted with brown, is found in shallow bays from Labrador to South Carolina. The annual catch of shrimp in the United States is about 70 million pounds, most of which is taken along the southern coast from North Carolina to Texas. Louisiana, Florida, Georgia, and Mississippi lead in production. In San Francisco bay the catch of the California shrimp (*C. franciscorum*) amounts to about $250,000 yearly.

Silkworm. A name applied to the larvæ, or caterpillars, of several species of moths. The common silkworm moth (*Bombyx mori*) is the most important silk-producing species. It is a native of China, where it has been cultivated from a remote period. The mature moth is of a cream color with faint brownish markings. The caterpillar (silkworm) when first hatched is black or dark gray, becoming cream-colored after the last molt. It feeds upon the white mulberry, and will also eat the black mulberry and the Osage orange.

The silk is produced in a pair of specially constructed vessels which contain a gelatinous substance and become much enlarged at the time when the animal is about to spin. These silk organs unite at the mouth to form a common duct termed the spinneret. Through this tube the semifluid substance is ejected. On coming in contact with the air, it hardens into the soft fiber so highly prized for textile fabrics.

The caterpillar employs the silk in constructing a cocoon in which it assumes the pupa state. The pupa is usually killed by heating gently in an oven, because the natural exit of the moth is injurious to the silk. After soaking in warm water, the fibers composing the cocoon are unwound and reeled into hanks or skeins, known as the raw silk of commerce.

Sirenia (*sī-rē′nĭ-ȧ*). An order of aquatic mammals, with thick, naked or slightly hairy skin, finlike fore limbs, and the hind limbs lacking. While somewhat resembling the whales in appearance, they are quite different in structure. The order comprises only the dugongs of the Indian Ocean and the manatees of tropical America and Africa. See *Dugong*, *Manatee*.

Skate (*Raja*). A numerous group of fishes closely related to the sharks, represented by about 40 living species, inhabiting the colder seas. The angular, much flattened body, sometimes broader than long, is usually armed with spines. Their eggs, which are "wheelbarrow-shaped" with a tube projecting from each of the four corners, are from 3 to 8 inches long. Most species are edible and some are largely used for food.

The common skate (*R. erinacea*), of the North Atlantic, called also tobacco-box from its shape, is about 18 inches in length. The light-brown body is variegated with dark spots and covered with spines. The barn-door skate (*R. lævis*), of Atlantic shores, so named on account of its size, is about 4 feet long, and nearly spineless. A similar skate (*R. binoculata*) occurs in California waters.

Skunk. A fur bearing animal of the marten family, closely allied to the badger, found only in the New World, sometimes incorrectly called polecat. There are many species, distributed from northern Canada to Patagonia. They are somewhat smaller than a cat in size, with long hair, bushy tails, and black and white markings. All are noted for the possession of large anal glands from which a powerfully acrid fluid with an exceedingly offensive odor may be projected to a distance of several feet.

The North American skunk (*Mephitis*), of which 9 forms or species are recognized, occurs from Hudson bay to Guatemala. They live in dens or burrows, are chiefly nocturnal, and prey upon small rodents, birds, reptiles, and insects, destroying many noxious kinds. Except for their depredations on poultry, skunks are in the main beneficial to the farmer. Since early colonial times, skunks have been trapped and sometimes reared for their valuable fur. See *Polecat*.

Sloth (*Bradypodidæ*). An edentate mammal, found only in Central and South America, so named because of the extreme sluggishness of its movements. All sloths are arboreal, living in an inverted position, suspended by their long curved claws from branches in tree tops. They feed on leaves and twigs. Sloths are clothed with thick shaggy hair, which often so closely resembles the lichen-covered bark of the trees upon which they are suspended that it is difficult to see them. Their heads are round, the short ears are nearly concealed in the heavy fur, the forelegs are much longer than the hind legs, and the toes are provided with very long claws. See *Edentata*.

Smelt (*Argentinidæ*). A family of excellent food fishes, all marine and closely allied to the salmon. The American smelt (*Osmerus mordax*), seldom exceeding 10 inches in length, occurs on the Atlantic coast from Virginia to the Gulf of St. Lawrence. In the winter it enters the mouths of rivers and bays to spawn, and is taken in great numbers for the markets. Its flesh is delicate, tender, and oily, with a distinct odor and taste. The surf smelt (*Mesopus pretiosus*), of the California coast, is prized as a pan fish.

Snail. The common name for the air-breathing gastropod mollusks constituting the numerous order *Pulmonata*, which embraces about 19,000 known species of land and fresh-water snails. With the exception of the slugs, in which the shell is rudimentary or absent, snails have a well-developed, external spiral shell, which encloses the whole body as a protective covering. The part of the snail protruding from the shell is the foot, upon the forward end of which is the head, bearing one or two pairs of tentacles or feelers. The eyes are either at the base of the tentacles or, as in the land snail, on the ends of the upper pair. The mouth has a hard, horny upper jaw and lip for biting, and contains a long, rasplike tongue, the radula, for tearing or rasping food.

While a few are carnivorous, most snails feed upon vegetable matter and some are destructive to vegetation. They lay round, semitransparent eggs which are either deposited on the surface of the ground or buried beneath it. Some species are edible and highly prized for food. The garden snail (*Helix pomatia*) was considered a great luxury by the ancient Romans, and in southern Europe and in France is still grown in large numbers as an article of food. It has been introduced at New Orleans and other places in the United States.

Snake Bird (*Anhinga*). A small group of web-footed birds, closely related to the cormorants; called also anhingas or darters. They have elongated bodies, long, snakelike necks, small, narrow heads, and slender, sharp pointed bills. There are four species, natives of warm regions, ranging in length from 28 to 36 inches. They usually live in pairs around bodies of fresh water, are expert swimmers and divers, and feed upon fish. The American snake bird, or water turkey (*A. anhinga*), of tropical America, is also common in the Gulf states and breeds as far north as southern Illinois. Its plumage is glossy black with greenish reflections.

Snakes (Suborder *Ophidia*). A numerous group of reptiles, which, together with the lizards (Suborder *Lacertilia*), makes up the order *Squamata*. Snakes have greatly elongated, scaly bodies, without limbs or with only tiny vestiges of hind limbs, and without eyelids or external ear openings. They have a bifid tongue; the teeth are consolidated with their supporting bones, and usually the right and left halves of the lower jaw are connected by an elastic band. The vertebræ are very numerous, sometimes nearly 300, and, excepting the atlas and those of the tail, all bear ribs. There is usually only one lung, which is much elongated.

Most snakes are timid and harmless, but numerous species have highly developed poison glands and powerful fangs, so that their bite is dangerous and often fatal to man and to many animals. Snakes are oviparous, usually depositing from 10 to 80 leathery-shelled eggs, which are hatched by the heat of the sun. The most venomous, however, as well as many common, harmless species, retain their eggs in the oviducts until the embryos are developed, and then bring forth living young.

Snakes are usually carnivorous, feeding upon small rodents, frogs, reptiles, and insects, and, on the whole, are of great service to agriculture. Their flesh, which is white, chicken-like, and wholesome, is often eaten by savage peoples.

There are about 2000 existing species of snakes, comprising about half of all living reptiles. They occur throughout the world, except in latitudes where the subsoil is permanently frozen, or in

isolated islands, such as New Zealand, Hawaii, and the Azores. In Scandinavia, snakes pass north of the Arctic circle. They vary greatly in habits, the chief distinctive groups being burrowing snakes, ground snakes, tree snakes, fresh-water snakes, and sea snakes.

Many entirely different snakes are remarkably similar in general appearance. Hence it is difficult to make distinctions between them in nontechnical language. In consequence, many entirely harmless species are popularly regarded as venomous and there is great confusion of names.

Some 600 species, or more than a fourth of all the existing snakes in the world, are more or less venomous. About half of these are only mildly poisonous and a much smaller fraction are regarded as fatally poisonous to man. North America is remarkably free from poisonous snakes, only 24 out of about 110 native species being considered dangerous. Of these, the poisons of only the larger rattlesnakes and their allies are fatal to man.

Snipe (*Gallinago*). A small game bird, closely related to the woodcock and the sandpiper, with short legs and tail, medium wings, and a long, straight, slender bill. Snipes inhabit marshy places, feeding upon worms, insects, and larvæ, which they obtain by probing in the mud. They nest in shallow hollows in the ground, usually laying 4 eggs. There are about 23 widely distributed species, only one of which is native to North America. Wilson's snipe (*G. delicata*), called also English snipe and jack-snipe, is about 11 inches long, mottled brown and buff above and white below. It breeds from Connecticut to Utah, northward to beyond the Arctic circle, and winters far southward. Its flesh is considered a great delicacy.

Snowbird (*Junco hyemalis*). A small bird of the finch family, about 6 inches long, slaty gray above, with a darker head, and white below. It breeds from northern Minnesota and New York northward, migrating southward, upon the approach of snow, as far as the Gulf states. It nests on the ground, laying 4 or 5 whitish, finely speckled eggs, and feeds upon insects and weed seeds. In winter, snowbirds often fly about barns or approach the doors of houses in search of food. Several varieties occur in the Western and the Southern states.

Sole (*Soleidæ*). The soles constitute a family of flatfishes related to the flounders. They differ from the flounders, however, in having small eyes, placed close together, and a small, much twisted mouth, with few teeth. There are about 150 species. The common sole (*Solea vulgaris*), found from Norway to Italy, is the most valued representative of the true soles. It is from 1 to 2 feet long, usually weighing about a pound, though sometimes reaching a weight of 9 pounds. When properly cooked, it is esteemed as one of the most delicate of European table fish.

Sparrow. A small bird of the finch family, usually with dull plumage, conical bill, and feeble song, living on or near the ground, and nesting in bushes or on the ground. The name was first given to the common house or English sparrow (*Passer domesticus*), but it is now extended over a large number of closely related species. Some 75 or more North American birds are known as sparrows. Among these are the black-throated, chipping, field, fox, lark, sage, savanna, seashore, song, swamp, tree, vesper, white-crowned, white-throated, and wood sparrows.

In strong contrast to the pestiferous English sparrow, the native American species are highly useful birds. They consume tons of noxious weed seeds in winter and myriads of injurious insects in summer, but destroy very little grain or cultivated fruit.

Spider. The spiders are insect-like arthropods forming the order *Araneida* or *Araneæ*, of the class *Arachnida*. They differ from insects in having the head and thorax united in one piece, called the cephalothorax; by having four pairs of legs; and by the absence of wings and antennæ. The abdomen, which is joined to the cephalothorax by a short, narrow stalk, is provided at the end with organs for spinning silk. This is used in weaving webs to entangle prey, for making abodes, and for various other purposes.

Spiders are carnivorous, feeding chiefly on insects. Some powerful tropical species, with bodies 3 inches long, are able to kill small birds, fish, and even rats. All spiders have poison glands, connected with their hooked, biting jaws, and use the venom from them in capturing their prey. In nearly all species the jaws are far too weak to pierce the human skin and the amount of poison they can eject is too small to produce any serious injurious effect. Some of the larger forms, called tarantulas, produce painful wounds, but, so far as accurate records go, these never prove fatal.

Spiders lay spherical eggs which the female winds with silk into a roundish mass called the cocoon. This she fastens in her web, to a grass stalk, or hides in her nest. The young are born in the form of their parents but differ from them at first in appearance. When grown, the males are much smaller than the females.

There are more than 10,000 known species of spiders, some 1300 of which are found in the United States. Among the chief families are the orb-web, trapdoor, funnel-web, crab, wolf, and jumping spiders. See *Tarantula*.

Sponge. A group of low water animals, forming the branch *Porifera*. The body is penetrated by numerous channels of pores, some of which are inlet tubes, others outlet tubes, and others form a third set connecting the two. The outside of the sponge is covered with a thin, leathery membrane, the *ectoderm*; the pores are lined with a softer membrane, the *endoderm*, and between these is a third membrane, the *mesoderm*, which is strengthened by fibrous, limy, or glassy material.

In the connecting tubes are chambers lined with ciliated cells. The water enters through the inlet tubes, passes through the connecting tubes, and is expelled through the outlet tubes. In passing through the chambers lined with ciliated cells, the cells capture and digest minute vegetable and animal organisms in the water, and by movement of the cilia create currents which keep the water moving through the sponge.

Sponges are almost exclusively marine. They are generally found attached to the underside of projecting rocks, or clinging to the roofs of submarine caverns. Common bath sponge is the siliceous skeleton of a certain kind of sponge with the living animal tissue entirely removed. Commercial sponges are mostly obtained from the Grecian archipelago, Florida, and the Bahamas.

Squid. A cephalopod mollusk, closely related to the cuttlefish and the octopus. It differs from the cuttlefish in having a narrow, horny pen or shell beneath the skin of its back, and from the octopus in having ten arms, two of which are much longer than the others. When pursued, it ejects an inky fluid to conceal its movements. There are many species, frequenting all seas and feeding largely upon fish. Some are used for human food.

The common squid (*Loligo pealei*), about 8 inches long, is abundant from Maine to South Carolina. The flying squid (*Ommastrephes illecebrosus*), about a foot long, common from Long Island northward, is much used for bait in the cod fishery. The California squid (*O. tryoni*), 8 inches long, is caught in great numbers on the Pacific coast, and dried for export to China.

The giant squid (*Architeuthis princeps*), of the North Atlantic, is the largest known invertebrate animal. Its body is sometimes 19 feet long, with tentacular arms 35 feet long, so that its total length

when outstretched exceeds 50 feet. Its huge eyes are 14 inches in diameter. See *Cuttlefish, Octopus.*

Squirrel. A small rodent mammal with a bushy, hairy tail. There are more than 250 species, occurring nearly everywhere except in Australia. In America the squirrel family (*Sciuridæ*) is divided into three groups—the marmots, the flying squirrels, and the true squirrels. The true squirrels are divided into the tree squirrels, the rock squirrels, and the ground squirrels, according to their mode of living.

The tree squirrels are mostly arboreal, living either in hollow trees or building spherical nests on the branches. The gray squirrel (*Sciurus carolinensis*) is typical of this group. As the name indicates, it is grayish or iron grayish on the back, and the tail is fringed with white. From tip of nose to tip of tail its length is 18 inches.

The rock squirrels live in rocks, stone piles, and fence corners. The chipmunk (*Tamias*) is the type of this group. It has cheek pouches, and uses them to gather and store up grain and nuts for the winter.

The ground squirrels burrow in the earth and store their food in their burrows. They live mostly on grain, and from this fact are known as spermophiles, or "seed lovers." They are most numerous west of the Mississippi river.

The largest squirrel in the world is the Malabar squirrel (*Sciurus malabaricus*) of India, over 30 inches long and weighing 4 pounds. The most beautiful squirrel is Prevost's squirrel (*Sciurus prevosti*) of the Malay peninsula, with a handsome color pattern of brown, black, white, and buff. Nearly all squirrels are eaten as food, and the skins of various species have some commercial importance as fur. See *Flying Squirrel.*

Starfish. The starfishes proper (*Asterias*) are echinoderms covered with a tough, leathery skin beset with prickles. They have the form of a star, with five or more rays radiating from a central disk In the middle of the undersurface of the disk is situated the mouth, opening into a digestive system which sends prolongations into each ray. If the prickly skin be removed, it will be seen to be supported by a series of plates beautifully jointed together. On the undersurface of each ray the plates exhibit a series of perforations, through which, in the living state, the ambulacra, or tubular feet, can be protruded so as to effect locomotion.

Starfishes are found in almost all tropical, European, and American seas, and some species occur as far north as Greenland. They are very destructive to oysters, clams, mussels, barnacles, snails, worms, and small crustaceans.

Starling. The starlings compose a large family of birds (*Sturnidæ*) intermediate between the crows and the blackbirds. There are about 200 species, mostly natives of tropical Asia and Africa. The common starling (*Sturnus vulgaris*) is a European bird noted for its song and powers of mimicry. It is about 8 inches long, with glossy black-brown plumage and a buff tip to each feather. Its food consists of insects, worms, snails, seeds, and fruits. When numerous, starlings sometimes inflict great damage on orchards. They nest in holes in trees or in old buildings, laying from 4 to 6 pale blue eggs. The starling was well known to the ancients and is now often kept as a cage bird. In 1890 it was introduced into Central park, New York, and has since become naturalized in several northeastern states.

Sting Ray (*Dasyatidæ*). A family of rays which have a slender, whiplike tail armed with a long spine having backwardly projecting teeth; called also "stingaree." In many species this tail spine serves as a very effective weapon, making a lacerated wound which, in man, is attended with much danger of blood poisoning. Sting rays inhabit nearly all seas, lying flat on sandy bottoms, and feeding upon crabs, oysters, and other shellfish. All hatch their eggs within the body. The common sting ray (*Dasyatis centrurus*), found on Atlantic shores from Cape Cod southward, attains a length of 12 feet. A similar species of the Pacific coast (*D. dipterura*) abounds in the vicinity of San Diego bay. See *Ray.*

Stork (*Ciconia alba*). A large, voiceless, Old World wading bird, closely related to the herons. It is common in summer over most of Europe and Central Asia, migrating southward in winter to Africa and India. It is about 3½ feet long, stands fully 3 feet high, and, excepting the black wing coverts, its plumage is pure white throughout. The long bill and the legs are red, the neck long and usually arched, and the breast feathers long and pendulous. The stork frequents marshes, feeding upon eels, frogs, lizards, snakes, small mammals, young birds, and insects. It also eats offal and scraps of food refuse around villages and towns. Long associated with man, it seeks rather than avoids human habitations. It usually selects a chimney or a roof for a nesting site, to which it returns year after year, although it sometimes builds its nest in trees or on high rocks. The eggs, 3 to 5 in number, are pure white.

In various European countries, particularly in Holland and in Germany, storks are welcomed and protected on account of their value as scavengers and also for their fidelity to their young, which is proverbial. It is a common belief among many peoples that good luck will attend the house to which a stork attaches itself, and when a new baby comes to a family it is customary to say "the stork has arrived."

The smaller black stork (*C. nigra*), of range similar to the white stork, lives in secluded swamps, nesting in tall trees. The wood ibis and jabiru are closely related American species.

Sturgeon (*Acipenseridæ*). The sturgeons compose an important family of ganoid fishes. They have cartilaginous skeletons; the body is armed with five rows of large, bony, and usually spiny bucklers, and the upper lobe of the tail is much larger than the lower. All are sluggish, bottom feeding fish; the mouth, which is situated beneath the snout, is sucker-like and devoid of teeth. There are about 30 species, abounding in rivers and seas. Some live exclusively in fresh waters; others are marine, ascending streams only to spawn. They range in length from 2½ to 30 feet. and include some of the largest living fishes, some attaining a weight of 2000 pounds.

All kinds of sturgeon are used for food, and, from their abundance, are of great economic value. Their flesh is marketed in vast quantities, both fresh and smoked, the roe forms the caviar of commerce, and their air bladders are made into isinglass. The common sturgeon (*Acipenser sturio*), of both shores of the Atlantic, is the largest and most valuable species in American waters. It sometimes attains a length of 10 feet and a weight of 500 pounds.

Sucker (*Catostomidæ*). A group of fishes closely related to the carp and minnows, but differing chiefly in the structure of the mouth, which is placed underneath the head and provided with fleshy, tubular lips for sucking food from the bottom of streams. There are about 60 species, all except two of which are found in the rivers of North America.

The white sucker (*Catostomus commersoni*), abundant in streams and lakes from Quebec to Montana and southward to Missouri and Georgia, attains a length of 18 inches, and is locally important as a food fish. The Buffalo Fish (*Ictiobus cyprinella*) of the Mississippi valley, so named because of its humped neck, is a huge sucker which attains a length of 3 feet and weighs from 20 to 40 pounds. Many millions of pounds of buffalo fish are marketed annually in Illinois, Missouri, Mississippi, and Arkansas. See *Carp, Minnow.*

Sunfish. A group of small, perchlike, freshwater fishes found in ponds and streams in most parts of North America. The common sunfish, or Pumpkin Seed (*Eupomotis gibbosus*), abundant from Minnesota eastward and southward, is usually about 8 inches long and weighs about half a pound. In color, it is olive green, often brilliantly marked with blue, orange, and scarlet. As it is easily caught, it is a prime favorite with young anglers. The blue-gill sunfish (*Lepomis pallidus*), a somewhat larger but less handsome species, is suitable for pond-culture.

Surf Fishes (*Embiotocidæ*). A family of small, perchlike fishes, 5 to 18 inches in length. All, save two Japanese species, are natives of California waters. They differ strikingly from all related higher fishes in being viviparous. The young, some 10 to 20 in number, are brought forth alive at an advanced stage of development, those of some species being about a third as long as their parents. The blue surf fish (*Embiotoca jacksoni*), first discovered in Sausalito bay in 1863, is the most common species.

Swallow. The swallows constitute a very distinct family (*Hirundinidæ*) of small passerine birds. They have compact, usually lustrous plumage; long pointed wings; more or less forked tails; very short, flat, triangular, deeply cleft bills, and weak feet, adapted only for perching. Swallows feed almost exclusively upon insects, which they capture on the wing. They nest in pairs and colonies, and during migrations associate in immense numbers. There are about 80 species, very widely distributed throughout the world, except in arctic regions. They cannot endure cold and hence migrate northward only upon the sure approach of summer, usually returning southward well in advance of frost.

Among the best-known American species are the familiar barn swallow, the cliff or eave swallow, the white-bellied or tree swallow, the rough-winged swallow, the bank swallow, and the purple martin. By reason of destroying many noxious insects, swallows are of considerable economic value.

Swan (*Cygninæ*). A group of large, graceful, web-footed, swimming birds, closely related to the ducks and the geese. Swans differ from geese in that the neck is longer than the body and from ducks in that the sexes are alike in color. There are about 8 species, all except 2 of which have pure white plumage. They walk awkwardly, fly strongly, and swim with remarkable grace. A young swan is called a cygnet. The handsome trumpeter swan (*Cygnus buccinator*), so named for its loud, sonorous cry, is found chiefly in the interior of North America and west to the Pacific coast, breeding from Iowa to the Arctic Ocean. It is about 5 feet long, with a wing spread of 8 to 10 feet.

The noisy whistling swan (*Olor columbianus*), 4½ feet long, with a wing spread of about 7 feet, nests and rears its young on the shores of the Arctic Ocean, ranging southward in winter to Mexico. At night its clamors may be heard at a distance of several miles. The famous black swan (*Chenopsis atrata*) of Australia, 40 inches long, is black throughout except the white outer wing feathers and the scarlet bill. It is comparatively tame and is frequently kept as an ornamental bird. The beautiful black-necked swan (*Chenopsis melanocoryphus*), of Argentina and Patagonia, is pure white throughout, except the upper part of the neck which is velvety black. The mute swan (*Cygnus olor*), native of Europe and Asia, so named because it is voiceless in the domesticated state, is the parent wild species from which the tamed swans of parks and gardens have been developed. It is about 5 feet long, with pure white plumage.

Swans were partly domesticated by the ancient Romans, who used their flesh for food. During the middle ages, swans became a part of the regalia of European courts, and only kings were permitted to keep them. Swans are now reared as ornamental birds throughout the world.

Swift. The swifts form a group of exceedingly active small lizards, which includes the small-scaled swifts (*Uta*) and the spiny swifts (*Sceloporus*). In the United States there are about 15 species of the former and 35 species of the latter, nearly all confined to the West and Southwest. The harmless common swift (*Sceloporus undulatus*), which feeds on insects, occurs from New Jersey to Oregon and southward. It is about 5½ inches long, gray with wavy black crossbands, and with sharply keeled and bristling scales. It frequents fallen tree trunks and rail fences, and moves about with lightning-like rapidity.

Swine (*Suidæ*). A name properly given to the domesticated pig or hog, but embracing also its wild relatives which include the Old World swine and the American peccaries. The true swine (*Sus*) have a long mobile snout, with the nostrils placed in its flat terminal surface, and narrow feet, each with four toes, two of which do not ordinarily reach the ground in walking. They include the wild boar of Europe (*S. scrofa*), the wild boar of India (*S. cristatus*), the banded pig of Sumatra (*S. vittatus*), the warty pig of Java (*S. verrucosus*), the bearded pig of Borneo (*S. barbatus*), and the pygmy hog of Nepal (*S. silvanus*). Closely related to the true swine are the river hogs and wart hogs, or bush pigs, of Africa, and the babiroussa of Celebes. See *Babiroussa*, *Hog*, *Peccary*.

Swordfish (*Xiphius gladius*). A huge, pugnacious fish of the open seas, with the bones of the upper jaw prolonged into a long, stiff, horizontally flattened sword. It attains a length of 15 feet and sometimes weighs from 400 to 800 pounds. The swordfish is a powerful fighter, and many instances are on record wherein it has driven its armed beak through the sides of boats or even of small ships. It preys upon fish which swim in schools, killing large numbers by swift strokes of its sword. While somewhat oily, its flesh is much esteemed for food, over two million pounds being marketed annually by New England fishermen.

Tanager (*tăn'à-jẽr*). The tanagers form a large, exclusively American family of birds (*Tanagridæ*), closely related to the finches, remarkable for their beautiful plumage. There are about 350 species, nearly all natives of the tropics, only 5 of which reach the United States during summer. They are forest-loving birds, nesting in trees, and feeding on flowers, fruit, and insects. Like many other birds of brilliant plumage, they are not musical. The scarlet tanager (*Piranga erythromelas*), about 7 inches long, bright scarlet with black wings and tail, breeds from Illinois and Virginia to southern Canada. The summer tanager (*P. rubra*), 7 inches long, dark red above and bright red below, is a summer resident of the southeastern United States which sometimes wanders northward as far as Nova Scotia. The western tanager (*P. ludoviciana*), 6½ inches long, with red, yellow, and black plumage, breeds from western Nebraska to British Columbia and southward to Mexico.

Tapir (*Tapirus*). Large, thick-skinned mammals of the tapir family, with the nose prolonged into a short movable trunk or proboscis. In appearance they somewhat resemble the pig and the elephant. Tapirs differ from all other ungulates in having 4 toes on the forefeet and 3 toes on the hind feet, all separate and with naillike hoofs. There are 5 known species, 4 of which occur in tropical America and 1 in the East Indies. Tapirs are forest loving and nocturnal, generally sleeping by day and going forth at night to feed upon fruits, grasses, water plants, and other vegetables. They are usually shy, solitary, and harmless, living near the water into which they invariably flee when attacked.

The American tapir (*T. americanus*), native to the great South American forests from Venezuela and Guiana southward through Brazil and Paraguay to Argentina, is about 6 feet long, 3½ feet high, and mahogany brown in color. It subsists chiefly upon palm leaves and fruits but often raids plantations in search of melons and sugar cane. It is much hunted by the natives for its juicy, well-flavored flesh, which is said to resemble beef. It is readily tamed when young, and domesticated tapirs are often seen wandering about the streets of South American towns. This species is the one commonly seen in menageries.

Tarantula (*tà-răn'tū-là*). The name given to various species of venomous spiders. The true tarantula is a large wolf spider (*Lycosa tarantula*) of southern Europe. Its bite was fabled to produce the dancing mania called tarantism. Several large hairy spiders of the American tropics, including the huge bird spider or the crab spider, are called tarantulas, as is a spider-like scorpion, *Tarantula whitei*, found from Texas to California. While painful, their bites, so far as authentic records go, are not dangerous and never prove fatal. See *Spider*.

Tarpon (*Tarpon atlanticus*). A magnificent game fish of the Gulf coast and West Indian waters, sometimes 7 feet long and weighing over 300 pounds. It is remarkable for its enormous silvery scales, 1 to 4 inches in diameter, which are sometimes sold as curiosities. Next to the tuna, it is the greatest of game fishes, and various points on the Gulf coast have become famous as resorts for tarpon fishermen.

Teal. A group of small, beautiful fresh-water ducks. There are about 15 species, all favorite game birds, widely distributed throughout the world. Teal are migratory, make their nests usually at some distance from the water, and lay greenish or cream-colored eggs. The most common North American species is the handsome green-winged teal (*Nettion carolinense*). Other North American species are the blue-winged teal (*Querquedula discors*) and the cinnamon teal (*Q. cyanoptera*).

Tern (*Sterna*). A long-winged, web-footed, swimming bird of very graceful flight, closely related to the gulls; called also sea swallow. There are about 50 species, distributed throughout the world, most abundant on ocean shores, but also found around many inland ponds, lakes, and riv rs. In size, terns are smaller and more slender than the gulls, ranging from 6 to 22 inches in length. Some 18 kinds of terns occur in North America.

Terrapin. Various small chelonians, often called pond turtles or river turtles. They inhabit marshes, ponds, and shores of slow streams. In size they vary from 6 to 14 inches, and often have beautifully colored markings. Several edible species are sold in markets as "slider" terrapin. The Diamond-back (*Malacolemmys palustris*), of the salt marshes of the Atlantic coast, is highly valued by epicures, selling from $60 to $80 a dozen and upwards. The shield plates of the shell or carapace have diamond-shaped markings, whence the name "diamond-back."

The painted terrapin (*Chrysemys picta*), also called "painted tortoise" or "mud turtle," is beautifully marked with crimson, yellow, and olive. It is about 5 inches long, and occurs from New Brunswick to Louisiana. The Western Pond Turtle, or Ellachick (*Chelopus marmoratus*), is the only fresh-water turtle of the Pacific region north of Lower California. See *Turtle*.

Thrasher (*Toxostoma*). A name given in the United States to several large thrushlike wrens, with a decurved bill, short wings, and a long tail. They are usually brown or ashy in color, with spotted breasts.

The brown thrasher (*T. rufum*), often incorrectly called "brown thrush," is one of the most familiar song birds of eastern North America. Like the mocking bird, to which it is closely related, the brown thrasher is a fine mimic. It is about a foot long, reddish brown above and buffy white streaked with blackish below. The brown thrasher nests from the Gulf states to Manitoba, Quebec, and Maine, and winters from Virginia southward. It builds its nest in bushes, thickets, and hedgerows, laying 3 to 6 bluish white, thickly speckled eggs. Its food consists chiefly of insects, spiders, small fruits, and seeds. Although injuring some grain and fruit, it amply pays for it by destroying cutworms, cankerworms, and other noxious insects.

Several similar species, including the curved-bill, Sennett, Palmer, Bendire, Leconte, Crissal, and California thrashers, are found in the western and southwestern United States.

Thrush. The thrush family (*Turdidæ*) includes many of our most familiar birds and sweetest songsters. In America, the robin (*Merula migratoria*) and the bluebird (*Sialia sialis*), both of this family, are among the earliest birds of spring, and build their nests in orchards or near the habitations of men. Of the true thrushes (*Turdus*), the veery, or Wilson's thrush, the hermit thrush, and the wood thrush are famous for the sweetness and brilliancy of their song. All are cinnamon-brown upon the upper parts with brown spots upon the breasts or sides, and all are inhabitants of groves and woodlands.

Among the thrushes of the Old World are the song thrush or mavis of the Scotch, the fieldfare, the blackbird, the song ouzel, and many others. The name thrush is also inaccurately given to birds of other families that are fine singers. See *Bluebird*, *Robin*.

Tiger (*Felis tigris*). The largest, most powerful, and most dangerous of the great cats (*Felidæ*), slightly exceeding the lion in size, and far surpassing it in destructiveness. The tiger is purely Asiatic and reaches its highest development, both in size and coloration, in the hot plains of India. A full-grown male Bengal tiger is from 9 to 11 feet and the tigress from 8 to 10 feet from the nose to the tip of the tail, and from 3 to 3½ feet high at the shoulder. The ground color of the body is rufous or tawny yellow, shaded with white on the ventral surface. This is varied with vertical black stripes or elongated ovals and brindlings. On the face and posterior surface of the ears the white markings are peculiarly well developed.

While possessing immense strength and ferocity, the tiger, unless strongly provoked, rarely attacks groups of armed men, though it often carries off defenseless women and children. In India the principal food of the tiger is cattle, deer, wild hogs, monkeys, and peafowl. When pressed by hunger or enfeebled by age and incapable of dealing with larger prey, such as buffaloes, the tiger prowls around villages, and, having once tasted human flesh, becomes a "man-eater." In 1902, man-eating tigers caused the destruction of about 1300 lives in British India. See *Cat Family*.

Toad (*Bufonidæ*). The common name for a numerous family of tailless amphibians. Most toads have a short-limbed, thickset body, a warty skin, and are terrestrial or burrowing in habit. They differ from the true frogs in the absence of teeth. Although living chiefly on land, toads almost uniformly deposit their eggs in water, though one African species brings forth its young alive. There are upwards of 100 species, of which 13 are found in the United States, the greatest variety occurring in Texas.

The common toad (*Bufo lentiginosus*) occurs from Mexico north to Great Slave lake eastward of the Rocky mountains, throughout North America. It is 3½ inches long, or longer, with a rough, warty skin, generally brownish above and yellowish below. It remains quiet in shady places or burrows beneath the earth during the day, going forth at night in

search of food. A single female sometimes lays as many as 12,000 eggs, which are deposited in water in gelatinous ropes or cylinders. When frightened, toads puff out their skins, which secrete an acrid fluid very irritating to tender surfaces, such as the lips of a dog, but otherwise they are harmless. Toads are not poisonous, nor can they produce warts. On the other hand, they destroy immense numbers of injurious insects and should, therefore, be preserved and protected. See *Amphibians*.

Torpedo (*Narcobatidæ*). A family of remarkable rays. They are provided with an electric organ, situated under the skin about the back of the head, which is capable of benumbing an enemy by a severe electric shock. Torpedoes are known also as crampfishes and numbfishes, and, though not abundant, are found in all warm seas. The torpedo, or crampfish (*Tetronarce occidentalis*), of the Atlantic coast, 3 to 5 feet long and sometimes weighing 200 pounds, is one of the largest species known. The rare California torpedo (*T. californica*), which reaches 3 feet in length, is sometimes taken in warm sandy bays on the Pacific coast. See *Ray*.

Tortoise (*Testudinidæ*). The common name of the land turtles whose limbs are developed for walking. Many frequent barren situations and some live in true deserts. Of some 40 species, 3 occur in North America. The gopher tortoise (*Testudo polyphemus*) dwells in burrows in sand hills from South Carolina to Texas. Its high dome-shaped shell is much longer than wide. Agassiz's tortoise (*T. agassizi*), about 9 inches long, is found in the deserts of Arizona and southern California. The giant tortoise (*T. vicina*) of the arid Galapagos islands, attains great size, weighs several hundred pounds, and is believed to live for centuries. Specimens have been kept in captivity for more than 100 years. See *Turtle*.

Totem Animals. Among savage peoples no belief is more common than that some peculiar kind of animal is the guardian of each clan or local group, protecting it in all its affairs. This animal is the totem of the group. Each member of the group must show this totem animal proper respect, may regard it without fear, must not injure, kill, or eat it, but must worship and propitiate it.

The savage believes that he is descended from his totem. His clan is named from it, and identified by crude symbols or images of it. Be it bear, deer, eagle, or whatever else, he may embroider it as a symbol on his tent, as did the Indians of the United States, or carve it on a tall post set in front of his house, as did those of Alaska; or he may tattoo it upon his body, as did the natives of the South Pacific. When an animal of the kind dies, he buries it with the same rites that are accorded to a member of his clan.

Toucan. The toucans form a numerous family of birds (*Rhamphastidæ*), allied to the puff birds and woodpeckers, remarkable for the immense size of their bills, sometimes more than half the length of the body, and for their brilliantly colored plumage. There are about 60 species, all natives of tropical America. While subsisting chiefly on fruit, they also devour small birds, lizards, and other small animals. Toucans are readily tamed and make interesting pets. The largest is the Toco toucan (*Rhamphastos toco*) of Argentina, 24 inches long, with a bill nearly 7 inches long. One of the best-known is the ariel toucan (*R. ariel*) of Brazil, with brilliant yellow and scarlet markings.

Tree Frogs (*Hylidæ*). This interesting family of small amphibians, though possessing teeth in the upper jaw, is otherwise closely related to the toads. Tree frogs vary from less than 1 inch to 5 inches in length, are usually green or variegated in color, and their toes are expanded into adhesive disks for climbing. Owing to a large resonating sack in the throat, their voices are surprisingly loud. They possess the power of changing color to correspond with that of their surroundings. Owing to their abundance, they destroy immense quantities of insects. There are about 200 species, occurring throughout the world except in Africa. Fifteen species are found in North America. See *Amphibians*.

Trichina (*trĭ-kī'nȧ*) (*Trichina spiralis*). A small, nematode worm, closely related to the hookworm. In its immature state it inhabits the muscles of man, the pig, and other mammals, the original host being presumably the rat. The young worms, about $\frac{1}{25}$ of an inch long, are the cause of a very painful and often fatal disease, called *trichinosis*, in man.

When pork containing the encysted worms is eaten without being sufficiently cooked, living worms are released. Upon passing into the intestine they become mature in a few days' time. The female, a slender round worm, about $\frac{1}{8}$ of an inch in length, immediately brings forth young worms, continuing for a period of 2 or 3 weeks. These young worms pierce the intestinal wall and migrate through the blood and lymph to the muscles, where they encyst themselves. In thus migrating, they often so seriously impair the action of the muscles of the chest, throat, and jaws, as to cause death. See *Hookworm*.

Trogon. The trogons constitute a family (*Trogonidæ*) of beautiful tropical birds, related to the cuckoos and kingfishers. There are about 60 species, found in both hemispheres, but most numerous in tropical America. Trogons are of moderate size—the largest being somewhat smaller than a crow—with strong bills, weak feet, and long tails. They live in forests, feeding on insects, fruits, and berries, most of which they seize when on the wing. Their eggs, 2 to 4 in number, are laid in holes in trees. Among the most handsome species are the resplendent trogon, the red-bellied trogon, and the quezal. The coppery-tailed trogon (*T. ambiguus*), 12 inches long, bronze green above, rose-pink below, with black throat, white breast, and copper-colored tail, is found from southern Texas to Arizona and south to Mexico.

Trout (*Salmo* and *Salvelinus*). The most beautiful and highly prized of American fresh-water game fishes, closely related to the salmon. They are usually small or of medium size, and are often handsomely colored with various spots and markings. There are several species, all exceedingly active, swimming with arrow-like swiftness, stemming the strongest currents, ascending rapids, and leaping up small waterfalls.

For food, trout seek living prey, chiefly smaller fishes, crawfishes, worms, and insects. Trout thrive in cool, clear, rapidly flowing waters in which there are rapids and deep pools. They are most numerous in northern and western mountain brooks. Most trout spawn at the approach of winter, depositing their eggs in nests hollowed in the bottom of the stream, where they hatch early in the following spring. Nearly all trout are very gamy and afford fine sport for the angler. Their delicately flavored flesh is highly prized for food.

The brook trout (*Salvelinus fontinalis*) is the best-known American game fish. It is found in cold streams and lakes, from Maine to North Dakota, northward to the Arctic circle. It occurs also in the mountains of Alabama and Georgia and has been introduced in the Rocky Mountain and Pacific states. In small streams it ranges from 6 to 10 inches in length, but in larger ponds and lakes it attains 18 or 20 inches. Usually it does not exceed 1 or 2 pounds in weight, though it sometimes reaches 4 or 5 pounds.

The Great Lake trout or Mackinaw trout (*Christovomer namaycush*) is a food fish of great value, usually weighing from 15 to 20 pounds, but sometimes reaching 50 or 80 pounds. It occurs in

the larger lakes from Maine to Vancouver island, northward to Labrador and Alaska.

The mountain trout (*Salmo clarkii*) is characteristic of mountain streams and lakes from Colorado to California and northwestward. It weighs from 4 to 6 pounds in Lake Tahoe and from 20 to 30 pounds in Alaska.

The rainbow trout (*Salmo irideus*), "by many anglers regarded as the gamest of all fishes." (Jordan), is found in the mountains of California and Oregon. It is from 15 to 18 inches long and usually weighs from 2 to 3 pounds. This trout closely resembles the European salmon (*S. fario*). The steelhead trout (*S. rivularis*) is a highly prized game fish found in river mouths and bays from Santa Barbara to Alaska. It weighs from 12 to 20 pounds, and, on the Columbia river, it is canned in large quantities for food. It has been successfully planted in Lake Superior by the bureau of fisheries. See *Salmon*.

Trunkfish (*Ostraciidæ*). A family of curious fishes, mostly of tropical seas. Their bodies are enclosed in a bony box made up of six-sided scutes, connected by sutures, leaving only the jaws, fins, and tail free. They are from 4 to 12 inches long, are slow of motion, live in shallow water, and are protected against most enemies by their bony carapace. Unlike most solid-jaw fishes, they are not poisonous, and are often baked in the shell for food. The common trunkfish (*Lactophrys trigonus*), with the body enclosed in a three-angled shell, occurs on the Atlantic coast from New York southward.

Tuatara (*tōō'ä-tä'rä*) (*Sphenodon punctatus*). A lizard-like reptile of New Zealand. It is the only living representative of the primitive order *Rhynchocephalia* which otherwise became extinct in the Triassic age. As first pointed out by E. D. Cope, the anatomy of the tuatara sharply distinguishes it from the lizards. For example, the carpus or wrist contains ten bones, the primitive number, and all are separate. It is a sluggish animal, about 2½ feet long, fond of the water, and feeds upon worms, insects, crustaceans, and fish.

Turkey (*Meleagris*). The largest of the gallinaceous birds, and the only native American representative of the pheasant family. The wild turkey (*M. gallopavo*), of which there are several varieties, formerly ranged from the table-lands of Mexico northward over much of temperate North America, but is now rare in the United States except locally in the South and Southwest. It is about 3½ feet long and usually weighs from 15 to 20 pounds. In general its plumage is of a copper-bronze color with green reflections and variously barred with white, brown, and black. It inhabits woodlands, securing much of its vegetable and insect food by scratching among the leaves. While it runs swiftly, it is also a strong flier and roosts in trees. It nests on the ground, laying about 12 creamy-white eggs. The male is fond of strutting with the feathers puffed out and the tail spread.

The domestic turkey, a descendant of the Mexican wild turkey, was introduced into Europe by the Spaniards early in the 16th century. It is now reared in many countries for its excellent flesh and is the only domestic animal contributed by the New World that is in wide and valued use outside of its native region.

Turtle (Order *Chelonia*). The turtles differ from all other reptiles in having the body incased by a protective shell of bony plates. The upper part of this shell is called the *carapace*, and the lower, the *plastron*. Usually the head, legs, and tail can be drawn into the shell. While generally provided with claws, the feet of marine turtles are modified into flippers. Most turtles are carnivorous, though some are herbivorous. All lay eggs, covered with a leathery shell, which are usually buried in the sand and hatched by the heat of the sun, the young digging their way out. Turtles have no teeth, but their jaws have horny, chisel-like biting edges. While the name turtle properly applies to *marine* forms, terrapin to *fresh-water* forms, and tortoise to *land* forms, there is much confusion in their use.

The flesh and eggs of many turtles are much prized for food. Among the most highly esteemed are the green turtle and various terrapin. The eggs of Amazonian turtles yield oil of commercial value. There are about 300 living species of turtles, of which 44 occur in North America. Many fossil turtles are known, some of which are of enormous size. See *Sea Turtle*, *Terrapin*, *Tortoise*.

Umbrella Bird (*Cephalopterus ornatus*). A singular South American bird, related to the bell birds and cotingas, so named because of its large umbrella-like crest, which droops forward so as nearly to conceal the bill. It also has a feathered tuft or lappet, several inches long, which hangs down from the breast. The umbrella bird is about the size of a crow, with glossy black plumage. It lives in the tops of high forest trees, building a platform-like nest of small branches and laying four pure white eggs. Its food consists chiefly of fruits.

Ungulates (*ŭng'gû-lâts*) (*Ungulata*). An order of mammals embracing all the hoofed animals, or those characterized by having from one to four blunt nails or hoofs on each foot. To this important group belong most of the domestic animals, such as the horse, ox, sheep, goat, pig, and also the deer, antelope, buffalo, zebra, camel, llama, giraffe, tapir, elephant, rhinoceros, hippopotamus, and many others. With few exceptions, all the ungulates are herbivorous land animals. Their molar teeth are adapted for grinding, and the canine teeth are either very small or wanting. In all existing species the toes never exceed four in number, and in no case are plantigrade.

The living ungulates are grouped into four suborders: odd-toed forms (*Perissodactyla*), including animals like the horse, zebra, tapir, and rhinoceros; even-toed forms (*Artiodactyla*), embracing the cloven-footed animals, such as the ox, deer, pig, camel, and hippopotamus; animals with a proboscis or trunk, *Proboscidea*, as the elephant; and the peculiar conies or hyraxes, *Hyracoidea*. The elephants and the hyraxes differ so greatly from other ungulates that they are often regarded as composing distinct orders. There are more than 300 living species of ungulates, grouped in about 13 families and found in all parts of the earth except the Australian region.

Vampire. True vampires are small bloodsucking mammals belonging to the family of leaf-nosed bats, native of tropical Mexico and Central and South America. The bloodsucking vampire (*Desmodus rufus*) is a reddish brown bat, about 3 inches long, which remains in caves or hollow trees during the day. It issues forth at night in search of prey, attacking horses, cattle, and other warm-blooded animals, even including man, while they sleep, shaving the skin with their incisor teeth, and sucking the blood as it flows. It is believed that blood constitutes the sole food of this and a few other smaller species.

The great vampire, or false vampire (*Vampyrus spectrum*), a large leaf-nosed bat, 7 inches long, with a wing spread of 28 inches, occurs in the Amazon region. Its hideous face, black, shining eyes, erect, leathery ears, exposed teeth, and spear-pointed nose, give it a most diabolical expression, but it eats only fruit and insects and is entirely harmless. See *Bats*.

Vicuña (*vĭ-kōōn'yà*) (*Lama vicunia*). A South American animal of the camel family, intermediate in size between the llama and the alpaca. The vicuña is about 2 feet high at the shoulder, with a

slender neck, erectly carried head, and rich brown curly wool spotted with white. It is an exceedingly fleet-footed, alert, and active animal, with habits similar to those of the wild goat or antelope. It lives in herds in desolate places at very high altitudes in the ndes. While much hunted for its flesh and wool, it has never been domesticated like the guanaco. See *Guanaco*.

Viper (*Viperinæ*). The vipers compose a group of Old World serpents containing about 40 species, all venomous. They are usually short, with a thick body and a flat, often triangular, head, with no pit between the eye and the nostril.

The common viper, or Adder (*Vipera berus*), about 10 inches long, the only snake in England except the water snake, extends eastward throughout Europe and Asia. The Asp (*V. aspis*), common in the Alps, is the only poisonous snake found as far north as Sweden. The Puff Adder (*V. arietans*), found nearly throughout Africa, some 6 feet long, is a much dreaded reptile. When angry it hisses loudly with a puffing sound. The chain viper (*V. russellii*), sometimes 5 feet long, next to the cobra, is the most dangerous snake in India.

The horned viper (*Cerastes cornutus*), of North African deserts, about 2½ feet long, with a horn-like spike above each eye, is a vicious, aggressive snake whose bite is usually fatal. The asp associated with the death of Cleopatra is now supposed to have been this species.

Vulture. The New World vultures (*Cathartidæ*) are large, turkey-like, carrion-eating birds of prey, with powerful wings and of graceful flight. The head and the upper neck are bare; the long, weak bill is but slightly hooked, the nostrils are perforate, and the toes have blunt claws. All are voiceless. They build no nests but deposit their eggs, 1 to 3 in number, in a crevice in the rocks, in a hollow tree, or on the bare ground. There are about 9 species, most abundant in warm regions where they perform invaluable service as scavengers.

The turkey vulture, or Turkey Buzzard (*Cathartes aura*), ranges from Saskatchewan to Patagonia. It is about 2½ feet long, with a wing spread of 5 feet. The plumage is lustrous black, the bare head and neck crimson, and the bill white. It is very graceful on the wing, and soars in great circles to enormous heights. While subsisting chiefly on carrion, it will devour fresh meat, and even small living mammals, birds, and reptiles.

The black vulture, or Carrion Crow (*Catharista urubu*), is found from the Gulf states to Argentina. It is about 2 feet long, with a wing spread of 4½ feet. It associates with the turkey buzzard and acts as a scavenger, going about in flocks in the streets of populous cities. The rare California vulture (*Gymnogyps californianus*), called also California condor, is one of the world's largest birds of flight. It is from 44 to 55 inches long with a wing spread of 8¼ to 11 feet, and weighs 20 to 25 pounds. In wing spread it sometimes surpasses the famous condor of the Andes but is usually a lighter bird.

The Old World vultures (*Vulturinæ*) are similar to the American vultures in appearance though different in structure. There are 17 species, including the widely known lammergeier, the griffon, and the Egyptian vulture, or Pharaoh's hen. See *Buzzard, Condor*.

Walrus (*Odobenus*). A large marine mammal, closely related to the seals and sea lions, found in arctic regions. It is known at once by its enormous tusks or canine teeth which project straight downward from the upper jaw. These are longest in the female and sometimes attain a length of 2½ feet. They are composed of solid yellowish ivory, which is much inferior, however, to elephant ivory. Walruses have a thick, clumsy body, deepest at the shoulder. They reach a length of 12 feet and a weight of 2200 pounds. The skin, which rests upon a thick layer of fat, is clothed with brown fur but becomes more or less bare with age. The head is small and the upper lip has a sort of mustache of long, yellowish bristles. The feet, which are adapted for swimming, are also furrowed for holding on to smooth ice.

Walruses feed largely on clams and other mollusks, dug from the sea bottom with their tusks, though they also eat fish and various crustaceans. During the breeding season they visit islands and ice floes, often congregating in large numbers. Ordinarily only one young is produced at a birth and is suckled by the parent for about two years. In disposition the walrus is gentle and inoffensive, though a fierce, persistent fighter when attacked, and quick in rushing to aid a wounded companion.

There are two living kinds of walrus, one found in the Atlantic and the other somewhat larger form, in the Pacific. The Atlantic walrus (*O. rosmarus*), formerly abundant as far south as Newfoundland, is now found in few localities on the shores of the Arctic Ocean. The Pacific walrus (*O. obesus*) is the largest marine carnivore. It once existed in great herds on the northern shores of Alaska. Like the Atlantic walrus, it has been largely exterminated by commercial hunting for its valuable oil, hides, and tusks. South of the Aleutian islands it is now rarely seen.

To the Eskimo, the walrus is exceedingly valuable, furnishing flesh for food, oil for fuel and light, skins for making boats, sinews for bird nets, and ivory for various tools and implements. The almost total destruction of the walrus through commercial hunting caused great privation among the native peoples of Alaska and Siberia.

Wapiti (*wŏp'ĭ-tĭ*) (*Cervus canadensis*). A large, handsome species of true deer, the North American representative of the stag of Europe. It is usually but incorrectly called "elk." It was formerly widely distributed over the United States and Canada, but is now restricted to limited districts in the Rocky mountains and on the Pacific coast, being most numerous in the vicinity of Yellowstone national park.

The wapiti attains a height of about 5 feet at the shoulder and a weight sometimes exceeding 800 pounds. It is reddish brown in color, with blackish shades on the legs and ears. The antlers have a spread of 4 feet or more and weigh 20 to 30 pounds. Thriving equally well in mountains, forests, or plains, the wapiti is easily kept in parks and game preserves and increases in number in captivity. The Roosevelt wapiti (*C. roosevelti*), yellowish brown, with darker head and neck, and white spots on the body, is found in the Coast ranges of Oregon, Washington, and British Columbia. See *Deer* and *Moose*.

Warbler. Properly, a small song bird of either of two numerous passerine families, the American *Mniotiltidæ* or the Old World *Sylviidæ*.

The New World family, called by some the wood warblers, contains, according to Ridgway, about 200 species, most of which do not exceed 6 inches in length. They have pretty though never gorgeous plumage, and, while some sing well, most warblers have weak voices. With few exceptions, all are woodland birds and feed wholly upon insects. Of 60 or more kinds found in the United States and Canada, nearly all pass the coldest months within the tropics. Among these are the prothonotary, yellow, parula, swamp, Kentucky, Blackburnian, and hermit warblers. The birds known as redstart, ovenbird, yellow-breasted chat, water thrush, and Maryland yellowthroat are various species of wood warblers.

The Old World warblers number about 100 species, of which some of the best-known are the grasshopper, sedge, and willow warblers. The famous nightingale and robin redbreast belong to this family.

Wasp. The wasps belong to the *Hymenoptera*, the highest order of insects. They include the solitary wasps (*Sphecoidea*) and the social wasps (*Vespoidea*).

The social wasps, such as the hornet, or yellow jacket, are the best known. They build nests of paper attached to bushes, trees, roofs, and eaves of buildings. The paper is manufactured from wood fiber obtained from posts and unpainted boards. This is chewed in the mandibles or jaws and united into sheets, often of considerable extent. The nests are often top-shaped or balloon-shaped, with horizontal layers of cells inside resembling honeycomb, all enclosed in a spherical paper covering with a hole at the bottom for entrance and exit. The nests of some tropical species are occasionally 6 feet long. These wasps savagely attack intruders, and their sting is extremely painful. Wasp colonies include three forms,—males, females, and workers.

The solitary wasps include miners or diggers, mud daubers, and carpenters. The mason wasps, or mud daubers, are the most familiar, as their mud nests are commonly seen on beams and walls. The carpenters cut tubular nests in wood and divide them by mud partitions. The miners dig tunnels in the earth. Wasps are endowed with a marked degree of intelligence. See *Ant*, *Bee*, *Honeybee*.

Water Flea. A general name applied to small or microscopic crustaceans of the group of *Entomostraca*, found in all waters. They are mainly herbivorous, feeding upon the microscopic plants that float free in the water. In their turn, these minute crustaceans constitute a most important food supply for fishes and other aquatic animals. All water fleas have jointed swimming feet and antennæ. *Cyclops* has a pear-shaped body and a forked tail. *Daphnia* has a flat body enclosed in a delicately sculptured, two-valved, spine-tipped sh ll. There are many other common forms of great beauty and interest. As their bodies are highly transparent and their internal organs varicolored, many water fleas, when observed through a microscope, are most beautiful objects. See *Crustaceans*.

Water Snake (*Tropidonotus*). A large genus of fresh-water snakes, living in ponds, rivers, and swamps. There are about 100 species, widely distributed in North America, Europe, and Asia. Ten species are found in the Southern and the Eastern states. While active and pugnacious, none are venomous. The common water snake (*T. fasciatus*, var. *sipedon*), often wrongly called "water moccasin," is very abundant from Canada to Wisconsin and southward. It is from 3 to 4 feet long, dingy brown above and spotted with red below. When cornered it flattens its head and strikes viciously, but it is perfectly harmless. It is ovoviviparous, sometimes producing 40 young in a brood.

Weakfish (*Sciænidæ*). A family of spiny-finned sea fishes, many of which are highly prized for food. The common weakfish, or Squeteague (*Cynoscion regalis*) is one of the most valuable food fishes of the Atlantic coast. It is graceful in form, has an undivided tail fin and a projecting lower jaw. It usually weighs from 1 to 6 pounds, though it is often larger. The White Sea Bass, or Santa Catalina Salmon (*C. nobilis*), attaining a length of 4 to 6 feet and a weight of 20 to 80 pounds, is an important food fish of the Pacific coast. The California Bluefish, or Corvina (*C. parvipinnis*), steel-blue in color, sometimes 2 feet long and weighing 8 pounds, is also an excellent food fish.

Weasel (*Putorius noveboracensis*). A small fur bearing mammal of the family *Mustelidæ*. It has a remarkably slender body, a long head, and short legs, and is usually from 12 to 16 inches long, inclusive of the rather short tail. In color it is brown above and white or pale yellow below, with the end of the tail black. In the North, during winter, the fur, except the black tip of the tail, becomes more or less white. When in the winter phase, the animal, like various other species of weasels, is known as ermine.

In one or more of its varieties, the common weasel occurs throughout the eastern United States and Canada, ranging westward to Minnesota and southward to North Carolina. With tireless energy and great courage it preys upon rats, mice, hares, rabbits, birds, and other small animals. Fastening upon the neck of its victim, the weasel first sucks its blood, next devours its brains, and then sometimes eats part of its flesh, often killing many more animals than it needs for food. It is especially fond of eggs and is a notorious despoiler of birds' nests and henroosts. Although numerous, even near large cities, the weasel is but little known to most people, owing to its habit of coming forth only at night. It lives in holes under walls, rocks, and trees, and in burrows captured from woodchucks and ground squirrels. See *Ermine*.

Weaver Bird. The popular name for a numerous family (*Ploceidæ*) of Old World birds, closely related to the finches. There are about 275 species, 200 of which occur in Africa and the remainder in Asia and the East Indies. They are small birds, with conical, often coral-red bills, noted for their remarkabl skill in weaving elaborate nests. These exhibit great diversity of form and structure. Some are pouches elongated into tubes, entered from below; others are kidney-shaped, with the entrance at the side. The social weaver bird (*Ph letærus socius*) lives in communities, building an umbrella-shaped roof in a tree, under which there may be as many as 200 or 300 individual bird homes.

Weevils. A general name applied to seed-eating snout beetles (*Ryncophora* in the order *Coleoptera*), especially to those that feed upon grain. The most important are the members of the genus *Calandra*, which feed upon cereals, as, for example, the granary weevil and the rice weevil. They are exceedingly hard-shelled, very small beetles, one-eighth of an inch long, of grayish color, with the front of the head produced in a long, stout beak. In tight bins, weevils are controlled by fumigation with poisonous gases. See *Beetle*, *Boll Weevil*.

Whale. A cetacean mammal the largest of living animals. Though fishlike in form and living only in the sea, whales are true mammals. They are warm-blooded and air breathing, bringing forth their young alive and suckling them in the same manner as land mammals. There are two types of families, the baleen whales (*Balænidæ*) and the sperm whales (*Physeteridæ*), comprising in all about 25 species, distributed in all oceans.

The whale has an immense head, with distorted jaws and upward directed nostrils, great bulk, and rudimentary limbs. The nostrils, commonly called blowholes, are placed on the top of the head, and the animal can breathe only when these are above water. Instead of being vertical, as in fishes, the tail is horizontal, and furnishes immense driving power. The tail is used also as an offensive and defensive weapon. The blubber, which is a thick layer of fat, preserves the animal heat, and serves to bring the mighty bulk of the whale nearer to the specific gravity of the water in which it spends its life.

The food of whales consists chiefly of minute mollusks and crustaceans with which their immense pasture grounds in the seas abound. In the baleen whales the enormous head is entirely destitute of teeth. Instead of teeth, the palate is furnished with an apparatus of baleen, or whalebone. This serves the purpose of straining out of the water the small marine animals upon which these whales feed.

The sulphur-bottom whale (*Balænoptera sulfureus*) of the Pacific Ocean, the largest of the baleen group, and the largest known whale, sometimes reaches a length of 95 feet, and a weight of about

150 tons. The baleen of such whales weighs about 800 pounds. The blubber is from 1 foot to 2 feet in thickness, the whole mass in a large whale sometimes weighing more than 30 tons.

The right whale (*Balæna mysticetus*), called also the Greenland whale or "bowhead," is the most important species commercially. It abounds chiefly in the arctic regions, attaining a length of 60 or 70 feet. It furnishes large quantities of baleen and oil,—a single specimen sometimes yielding 3500 pounds of whalebone. The California gray whale (*Rachianectes glaucus*), 45 feet long, which frequents shallow water from the arctic seas to Lower California, is a savage and dangerous species.

Sperm whales have teeth in the lower jaw, but no baleen plates or whalebone. They live almost entirely upon cuttlefish and squid. The huge, very blunt head occupies one-third of the length of the body. The entire head consists largely of a cartilaginous case filled with an oily liquid. On exposure to the air, this oillike matter hardens, and the resulting waxlike substance is the valuable spermaceti of commerce, much used in making candles. The oil of this whale, called sperm oil, is much superior to ordinary whale oil. Another product is ambergris, used in perfumery. This is formed in the intestines but is usually found floating on the sea. The great sperm whale (*Physeter macrocephalus*), the largest and best-known member of the group, found in all warm seas, attains a length of 55 or 60 feet.

Whale fisheries were formerly a very important industry. Large fleets of whaling vessels sailed to nearly all quarters of the globe. Whale oil, whalebone, sperm oil, and spermaceti were staple articles of commerce. However, since the introduction of petroleum, gas, and electric lighting, the industry has greatly declined.

Whale Shark (*Rhinodon typicus*). An immense shark, called also basking shark, of the tropical Indo-Pacific ocean. It attains the greatest length of all known living fishes, sometimes exceeding 50 feet and reputed to reach 70 feet. It is a sluggish monster, with the mouth and nostrils near the end of the muzzle, and with feeble teeth. It does not pursue its prey, but feeds upon small marine creatures taken without effort. Like most species of sharks, it is harmless to man. See *Shark*.

Whippoorwill (*Antrostomus vociferus*). A species of goatsucker or nightjar, so named because of its peculiar cry, which is repeated continually in the night. The whippoorwill is found throughout eastern North America from the Canadian border southward. It is about 10 inches long, grayish in color, variegated with blackish and buff. The whippoorwill remains hidden during the day and flies by night, usually with its large mouth wide open to catch the insects which constitute its food. It makes no nest, but lays two brown-blotched whitish eggs on the ground or on a log or stump.

The similar Chuck-will's-widow (*A. carolinensis*), 12 inches long, reddish brown in color, occurs in the southern United States. It flies during twilight, feeding upon various insects. The Poorwill (*Phalænoptilus nuttallii*), about 10 inches long, breeds from Nebraska to British Columbia, southward into California, and winters in Mexico and Guatemala. It feeds upon night-flying moths and other nocturnal insects. See *Nighthawk*.

Whitefish (*Coregonus*). A group of food fishes of the salmon family. They have a long, flattened body, a cone-shaped head, and a very small mouth, almost destitute of teeth. In color they are bluish olive above and silvery below and on the sides. There are some 15 species, found in lakes and streams in northern America, Europe, and Asia.

The common whitefish (*C. clupeiformis*), 1 to 3 feet long, with an average weight of about 4 pounds, is regarded as the finest flavored food fish of interior American waters. It occurs in lakes from New England westward to Lake Superior and northward to the Arctic circle. The annual catch in the United States and Canada exceeds 30 million pounds.

The Sault whitefish (*C. labradoricus*), called also lake whiting, about 20 inches long, is found in clear lakes and streams from Maine to Labrador and Lake Superior. The Rocky Mountain whitefish (*C. williamsoni*) occurs in clear streams from the Rocky mountains to the Pacific coast. Like the trout, it will take a fly and is a favorite of sportsmen.

The closely related Lake Herring, or Cisco (*Argyrosomus artedi*), of the Great Lakes region, ranks next to the common whitefish in commercial importance. It is somewhat smaller, usually about 15 inches long, bluish above and silvery below, with a larger mouth and a projecting snout.

Wolf (*Canis*). A savage animal of the dog family, closely related to the fox and the jackal. There are several species, with numerous varieties, found chiefly in northern regions. None occur in Africa, South America, or Australia.

The gray wolf, or timber wolf (*C. occidentalis*), strongly resembles a tall, gaunt dog, with a wide head, erect ears, long nose, and pointed muzzle. The obliquely set eyes give it a vicious appearance. Including the bushy, drooping tail, it is about 5 feet long, and stands slightly over 2 feet high at the shoulder. In color it is gray above, more or less mixed with blackish, and yellowish gray varying to white below. As a rule, it is sly, stealthy, and cowardly, but, when provoked by hunger, becomes bold and dangerous.

The timber wolf lives chiefly upon poultry and other small animals, preying habitually upon the weak, sick, and injured. When hungry, it will eat also birds, mice, frogs, and sometimes carrion. It hunts singly and in packs. A single wolf can bring down a full-grown deer. A numerous pack will attack cattle, horses, and the largest game animals. Except when desperate from starvation, wolves rarely, if ever, molest man.

During the spring and summer, wolves live singly or in pairs, making dens in caverns in the rocks, in hollows under the roots of trees, or in holes in thickets dug by themselves. In these the young, called cubs, usually from 6 to 10 in number, are reared. During autumn and winter they often congregate in packs. When in groups, wolves utter short, rapid, snarling or snapping cries, but when alone their call is usually a long, weird, blood-curdling howl.

While formerly numerous, the timber wolf has been practically exterminated east of the Mississippi river and Lake Huron. It is locally abundant in the Rocky Mountain region, in the Pacific states, and in northern Canada, where it is often very destructive to sheep and other domestic animals.

The prairie wolf, or Coyote (*C. latrans*), is similar in form and color to the timber wolf but is about one-third smaller. While an exceedingly cowardly and slinking animal, it is a notorious killer of poultry, pigs, lambs, rabbits, young colts, calves, and other farm animals. The coyote is found in the Rocky Mountain region, from Mexico to northern Canada.

The white wolf (*C. albus*) of arctic America, pure white except the black-tipped tail, and the black wolf (*C. ater*) of the Florida everglades, are very closely related to the gray wolf. The European gray wolf (*C. lupus*), especially numerous in parts of Russia and Siberia, is also very similar in appearance, habits, and disposition to the American gray wolf.

While varying much as to length and thickness of hair, wolf skins are much prized for fur, and are extensively made into coats, robes, and rugs. See *Dog*, *Fox*, *Jackal*.

Wolverene (*Gulo luscus*). A carnivorous fur bearing animal, found in the northern United States and Canada. It is closely related to the marten, and is called also "carcajou," "glutton," and

"skunk-bear." It is about 2½ feet long exclusive of the tail, with a thickset body, square head, low ears, strong, short legs, bearlike feet, and a bushy tail. In color it is blackish with a light brown or whitish stripe on each side. The wolverene is noted for its voracity, ferocity, and sagacity. It feeds upon small mammals, birds, and carrion.

Where numerous, wolverenes are a great obstacle to fur-hunting, robbing traps of their bait or captured animals, and displaying great cunning in avoiding capture. The wolverene is notorious also for plundering stores of meat, fish, and provisions, often carrying away and hiding articles that it cannot use. Its valuable fur is much used for making mats, robes, and muffs.

Wombat (*wŏm'băt*) (*Phascolomys wombat*). A burrowing marsupial mammal, native to Australia and Tasmania. It is from 2 to 3 feet in length, of clumsy form, with stout legs, very short tail, blunt snout, and rough hair of varying color. In actions and general appearance, wombats resemble small bears. They have a similar shuffling gait, and even shorter legs and broader backs. Wombats live usually in burrows, and feed chiefly on roots, grasses, and other vegetable substances. In habit, they are nocturnal, sleeping by day and going forth for food at night. While possessing only limited intelligence, wombats are gentle in disposition and are capable of a minor degree of domestication. Their flesh, which is said to resemble pork, is highly esteemed for food. Besides the foregoing, there are several less common species, of similar size and habits. See *Marsupialia*.

Woodchuck (*Arctomys monax*). A hairy-tailed rodent, allied to the squirrels and known also as the American marmot and ground hog. It inhabits North America from the Atlantic seaboard to Nebraska and from Hudson bay to South Carolina. A full-grown specimen is about 19 inches long, inclusive of the tail, and weighs from 10 to 15 pounds. The head is broad and flat, the legs short, and the body thick and "chunky." The prevailing color is a grizzly, reddish gray, although individuals are frequently nearly black, while others are whitish. The fur has no commercial value.

Woodchucks dig holes, preferably in gravelly hillsides, in which they live and in which the young are born. The bottom of the burrow is usually below the frost line and may extend from 15 to 20 feet underground, sometimes having several connecting passages. In summer they frequent meadows and cultivated fields, doing much damage to the crops upon which they feed, and becoming very fat. At the approach of winter they retire to their burrows, preferring those in the woods, where they remain in a comatose state until spring.

The woodchuck is one of the earliest animals to go into winter quarters and one of the first to emerge in spring. According to popular legend he emerges on February 2, "Ground-hog Day." If he sees his shadow, he immediately returns to his burrow and sleeps six weeks longer, betokening a late, cold spring.

Woodcock (*Philohela minor*). A small game bird of the snipe family, found in eastern North America from Labrador to Manitoba and southward. It is about 11 inches long, with a stout body, short neck, and a long bill which is very sensitive at the tip. The large eye is placed far back in the head. In color it is mottled tawny, black, and gray above, and pale grayish buff below. The woodcock inhabits fresh-water swamps and margins of streams, feeding at night upon earthworms and various insects, which it secures by probing in the mud or by turning over leaves. It builds a nest of leaves and grass, usually on the ground in woods, and lays 4 buffy white eggs spotted with brown. The European woodcock (*Scolopax rusticola*) is similar but much larger. Both species are highly prized for the table, and, in consequence, their numbers have been very greatly depleted by hunting.

Woodpecker. The woodpeckers form a large and distinctly marked family of birds (*Picidæ*). They are forest birds, ranging from about 5 to 20 inches in length, with long, powerful, chisel-shaped bills, well adapted for cutting wood. The feet have two toes directed forward and two (rarely only one) backward, with strong claws for climbing. In many species the short, stiff, spiny-tipped tail feathers serve as a prop when climbing or resting. The long, distensible tongue has a horny, spearlike tip for impaling insects. Woodpeckers nest in holes which they excavate in trees, and their eggs are uniformly white. They feed chiefly upon insects, such as borers, grubs, and ants, which they dig from the bark and wood of trees. Some eat berries, seeds, and acorns, which they sometimes store like squirrels, and others subsist in part upon the sap of trees. The vocal powers of woodpeckers are of limited range, though some have strong, clear notes. Most species beat with their bills a long, rolling tattoo, which is a mating call or love song.

There are about 400 species of woodpeckers, found throughout the world except in Australia, Polynesia, and Madagascar. About half of these are native to the New World, some 25 occurring in North America. Among these are the flicker, the sapsucker, and the red-headed, white-headed, hairy, downy, ivory-billed, pileated, and three-toed woodpeckers. The California woodpecker (*Melanerpes formicivorus*), closely related to the eastern redhead, is noted for its habit of drilling holes in trees, sometimes thousands in a single trunk, into each of which it hammers an acorn to be used later as food.

Although occasionally eating fruit or grain, woodpeckers are very useful birds, destroying millions of tree borers and other injurious insects.

Wren. The wrens form a numerous family (*Troglodytidæ*) of small song birds. They are closely related to the mocking birds and creepers, and comprise about 150 species, chiefly natives of tropical America. About 12 occur in the United States, but only one true wren is found in Europe. Wrens have a somewhat curved bill, very short wings, a short tail, usually carried erect, slender legs, and dull plumage. As a rule, they are active, nervous, aggressive, highly musical birds, 4 to 8 inches long, dwelling mostly on or near the ground, in thickets, patches of cactus, or in piles of rock. Their food consists almost entirely of insects.

The familiar house wren (*Troglodytes aëdon*), 5 inches long, nests in or near dwellings from the Gulf states to Manitoba, Quebec, and Maine, and winters from South Carolina southward. It builds its nest in hollow trees, crevices in rocks, holes in walls, or in bird boxes, laying from 6 to 8 minutely speckled eggs, and often rearing two broods in a season.

Among other interesting species are the Bewick, Carolina, winter, and marsh wrens of the Eastern and Southern states, and the Baird, Vigors, Parkman, cactus, rock, and canyon wrens of the Western and Southwestern states. Of these, the cactus wren, about 8 inches long, is noted for its large size, and the Carolina and canyon wrens for their powers of song.

Yak (*Bos grunniens*). A ruminant mammal related to cattle and sometimes known as the "grunting ox of Tartary." It inhabits the highest and coldest regions of central Asia, pasturing near the snow line on the mountains. The yak is about the size of the domestic ox, which it somewhat resembles in form. The head is short, the horns tapering, spreading, and curved backward. The body is covered with long, silky, usually blackish brown hair which hangs down like the wool of a sheep. Between the horns is a mass of thick curly hair, and over the shoulders is a large bunch of long, fine hair, resembling a hump, and giving the animal the appearance of a buffalo or zebu. The tail is covered with long hair, like the tail of a horse,

and descends nearly to the ground. The voice is a short grunt very similar to that of a pig.

The domesticated yak is of great importance to the Tibetans, forming a large part of their wealth. It is used as a draft animal, as a saddle animal, and as a beast of burden. The milk is rich and yields a high per cent of butter, which is an important article of domestic commerce. The meat resembles beef and is palatable and nutritious. The hair is spun into ropes or woven into cloth for tent coverings; the finer fur of the hump is used for clothing. The skins, tanned with the fur on, are used for caps, outer winter garments, rugs, and blankets.

Yellowbird. The name given to several familiar birds with predominantly yellow plumage. In the United States, the name is applied to the American goldfinch and especially to the yellow warbler (*Dendroica æstiva*), which is commonly known as the "summer yellowbird." The latter is common in summer throughout the eastern United States and Canada. In color it is a bright yellow dimly marked with salmon-colored streaks. It builds a deep nest of strong, compactly woven fibers, which is placed in an upright fork of a shrub or small tree. The pinkish white eggs, 4 or 5 in number, are marked with reddish and purplish dots. Summer yellowbirds often outwit the cowbird which drops an egg in their nest, by building a false floor over the intruding egg and then hatching their own brood above it. Like various other warblers, the summer yellowbird has a sweet, trilling song, which is often heard in gardens, parks, and orchards. See *Goldfinch, Warbler.*

Yellowlegs (*Totanus*). The popular name for two well-known American birds of the snipe family. They have long, slender bills, cross-barred tail feathers, and long, greenish yellow legs. Because of their great alertness and continual noisy calls, sportsmen often call them "telltale snipe."

The greater yellowlegs (*T. melanoleucus*) is about 14 inches in length with a wing spread of 2 feet. The upper parts are dark ashy, and the under parts are white, streaked and barred with black. During some part of the year this game bird inhabits nearly all parts of the Americas. In summer, it breeds from the northern United States northward far beyond the Arctic circle; in winter, it migrates as far south as Argentina. In the United States, it is seen most commonly along ocean shores, though it migrates through the Mississippi valley, and is found also around the interior lakes. Its food consists largely of small fishes, mollusks, shrimps, crabs, worms, and insects. Its nest is a grass-lined depression in the ground, in which it lays usually 4 greenish yellow eggs, blotched with gray and brown.

The lesser yellowlegs (*T. flavipes*), 10 to 11 inches long with a wing spread of 20 inches, is very similar in color, range, and habits. In the eastern United States, it is more common than the greater yellowlegs, flies in larger flocks, and is better known to hunters of shore birds.

Yellowtail. The name given in various parts of the world to several different fishes because of the yellow or orange color of their tail fins. The yellowtail, or blanquillo (*Caulolatilus princeps*), of southern California and Mexican coasts, is interesting as a game fish, and is also highly prized for food. It is closely related to the Atlantic tilefish, and is abundant along rocky shores. While usually of smaller size, it attains a length of 3 feet and a weight exceeding 50 pounds.

Zebra (*Equus*). A large asslike mammal, native of Africa. It is strikingly distinguished from all other members of the horse family by having the body marked with dark brown or blackish stripes. It differs from the horse in its larger head, longer ears, narrower hoofs, and upright mane. Four species are usually recognized, one of which, the *quagga*, has recently become extinct.

The mountain zebra (*E. zebra*), often called the "true" zebra, is a native of the mountainous districts of South Africa. It is about 4 feet high at the shoulder, of graceful form, with slender limbs, light head, and long open ears. Its ground color is white or yellowish white, and the head, neck, body, and legs are transversely striped with black. This handsome species has now become rare.

The other living species are Burchell's zebra (*E. burchelli*), of South Africa, and Grevy's zebra (*E. grevyi*), which inhabits the hilly country north of the Victoria Nyanza. The former, called "dauw" by the Boers, is the species most often seen in menageries. The latter is more slender than the true zebra, and the black markings are narrower and closer together. The habits of the zebra, on the whole, are very similar to those of wild horses and asses. See *Horse.*

Zebra Wolf (*Thylacinus cynocephalus*). The largest of the flesh-eating marsupial animals; called also pouched dog, Tasmanian wolf, or thylacine. It is slightly smaller than the common wolf, which it resembles in general appearance, but differs by having black stripes across the back, somewhat like those of a zebra. This peculiar marsupial is found only in Tasmania, where it was formerly abundant. In its nocturnal raids for food, it commits great depredations on sheep and poultry. See *Marsupialia.*

Zebu (*Bos indicus*). The European name given to the humped ox found in southern Asia, eastern Africa, and adjacent islands. It has been domesticated since remote antiquity and the parent wild species is unknown. The ancient Egyptians pictured it on their monuments, and the Hindus have held it in age-long veneration. Thousands of years of domestication have produced breeds varying extremely in size, some being larger than our largest oxen while others are no larger than a Newfoundland dog.

The prevailing color is a rusty gray or mouse color but this is not constant, buff, red, and black also being found. The ears are pendulous and the horns usually short or wanting. There is a conspicuous dewlap, and a prominent fatty hump over the shoulders. The flesh makes excellent beef, the fatty hump being regarded as a great delicacy. These cattle are gentle and docile, and are used as beasts of burden and as draft and saddle animals. It is said that a zebu may be driven 30 miles in a day when hitched to a carriage, or ridden when saddled at the rate of 6 miles an hour for 15 hours.

In India, the white bulls are considered sacred by the Brahmans and allowed to graze, without interference, in gardens and cultivated fields as they will. Humped cattle have been introduced into Central America and Jamaica for use on plantations. The Galla Ox, called also sanga or sunga, is a peculiar Abyssinian breed with massive horns nearly 4 feet long. See *Ox.*

Zeuglodon (*zū'glō-dŏn*). A member of a group of extinct whalelike cetaceans whose fossil remains are found in the strata of the Eocene period. The living animal was probably about 70 feet long and in shape somewhat resembled the whale of the present day, but was more slender and snakelike. It differed from all existing whales, however, in having two kinds of teeth. The incisors and canines were conical, but the back teeth, or molars, had serrated triangular crowns and were inserted in the jaw by two roots. In appearance each molar tooth resembled two teeth united by their crowns. This peculiarity gave rise to the name zeuglodon, which, in Greek, means "yoke tooth."

The bony remains of these whales occur in great profusion in the Eocene marls of the southern United States. According to Dana, the larger joints of the backbone (vertebræ) were a foot and a half long and a foot in diameter. In some localities in Alabama these bones were formerly so abundant that they were built into walls or burned in order to clear the fields for cultivation.

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MOTHS AND BUTTERFLIES

1 Ailanthus Silkworm Moth. 2 Polyphemus Moth. 3 Cocoon, Ailanthus Silkworm Moth. 4 Luna Moth. 5 Cocoon, Polyphemus Moth. 6 Larva, White-lined Sphinx Moth. 7 Promethea Moth. 8 Larva, Cecropia Moth. 9 Spicebush Swallow-tail Butterfly. 10 Cocoon, Cecropia Moth. 11 Mourning-Cloak Butterfly.

Citrous Fruits

BOTANY is the science which treats of plant life. As plants may be considered from various points of view, there are several important divisions of the science.

Regarded as a living organism, an individual plant may be considered in two ways. First, it may be studied with reference to its form and parts; that is, its *structure*. Second, it may be studied with reference to the uses of these parts or organs; that is, its *functions*. In these are represented the two great fundamental divisions of botanical science,—anatomy, or structural botany, and physiology, or physiological botany. All other divisions of the science are special developments of one or both of these, either exclusively or in relation also to other branches of knowledge.

Structural Botany. This division, called also *Plant Morphology*, deals with the form and structure of plants, especially with the shape and relation of their different parts or organs. It includes *Plant Anatomy*, and passes into the microscopic consideration of vegetable tissues, or *Plant Histology*. The latter includes *Cytology*, which is the study of the various forms of *cells* as the organic units of plant life. The essential element in the cells is *protoplasm*, or life substance. All plant structures, from the simplest to the largest and most complex, arise from various combinations of cells.

Physiological Botany. The study of the living plant in action, called also *Plant Physiology*. It considers all the important life processes and functions, including nutrition, absorption, transpiration, photosynthesis, respiration, movement, and reproduction.

Systematic Botany. The study of the classification of plants and their grouping into floras, or the orderly arrangement of the plants of different regions. This division is called also *Taxonomy*.

Plant Sociology. This division, commonly termed *Ecology*, and also regarded as a part of *Bionomics*, takes up plants in their relation to other plants and considers their adjustment to their physical surroundings. Certain plants live in the water, other plants live in marshes, still others in deserts, and some upon high mountains. Ecology studies the plants of each group in relation to their environment.

Economic Botany. The study of plants with reference to their usefulness to man, including the origin and distribution of cultivated plants. This division of botany considers also wild plants of economic value, such as timber trees, rubber and other gum trees, medicinal plants, dye plants, and forage plants.

Plant Breeding. The study of plant improvement, by means of crossing and selection, thereby developing more productive or desirable varieties of economic plants. On its scientific side, called *Genetics*, it deals with the problem of heredity. The practical application or art of plant breeding is revolutionizing agriculture, horticulture, and floriculture.

Plant Pathology. The study of plant diseases, called also *Phytopathology*. In agriculture, horticulture, and floriculture, this subject is of immense practical value. By reason of their great economic importance, the nature, effects, and especially the prevention of plant diseases, are subjects of extensive investigation and research.

Plant Geography. The distribution of plants throughout the world, called also *Phytogeography*. This division of botany concerns itself with the causes which have brought about and now maintain the distinctive plant populations or floras existing in various regions. On the side of plant relations, plant geography merges with ecology, and, on the side of plant history, with paleobotany.

Geological Botany. This division, called also *Paleobotany*, comprises the study of fossil plants or extinct vegetable life. It is of great interest and value for what it reveals concerning the ancestry, development, and relationships of the plants now existing upon the earth.

CLASSIFICATION OF PLANTS

Beginning with plants having the simplest structure and progressing upwards to the most highly organized forms, the vegetable world comprises four great natural divisions:

PLANT KINGDOM

Phylum I. THALLOPHYTES. Unicellular and multicellular plants of simple organic structure; propagation by spores and division.

- Class 1. Algæ. Chlorophyll-bearing. Diatoms, desmids, pond-scums, seaweeds.
- Class 2. Fungi. Destitute of chlorophyll. Bacteria, yeasts, molds, mushrooms—lichens.

Phylum II. BRYOPHYTES. Moss-like plants. Composed of cellular tissue showing little differentiation.

- Class 1. Liverworts (*Hepaticæ*)
- Class 2. Mosses (*Musci*)

Phylum III. PTERIDOPHYTES. Ferns and Fern Allies. Plants with vascular tissue and true roots.

- Class 1. Ferns (*Filicinæ*)
- Class 2. Club-mosses (*Lycopodinæ*)
- Class 3. Horsetails (*Equisetinæ*)

Phylum IV. SPERMATOPHYTES. Flowering and Seed-bearing Plants. Trees, shrubs, herbs.

- Class 1. Gymnosperms. Ovules borne naked; no proper ovary. Cycads; ginkgo; conifers.
- Class 2. Angiosperms. Ovules in a carpel or ovary.
  - Subclass 1. Monocotyledons. One seed-leaf.
  - Subclass 2. Dicotyledons. Two or more seed-leaves.

The thallophytes have plant bodies which are not separated into root, stem, and leaves, and they do not possess the reproductive structures known as *archegonia* found in the next higher group.

The moss plants have reproductive structures known as *archegonia*, but they do not possess the fibrovascular bundles or true plant ducts and woody tissues found in all higher groups.

The fern plants possess fibrovascular bundles but do not produce seeds. (In phyla I, II, and III, propagation is by spores.)

The seed plants possess fibrovascular bundles or true woody tissue, and normally produce seeds.

While all plants so far known may be readily referred to the foregoing groups, these grand divisions are not regarded as equivalent natural groups. Some eminent authorities hold that there should be more subkingdoms; that is, more divisions of primary rank.

The plants which, without the aid of cultivation, grow naturally and spontaneously in any region constitute its flora. The name "flora" is given also to a book in which the plants of a designated area are described in systematic order.

The classification of a plant in a flora is determined by the structure of the plant itself and by its relationships to other plants. For example, the place of the white oak in the plant kingdom is as follows:

Phylum:	*Spermatophyta*, or seed-bearing plants.
Class:	*Angiospermæ*, or plants with seeds enclosed in seed vessels.
Order:	*Fagales*, plants of the beech-birch alliance.
Family:	*Fagaceæ*, plants of the beech group.
Genus:	*Quercus*, the oaks.
Species:	*alba*, the white oak.

PLANTS

Acacia (*ȧ-kā'shȧ*). A numerous genus of shrubs and trees of the mimosa group of the pea family, containing about 450 species. Of these, about 300 are native to Australia and Polynesia, the remainder being found in other warm regions. About 17 species grow in the southern United States. The leaves are usually divided into minute leaflets, but in many Australian species the leaflets are practically wanting, the enlarged green leafstalks, called *phyllodia*, serving in place of true leaves. The very numerous small flowers are mostly borne in globular clusters.

Many acacias are of importance as the source of valuable gums, timber, tan barks, and food products. Several Asiatic and African species yield gum arabic. Gum senegal and the drug catechu come from acacias. The Blackwood, or Blackheart, an Australian species (*A. melanoxylon*), now grown in California, furnishes a very valuable cabinet wood. Various species of acacia are planted for ornament, especially those of rapid growth.

Among the best-known American species are the Catsclaw (*A. greggii*), an exceedingly thorny shrub of the southwestern deserts, and the Huisache (*A. farnesiana*), a small tree, native to Texas, with bright yellow, very fragrant blossoms appearing in February. The huisache is often grown for ornamental purposes.

Alder (*Alnus*). Trees and shrubs of the birch family, natives of cold and temperate regions. There are about 14 species, some 9 of which occur in North America.

The European black alder (*A. glutinosa*), a native of Europe and Asia and introduced into eastern America, is a tree 30 to 60 feet high, with smooth bark and sticky leaves. The wood is extensively used in making the best kinds of charcoal for gunpowder. It resists decay in water and is much employed for piles, pumps, sluices, and pipes. The bark yields a yellow and a black dye.

The speckled alder (*A. rugosa*) is a swamp shrub which grows from Newfoundland to Saskatchewan and south to Pennsylvania and Nebraska. The wood is of little value but the bark is used in dyeing.

The white alder (*A. rhombifolia*), 30 to 100 feet high, grows in the Sierra Nevada and Coast ranges from southern California to Washington. The Oregon alder (*A. rubra*), 40 to 90 feet high, ranges from Idaho to Washington and Oregon and southward through California. The wood is used for cheap furniture, piles, bridge foundations, and boats. The mountain alder (*A. tenuifolia*), 8 to 30 feet high, found from Saskatchewan to British Columbia and southward to New Mexico and Lower California, is the common alder of the Rocky Mountain region. The Sitka alder (*A. sinuata*), 20 to 30 feet high, grows from Alaska to Oregon and Montana. The wood is of no commercial value.

Alders are usually the first trees to grow at the borders of retreating glaciers or in the track of avalanches.

Alfalfa (*Medicago sativa*). A valuable fodder plant, called also lucerne, of great importance throughout the world.

Alfalfa belongs to the clover group and is closely related to peas, beans, and other legumes. It is a strong, deep rooted perennial, with a large root system often penetrating from 10 to 20 feet or more below the surface. The much branched stem grows from 18 to 24 inches in height and bears small leaves composed of three-toothed leaflets, and small, purplish flowers, somewhat like those of the pea. The pods are coiled into two or three spirals and the kidney-shaped seeds are about one-twelfth of an inch long.

Alfalfa is native to western Asia, where it has been cultivated for at least 2500 years, and is especially well adapted to dry regions. The Persians introduced it into Greece about 470 B. C.,—the present scientific name *Medicago* meaning "what the Medes planted." Virgil, Varro, and other Roman writers mention it. The Spanish took it to Mexico and South America, whence it was introduced from Chile into California in 1854.

In the western United States and Canada, alfalfa is the chief forage crop under irrigation. It is becoming an increasingly valuable crop eastward to New York without irrigation, particularly in Kansas and Oklahoma. In commercial beekeeping alfalfa is of great importance as a honey plant. See *Leguminous Plants*.

Algæ (*ăl'jē*). The simplest and most primitive forms of plant life. They constitute a large group which embraces the seaweeds and also various filamentous and microscopic organisms found everywhere in stagnant pools and in moist places, such as damp soils, dripping stones, and the bark of trees. Algæ vary in size from minute bits of nucleated protoplasm, distinguishable only by the microscope, to giant seaweeds 800 feet long.

None of the algæ possess true leaves, stems, or roots, however much some of their structures may resemble them. All possess chlorophyll, though its green color is sometimes masked by other pigments. They differ from the fungi by possessing the power to extract and to build up their own food from inorganic substances, while the fungi subsist only on plant or animal food.

The algæ are divided into four great groups: The blue-green algæ (*Cyanophyceæ*), the green algæ (*Chlorophyceæ*), the brown algæ (*Phæophyceæ*), and the red algæ (*Rhodophyceæ*). The green algæ embrace those of simplest structure, including the green slimes (*Protococcus*) found on the bark of trees, the pondscums (*Spirogyra*), diatoms, desmids, and stoneworts. The brown algæ include the kelps, rockweeds, and other marine forms. The red algæ contain the red seaweeds, the most beautiful of all the marine algæ.

Almond (*Prunus amygdalus*). A small tree of the rose family, closely resembling the peach, native to the Mediterranean basin and western Asia. It yields the sweet almond, valued as an edible nut, and the bitter almond, used in making flavoring extracts and as a source of prussic acid. The cultivation of the almond is prehistoric in western Asia, where it has been grown for more than 4000 years. The great naturalists of the ancients, Theophrastus, Pliny, and Dioscorides, mention the almond, and references are made to it in the Bible.

The production of sweet almonds is commercially important in southern Europe and in California, but cultivation of the bitter almond is limited chiefly to the Mediterranean region. Sweet almonds, either raw or cooked, are widely used for food and also in making cakes and candies. Salted almonds and sugared almonds are highly esteemed delicacies. The bland oil of sweet almonds is used in medicine.

The flowering almond (*A. nana*), a low shrub native to southern Russia, which bears a profusion of purplish red flowers in early spring, is often planted for ornament. See *Peach*.

Aloe (*ăl'ō*). A genus of plants of the lily family, containing about 100 species, mostly natives of western Asia and South Africa, some of which are cultivated in the Mediterranean region and the West Indies. They vary in height from a few inches to 30 feet. From the fibers obtained from their succulent leaves, the Negroes of West Africa make cordage and nets. Aloes are valuable chiefly for their medicinal properties, the dried juice of the leaves of various species yielding the intensely bitter cathartic drug called aloes.

Alpine Plants. The vegetation of high mountains near the line of perpetual snow. The adverse conditions for growth result in various gnarled, dwarfed, and creeping plants. These grow usually in close tufts, often forming mats, or carpet-like patches. The flowers of many species are abnor-

mally large and brilliantly colored so as to attract the scarce insect life of such regions. Saxifrages, arenarias, primroses, gentians, and certain forms of heaths, especially rhododendrons and azaleas, are characteristic flowering plants of high altitudes. Along with these, and extending above them sometimes to the snow line, are various small ferns, mosses, lichens, and algæ. See *Desert Plants*.

Anemone (*à-nĕm'ô-nē*). A genus of small perennials of the crowfoot family, comprising about 90 species native to cold and temperate regions. About 18 species occur in North America, usually bearing beautiful flowers which blossom in early spring.

The wood anemone (*A. quinquefolia*) is a delicate forest species of the eastern United States, having white flowers tinged on the outside with purple. The Pasque Flower (*A. patens nuttalliana* or *Pulsatilla hirsutissima*) is conspicuous in early spring on the prairies from northern Illinois to Saskatchewan and southward across the high plains to Texas. It is the state flower of South Dakota. The Canada anemone (*A. canadensis*), with large, showy white flowers, is abundant in low grounds from Labrador to Saskatchewan and southward to Maryland and Colorado.

The garden anemone, much prized by florists, was probably developed from *Anemone coronaria*, a handsome West Asian species, thought by some to be the "lily of the field" mentioned in the Bible.

Anise (*ăn'ĭs*) (*Pimpinella anisum*). An annual of the parsley family, 1½ to 2 feet high, native to Mediterranean countries. It is much cultivated in southern Europe, Germany, South America, and India for its pleasantly aromatic seed. This is used as a condiment, in making liqueurs, and in medicine.

Annuals. The term annual is applied to a plant which reaches maturity and completes its life cycle during the first season of growth. After producing flowers and ripening seeds, the plant dies. The annuals include a vast number of ornamental plants together with the most important economic plants, such as the cereals,—wheat, maize, rice, rye, barley, and oats; the sorghums and millets; the fiber plants,—cotton, flax, hemp, and jute; the legumes, —pea, bean, peanut, lentil, lupine, and various clovers; the gourd plants,—watermelon, muskmelon, pumpkin, and squash; the vegetables,—tomato, lettuce, radish, mustard, okra, eggplant, and spinach; the narcotic, tobacco; and the subtropical food plants,—quinoa and sesame. See *Biennials, Perennials*.

Apple (*Pyrus malus*). A small tree of the rose family, native of Europe and Asia Minor, producing a valuable fruit, which ranks with the grape, olive, orange, lemon, and banana among the leading fruits of the world. It has been cultivated since prehistoric times, having been grown in Europe for at least 4000 years. Apples were abundantly used by the Lake Dwellers of the Stone age in Italy and Switzerland.

North America, however, is now the leading apple growing region. Cultivation dates back to the earliest settlements. The records show the introduction of the apple in Massachusetts in 1629 and the production of cider in New York in 1639. New York, Pennsylvania, Ohio, Michigan, Virginia, and West Virginia in the East, and Washington, Oregon, and California in the West, are important apple producing states. In Canada, the apple is the leading fruit, Ontario producing more than half of the total yield. See *Crab Apple, Pear, Quince*.

Apricot (*Prunus armeniaca*). A small tree of the rose family, widely esteemed for its plumlike fruit. In some regions it blossoms as early as January, the white flowers appearing in advance of the heart-shaped leaves. The sweet, yellowish fruit, somewhat smaller than a peach, has a delicate flavor. It is marketed fresh and is also dried and canned in large quantities.

The apricot is supposed to be a native of China where it was in cultivation earlier than 2000 B. C. It was introduced into southeastern Europe at the time of Alexander the Great, and is now extensively grown in India, Persia, southern Europe, and Egypt. In the United States, marketable quantities have been produced in New York, but the crop is commercially important only in California and Oregon, where it is a leading orchard fruit. See *Peach, Plum*.

Aquatic Plants. Plants which live either entirely or partly submerged in water. Among the lower forms of plants the seaweeds and the freshwater algæ are typical aquatics. Among the higher plants, noteworthy aquatics are the cat-tail, pondweed, arrowhead, water hyacinth, water buttercup, pickerel weed, nelumbo, and water lily. With few exceptions, as in the sea wrack (*Zostera*) which blossoms under water, aquatic seed plants produce their flowers above the surface. There they are fertilized by the wind and by insects, like the flowers of other higher plants. Aquatic plants usually have special modifications of structure to insure the retention of air in their tissues.

Araucaria (*ăr'ô-kā'rĭ-à*). A genus of magnificent trees of the pine family, highly prized for timber and for ornamental planting. There are some 15 species, native to South America and Australia. While in form they somewhat resemble the true pines, the leaves are very different, being scalelike, stiff, and broad, and the branches usually appear in whorls.

The Chile Pine (*A. araucana*), often called "monkey puzzle" on account of the peculiar growth of its branches, attains a height of 150 feet. It is highly valued for its strong, white wood, and for its seeds which are used by the Indians for food.

The Norfolk Island Pine (*A. excelsa*), a native of New Caledonia, reaches 220 feet in height and 11 feet in diameter. The wood is close-grained, tough, and very heavy. This species is a favorite greenhouse plant. Both of the foregoing are much planted in warm regions, particularly in California, and occasionally in the Southern states.

Arbutus, Trailing (*Epigæa repens*). A creeping plant of the heath family, with branching stems and oblong, hairy, evergreen leaves, known in New England as "mayflower" and in the South as "ground laurel." It occurs in gravelly soils from Canada to Texas and is highly esteemed for its delicate, fragrant, pinkish white flowers which blossom in early spring. See *Mayflower*.

Arnotto (*ăr-nŏt'ō*) (*Bixa orellana*). A small tropical-American evergreen tree of the bixa or Indian-plum family. The seed coverings yield the well-known yellowish red dye, arnotto, used for coloring butter, cheese, various lacquers, varnishes, ointments, and plasters. The tree, long cultivated in tropical America and now naturalized in India, is called also arnatto, annatto, and anatto.

Arrowroot (*Maranta arundinacea*). A perennial plant, about 2 feet high, of the arrowroot family. It is a native of tropical America now extensively cultivated in the West and the East Indies. It is grown also in Africa and in Florida. The tuberous rootstocks yield the excellent starch food called arrowroot, widely used for children and invalids. The name "arrowroot" is said to have originated from the use of the freshly cut roots by the South American Indians as a remedy for arrow poison.

Artichoke (*Cynara scolymus*). A somewhat thistle-like plant of the composite family, native to South Europe and North Africa. It is much esteemed in Europe as a garden vegetable, but as yet is only sparingly used in the United States. Parts of the flower head are eaten raw as a salad, or boiled and served with butter. The artichoke was cultivated 2000 years ago by the Romans. It was not brought into England, however, until 1548. In the wild state the plant is called cardoon.

During the 19th century the cardoon was introduced into Argentina, where, as a weed, it has spread over vast areas of the pampas.

Artichoke, Jerusalem (*Helianthus tuberosus*). A tall species of sunflower, native to the Ohio and the Mississippi valley, sparingly cultivated in the United States for its large, coarse, tuberous roots, used chiefly as food for swine. The plant is now grown most extensively in France, some 300,000 acres being planted annually for the production of alcohol from the roots. Fruit sugar also may be derived from the roots. It yields enormous crops of 200 to 500 bushels or more to the acre.

Ash (*Fraxinus*). A genus of valuable forest trees of the olive family, with light, tough wood, and usually with rather thick furrowed bark and ash colored branches. Some 50 species grow in northern temperate regions. About 20 are native to the United States, several of which are important timber trees.

The white ash (*F. americana*), of the eastern and southern United States, with a trunk sometimes 120 feet high and 6 feet in diameter, is the most valuable for timber. It is extensively used in making agricultural implements, wagons, carriages, and tool handles, and sparingly for furniture. The black or brown ash (*F. nigra*) grows from Canada to Delaware and Arkansas, reaching 90 feet in height. It is much used for making barrel hoops, splint baskets, and for interior finish.

The red ash (*F. pennsylvanica*), occasionally 60 feet high, grows from Canada to Florida. The heavy hard wood is sometimes substituted for that of the more valuable white ash. The green ash (*F. lanceolata*), very similar to the red ash, occurs from New York to Saskatchewan and southward to Arizona. The wood is likewise used in place of white ash. The blue ash (*F. quadrangulata*), confined mainly to the central United States, usually 60 to 70 feet high, has stout, four-angled branchlets. In general appearance it resembles the black ash. The wood is the strongest of all the ashes, and is the finest for fork handles. A blue dye is obtained from the bark. The Oregon ash (*F. oregana*) has a trunk sometimes 80 feet high and from 2 to 3 feet in diameter. It is one of the most important deciduous timber trees of the Pacific states.

Asparagus (*ăs-păr'ă-gŭs*) (*Asparagus officinalis*). A perennial plant of the lily family, native to Europe and western Asia. It has been much changed by 2000 years of cultivation, the succulent young stems, highly prized for food, attaining many times their usual size in the wild state. Asparagus is an increasingly popular table vegetable. The plant is often grown in flower gardens and cemeteries for its delicate ornamental foliage.

Aster. A large genus of the composite family containing some 250 species, mostly natives of the United States. They are usually perennial, blooming from July to November, with a profusion of blue, lavender, pink, or white flowers, and, with the goldenrods, are the most common autumn wild flowers in eastern North America. The New England aster (*A. novæ-angliæ*) is one of the most showy native species. Many kinds are in cultivation. The most valuable of these is the China aster (*A. chinensis* or *Callistephus chinensis*), of which more than 200 varieties are grown. In the United States, wild asters are of considerable economic importance as late autumn honey plants.

Avocado (*ăv'ô-kä'dō*) (*Persea americana*). A tree of the laurel family, native to Central America and the West Indies. It is much cultivated for its highly esteemed fruit, called also midshipman's butter and alligator pear. There are three natural varieties, the Mexican, Guatemalan, and West Indian. The Mexican has a small thin-skinned fruit, usually below 8 ounces in weight; the Guatamalan bears fruit weighing from 1 to 3 pounds. These two are very rich in fruit oil. The West Indian type is sweeter and has an oil content about one-half that of the other two. Its fruit averages from 8 ounces to 3 pounds. The shape of the avocado varies in form from nearly spherical to pear-shaped and bottle-shaped, and varies in color from light green to purple, brown, and red.

The properly ripened fruit has a firm, butter-like marrow, possessing a rich, nutlike flavor. While essentially a salad fruit, the avocado is also eaten as a dessert, with sugar and cream. In the United States, avocados are grown chiefly in Florida and southern California.

Azalea (*ă-zā'lê-ă*) (*Azalea* or *Rhododendron*). Shrubs of the heath family, usually with showy flowers, differing from the true rhododendrons chiefly in having deciduous instead of evergreen leaves. There are about 40 species, natives of North America and Asia. The Pinksterflower, or Wild Honeysuckle (*A. nudiflora*), which grows in rocky woods from Canada to Texas, has long been cultivated in Europe for its delicate pink-white flowers. The Swamp Pink, or Honeysuckle (*A. viscosa*), with showy, fragrant blossoms, is found in swamps from Maine to Texas. At flowering time, the flame azalea (*A. calendulacea*) covers whole mountain slopes in the South. These species are placed by some authorities under *Rhododendron*, which see.

Baby Blue-eyes (*Nemophila insignis*). A small plant of the waterleaf family, native to California. It bears delicate blue blossoms veined with white, which bloom in early spring. This dainty plant is one of the most beautiful of Pacific Coast wild flowers, and is now widely cultivated. In England it is regarded as one of the choicest garden annuals.

Bacteria. Minute, one-celled plants, the smallest living things known, called also microbes or germs. They are so minute that microscopes magnifying 1000 or more diameters are required for their study. A single drop of water may contain thousands of these tiny organisms.

Bacteria are found almost everywhere,—in the air, in water, and in nearly all foods. They are always present in the mouth, in the digestive organs, and in the outer layers of the skin. Well water, spring water, artesian well water, and even sulphur spring water alike contain bacteria, as does the air, not only of cities, but also of plains and mountains. They are present in enormous numbers in all decaying vegetable and animal matter; in fact, they are the chief cause of decomposition.

Bacteria are of various shapes. For example, *Bacillus* forms little rods, *Micrococcus* consists of single rounded cells, *Streptococcus* forms chains of rounded cells, *Sarcinæ* occur in irregular cubes, and *Spirillum* is spiral in form. Bacteria multiply either by transverse division or by spore formation. When a bacillus reproduces by division, it elongates and an indentation appears near the middle. This is followed by complete division into two smaller daughter cells exactly similar to the parent cell. These new cells in turn split in the same manner. Under favorable conditions this process is very rapid. A bacterium sometimes reproduces itself in 15 or 20 minutes. At such rate a single germ would produce many millions of its kind within the short period of one day.

In reproduction by means of spores, the process is much slower. The bacillus, for example, forms within itself a small round body which finally entirely replaces the bacillus. This minute body is called a spore. A bacillus can form only a single spore, and a spore, upon developing, can form only a single bacillus. But the spore may be blown about by the winds or be subjected unharmed to severe heat, cold, or other extremes that would instantly destroy the bacillus.

Many bacteria are beneficial to man. Various kinds convert dead organic matter into soluble food material for plants. Some possess the power to transform the nitrogen of the air into usable plant food, thereby greatly enriching soils. Other bacteria promote useful fermentations, as in the making of vinegar and in the curing of cheese. On the other hand, various *pathogenic* bacteria cause nearly all of the most dangerous contagious and infectious diseases, such as diphtheria, typhoid fever, pneumonia, tuberculosis, leprosy, lockjaw, cholera, erysipelas, influenza, and bubonic plague. See *Fungi*.

Balsa (*Ochroma lagopus*). An American tropical tree having a light strong wood, called also *corkwood*, used for rafts or floats.

Bamboo (*Bambusa*). The common name of a group of treelike grasses. There are many species, native to the warmer parts of Asia, Africa, and America, ranging from a few feet to fully 100 feet in height and reaching a foot in diameter.

The best known is the common bamboo (*B. vulgaris*), abundant in tropical and subtropical regions. From the underground rootstock spring several round jointed stalks, which grow to their full height unbranched, but afterward throw out horizontal branches. The oval leaves, eight or nine inches long, are placed on short footstalks. The flowers grow in large panicles from the joints of the stalk.

The woody stems grow to eight or ten inches in diameter, and are so hard and durable as to be used for innumerable purposes in the East Indies, China, and other eastern countries. Cottages are made almost wholly of bamboo. It is also used for making bridges, boxes, water pipes, ladders, fences, bows and arrows, spears, baskets, mats, paper, and masts for boats. The young shoots are pickled and eaten, or otherwise used as food; the seeds also of some varieties are eaten. Several species of bamboo have been introduced into Florida, Louisiana, and California. Some of the more hardy kinds are widely used in landscape gardening.

Banana (*Musa sapientum*). A perennial plant, with a tall, herbaceous stem, 10 to 40 feet in height, bearing a whorl of very large leaves, each usually 6 to 10 feet long and 1 or 2 feet wide. It belongs to the banana family (*Musaceæ*) and is a native of India, where its cultivation, antedating all historical records, has been extensive for more than 4000 years. Pliny writes that the Greeks with Alexander the Great saw the banana growing in India.

Only the wild plants produce seeds, the various cultivated varieties being reproduced by offshoots or suckers from parent rootstocks. When the plant is full grown, a huge cluster appears, composed of small purple blossoms, from each of which, when fertilized, grows a banana. From 50 to 150 bananas grow in a single cluster or bunch, which may weigh from 40 to 100 pounds. The fruit, which is eaten both raw and cooked, contains about 20 per cent of starch and sugar. Pound for pound it has a greater food value than other common fresh fruit.

The banana is the most important tropical fruit used in temperate regions, ranking with the apple, grape, olive, orange, and lemon among the leading fruits of the world. It is grown in all tropical countries, enormous quantities being produced in the West Indies and Central America and shipped to the United States and to Europe. Beginning with a few hundred bunches in 1870, the shipments of bananas to the United States have increased in value to millions of dollars annually.

Banyan (*băn'yăn*) (*Ficus bengalensis*). A noted East Indian fig tree remarkable for its habit of growth. From its larger branches it sends down shoots that take root in the ground and grow into prop trunks. These, in turn, extend from their branches similar shoots which likewise take root. Thus the tree becomes in time a cluster or small grove of connected trunks which sometimes covers a considerable area of ground. In the Calcutta Botanical Gardens there is a famous banyan, known to be about 100 years old, which has upwards of 200 trunks ranging from 6 to 10 feet in circumference. A banyan, with 350 large prop trunks and more than 3000 smaller ones, has been described. It is estimated that 7000 persons can stand under it. The Hindus rank the banyan among their sacred trees and believe that its bark and leaves have medicinal virtues. The wood is too soft and porous to be of commercial value.

Baobab (*bā'ō-băb; bā'ō-băb*) (*Adansonia digitata*). One of the largest trees known, though not one of the tallest, called also sour-gourd and cream-of-tartar tree. It belongs to the silk-cotton-tree family (Bombacaceæ) and is a native of tropical West Africa but is now cultivated in other warm regions. Although in height the baobab is usually less than 70 feet, the massive trunk sometimes attains a girth of 90 feet. Old baobabs have branches as large as the trunks of our ordinary forest trees. In shape the leaves resemble those of the horse-chestnut. As the huge branches droop, the foliage forms an immense dome which makes the tree appear at a distance like a small grove.

Baobabs bear large, white, somewhat poppy-like flowers, and woody, gourdlike fruits. Each fruit contains 8 or 10 cells filled with pulp, enclosing seeds about the size of peas. The pulp is somewhat tart but has an agreeable flavor and is eaten by the natives. It is also a favorite monkey food; hence the Negroes call the baobab the monkey-bread tree. A beverage is prepared from the pulp, and an infusion of the bark is used as a medicine in fevers. Ropes and cloth are made from the bast or inner bark. Decayed baobabs are often hollowed out by the natives and utilized as houses or as receptacles for corpses.

Barberry (*Berberis*). A genus of low shrubs of the barberry family. They have small leaves, which grow in the axils of spines, and produce showy, yellow flowers followed by an oblong, acid, usually red fruit. There are about 80 species, widely distributed throughout the world. While used chiefly as ornamentals, some kinds yield an edible, currant-like fruit and others are used in tanning and dyeing.

The common barberry (*B. vulgaris*), a native of Europe, was formerly widely planted in the United States. Its fruit is made into preserves, and various parts of the plant have been used medicinally. Since the discovery that this species acts as an intermediate host plant for the destructive wheat rust, its culture has been very greatly restricted. The similar American barberry (*B. canadensis*), native to mountain woods from Virginia to Missouri, as well as the Japanese barberry (*B. thunbergii*), planted for hedges, does not harbor the wheat rust.

Barley (*Hordeum vulgare*). A valuable cereal, belonging to the grass family, native to Asia, and widely cultivated throughout the world. Barley is found in the oldest Egyptian tombs and among the remains of the Lake Dwellers of the Stone age in Switzerland, so that for upwards of 4000 years it has been grown for food. This grain yields profitable crops in greater extremes of climate than any other cereal. It is grown in Iceland, Alaska, and Norway; also in Egypt and India, as well as in all temperate regions. Barley ranks sixth in importance among the great world cereals, being preceded by wheat, rice, maize, oats, and rye. See *Cereals, Grasses*.

Bean, Lima (*Phaseolus lunatus*). A leguminous annual plant, native to Brazil. It is widely grown for food in tropical regions, especially in Africa, where it was introduced through the slave trade. In temperate regions this bean is rather sparingly grown. In the United States, production is most

extensive in California. The presence of the Lima bean in ancient Peruvian tombs indicates its prehistoric cultivation in South America.

Bean, Mexican Jumping. This name is popularly applied to the fruit of a euphorbia, native to the southwestern United States and Mexico. The larva of a moth enters the seed, on which it feeds, and by its contortions makes the seed jump.

Bean, Navy (*Phaseolus vulgaris*). An annual, more or less climbing plant of the pea family, called also kidney bean. It is a native of South America, and was introduced into Europe after the discovery of the New World. It is now the common garden and field bean of the United States. More than 150 varieties are grown as garden vegetables and as forage crops. The closely related *frijoles*, now grown in the southwestern United States, are universally cultivated in Mexico and other Spanish American countries, where these beans rank second only to maize as a food crop.

Bean, Soy (*Glycine Max*). A leguminous annual, closely related to the common kidney bean, native to China, Java, and Japan. Its cultivation is most ancient, being mentioned in Chinese records dating to 2700 B. C. It is now grown in enormous quantities in eastern Asia, especially Manchukuo. In various preparations this bean enters largely into the daily food of millions of people, supplying necessary protein elements. It is used also for fodder and for making plastics, glue, paint, varnish, linoleum, soap, lubricating oil, flour, and milk substitutes. The soy bean is extensively planted in Europe and in the United States as a forage, hay, and soiling crop. On a rapidly increasing acreage in America, the crop is cultivated for the making of fast drying paint oils and of plastics, many of which are used in automobile manufacture.

Beech (*Fagus*). An important forest tree, closely related to and of the same family as the oak and chestnut. It is much valued for its hard, fine-grained wood and small, sweet flavored, triangular nuts. There are about five species of beech, only one of which is native to the United States. The American beech (*F. grandifolia*) is a handsome tree, usually 70 to 80 feet high, with a trunk 3 to 4 feet in diameter, smooth, gray bark and deep green foliage. It grows from eastern Canada to Wisconsin and southward to Florida and Texas, often forming nearly pure forests. The wood is extensively used in making chairs, shoe lasts, plane stocks, tool handles, and for fuel.

Beet (*Beta vulgaris*). A fleshy-rooted plant of the goosefoot family, native of the Mediterranean region. Since about the 3d or 4th century B. C. it has been cultivated in southeastern Europe for its root and leaves. Its cultivation for the production of sugar from the root was established in France and Germany about 1810.

The development of this relatively unimportant garden vegetable into an economic plant of the first rank is perhaps the most striking achievement of modern scientific agriculture. In less than a century the sugar beet rose to the leading position among the world's sources of sugar, furnishing in 1900 over three-fifths of the total production. Germany, France, and Russia have been the principal producers. Since 1900 the beet sugar industry has developed notably in the United States.

Garden beet roots vary in color from white to dark red, the red varieties being preferred. Sugar beet roots are usually yellowish white and the better varieties contain, on the average, about 14 per cent of sugar. Some varieties of the beet are grown exclusively for the leafy top, as, for example, the excellent Swiss chard. Coarse varieties, commonly called mangels, are widely grown as food for cattle. See *Sugar*.

Begonia (*bē-gō'nĭ-ȧ*). A numerous genus of herbaceous plants of the begonia family. They have fleshy, oblique, variously colored leaves, and showy, mostly pink or red flowers. There are 450 species, natives of the tropics. Cultivation of begonias began in 1777, and since that date hundreds of fine varieties have been developed. From the shape of their leaves these plants are sometimes called elephant's-ear.

Betel (*bē't'l*) (*Piper betle*). A shrub of the pepper family, native to the Malaysian islands. The leaves have been chewed with the betel nut, or areca nut, since ancient times by Malay peoples. Cultivation of betel is extensive in the East Indies, where the consumption of the leaves as a narcotic stimulant is enormous.

Betel Nut (*Areca catechu*). A small palm tree, native to the Malay archipelago. It produces a nut, about the size of a hen's egg. This nut, called also areca nut, is extensively used wherever betel chewing is practiced. The cultivation of this palm by Malay peoples considerably antedates the Christian era. The betel nut, mixed with lime and chewed with betel leaves, serves as a stimulant and narcotic. Its use in this manner stains the lips and blackens the teeth. Immense quantities of the betel nut are produced in India, Cochin China, Ceylon, and the Malaysian islands, where it forms a considerable article of trade. See *Betel*.

Biennials. Plants whose life period requires two seasons of growth in order to produce flowers and ripen seeds. In many cases the first season is employed to store up surplus food in enlarged portions of the root, stem, or leaves. This is used during the second season to mature seeds. Then the plant perishes. While few in number compared with annuals or perennials, the biennials include several valuable economic plants, such as the beet, cabbage, carrot, celery, parsley, parsnip, turnip, and onion. See *Annuals, Perennials*.

Big Trees. According to information issued by the United States Forest Service in 1930, the tallest tree in the United States was a California redwood (*Sequoia sempervirens*), growing in Bull Creek flat, California, which was 363 feet high. The tallest tree in Australia to be accurately measured was a Eucalyptus (*Eucalyptus regnans*), at Colac, Victoria, which grew to a height of 346 feet. A Douglas fir (*Pseudotsuga mucronata*), in Seymour valley, near Vancouver, Victoria, cut down in 1895, is reported to have measured 417 feet.

None of these trees attain to a diameter equal to that of the giant redwood, or California big tree (*Sequoiadendron giganteum*), which may reach a basal diameter of 30 to 35 feet and a height of more than 300 feet. The baobab, or monkey-bread tree (*Adansonia digitata*), of tropical Africa and the East Indies, attains a basal diameter of 20 to 30 feet or more but does not rise to a great height.

The giant cypress (*Taxodium mexicanum*) of Mexico sometimes grows to an immense girth. Like the baobab, it does not reach a correspondingly great height. For example, the famous "big tree" of Tule measures 154 feet in circumference at 6 feet above the ground. Yet the height of the huge spreading crown is only about 150 feet.

The banyan tree (*Ficus bengalensis*) of India, with its immense system of prop roots, shades a greater area than any other tree. See *Banyan, Baobab, Blue Gum, Eucalyptus, Sequoia*.

Birch (*Betula*). A genus of trees and shrubs of the birch family, *Betulaceæ*, all natives of the North Temperate Zone. There are about 30 species, of which 20 species and varieties grow in North America, ranging in size from small shrubs to large forest trees.

The European birch (*B. alba*), of northern Europe and Asia, is a beautiful, hardy tree which sometimes attains a height of 70 feet. It is noted for its silvery white bark, slender, drooping branches, and bright green, quivering leaves. The close-grained wood has many uses, and an extract from the bark is used in medicine and also in tanning

Russia leather. A graceful variety, with long, pendulous branches, called weeping birch, is often planted for ornament.

The paper birch, or canoe birch (*B. papyrifera*), very similar to the European birch, 80 feet high, grows from Newfoundland to Alaska and southward to Pennsylvania, Nebraska, and Washington. The brilliant white bark, which is easily separated into thin layers, is used by the Indians for making canoes and baskets. Very thin strips of the bark have been used as a substitute for paper. The light wood is used for making wood pulp and in turnery.

The cherry birch, or sweet birch (*B. lenta*), which grows from 70 to 80 feet high and sometimes 5 feet in diameter, has aromatic twigs and bark. These yield an oil very similar to the oil of wintergreen, for which it is used as a substitute. This birch grows from Newfoundland to Iowa and southward. The strong, hard, reddish brown wood is much prized for making furniture.

The yellow birch (*B. lutea*), one of the largest deciduous trees of northeastern America, sometimes reaches a height of 100 feet and a trunk diameter of 4 feet. It is distinguished by its glossy, yellowish brown bark, and is native to rich woods from Newfoundland to Minnesota and southward to North Carolina. The valuable, close-grained wood of this birch, and also that of the sweet birch, is much employed in making imitation mahogany furniture, wheel hubs, tool handles, and interior finishings.

The red birch, or river birch (*B. nigra*), grows in swampy land and along streams and lakes from Massachusetts to Minnesota and southward to Florida and Texas. It is a slender tree, sometimes attaining a height of 90 feet and a trunk diameter of 2½ feet. The bark is reddish or greenish brown, peeling in very thin layers. The light brown, hard, strong wood is used for ox-yokes, woodenware, and furniture. This tree, sometimes called black birch and water birch, grows rapidly and is suitable for planting in lawns and parks.

Bitterroot (*Lewisia rediviva*). A low, stemless plant of the purslane family, related to the portulacas of the gardens. It bears thick roots, short, fleshy leaves, and large, handsome, rose-red, cactus-like flowers which bloom in great profusion on mountain ridges and in alpine valleys in early spring. The bitterroot grows from Montana to British Columbia and south to New Mexico and southern California. It was first described from specimens collected by Captain Meriwether Lewis of the Lewis and Clark Expedition, the scientific name *Lewisia* being bestowed in his honor. On account of its large, starchy roots, bitterroot was highly prized as a food plant by the Indians, who called it spatlum.

Bitterroot is a corruption of butterroot, a common name first given to the plant. The Bitterroot mountains and the Bitterroot valley, in Montana, derive their names from this plant, which has been adopted as the state flower.

Bittersweet (*Solanum dulcamara*). A poisonous plant of the potato family, called also dulcamara or woody nightshade. It is a native of the Old World, now widely introduced in the United States and Canada. It has climbing, somewhat woody stems, heart-shaped or spear-shaped leaves, and purple or blue flowers much resembling those of the potato. The bittersweet bears poisonous red berries of tempting appearance. These are sometimes the cause of serious accident to children who carelessly eat them. The twigs contain solanin and dulcamarin, used in medicine. See *Climbing Bittersweet.*

Blackberry (*Rubus*). The name given to various prickly fruit-bearing shrubs, closely related to the raspberries. There are two main types, the trailing or creeping forms, commonly called Dewberry (*R. villosus* or *canadensis*), and the upright, bushy forms, generally known as blackberry or as high-bush blackberry (chiefly *R. allegheniensis* or *nigrobaccus*).

Although several wild species of the eastern United States yield berries of excellent quality, they received but little attention as garden fruits previously to 1850. Since that date, numerous improved varieties of blackberries and dewberries have been developed from the native plants. Many of these are widely grown, producing an important bush-fruit crop. Blackberries are marketed chiefly fresh for dessert purposes and are also used extensively for canning. Outside of the United States and Canada, the blackberry has not as yet become commercially important.

The bark of the blackberry root possesses tonic properties and an extract made from it is sometimes prescribed in cases of diarrhea. In Great Britain, the bramble (*R. fruticosus*), which bears an inferior fruit, is sometimes called blackberry. See *Loganberry, Raspberry.*

Black-eyed Susan (*Rudbeckia hirta*). A rough, hairy, biennial species of coneflower, common in the eastern United States. It grows about 2 feet high, with nearly entire leaves and naked flowering stems. Each of these stems bears a single large head of brilliant yellow ray flowers surrounding a conical dark brown center. This is one of the most handsome of native American plants and is the state flower of Maryland.

Bladder Nut (*Staphylea trifolia*). A shrub of the bladder nut family, usually 6 to 15 feet high, with leaves of three leaflets, and greenish striped branches. It bears small flowers from which develop large, bladdery, three-horned pods. This shrub, which becomes treelike in the South, grows in moist thickets from Quebec to Minnesota and southward to South Carolina and Kansas. A somewhat similar species (*S. bolandieri*) occurs in California.

Bloodroot (*Sanguinaria canadensis*). A beautiful plant of the poppy family. It has palmately lobed leaves and a fleshy rootstock, the latter containing a red, acrid juice. It produces large, handsome, pure white blossoms, which are among the earliest and most conspicuous of eastern American wild flowers. The bloodroot, called also "red puccoon," "redroot," and "snakebite," is found in rich woodlands from Nova Scotia to Manitoba and southward. The stem and root are poisonous.

Blueberry (*Vaccinium*). Widely branching shrubs of the heath or huckleberry family. In the eastern United States and Canada the sweet, edible, many seeded, bluish black berries of several species are gathered wild in large quantities. Efforts are being successfully made to bring some of the most highly prized native blueberries into cultivation.

The tall blueberry (*V. corymbosum*), 6 to 15 feet high, is found in swampy woods from Quebec to Minnesota and southward to Florida and Louisiana. It yields the greater part of the late blueberries of the markets, and is the species best adapted for cultivation.

Several smaller species, ranging from 6 inches to 4 feet in height, are locally abundant and produce excellent fruit. Among these are the early blueberry (*V. pennsylvanicum*), the low blueberry (*V. vacillans*), and the Canada blueberry (*V. canadense*).

Bluebonnet (*Lupinus texensis*). A small plant of the pea family. It has silky-hairy, palmate leaves of five leaflets and handsome blue flowers borne in a terminal cluster. The bluebonnet is a native of Texas, where it is exceedingly abundant and popular, having been adopted as the state flower. See *Lupine.*

Blue Gum (*Eucalyptus globulus*). A large tree of the myrtle family, native to Australia. It is one of the world's tallest trees, sometimes reaching a height of 375 feet. The blue gum was introduced into various dry and warm regions of the world about 1850. It was planted in California first in 1856 and is now grown there extensively for fuel and timber. It is said to be the most rapidly growing hardwood tree in the world. The heavy wood is difficult to work but exceedingly strong. It is used for wheel spokes, hubs, and in turnery, and also for mining timber, as it is resistant to borers. The leaves yield eucalyptus oil, important medicinally.

Plantations of eucalyptus thrive only in climates permanently above the frost line. It was once believed that where this tree grew there could be no malaria. Hence it was extensively planted in and about the Pontine marshes of Italy. Its effectiveness in this respect is now known to be due to its enormous consumption of soil moisture. These quickly growing trees remove the water in which the malaria-carrying mosquito breeds. See *Big Trees, Eucalyptus.*

Boneset (*Eupatorium perfoliatum*). A useful perennial herb, of the composite family, called also "thoroughwort." It is a native of North America, growing from Nova Scotia to Manitoba and south to Florida and Texas. The plant is easily recognized by its tall stem, four or five feet in height, passing through the middle of large, double, hairy leaves, and surmounted by a broad, flat cluster of white flowers. In pharmacy, boneset is a recognized official plant, used for its stimulant, laxative, and emetic properties. Boneset tea, made from the leaves, is much used in household medicine as a tonic and for causing perspiration.

Bottle Tree (*Sterculia*). Peculiar trees of the sterculia family, somewhat allied to the cacao or cocoa tree. The Australian bottle tree (*S. rupestris*) is noted for the globular expansion of its trunk, which gives it the aspect of a huge bottle with the limbs appearing to grow from its mouth. The enlarged stems are hollow and contain a quantity of water which travelers and the Australian natives sometimes secure for use by cutting through the soft wood.

The maple-leaved bottle tree, or Flame Tree (*S. diversifolia*), the stem of which tapers rapidly from a broad base, is also a native of Australia. It is often planted for ornament in California and in other mild climates. The seeds of various species are edible, some contain an illuminant oil, and the bark contains a tough, waterproof fiber, suitable for mats and cordage.

Box Tree (*Buxus sempervirens*). A shrubby evergreen tree, of the box family, native to Europe and parts of Asia. It grows about 12 feet in height and bears small, oval, opposite, evergreen leaves, and greenish, inconspicuous flowers. The wood is yellowish, close-grained, very hard and heavy, and takes a beautiful polish. It is much used by turners, wood carvers, engravers on wood (no wood surpassing it for their requirements), and by mathematical-instrument makers. Flutes and other wind instruments are made of it. The boxwood of commerce comes mostly from the regions adjoining the Black Sea and the Caspian Sea, and from Spain and Portugal. In gardens and shrubberies, box trees may often be seen clipped into various formal shapes. A dwarf variety is grown as an edging for garden walks.

Brake (*Pteris aquilina*). One of the most abundant and widely distributed ferns, called also bracken. It occurs in nearly all parts of the world, frequently covering large tracts. The plant has a long, creeping, black rootstock from which arise naked stipes. Each of these stipes divides at the top into three branches which bear the leafy portion of the fern. In Japan the young shoots are highly prized as food; in Siberia great quantities of the rootstock are used as an ingredient in making a beerlike beverage. Brake is sometimes used in dressing leather, for thatching, and as fodder for cattle.

Brazil Nut (*Bertholletia excelsa*). A beautiful tree of the lecythia family, native to Amazon and Orinoco forests. It grows from 100 to 150 feet high, with leathery leaves 2 feet long. It bears a large, spherical, hard-shelled fruit, about 6 inches in diameter, which contains 18 to 24 three-sided seeds or nuts—the brazil nuts or "niggertoes" of commerce. The fruit is extensively gathered by the natives, who chop open the thick shell to obtain the nuts. These are exported in large quantities, chiefly from Pará.

Breadfruit (*Artocarpus communis*). A slender tree of the mulberry family, related to the fig. It is a native of the Sunda islands, from which its cultivation has been widely extended in the Indian archipelago and the Pacific islands. The tree attains a height of from 30 to 40 feet and bears large, glossy, deeply cut leaves. The large, edible fruit is somewhat like a watermelon in size and shape. Upon being properly baked, it resembles wheat bread. The bark furnishes a fairly good fiber for making clothes, the juice yields a serviceable glue for caulking canoes, and the wood has many economic uses. The breadfruit tree, like certain species of palms, is necessary to the existence of the native peoples inhabiting many oceanic islands. The closely related African breadfruit, the Australian breadfruit, and the jack fruit are also valuable as food producers.

Broom Corn (*Sorghum saccharatum*). One of the many useful varieties of *Sorghum* which have been developed in the course of forty or more centuries of cultivation. Broom corn is grown solely for the valuable brush fibers of the flowering panicle, which remain after the more or less ripened seeds have been removed. It is cultivated chiefly in Italy, France, Germany, and the United States, and the product is used entirely in making various kinds of brooms. The first broom corn in the United States was grown somewhat earlier than 1800. Illinois, Kansas, Missouri, and Oklahoma now produce nearly the entire crop, Oklahoma contributing approximately one-half. See *Sorghum Cane.*

Brussels Sprouts. A cultivated variety of cabbage with an elongated stem, from 2 to 5 feet high, on which are borne numerous small, clustering green heads, like miniature cabbages. This vegetable is extensively cultivated near Brussels and in many other parts of the world. See *Cabbage.*

Buckeye (*Æsculus*). A genus of trees or shrubs of the buckeye family. They have digitate leaves and bear large, nutlike seeds, somewhat resembling chestnuts and often called horse-chestnuts. There are about 15 species, natives of the northern hemisphere. Of these, 6 species occur in the United States.

The Ohio buckeye (*Æ. glabra*) grows sometimes 70 feet high. It bears yellow flowers and spiny seed capsules. This tree is native to rich soil from Pennsylvania to Iowa and southward. The leaves and nuts are reputed poisonous.

The sweet buckeye (*Æ. octandra*) often attains a height of 90 feet and a trunk diameter of 3 feet. It has yellow flowers and smooth seed capsules. This species occurs in the central and southern United States.

The red buckeye (*Æ. pavia*), a shrub 4 to 12 feet high, with red flowers and smooth fruiting capsules, grows from Virginia to Texas. The southern buckeye (*Æ. austrina*), about 25 feet high, with downy leaves and yellow seeds, is found from Tennessee to Texas. The California buckeye (*Æ. californica*), sometimes 30 feet high, with pale rose-colored, showy flowers and with large,

smooth seed capsules, is sometimes planted for ornament. Its seeds are said to be used for food by the Indians.

The Horse-chestnut (*Æ. hippocastanum*) is a native of Asia, now grown extensively in many temperate countries. It bears white flowers followed by large prickly seed capsules. This common Old World species is widely planted as a shade tree in the eastern United States and Canada. In France, starch, used for food, is made in large quantities from the seeds. During the World War the British government caused enormous stores of the seeds to be collected from the horse-chestnut trees in England. The bitter principle, esculin, always present in the starchy flesh, was removed by a chemical process, so that the seeds could be utilized for human food. In several countries the seeds are extensively used for feeding livestock.

The soft wood of the horse-chestnut and of the various species called buckeye is of little commercial value.

Buckthorn (*Rhamnus*). Small trees or shrubs of the buckthorn family (*Rhamnaceæ*). There are some 90 species, native to tropical and temperate regions, about 15 of which grow in the United States and Canada.

The common buckthorn (*R. cathartica*), a somewhat spiny shrub, 6 to 20 feet high, is a native of Europe. It is cultivated and sparingly naturalized in the eastern United States. The berries yield a yellow dye and have powerful purgative properties. The Indian Cherry (*R. carolinana*), sometimes 40 feet high, with a black, seedy fruit resembling small cherries, grows wild from Virginia to Nebraska and southward.

The Cascara Sagrada (*R. purshiana*) yields the cascara bark of commerce, widely used in medicine. It is a slender tree, 35 to 40 feet high, which grows from Idaho and northern California to Puget sound. The California Coffee (*R. californica*), with large, black, grapelike fruit, is a common shrub, 6 to 8 feet high, on the Sierra Nevada foothills. The medicinal properties of the bark are similar to those of cascara sagrada, and the two barks are said to be mixed by collectors.

Buckwheat (*Fagopyrum esculentum*). An annual plant of the buckwheat family, native of Manchukuo and Siberia. It has smooth, branching stems, somewhat heart-shaped leaves, and pale red or white flowers, which yield a good quality of honey. The triangular, dark-coated seed, called buckwheat, is sometimes incorrectly classed with the true cereals.

The cultivation of buckwheat as a food plant probably dates back 2000 years in Asiatic Russia, whence it was introduced into Europe during the middle ages. While a common article of diet throughout much of Russia, buckwheat is relatively unimportant as a food in the remainder of Europe and elsewhere.

In the United States, where the chief use of buckwheat is for pancakes or griddlecakes, production has declined about one-third since 1860. New York and Pennsylvania are the leading producers. Canada grows over half as much buckwheat as the entire United States, the production centering chiefly in Ontario and Quebec.

Buffalo Berry (*Shepherdia argentea* or *Lepargyrea argentea*). A handsome shrub of the oleaster family, native to the northern Rocky Mountain region. It has small, silvery leaves and bears red or yellow currant-like berries. Long valued as an ornamental, the buffalo berry has recently taken rank as a fruit plant. It is successfully cultivated in the Northwest, where it is much used for jellies.

Buttercup. The popular name for many yellow-flowered species of *Ranunculus*, usually growing in moist places and flowering in early spring. The marsh or swamp buttercup (*R. septentrionalis*), with large, brightly colored blossoms, abounds in wet grounds from New Brunswick to Kansas. The creeping buttercup (*R. repens*), spreading by runners, occurs from Newfoundland to British Columbia and southward. The early buttercup (*R. fascicularis*), with tufted thickened roots, is found in woodlands from Ontario to Texas. The California buttercup (*R. californicus*) is a showy species, immensely abundant on the Pacific coast. In early spring, unforested hills, sometimes many square miles in extent, are colored bright yellow by the blossoms of this wild buttercup. The tall or meadow buttercup (*R. acris*), naturalized from Europe, is very abundant in fields and roadsides in southern Canada and the northeastern United States. The bulbous buttercup (*R. bulbosus*), also introduced from Europe, is common from New England to Louisiana.

Cabbage (*Brassica oleracea*). A fleshy-leaved plant of the mustard family, native to rocky shores of Europe. It has been cultivated in various forms since prehistoric times, and is perhaps the most ancient of all vegetables now in extensive use. There are evidences indicating that the cabbage has been in cultivation for more than 4000 years. It is now very widely grown in the Old World. In the United States, cabbage is produced upon a greater number of gardens and farms than is any other vegetable. The leaves only are eaten, and, in ordinary kinds, these are crowded in a dense head around the top of the short, stout stem. The name "cabbage" is derived from the Latin *caput*, meaning a head.

The ancient Greeks grew three varieties of cabbage; Pliny mentions six; and at the present time there are more than 150. Centuries of cultivation have developed several greatly modified forms, remarkably different from ordinary cabbage. Among these are kale, kohl-rabi, cauliflower, and Brussels sprouts. The tree cabbage, or cow cabbage, grown for cattle, is a tall perennial form which, in France, sometimes attains a height of 15 feet. See *Brussels Sprouts*, *Cauliflower*, *Kale*, *Kohl-rabi*.

Cacao (*kȧ-kā′ō*; *kȧ-kä′ō*) or **Cocoa** (*Theobroma cacao*). A medium-sized tree, 12 to 30 feet high, with large, entire leaves and clustered flowers, belonging to the sterculia family. It was cultivated in the Amazon valley before the discovery of America; at present about 78 per cent of the world's supply comes from British West Africa and the adjacent regions, the remainder from Brazil and other American countries. The seeds lie embedded in a large pulpy, edible fruit. These seeds, known as cocoa beans in commerce, are the source of chocolate, cocoa, and the semisolid oil, chemically a hard fat, called cocoa butter, the last mentioned constituting over 50 per cent by weight of the shelled beans. The cacao tree bears fruit within 4 or 5 years from planting, attains full productiveness in 12 years, and thereafter yields 2 principal crops annually for many years. Cocoa, as usually prepared, contains an alkaloid stimulant called theobromine similar to the caffeine of coffee and the theine of tea. See *Coffee*, *Maté*, *Tea*.

Cactus. Any plant of the cactus or Indian fig family. There are about 1000 species, commonly fleshy-jointed, succulent shrubs a few feet high. All, except a few African species, are natives of America, and are found mostly in very dry, warm regions, being most numerous in Mexico. In structure these plants show remarkable adaptation to climatic conditions. Their problem is to absorb and retain as much moisture as possible. The stems are fleshy, permitting the storage of a large amount of water. To avoid losing it by evaporation, they expose but little surface to the air. The leaves are reduced to minute bracts, scales, or hairs, or are entirely wanting, and the smooth, hard, green bark functions in place of leaves.

The various types assume many weird and peculiar forms of growth. Some have great treelike, deeply-ribbed stems, 40 to 70 feet high, with huge

columnar branches. Others are cylindrical, barrel-shaped, or globular, ranging in height from a few inches to several feet. Many of the most widely known are made up of thick, oval, flattened joints. Practically all are heavily armed with exceedingly sharp, needle-like spines.

In the arid deserts of the southwestern United States about 100 kinds of prickly pear (*Opuntia*) occur, together with some 30 kinds of hedgehog cactus (*Echinocereus*), and many other species. Among the most striking are the giant cereus or saguaro, the thorny chollas, the deerhorn cactus, the melon cactus, and the barrel cactus. About 10 kinds of cactus grow from the Great Plains eastward, one species of which, the eastern prickly pear (*Opuntia vulgaris*), occurs in Massachusetts, Kentucky, and Florida. Several kinds of cactus have become naturalized in the Old World; as, for example, in Italy, northern Africa, Palestine, and various islands in the Mediterranean.

The fruits of the prickly pear, Indian fig, or tuna, and various other species are edible. The stored sap of the barrel or melon cactus is sometimes used for drinking when water is not available. A thornless variety of opuntia, developed by Burbank, with large oval-jointed stems 8 to 15 feet high and cucumber-like fruit, promises to become valuable as a food and forage plant in arid regions.

The flowers of the various kinds of cactus are usually very large and brilliantly colored. Some, such as those of the night-blooming cereus, are remarkably beautiful. Many varieties of cactus are cultivated in greenhouses and gardens. See *Cereus*, *Saguaro*.

California Poppy (*Eschscholtzia californica*). One of the most common, striking, and widely diffused of native California plants. It blossoms profusely in the spring, but is sometimes found in flower at all seasons. This wild poppy has suberect, diffuse stems a foot or two in length, dissected leaves, and large, golden yellow flowers. The petals are sometimes 2 inches or more long, with a rich sheen, very brilliant in the sunshine. There are many fanciful or poetic names for this handsome plant, mostly from Spanish sources, such as "copa de oro," "toroso," "amapolo," and "dormidera." It is the state flower of California, and is widely planted in gardens in other regions.

Calla Lily (*Zantedeschia æthiopica*). A fleshy-leaved plant of the arum family, native to Africa. It is now widely grown as a house plant and in gardens for its large beautiful white spathes. These surround a central portion (spadix) which bears the true but inconspicuous flowers.

Camellia. Handsome shrubs or trees of the tea family with dark green, shining, laurel-like leaves, and showy, roselike, waxy flowers. *Camellia japonica*, native to Japan and China, is a tall tree of graceful proportions. It is the parent of many beautiful cultivated shrubs with double-flowered variations, universally grown in gardens. Besides the foregoing, the so-called *Camellia sasanqua*, with small, white, scentless flowers, and *Camellia reticulata*, with large, peony-like blossoms, are also cultivated in the southern United States. While these ornamentals were long regarded as belonging to the genus *Camellia*, and are popularly known as camellias, some botanists now place them in the genus *Thea*, to which the tea plant also belongs. See *Tea*, *Tea Oil Tree*.

Camphor Tree (*Cinnamomum camphora*). A large evergreen tree of the laurel family, usually regarded as a native of China, now extensively cultivated in many warm countries. It is highly valued for timber and as the source of gum camphor, much used in making celluloid and explosives and also in medicine. Camphor trees are extensively planted in California and in the Gulf States, chiefly for ornament.

Candleberry (*Myrica cerifera*). A shrub or small tree of the sweetgale family, native of the eastern United States, called also bayberry, wax myrtle, and tallow tree. It is usually from 4 to 18 feet high, with evergreen lanceolate leaves, small flowers, and a somewhat fleshy, stone fruit. When bruised, both the bark and the leaves emit an agreeable odor. The fully ripe, dry fruits are covered with a whitish wax. This is collected by boiling the fruits and skimming the wax off the surface of the liquid. The refined wax is used in making candles which burn slowly with a pleasant, balsamic odor, though with a feeble light.

The California Myrtle (*M. californica*), a small tree or shrub, grows on the Pacific coast from Washington to California. Its wax-covered berries yield a wax similar to that of the eastern candleberry. See *Tallow Tree*.

Caraway (*Carum carui*). A perennial plant of the carrot or parsley family, with a tapering, fleshy root, a furrowed stem, and white flowers. It is native to Europe where it extends northward to within the arctic circle. Caraway is widely cultivated for its aromatic seeds, used by confectioners and perfumers and also in making cakes and sweetmeats. In medicine, caraway seeds have recognized stimulant and diuretic properties.

Carnation. The name given to double-flowering forms of the clove pink (*Dianthus caryophyllus*). The carnation ranks among the most popular flowers in cultivation. It is a native of southern Europe, where, for more than 2000 years, it has been grown for its spicily fragrant flowers. Carnations are now produced in immense quantities for city flower markets. A large number of varieties, as to both form and color, have been developed. Red, white, pink, and yellow varieties predominate. Striped variegations occur, ranging from one to three colors. In other forms, petals are found edged with a color which is different from the general hue of the flower.

Carrot (*Daucus carota*). A hardy biennial of the parsley family, native to Europe, where it has been grown since ancient times. It is in general, though not extensive, cultivation as stock food and as a table vegetable. The slender, tapering roots of the cultivated kinds are yellow, white, or reddish in color, with a bland or sweetish taste when cooked, owing to the sugar which they contain. The carrot is wholesome and nutritious as an article of diet and is especially prized as a food for dairy cattle.

In the wild state and wherever naturalized, as in the eastern United States, where it is known also as Queen Anne's lace, the carrot often becomes a pestiferous weed. In this condition it has a woody root with a very strong flavor. The wild plant is frequently infected by the leaf-spot fungus (*Cercospora apii*) which is very injurious to celery.

Carthamin (*kär'thà-mĭn*) (*Carthamus tinctorius*). An annual plant of the composite family, called also safflower. It is unknown in the wild state but is thought to be originally a native of western Asia. Carthamin has been cultivated since remote antiquity as the source of a beautiful red dye for cotton and silk. The grave clothes of mummies were dyed with carthamin, and fragments of the plant itself have been discovered in ancient Egyptian tombs. The Chinese received the plant from the West about 150 B. C. It has been largely supplanted as a dyestuff by modern coal-tar products, except in China and India, where it is still locally important. Carthamin is grown to some extent in France, Italy, and Spain. The extract, when mixed with talcum powder, forms the standard cosmetic known as rouge.

Cashew (*kà-shōō'*) (*Anacardium occidentale*). A spreading tree, of the cashew or sumac family, which attains a height of from 20 to 40 feet. It is a native of tropical America, where it is much

cultivated for its fleshy fruit stalks and oily nuts which are used as food. The trunk of the tree yields a gum similar in character to gum arabic. Since the discovery of America the cashew has become very widely distributed in tropical regions, notably in West Africa, British India, and the East India islands.

Cassaba (*kă-să'bă*). A variety of winter muskmelon, called also pineapple melon. Under proper handling, it is capable of keeping several weeks after being picked. The cassaba melon is large, firm, smooth skinned, and yellow in color, with a very thick, yellow flesh. When fully ripened it has a delicious flavor. The name is derived from the town Kassabah, not far from Smyrna in Asia Minor, whence it was introduced. Seeds were sent to California in 1878, and the first crop was produced for the market in 1879. This attempt was a failure because the melons were picked too green. With later improved methods of handling, the cassaba has become very popular. It is now very extensively grown in the San Fernando valley and elsewhere. See *Muskmelon.*

Cassava (*kă-să'vă*) (*Manihot utilissima*). A bushy, somewhat herbaceous shrub, 6 to 8 feet high, with large palmately divided leaves. It belongs to the spurge family, and is native to tropical America, where it was cultivated for food for several centuries previous to the Spanish exploration. During the period of the slave trade, cassava became widely distributed in Africa. It is now grown to some extent in Florida.

Cassava is propagated from cuttings of its stems and branches planted in furrows, and is cultivated much like corn. About 7 months are required to mature the large, farinaceous roots, which are 1 to 3 inches thick and 1 to 3 feet long. There are 2 varieties, the poisonous, or bitter, and the nonpoisonous, or sweet. The poison in the bitter variety is due to the presence of hydrocyanic or prussic acid in its sap. Both varieties yield wholesome food, as the poisonous principle is readily dispelled by cooking.

The starchy, somewhat potato-like roots constitute an important article of food in many tropical countries. This starch, when it is dried quickly under the action of intense heat, forms into pellets, or "tapioca," the well-known article of food which is sometimes sold under the name of Brazilian arrowroot.

Castor Oil Plant (*Ricinus communis*). A widely known plant of the spurge family, thought to be a native of tropical Africa. In warm countries it is a perennial, occurring as a small, much-branched tree; but, as it cannot endure frost, it becomes an annual in temperate regions.

The castor oil plant has been cultivated since extremely remote antiquity, dating back more than 4000 years in Egypt, where its seeds are found in the ancient tombs. The Romans knew it as *Ricinus* and it is mentioned by Theophrastus and by Dioscorides. The oil obtained from the seeds, called castor beans, is used in medicine, in the arts, and, in the Far East, as lamp oil. The plant is cultivated in Italy, France, Spain, India, Algeria, and the West Indies. Although often planted in the United States for ornamental purposes, its cultivation for commercial use is as yet of slight importance.

Catalpa (*kă-tăl'pă*). A tree of the trumpet creeper family, with large leaves and showy flowers in terminal clusters. The common catalpa (*C. catalpa* or *bignonioides*) is native to the Gulf States but is widely cultivated in the eastern United States for ornament. It reaches 60 feet in height, has light gray bark, strong scented, entire or sometimes lobed leaves, and bears numerous white flowers strongly dotted inside with yellow and purple spots.

The hardy catalpa (*C. speciosa*) occurs from southern Indiana, Illinois, and Tennessee to Missouri and Arkansas. It attains a height of 120 feet and a diameter of 4½ feet. The bark is rough and thick, the leaves are not unpleasantly scented, and the large white flowers are but faintly spotted within. It grows rapidly and in the Middle West is often planted for timber as well as for ornament. The durable wood is used for ties and fence posts and for telephone and telegraph poles.

Catnip (*Nepeta cataria*). A small erect herb of the mint family, so named because of the remarkable fondness which cats display for its foliage. It grows from 2 to 3 feet in height, with velvety, heart-shaped leaves, whitish-downy beneath, and a terminal spike of small blue flowers. It is a native of Europe and has become widely naturalized in North America from New Brunswick to Oregon and southward. Catnip is used in rural districts as a home remedy, its properties being regarded as tonic.

Cat-tail (*Typha*). A genus of reedlike aquatic plants of the cat-tail family. They have swordlike leaves, and an erect stem bearing a club-shaped spike of minute flowers. There are about 10 species, two occurring in North America.

The broad-leaved cat-tail (*T. latifolia*) has stout stems 4 to 8 feet high, flat leaves about an inch wide, and dark brown spikes an inch or more in diameter. It is abundant in swamps nearly throughout the northern hemisphere. The astringent rootstocks are rich in starch. In Russia the young shoots are eaten like asparagus.

The narrow-leaved cat-tail (*T. angustifolia*) has slender stems 5 to 10 feet high, somewhat convex leaves about a half inch wide, and light brown spikes, usually less than a half inch in diameter. This plant occurs abundantly in coastwise marshes but rather rarely inland.

The leaves of both species are used in making mats, baskets, chair bottoms, and in cooperage. Cat-tail rootstocks are much eaten by muskrats. These valuable fur-bearing animals are usually numerous in large cat-tail marshes.

Cauliflower (*kô'lĭ-flou'ĕr*). A variety of cabbage in which the budlike head of compacted leaves is replaced by a tight head of clustered rudimentary flowers. On account of its delicate flavor, cauliflower is highly esteemed as a table vegetable. However, its cultivation is much more difficult than that of cabbage. Cauliflower seed is very expensive, being largely imported from northern Europe, though increasing quantities are supplied from Washington and British Columbia.

Broccoli is a variety of cauliflower, the popular Italian or sprouting kind having an open panicle, instead of a dense head, of undeveloped flowers.

Cauliflower requires a well drained but permanently moist and highly fertile soil. It must also be sheltered from the direct rays of the sun. The latter condition is met either by growing it on north slopes or by planting it very early or very late in the season, so as to avoid maturing the heads during midsummer. When the head begins to form, the surrounding leaves are drawn up and tied above it. This process, by screening the sunlight, blanches the heads to a milk white color, making them more tender and delicate and improving their appearance for the market. See *Cabbage.*

Cedar. A name given to various kinds of evergreen coniferous trees. However, it is properly applied only to the two or three species of *Cedrus*, namely, the cedar of Lebanon (*C. libani*), famous since biblical times for its fragrant, enduring, reddish wood; the Himalayan or deodar cedar (*C. deodara*), of India; and the African cedar (*C. atlantica*), of the Atlas mountains.

The so-called white cedar of the eastern United States (*Chamæcyparis thyoides*) grows in swampy regions near the Atlantic coast. The yellow cedar of the Pacific coast (*Chamæcyparis nookatensis*), with fragrant yellow wood, occurs from California to Alaska. The Port Orford cedar (*Chamæcyparis lawsoniana*), a valuable timber tree often 175 feet high, is found in Oregon and California. The arbor vitæ (*Thuya occidentalis*) is called northern white cedar, while the giant arbor vitæ of the Northwest (*Thuya plicata*) is called western red cedar.

The name cedar is also popularly given to red-wooded species of juniper (*Juniperus*) and to various trees which are not conifers. Among the latter is the Spanish cedar (*Cedrela odorata*), extensively used for cigar boxes. See *Deodar*, *Juniper*.

Celandine (*sĕl'ăn-dĭn*) (*Chelidonium majus*). A smooth, brittle, branching herb of the poppy family. It has deeply cut leaves and bears small clusters of showy yellow flowers. A native of Europe, celandine is now widely naturalized in the eastern United States as a weed. The yellow juice is very acrid and burning to the skin, and, in large doses, is an active poison.

Celery (*sĕl'ĕr-ĭ*) (*Apium graveolens*). A biennial plant of the parsley or carrot family. It is a native of Europe, West Asia, and North Africa. The plant was anciently grown as a vegetable in the Mediterranean region. It is mentioned in Homer's *Odyssey*; and eating celery, as well as eating the onion, was recommended by Dioscorides as a means of inducing sleep. Celery is now widely cultivated in Europe and America for the leaf stalks, which are blanched and eaten as a salad and also cooked as a vegetable. In Europe a form called celeriac is extensively grown for its thickened root. The ripe seeds of celery contain a volatile oil used in medicine as a sedative.

Century Plant (*Agave americana*). A stout perennial of the amaryllis family, native to Mexico, called also agave and American aloe. In its growing stage the plant consists of a large rosette of long, fleshy, sharp-pointed, spiny-margined leaves. It is sometimes many years in attaining maturity, whence the misleading name century plant. At blossoming time it quickly develops a very tall and stout flowering stem, sometimes 30 feet high, surmounted with a huge panicle of flowers. After flowering, the seeds ripen and the whole visible plant withers and dies.

The cultivation of the agave in Mexico far antedates the Spanish discovery of that country. *Pulque*, the national beverage of the Mexicans, is made from the fermented sap, and, by distillation, *mescal* is produced. The maguey or Pita flax and the sisal hemp, both very valuable fibers used for cordage and binding twine, are obtained from very similar species. The agave was introduced into Europe in 1561, and is widely grown in many countries as an ornamental plant. See *Sisal*.

Cereals. The plants belonging to the grass family which are cultivated for their seeds used as human food,—the name being derived from Ceres, the goddess of agriculture. They are called also corn plants or bread plants. The standard cereals are wheat, barley, rye, oats, rice, and maize or Indian corn. The millets and sorghums, also raggee and Job's tears, are often grouped with the cereals. Buckwheat, which is not a grass, is sometimes incorrectly classed with them.

Cereus (*sē'rē-ŭs*). A genus of the cactus family, including about 100 species, natives of the southwestern United States, Mexico, and dry regions southward to Argentina. Some of these attain gigantic size and others produce some of the most splendid flowers known. The immense flowers of the night-blooming cereus (*C. grandiflorus*), sometimes eight inches in diameter, are famous for their beauty and fragrance. See *Cactus*.

Chamisal (*chä'mē-säl'*) (*Adenostoma fasciculatum*). A small evergreen shrub of the rose family. It grows usually from 2 to 5 feet high, with resinous, narrow leaves in bundles or fascicles, and small clusters of white flowers. The chamisal covers large areas on the slopes of California mountains. It is one of the most valuable covering shrubs of the chaparral belt, preventing erosion and the rapid run-off of water.

Chaulmoogra (*chôl-mōō'grà*) (*Taraktogenos kurzii*). A large tree native to tropical forests of southeastern Asia. It bears a fruit which, in size, is about equal to a small orange. Within the hard rind is a sweetish pulp, closely packed with large seeds. From these seeds is obtained the highly valuable chaulmoogra oil. This oil, which, in the Orient, has been long used in the treatment of skin diseases, was formerly the only known means of arresting the course of leprosy.

Cherimoya (*chĕr'ĭ-moi'à*) (*Anona cherimola*). A small tree of the custard apple family, called also cherimoyer. It is a native of tropical America and is widely cultivated in warm regions for its delicious fruit. It grows from 15 to 30 feet high, with drooping branches, oblong leaves which are velvety beneath, and highly fragrant flowers. The fruit, which ranks among the finest produced in the tropics, ranges from the weight of an orange to 15 pounds or more. It is roundish or heart-shaped, with a thick, yellowish or reddish skin and a white, juicy flesh. Cherimoyas are grown to some extent in southern California and Florida.

Cherry (*Prunus*). A genus of small trees of the rose family, comprising, with the almond, peach, apricot, and plum, the important group of stone fruits. Garden cherries have originated chiefly from two species, the sour cherry (*P. cerasus*) and the sweet cherry (*P. avium*), both natives of eastern Europe and western Asia where they have been cultivated since ancient times. They bear a profusion of white flowers in early spring, followed by mostly red, yellow, or black fruit, without bloom, containing a smooth, nearly round stone.

The common red or sour cherry is a low, spreading tree, usually not exceeding 15 feet in height, with somewhat drooping branches. Sour cherries, especially the dark red morello varieties, are extensively grown in the eastern United States. Large quantities are marketed, either as fresh fruit or canned, Pennsylvania usually leading in production.

The sweet cherry, called also bird cherry or mazzard, is a larger and stronger tree, sometimes reaching a height of 45 feet. It includes the various black and white cherries which have a sweet pulp when ripe. While cultivated to some extent in the eastern United States, sweet cherries are produced chiefly in California, whence they are shipped to eastern markets.

The wood of both species is reddish brown, close-grained, and takes a high polish. It is prized for making furniture, interior finishings, and musical instruments. See *Plum*.

Cherry, Wild (*Prunus*). Trees or shrubs of the rose family, closely related to the plums. Those found in North America form three groups, the bird cherries, with small, bright red fruit, the dark fruited cherries, and the evergreen cherry laurels.

The most important is the wild black cherry (*P. serotina*), a large, handsome tree, sometimes 100 feet high, with a trunk 4 to 5 feet in diameter, and bearing a small, thin-fleshed, bitterish, black fruit. It grows from Nova Scotia to North Dakota and southward to Florida and eastern Texas. The light red wood is much used in cabinetmaking.

The wild red cherry (*P. pennsylvanica*), called also bird cherry, 30 to 40 feet high, with slender trunk, reddish branches, and small, light red, sour fruit, occurs throughout eastern North America. The bitter cherry (*P. emarginata*), often a mere

shrub, but sometimes 30 to 40 feet high, with bright red, bitter fruit, grows from Montana and Arizona westward to the Pacific Ocean. The choke cherry (*P. virginiana*), a shrub or small tree, with reddish black, very astringent fruit, is common east of the Rocky mountains. The western choke cherry (*P. demissa*), similar to the last, occurs from the Rockies to the Pacific slope.

The holly-leaved cherry or Islay (*P. ilicifolia*), an evergreen species of California and the coast islands, is usually shrubby but sometimes grows 30 feet high. It bears thick, spiny-toothed leaves and dark purple fruit with a very large stone.

The laurel cherry (*P. caroliniana*), of the South Atlantic and Gulf states, sometimes called "mock orange," is another evergreen-leaved species. It is usually a small tree and in the South is sometimes planted for ornament. Its small, black fruit has a thin, dry flesh. See *Plum*.

Chestnut (*Castanea*). A genus of trees of the beech family. There are 4 or 5 species, natives of temperate climates.

The American chestnut (*C. dentata*) is a stately, spreading tree which reaches a maximum height of about 90 feet with a trunk diameter of 4 feet. It is found from Maine to southern Michigan and southward to Delaware, Tennessee, and Mississippi. The fruits are finely flavored nuts, which are enclosed in burs, usually 2 or 3 nuts in a bur. The wood is yellowish brown, soft, and weak, but durable in the soil and much used for fence posts and also in furniture manufacturing. In recent years a fungus disease, believed to have been introduced from China, has killed thousands of chestnut trees.

The Japanese chestnut (*C. crenata*), a smaller tree, is now much cultivated for its productiveness, its large nuts, and its freedom from blights. It is often grafted on the American species.

The Chinquapin or Chinkapin (*C. pumila*) is a shrub or small tree native to dry soil from New Jersey to Missouri and southward to Florida and Texas. It is generally about 10 feet in height, but occasionally reaches 40 feet, especially in Arkansas, where it attains its highest development. The nuts are ovoid, sweet, and about half the size of ordinary chestnuts. The brown, coarse-grained, hard, durable wood is extensively used for fence posts and railroad ties.

Chicory (*Cichorium intybus*). A herbaceous perennial of the composite family, with handsome blue flowers, native to the Mediterranean region. It was known to the Greeks and Romans and is still widely cultivated in Europe as a salad plant, for fodder, and for its roots. The latter, when roasted and ground, are used as a substitute for, or as an adulterant of, coffee. Chicory has become naturalized as wayside weed in many parts of the United States, where it is now grown to some extent for its roots.

Christmas Berry (*Heteromeles arbutifolia*). A shrub or small tree of the rose family, native to the chaparral belt of California foothills and low mountains. This elegant shrub is known also as toyon, tollon, and California holly. It has a short, thick trunk with many upright branches, ashy gray, wrinkled bark, oblong, shiny, evergreen leaves, and whitish flowers borne in large clusters. The handsome, bright red berries, which ripen from October to February, are sold in the markets, like holly, for holiday decorations. Though very suitable for turnery, the hard, heavy, reddish brown wood is as yet but little used. See *Holly*.

Chrysanthemum. A numerous genus of plants of the composite family, embracing about 200 species, mostly native to Asia, Europe, and North Africa. Nearly all are free blooming and produce showy white, yellow, or rose-purple flowers. In popular language the name chrysanthemum is confined to the many greenhouse and garden varieties, now widely cultivated in Europe and America, which have been derived from two Chinese and Japanese species, *C. indicum* and *C. sinense*. By cross-fertilization and selection, a remarkable array of forms and colors has been produced, ranging in size from mere button-like tufts to huge heads nearly 8 inches in diameter, with ray florets 4 inches long. Like the rose in the western world, the chrysanthemum is a favorite in the Far East, and is the national flower of Japan.

The Oxeye Daisy, which has become a troublesome weed in the eastern United States, is a chrysanthemum (*C. leucanthemum*) native to Europe, as are also the Feverfew (*C. parthenium*) and the Costmary (*C. balsamita*), which have escaped from gardens. In France, the Marguerite (*C. frutescens*) is much grown in gardens for ornamental purposes.

Cinchona (*sĭn-kō'nȧ*). A genus comprising several small trees of the madder family, natives of Bolivia and Peru. They yield cinchona bark, the source of the quinine of commerce, and are now extensively cultivated in Jamaica, Japan, India, and Ceylon. The bark of these trees was first introduced into Europe by the Countess of Cinchon, the wife of a viceroy of Peru. She was cured of malaria by its use.

Cinnamon (*Cinnamomum zeylanicum*). A small tree belonging to the laurel family, native of Ceylon, the bark of which yields cinnamon oil and cinnamon, the well-known spice for flavoring. From biblical times the bark had been taken from wild trees until systematic cultivation was begun by the Dutch in Ceylon about 1765 and later was extended to Brazil, the West Indies, Egypt, and Java.

Citrous (or **Citrus**) **Fruits.** A group of valuable fruits, produced by trees and shrubs of the rue family. They belong chiefly to the genus *Citrus*, and, by many, are called "citrus" fruits. The most important are the orange, the lemon, and the grapefruit. Other fruits of the group include the citron (*C. medica genuina*), the thick rind of which is used in confectionery and in preserving; bergamot (*C. aurantium bergamia*), which yields an essential oil used in perfumery; also the citrange, the mandarin, the tangelo, and the tangerine. The closely related trifoliate orange (*Poncirus trifoliata*) and the kumquats (*Fortunella*) are classed with the citrous fruits. See *Citrous Belt*, *Grapefruit*, *Kumquat*, *Lemon*, *Lime*, *Orange*, *Tangerine*.

Clematis (*klĕm'ȧ-tĭs*). A genus of trailing vines of the crowfoot family. They bear conspicuous flowers and seeds, the latter having usually long feathery awns. There are about 150 species, some 20 of which are native to the United States and Canada.

The Virgin's Bower (*C. virginiana*), with leaves divided into three leaflets and showy clusters of white flowers, grows from Nova Scotia to Manitoba and southward to Georgia. The Western Virgin's Bower (*C. ligusticifolia*), with leaves divided into five leaflets and flowers similar to the preceding, ranges from Missouri to the Pacific coast. The large-flowered clematis (*C. lasiantha*), with leaves of three leaflets and solitary flowers, is found in California.

Many handsome species are in cultivation. Among the most popular are *Clematis paniculata*, with fragrant flowers, *Clematis viticella*, with solitary bell-shaped flowers, and *Clematis patens*, with large, blue flowers—all natives of Japan, and the evergreen *Clematis indivisa*, from New Zealand.

Climbing Bittersweet (*Celastrus scandens*). A woody vine of the staff-tree family, which grows in rich soil from Quebec to Manitoba and southward to North Carolina and New Mexico.

It has alternate leaves, greenish flowers with finely toothed margins, and an orange-yellow fruiting capsule or pod. This opens after the leaves have fallen, exposing the scarlet aril covering the seeds. The handsome clusters of brightly colored fruit are used for winter ornament. See *Bittersweet.*

Clover (*Trifolium*). An important genus of plants of the pea family, embracing 275 species widely distributed in temperate regions. Of these, more than 60 are native to the United States. The true clovers have leaves composed of three leaflets, nontwining, herbaceous stems, and roundish or oblong heads of small flowers, which persist in a withered state until the seeds ripen. Several species are of great value to agriculture as pasture, fodder, and honey plants.

Among the most important cultivated kinds are red clover (*T. pratense*), alsike or Swedish clover (*T. hybridum*), Italian or crimson clover (*T. incarnatum*), and Egyptian clover (*T. alexandrinum*). In many sections the white clover (*T. repens*), a native both of Europe and of North America, quickly establishes itself in pastures and meadows without cultivation. In common with many other leguminous plants, the clovers possess the power, through the agency of bacteria living on their roots, of taking nitrogen from the air and transforming it into a soil fertilizer.

Many related plants which do not belong to the true clover group (*Trifolium*) are popularly called clovers. Among these are the sweet clover (*Melilotus*), bur clover (*Medicago*),. prairie clover (*Petalostemon*), and bird's-foot clover (*Lotus*). See *Leguminous Plants.*

Clove Tree (*Eugenia aromatica*). An ornamental evergreen tree, 20 to 40 feet high, belonging to the myrtle family. It bears large oval leaves and numerous clusters of crimson flowers. The unexpanded flower buds, when properly dried, form the cloves of commerce. The tree was found native in the Molucca or Spice islands by early Portuguese traders. It has since become naturalized in various other warm regions, and is now cultivated in Sumatra, Mauritius, Zanzibar, the West Indies, and elsewhere in the tropics.

Coca (*Erythroxylum coca*). A small shrub, 3 to 6 feet high, belonging to the coca family, native to Peru and Bolivia. The tealike leaves are much used by the natives of several South American countries as a narcotic stimulant. The plant was grown for this use by the Indians of the Andes long before the discovery of America. Quantities of the leaves are found buried with the mummies in ancient Peruvian tombs. Coca is the source of the medicinal alkaloid *cocaine*, extensively used in medicine. The shrub is now cultivated in various parts of South America, India, Java, and Ceylon. The yearly production of leaves in the South American trade is estimated at about 35 million pounds.

Coconut (*Cocos nucifera*). A very valuable tree of the palm family, probably native to the Malay archipelago and possibly to tropical America. In southern Asia and the East India islands this palm has been cultivated for upwards of 3000 years. It is now diffused along the coasts of all tropical regions and is the principal food plant of many Pacific islands. The stem, which is about a foot in diameter and from 60 to 80 feet high, bears at the summit a crown of downward-curving leaves, 12 to 20 feet long.

The chief product of this palm is the coconut, whose dried kernel or meat is the *copra* of commerce and the source of coconut oil. Palm wine, arrack, and sugar are obtained from the sap; cordage is made from the fiber of the leaves, and coir from husks of the nut. The wood of the lower part of the stem, very hard when seasoned, takes a beautiful polish and is employed for a great variety of uses. It is known commercially as porcupine wood. See *Palms.*

Coffee (*Coffea arabica*). A small tree of the madder family, native to Ethiopia, and ranking with tea among the world's most important beverage plants. In ordinary cultivation, coffee is a pyramidal tree, 6 to 10 feet high, with evergreen, leathery leaves and small, white, fragrant flowers. It bears a dark red, cherry-like fruit which encloses two somewhat hemispherical seeds with flattened faces, called coffee beans. These seeds, when properly prepared and cleaned, constitute the coffee of commerce.

The use of coffee is comparatively recent, probably dating back about 500 years in Arabia, whence it was introduced into Europe in the 16th century. The Dutch began growing coffee in South America in 1718, and its cultivation has since become extensive in many tropical countries. Coffee culture is now the chief industry of Brazil, which produces about two-thirds of the world's supply.

The stimulating principle in coffee is the alkaloid, caffeine, which is very similar in its action to the theine of tea and the theobromine of cocoa. See *Cacao, Maté, Tea.*

Columbine (*kŏl'ŭm-bīn*) (*Aquilegia*). A herbaceous plant of the crowfoot family, noted for its handsome flowers. These have 5 petal-like, colored sepals and 5 tubular petals with hornlike spurs, usually ending in honey sacs. There are about 50 species, mostly native to north temperate countries, over 20 of which occur in North America. The common columbine (*A. canadensis*), with scarlet, yellow, or rarely white flowers, 1 or 2 inches long, grows in rocky woods throughout eastern United States and Canada. The blue columbine (*A. cærulea*), one of the most beautiful species, native to the Rocky mountains, is the state flower of Colorado.

Compass Plant (*Silphium laciniatum*). A tall, coarse plant of the composite family, native to the prairie regions of the United States, called also resinweed. It has a tall, resinous stem and nearly vertical root leaves. When growing in open situations, exposed alike on all sides to the sunlight, the edges of most of the leaves point approximately north and south. This peculiarity is mentioned in Longfellow's "Hiawatha." The stem leaves of the prickly lettuce (*Lactuca scariola*) exhibit the same compass-like property.

Compositæ (*kŏm-pŏz'ĭ-tē*). The composite family, called also aster, thistle, or sunflower family, is the most numerous natural group of flowering plants. It contains upwards of 800 genera and about 12,500 known species, or about one-tenth of all seed-bearing plants, very widely distributed throughout the world. In some regions this family constitutes a large part of the total flora, comprising over one-sixth of the flowering plants in California, over one-fifth in Chile, and in certain regions of the Andes more than one-third.

The *Compositæ* are now regarded by botanists as the most highly developed of plants, and in recent classifications the group is placed at the head of the vegetable kingdom. Some botanists divide this great group into three distinct families, as, for example, into the *Cichoriaceæ* or chicory family, the *Ambrosiaceæ* or ragweed family, and the *Asteraceæ* or aster family. Other authorities, while regarding the ragweed and chicory families as distinct and separate, retain the name Compositæ for the remainder, which comprises about five-sixths of the entire group.

The family includes many useful plants, such as the artichoke, carthamin, endive, chicory, lettuce, salsify, scorzonera, wormwood, camomile, tansy, arnica, coltsfoot, pyrethrum, and elecampane. Among the very large number of cultivated ornamental plants belonging to this family are the dahlia, chrysanthemum, aster, cineraria, coreopsis, cosmos, cornflower, immortelle, and marigold.

Conifers (*kō'nĭ-fĕrz*) (*Coniferæ* or *Coniferales*). The chief group of living gymnosperms. All are trees or shrubs of temperate regions or of high altitudes in the tropics, mostly with evergreen, resinous, needle-shaped or scalelike leaves. They usually produce a cone-shaped strobile, or cone, containing the seeds, whence the name *conifer*, or "cone-bearer." There are two great groups: (1) the pine family (*Pinaceæ*), with about 240 species, commonly with scaly cones, including the pines, spruces, firs, hemlocks, cedars, larches, junipers, cypresses, redwoods, and araucarias; (2) the yew family (*Taxaceæ*), comprising about 75 species, with a somewhat fleshy fruit, including the yews, *Torreyas*, *Cephalotaxus*, *Dacridium*, and the South American podocarps.

Cork Tree. The cork oak (*Quercus suber* and *Q. occidentalis*) is native to southern Europe and northern Africa. It grows from 20 to 40 feet high and sometimes has a trunk 4 feet in diameter. The thick, spongy outer bark, known as cork, has been widely used since ancient times. Theophrastus refers to it; Plutarch mentions cork life preservers; and Pliny tells of the use of cork for stoppers, floats for nets, and for inner soles of shoes. Cork is taken from both wild and cultivated trees, at intervals of about 9 years. The removal of the thick outer layer does not injure the vitality of trees, which yield the best bark at 40 years and continue to produce for about 150 years. Spain and Portugal now furnish over two-thirds of the world's supply of cork.

The cork oak trees planted in the South Atlantic and Gulf states and in southern California between 1880 and 1890 are still living. They have not, however, been worked for commercial cork, which, under proper management, they would probably yield. See *Oak*.

Corn (*Zea mays*). An annual of the grass family, producing a valuable cereal grain. Corn, called also Indian corn and maize, is the most important contribution made by the New World to the economic plants used by man, ranking with wheat and rice among the world's chief food plants.

Like wheat and some other very anciently cultivated plants, corn is unknown in the wild state. By most authorities it is supposed to have originated from a parent wild species growing on the high plateaus of tropical America between Mexico and Peru. Some investigators have regarded the Mexican teosinte (*Euchlæna mexicana*) as a possible ancestor of maize. These two plants hybridize freely and produce fertile offspring. From such hybrids Burbank and other plant breeders derived by selection degenerate forms of corn, but the origination of corn from pure teosinte has not been proved.

While botanists generally recognize only a single species of corn, centuries of cultivation have developed many varieties, ranging in size from dwarf kinds only two feet high to giant West Indian forms exceeding 30 feet in height. The most important varieties are the dent corns, flint corns, sweet corns, pop corns, soft corns, and pod corns. See *Cereals*, *Grasses*.

Cotton (*Gossypium*). A genus of small trees, shrubs, and herbaceous plants of the mallow family, comprising many species which are widely distributed in the tropics. From the long hairs covering the seeds of various forms now cultivated in warm regions, the world's supply of cotton fiber is obtained. The seeds yield cottonseed oil, cottonseed meal, and fertilizer.

According to the researches of Sir G. Watt, the commercially important cottons are derived chiefly from the following five species: (1) sea island or Egyptian cotton (*G. barbadense*), native to tropical America, and highly valued for its long fiber; (2) upland cotton (*G. hirsutum*), native to Mexico, the most important cotton yielding plant and source of the standard American cotton; (3) kidney cotton (*G. brasiliense*), native to South America, and yielding a harsh, wiry fiber suitable for mixing with woolens; (4) levant cotton (*G. herbaceum*), native to India, and source of most of the short-fibered cottons grown in Asia, and (5) tree cotton (*G. arboreum*), native to northern Africa, and sparingly cultivated in the Orient for its silky fiber.

Cotton has been grown in southern Asia for upwards of 2000 years, and was known also to the ancient Greeks. In the New World its cultivation and use were well established from the West Indies to Peru and from Mexico to Brazil at the time of the discovery of America. See *Cotton Cloth*, *Flax*, *Ramie*.

Cowpea (*Vigna sinensis*). A leguminous annual, native to southeastern Asia. It has been cultivated since prehistoric times as a food and forage plant, having been known to the ancient Romans. The cowpea is now widely distributed in tropical and subtropical regions. Its introduction into the United States dates from about 1725. In the South the cowpea has become a valuable fodder and soiling crop, corresponding in importance to red clover in the North or to alfalfa in the Western States.

Crab Apple (*Pyrus*). A name commonly given to various species of apple, bearing hard, sour fruit. The Siberian crab apple (*P. baccata*), a native of northern Asia and Europe, has been notably improved by cultivation. It is of great importance to fruit growers because it transmits its hardiness to crosses with the common apple, many valuable resistant varieties having been developed.

The American or sweet crab apple (*P. coronaria*) is one of the most beautiful trees of the eastern United States when its fragrant pink flowers are in bloom. Its fruit is of little value. The similar narrowleaf crab apple (*P. angustifolia*), a small tree growing from Pennsylvania to Florida and Louisiana, is very popular on account of its sweet-scented, rose-colored flowers. The prairie or Iowa crab apple (*P. ioensis*), similar to the eastern crab apple, produces larger and less acid fruit. Valuable crosses with the common apple have already been made, including the so-called Soulard apple (*P. soulardii*). Horticulturally, the Iowa crab apple is the most promising native species. See *Apple*.

Cranberry (*Vaccinium macrocarpum*). A small, creeping shrub of the heath family, native to peaty bogs and marshlands in the northeastern United States and in Canada. It is highly esteemed for its firm, red, acid fruit, which is of good keeping quality. The cultivation of the cranberry was begun in New England about 1800. Cranberry culture is now of commercial importance in Wisconsin, New Jersey, and Massachusetts, the last-mentioned state usually producing somewhat more than half of the total crop. This now exceeds a million bushels.

Creosote (*krē'ô-sōt*) **Bush** (*Covillea glandulosa*). A common evergreen desert shrub, of the caltrop or bean caper family, occurring from Texas to California, and usually attaining a height of 3 or 4 feet. It has somewhat brittle stems and small, olive green leaves which emit a strong, tarry odor. Early in the season it bears a profusion of yellow flowers, followed by woolly seed vessels. Throughout vast areas in the Gila, Colorado, and Mohave deserts the creosote bush is a characteristic plant. As it harbors a small insect which secretes a resinous substance identical in composition with the lac used in making varnishes, the creosote bush possibly may become commercially important.

Cucumber (*Cucumis sativus*). A vinelike annual of the gourd family, native to India, and cultivated as a garden vegetable since prehistoric times. It was known to the ancient Greeks and Romans, was introduced into China about 150 B. C., and is now widely grown throughout the world. The oblong, fleshy fruit, 4 to 30 inches long, is eaten in the green state as a salad and is also extensively used in pickling.

Cultivated Plants. Along with the domestication of animals, the invention of tools, and the use of fire, the cultivation of plants ranks as one of the fundamental advances made by primitive man. The earliest historical records show that many of the plants still of supreme importance to mankind were well established in cultivation at an extremely remote period.

According to De Candolle, some 50 plants are known to have been in cultivation for upwards of 4000 years. Among these are wheat, barley, millet, rice, bean, lentil, apple, peach, apricot, olive, fig, date palm, cabbage, onion, turnip, flax, hemp, saffron, carthamin, and tea.

Among plants in cultivation since the beginning of the Christian era but not known to have been grown for more than 4000 years are oats, rye, beet, carrot, lettuce, celery, pea, asparagus, watermelon, orange, lemon, grapefruit, madder, indigo, poppy, cotton, and probably the potato, sweet potato, maize, and tobacco.

During the last 2000 years few plants of primary importance have been placed in cultivation, though some older plants have been very greatly improved and many valuable minor plants have been added to husbandry. Among these are buckwheat, horseradish, parsnip, parsley, chicory, endive, artichoke, pumpkin, squash, tomato, Lima bean, okra, New Zealand spinach, currant, gooseberry, raspberry, blackberry, strawberry, muskmelon, persimmon, pineapple, various clovers, jute, sisal, cinnamon, clove, hop, and cinchona, coca, peanut, coffee, maté, and cocoa.

There were three distinct regions in which most cultivated plants were developed, namely, China, southwestern Asia from the Ganges to the Nile, and tropical America from Mexico to Peru. The number of useful cultivated plants when compared to the vast array of unused wild species is exceedingly small. About 140,000 species of higher plants have been described, but of this number only about 300 have become permanently useful and economically important in cultivation. Of these, the Old World has contributed about four-fifths and the New World about one-fifth. In the New World, South America heads the list, being credited with the potato, tobacco, tomato, Lima bean, peanut, manioc, coca, cocoa, cassava, cinchona, and usually with Indian corn or maize. Among those originating in the United States are the American grape, strawberry, plum, blackberry, and raspberry; also the pumpkin and the Jerusalem artichoke.

Currant, Black (*Ribes nigrum*). A small shrub of the saxifrage family, native to northern Europe, and Asia. It has been cultivated in Europe since the early middle ages for its black, strongly scented, berry-like fruit. It is now widely grown in Canada but only sparingly in the United States. The unpleasant odor and taste of the raw fruit are removed by scalding. In France large quantities of *liqueur de cassis* are made from it. The native North American black currant (*R. floridum* or *americanum*), possessing similar qualities, is sparingly cultivated.

Owing to the fact that this and other species of *Ribes* are intermediate hosts of the white pine blister rust, a deadly fungous disease of all 5-leaved pines, the sale and distribution of currant and gooseberry bushes have been greatly curtailed. See *Gooseberry*.

Currant, Red (*Ribes rubrum*). A small shrub of the saxifrage family, native to northern temperate regions. It is highly esteemed for its agreeable, acid fruit, which is extensively used for jellies. In Europe, the cultivation of the red currant began early in the middle ages, though it was but little known in England until after 1600. It is now very widely grown in fruit gardens in the northern United States and Canada. As with the black currant, this fruit is much less cultivated than formerly because of the threat it carries to white pine. See *Gooseberry*.

Cypress (*Cupressus*). A genus of coniferous trees. The European cypress (*C. sempervirens*) is a dark-colored evergreen, with extremely small, scalelike leaves entirely covering the twigs. Cypress trees, though of a somewhat somber appearance, may be used with great effect in shrubberies and gardens. They are much valued also on account of their wood, which is hard, compact, and very durable, of a reddish brown color and a pleasant smell.

The Monterey cypress (*C. macrocarpa*) is native to a few miles of shore (Cypress and Pinos points) near Monterey, California, whence all the trees of this species, now widely planted for ornament in America and Europe, were originally obtained. The bald cypress (*Taxodium distichum*), of the southern United States and Mexico, is a deciduous-leaved species, highly prized for its valuable timber, which, under water, is almost imperishable. In the swamps of the southern United States this cypress constitutes forests hundreds of square miles in extent. See *Big Trees*.

Dahlia. A genus of perennial plants of the composite family, native to Mexico and Central America, and named in honor of Dahl, a Swedish botanist. Dahlias were first brought to Madrid in 1789, and from two species, *Dahlia variabilis* and *Dahlia juarezii*, have been derived the immense number of handsome kinds now in cultivation. In the wild state the dahlia is a stiff, formal flower with 8 red rays about a yellow center. But, under cultivation, dahlias are produced in a great variety of colors and shapes. Some are compact and spherical, others have large, flat petals, while the beautiful cactus dahlias have double blossoms with twisted rays. After frost in the autumn the tuberous roots are dug and stored in cellars, like potatoes, to be planted in the spring for the next eason's flowering.

Dandelion (*Taraxacum officinale*). A common, stemless plant of the composite family. The smooth, erect, hollow flower stalk rises from the center of a rosette of leaves. It bears a bright yellow flower head, followed by a "blow-ball" of feathered seeds, which are blown everywhere by the wind. The whole plant contains a bitter, milky juice.

Originally a native of Europe and Asia, the dandelion is now very widely naturalized in temperate countries, and often immensely abundant as a weed, particularly in the eastern United States. It is used to some extent as a potherb and for salads. Medicinal qualities are ascribed to the root, which is sometimes used to adulterate coffee. The name dandelion means "tooth of a lion," referring to the irregular, jagged teeth on the leaves.

In the spring the dandelion is an exceedingly valuable plant to commercial beekeepers. It furnishes large quantities of nectar and pollen when most needed by the bees for rearing their brood.

Date Palm (*Phœnix dactylifera*). A large tree of the palm family, native of the oases in the deserts of southwestern Asia and northern Africa. In height it ranges from 40 to 80 feet and bears at its summit a crown of large, pinnated leaves. The fruit is produced in huge clusters, a single tree frequently yielding 300 to 500 pounds. In Egypt and Arabia the date palm has been cultivated for its valuable fruit for more than 4000 years. It is mentioned in Herodotus and is the palm of the Bible. This palm is an important source of wealth in Mediterranean countries, producing, in addition to the date of commerce, oil, fiber, and wood. Its cultivation has extended to Italy, France, China, and southwestern United States. American production exceeds 38 million pounds annually and is of exceptionally high quality. See *Palm*.

Deodar (*dē'ō-dăr'*) (*Cedrus deodara*). A magnificent cedar of the Himalaya mountains, called also the "god tree." It sometimes grows to a

height of 70 feet without branching, the trunks attaining great size. The close-grained, perfumed, highly resinous wood is much used for building. The deodar is often grown as an ornamental tree; it is also much planted in California for shelter belts about orange groves. See *Cedar*.

Desert Plants. Without special modifications of their structure, plants living in a very dry atmosphere would soon wither and die. Some desert plants are protected by a covering of densely matted hairs. Others are covered with scurfy scales or with waxy or resinous exudations. Still others have highly specialized structures guarding the breathing pores of the leaves. Many desert plants are bulbous, especially the biennials, and quickly wither down to the ground after a brief period of growth. Some, such as the cactus, century plant, and aloe, have fleshy leaves or stems in which a supply of water is stored. However, the great majority of desert perennials are shrubby or woody.

Besides perennials and biennials, desert vegetation usually includes a large number of short-lived annuals. These spring up with great rapidity after the scant rains. They often grow to maturity and ripen their seeds within a period of a few weeks. Then they quickly perish, leaving their seeds to be scattered broadcast by the winds. See *Alpine Plants*, *Aquatic Plants*.

Dogwood, Flowering (*Cornus florida*). A small tree of the eastern United States, rarely over 30 feet high. The true flower is greenish-yellow and inconspicuous, but is surrounded by four or more white or pink bracts. These bracts are showy and lend conspicuous beauty to the tree in the spring. The dogwood is the state flower of Virginia.

Douglas Fir (*Pseudotsuga taxifolia* or *P. mucronata*). A valuable timber tree of the pine family, called also red fir and Douglas spruce. It has some of the characteristics of the hemlocks and the firs but most closely resembles the spruces.

Except the great sequoias of California, the Douglas fir is the most gigantic tree of Pacific Coast forests. Under the most favorable conditions of growth, it often attains a height of 180 or 190 feet and a trunk diameter of from 3½ to 6 feet. Occasionally, the tree reaches a height of 250 feet, with a trunk diameter of 10 or 12 feet. It grows from British Columbia to South Dakota and southward to Texas and Mexico, attaining its greatest development in Oregon and Washington. In the two last-named states it forms immense forests, furnishing the strong structural timber known as "yellow fir" or "Oregon pine."

The Big-cone Spruce (*P. macrocarpa*), 30 to 90 feet high, grows on southern California mountains. It is remarkable for its large cones, sometimes 3 inches thick and 7 inches long, which hang downward from the widely spreading branches. This species is a valuable covering tree on dry mountain slopes. See *Fir*, *Hemlock*, *Spruce*.

Dutchman's-pipe (*Aristolochia macrophylla*). A slender, twining vine of the birthwort family. It grows sometimes 30 feet long, has broad heart-shaped leaves, and bears curved, somewhat pipe-shaped, purple-brown flowers. This quaint plant, which is native to rich woods from Pennsylvania to Minnesota and southward to Georgia and Kansas, is often planted for ornament.

Ebony (*Diospyros ebeneum*). A large tree of the ebony family, native to India, Ceylon, and other tropical regions. It produces a hard, heavy, durable, intensely black heartwood, susceptible of a fine polish, highly prized by cabinetmakers. Ebony is used in making various instruments and as a veneer. Various other species of *Diospyros* furnish ebony of a less excellent quality, including the native American persimmons (*D. virginiana* and *D. texana*), of the Southeastern states and Texas. See *Persimmon*.

Edelweiss (*ā′dĕl-vīs*) (*Leontopodium alpinum*). A beautiful perennial of the composite family. It grows about 6 inches in height, with sage-green leaves and dense heads of silver-white flowers surrounded by woolly bracts. Edelweiss is native to high mountains in Switzerland, where it is protected by law. It has become famous because of its rarity in the Alps and on account of the dangers involved in obtaining it. The plant, however, thrives in cultivation, and is now grown in gardens in Europe and America.

Eggplant (*Solanum melongena*). An annual plant of the potato family, called also aubergine and guinea squash. It has somewhat woody stems, usually less than 2 feet high, and prickly leaves. The eggplant is a native of India, where it has been grown since remote antiquity for its large, white or dark purple, fleshy fruit. This is sometimes 6 or 8 inches in diameter and is used as a vegetable. Through long cultivation the eggplant has become an important garden product in the East Indies. It is easily grown in many parts of the United States, particularly in the South, and its cultivation is increasing.

Eglantine (*ĕg′lăn-tīn*). A poetic name of the sweetbrier rose (*Rosa rubiginosa*). It has fragrant foliage and is often grown in gardens. A climbing West Asian rose (*R. eglanteria*), which has ill-scented yellow flowers, is likewise known as eglantine. The fruits of the sweetbrier and other roses are known as "hips." In Norway and other European countries these hips are collected and used as an article of food. See *Rose*.

Elder (*Sambucus*). A genus of shrubs and small trees of the honeysuckle family. There are about 25 species, widely distributed throughout the world. Of these, several are North American.

The common elder (*S. canadensis*) is a shrub with pithy stems, 4 to 10 feet high. It bears creamy white flowers appearing in June, and dark purple, edible berries. This elder grows from Nova Scotia to Manitoba and southward in the United States. The Simpson elderberry (*S. simpsonii*), of southern Florida, formerly thought to be a southern form of the preceding shrub, is a veritable tree, often a foot in diameter. The red-berried elder (*S. racemosa*) is a shrub 2 to 12 feet high, with white flowers appearing in April or May, and red, inedible berries. It occurs from Newfoundland to California and northward to Alaska.

The Mexican elder (*S. mexicana*), a tree 25 to 30 feet high, with creamy white flowers, appearing in March, and black fruit, is found from western Texas to California. The blue-berried elder (*S. glauca*), a widely branching tree, 30 to 50 feet high, with blue-black, pleasantly acid fruit, grows from British Columbia and California eastward to Utah.

Many species of elder possess medicinal qualities, the fresh fruits are used in making elderberry wine, and a perfume is made by distilling the flowers.

Elecampane (*ĕl′ê-kăm-pān′*) (*Inula helenium*). A tall, stout, herbaceous plant of the composite family, native to Europe and naturalized in America. It sometimes grows 6 feet high, has coarse, wrinkled leaves clasping the stem, and bears large yellow flowers which appear in late summer. The root contains an aromatic, acrid resin used in medicine.

Elm (*ĕlm*) (*Ulmus*). A genus of trees of the elm family common to all north temperate regions except western North America. The English elm (*U. campestris*), 60 to 80 feet high, found throughout Europe, West Asia, and North Africa, has been extensively planted in the eastern United States. The compact, durable wood is superior to that of any other elm. The smooth-leaved or Huntington elm (*U. glabra*), native of Europe, is also used as a shade tree in America, as are the Scotch elm (*U. montana*), a rough-leaved species of northern Europe, and the Camperdown elm, which has a low, broad, umbrella-shaped crown.

The American or white elm (*U. americana*), a magnificent, widely branching tree, sometimes 120 feet high, with a huge buttressed trunk 6 to 11 feet in diameter, grows in river bottoms from Newfoundland to the Rocky mountains and southward to Texas. The slippery elm (*U. fulva*), 60 to 70 feet high, with a trunk sometimes 2 feet in diameter, grows on stream banks and forest hills from Quebec to North Dakota and southward to Florida and Texas. The dark red, straight-grained wood is more valuable for various uses than that of the white elm. The mucilaginous bark is used for various purposes in medicine.

The wahoo elm, or winged elm (*U. alata*), a rather slender tree 40 to 50 feet high, with branchlets often bearing 2 thin, corky wings, grows chiefly in moist uplands in the Southern states. It is often planted as a shade tree as far north as Maryland. The cork elm (*U. thomasi*), sometimes 80 to 100 feet high, with branchlets usually clothed with 3 or 4 thick, corky wings, occurs from Quebec to Wisconsin and southward to New Jersey and Missouri. The cedar elm (*U. crassifolia*), with small, leathery leaves, often grows 80 feet high. It occurs from Texas and Arkansas to Mississippi and Mexico and is the common elm tree of Texas.

Elms of northeastern United States have been threatened seriously by the Dutch elm disease, caused by a European fungus and transmitted by two kinds of bark beetles. To check the spread of this disease, infected wood is burned and living trees are sprayed with certain chemicals.

Endive (*ĕn'dĭv*; *-dīv*) (*Cichorium endivia*). An annual or biennial, somewhat bitter plant of the composite family, closely related to chicory. It is a native of the Mediterranean region where it has long been cultivated, perhaps since Greek and Roman times, as a salad plant. It is grown like lettuce and is blanched for use by tying the root leaves together at the top.

Epiphytes (*ĕp'ĭ-fītz*). Plants which grow upon the surface of other plants for mechanical support but which do not obtain nutriment from their sap or growing tissues as do parasitic plants. Epiphytes are most abundant in warm, moist regions. Various mosses and lichens are epiphytic as are an immense number of tropical orchids and arums. The so-called Spanish moss (*Tillandsia usneoides*), a true flowering plant, which hangs in festoons from live oaks in the Southern states, is a good example of an epiphyte. See *Parasitic Plants*.

Eucalyptus (*ū'kă-lĭp'tŭs*). A numerous genus of trees of the myrtle family, comprising about 300 species, mostly natives of Australia and Tasmania. Many of these are popularly called gums or gum trees. They are usually trees of striking appearance and give a characteristic aspect to the forests of which they form a most valuable part. The leaves, which contain much volatile oil, are entire, leathery in texture, hang obliquely on their stalks, and are usually placed with their edges to the sun. The various species furnish excellent timber adapted to nearly every requirement. Some produce a kind of sugar and others yield kino, tannin, and the eucalyptus oil widely used in medicine. Certain species are exceedingly rapid growers, and several attain immense size. The Great Gum, or Peppermint Tree (*E. amygdalinus*), one of the tallest of trees, has been known to reach a height of 346 feet.

About 70 species of eucalyptus are grown for timber or ornament in California, Arizona, and Florida. Among these are the blue gum (*E. globulus*), the sugar gum (*E. corynocalyx*), the gray gum (*E. tereticornis*), the red gum (*E. rostrata*), the branched gum (*E. viminalis*), and the desert gum (*E. rudis*). See *Big Trees, Blue Gum*.

Evergreen. A tree or plant which remains verdant throughout the seasons. The commonest examples are the conifers, but not all conifers are evergreens. See *Cedar, Deodar, Douglas Fir, Hemlock, Juniper, Larch, Laurel, Pine, Spruce*.

Everlasting. The name given to various plants of the composite family whose flowers retain their form and color for long periods after being gathered and dried. Various species of *Helichrysum*, called also immortelles, are often cultivated. The pearly everlasting (*Anaphalis margaritacea*), a beautiful wild species, grows in dry woodlands from Newfoundland to Alaska and south to Oregon and Kansas.

Feijoa (*fā-zhō'ȧ*) (*Feijoa sellowiana*). A small tree of the myrtle family sometimes 15 feet high. It is native to Brazil, Paraguay, Uruguay, and Argentina, and is closely related to the guava. The feijoa has olive-like leaves, glossy green above and silver-gray beneath, and large flowers, white outside and purplish crimson within. The oval, dull green fruit is marked with crimson. It is about two inches long, with a translucent melting pulp and a delicate pineapple flavor for which it is very highly esteemed. The feijoa was introduced into cultivation in southern Europe in 1890. It was brought to the United States about 1900, and is now widely planted in California.

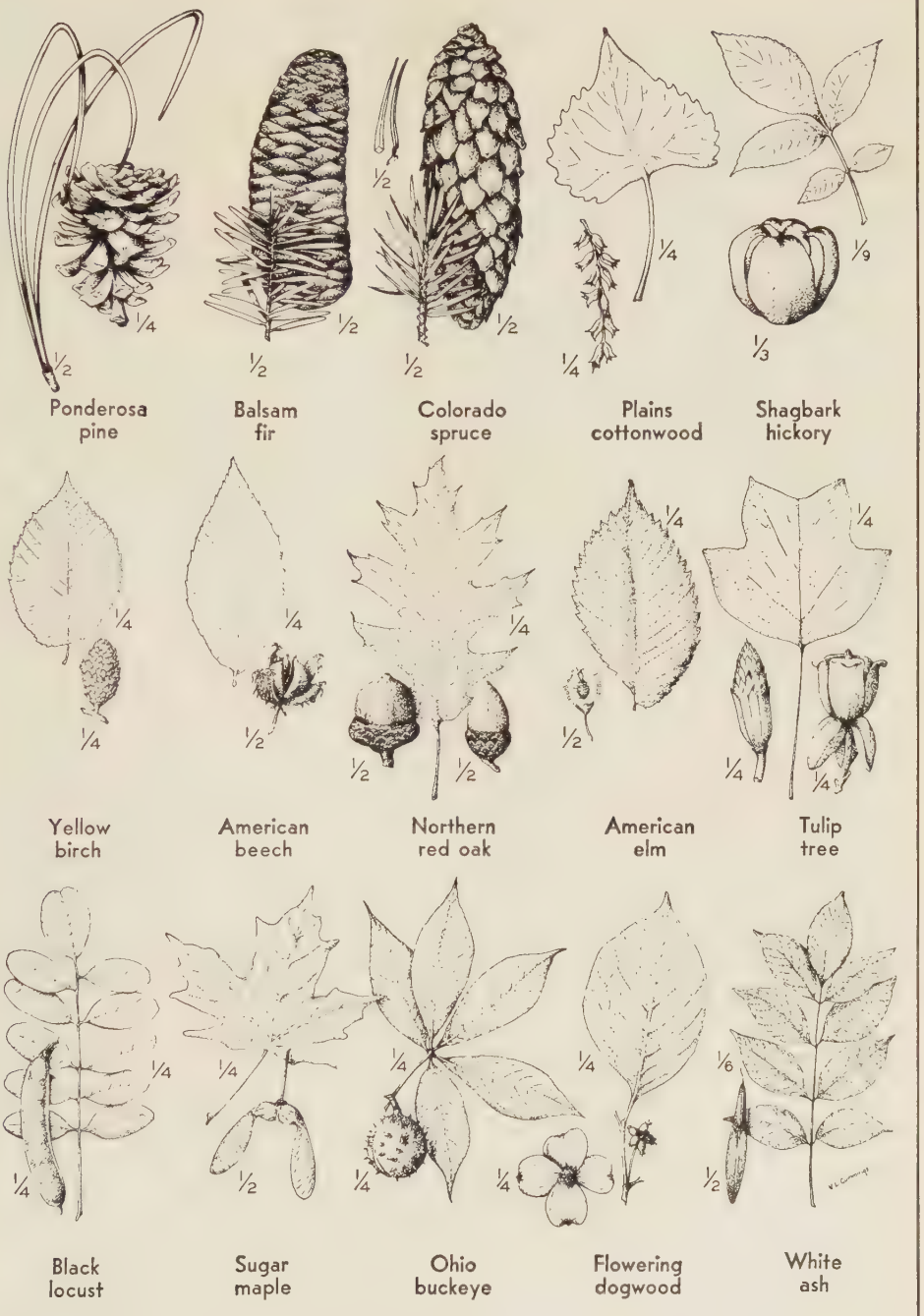
Ferns (*Filices* or *Filicales*). The highest group of the flowerless or non-seed-bearing plants, comprising about 5000 species, very widely distributed throughout the world but most numerous in humid tropical regions. In size they range from minute, mosslike plants to treelike forms rivaling the palms. Ferns are leafy plants, often strikingly beautiful in outline and texture, varying from delicate, filmy structures to vigorous, luxuriant growths.

In ordinary ferns, only the leaves, properly called *fronds*, are seen above the ground. The fronds are borne on more or less lengthened stalks, known as *stipes*, which usually rise from a nearly horizontal underground stem or *rhizome*. In tree ferns, the fronds form a rosette at the summit of a hollow arborescent trunk.

The method of reproduction in ferns is very interesting. The leafy plant never produces structures corresponding to flowers with stamens and pistils. It is, therefore, *asexual*. But, on the under side of the fronds of typical ferns are borne groups (*sori*) of little brownish structures, called *sporangia* or spore cases. In these are developed countless, exceedingly minute bodies, known as *spores*. Each spore consists of a single plant cell and is totally unlike a seed. When the spores have ripened, the spore cases split open, scattering abroad the spores. Upon falling on moist earth, these germinate and grow, not into leafy fronds, but into minute flattened bodies, called *prothallia*. These tiny prothallia bear organs corresponding to flowers, and are therefore *sexual*. They produce egg cells and antherozoids which, by a process of fertilization similar to that effected by the stamens and pistils of higher plants, develop an entirely new plant organism. In time this grows into the asexual leafy fern, which, in its turn, bears spores. This regular recurrence of asexual and sexual forms in the life history of a plant is known as the *alternation of generations*.

Ferns occur in greatest variety in moist tropical or subtropical islands, as, for example, in Hawaii, Samoa, the Philippines, and New Zealand. In the United States and Canada there are about 300 kinds of native ferns. In the island of Java there are nearly 600 species. The state of New York, about equal to Java in area, has only about 50 wild species. Among the best-known ferns growing in the United States and Canada are the bracken, maidenhair, spleenwort, polypody, adder's tongue, lady fern, shield fern, sword fern, Christmas fern, New York fern, royal fern, ostrich fern, sensitive fern, climbing fern, hay fern, chain fern, walking fern, deer fern, and gold fern.

On account of their graceful foliage, many ferns are widely cultivated for ornamental purposes. The bracken is sometimes used for thatch and the oil extracted from the male fern is used in medicine. See *Brake, Maidenhair*.



Prepared especially for THE FRONTIER PRESS COMPANY by Dr. Virginia L. Cummings

NATIVE NORTH AMERICAN TREES

SOME WILD FLOWERS OF AMERICA

1—New England Aster
2—Golden Buckwheat
3—Flowering Dogwood
4—Oswego Tea
5—Black-eyed Susan
6—Bush Morning-Glory
7—Azalea
8—Mountain Laurel

SOME WILD FLOWERS OF AMERICA

9—California Poppy
10—Columbine
11—Leopard Lily
12—Bluebonnet
13—Meadow Phlox
14—Indian Paintbrush
15—Spiderwort
16—Prickly Pear Cactus

At the Missouri Botanical Garden (Shaw's), a new geodesic dome greenhouse, 175 feet in diameter and rising to a height of 70 feet, features a unique climate control system. It can produce rain, mist, dry air or almost any other kind of atmosphere demanded by the rare tropical plants that are kept there.

Above Historic Orton Plantation near Wilmington, North Carolina. The gardens and the moss-covered trees have delighted tourists for four decades.

The garden and home of George Wythe in Williamsburg, Virginia. George Wythe was the first professor of law in America and his home was the headquarters for General Washington before the siege of Yorktown.

The truly magnificent North Vista of the Henry E. Huntington Botanical Gardens in San Marino, California. Stately trees planted in nearly perfect rows frame both sides of the vista.

FAMOUS GARDENS

The fountains viewed from the front of the Longwood Conservatory and Gardens in Kennett Square, Pennsylvania. These are the public gardens of the Du Pont family.

The gardens at Dumbarton Oaks, Washington, D. C., are a public showplace. The Dumbarton Oaks Estate and Library are now owned by Harvard University.

Fig (*Ficus carica*). A tree of the mulberry family, 15 to 30 feet high, with large, rough, deeply lobed leaves. It is a native of western Asia and the Mediterranean region, where, since prehistoric times, it has been extensively grown for its valuable fruit. The fig is pictured in Egyptian pyramids and its cultivation by the Greeks is mentioned by Homer, Herodotus, Aristophanes, Plato, and Theophrastus.

The fig is an oblong or pear-shaped fruit, about the size of a small peach. It is green, yellow, red, or blue-black in color, and, when ripe, very pulpy, juicy, and pleasant flavored. It is eaten fresh, canned, preserved, or, most commonly, when dried. The dried figs of commerce, which are nearly as nutritious as dates, are obtained chiefly from Asia Minor, especially from the vicinity of Smyrna. Since 1899 figs of Smyrna quality have been grown in California, where, in 1961, the production of dried figs exceeded 37 million pounds. Figs are grown also in Texas and other Gulf states.

The golden fig (*F. aurea*) and the poplarleaf fig (*F. populnea*) are small trees found in Florida and adjacent islands. Their fruit is unimportant.

Fir (*Abies*). A genus of large, handsome, evergreen trees of the pine family, some of which attain immense size. There are about 25 species, mostly native to northern mountain regions. The firs have more or less conical-shaped crowns, linear, flat, scattered leaves, and bear large cylindrical cones erect on the uppermost branches. The firs are peculiar in having blister-like cavities in the trunk bark which contain a honey-like oleoresin used in medicine and in the arts. The resin is obtained by puncturing the "blister" and forcing the fluid to flow into a wide-mouthed bottle. The cones of firs differ from those of spruces in having deciduous scales which fall away from a central woody stem when the fruit is ripe.

The balsam fir (*A. balsamea*) is a rather widely branching tree, 50 to 60 feet high, with fragrant, resinous leaves, growing from Labrador to Alberta, southward to Minnesota, and in the mountains to Virginia. It is the source of the valuable oleoresin known as Canada balsam.

The silver fir (*A. amabilis*), a handsome tree, native to the Olympic and Cascade ranges from Oregon to British Columbia, often attains a height of 250 feet, with a trunk 4 to 6 feet in diameter. The lowland white fir (*A. grandis*), sometimes 300 feet high, grows in valleys from Montana, Idaho, and British Columbia through Washington and Oregon to California. The red fir (*A. magnifica*), of the Sierra Nevada, is a beautiful tree often 200 feet high, with a trunk 4 to 6 feet in diameter. A variety of the red fir, the Shasta fir, occurring on Mt. Shasta, bears cones with exserted bracts.

The white fir (*A. concolor*) occurs from the Rocky mountains to the Sierra Nevada where it sometimes grows 250 feet high, with a trunk 6 feet or more in diameter. The noble fir (*A. nobilis*) forms extensive forests in the mountains of Oregon and Washington, whence it extends to northern California. It is a handsome tree, commonly 150 to 200 feet high, but sometimes reaching 250 feet, with a trunk diameter of 6 to 8 feet.

Unique among all of our native firs is the bristlecone fir (*A. venusta*), found only in a few narrow canyons in southern California. It is a handsome but little known species, with unusually long, sharp-pointed, glossy leaves, and long, bristle-like bracts extending from the cone scales.

While, with the exception of the noble fir, the wood of most of the firs is much inferior to that of pine or spruce, it is used for lumber, pulpwood, and various other purposes. See *Douglas Fir*.

Flax (*Linum*). A fiber and seed plant of great importance, cultivated since very ancient times in the Old World, and now widely grown in the New. The common flax (*L. usitatissimum*) grows wild in western Asia. It is an erect, narrow-leaved annual with a slender stem, 2 or 3 feet high, which branches near the top where it bears many handsome, bright blue, nodding flowers. These are followed by small, globular, many-celled pods, containing very smooth, flattened, brownish seeds, the linseed of commerce, from which linseed oil is obtained. Since the dawn of history various kinds of linen cloth, thread, cordage, and rope have been made from the fiber of flax stems. The mummies found in the most ancient Egyptian tombs are wrapped in cloth woven from the narrow-leaved flax (*L. angustifolium*).

Flax is grown in vast quantities for fiber in Russia, Hungary, Belgium, Holland, France, and Ireland. Russia usually produces about half the world's crop, though western Europe contributes the finer grades. Comparatively little effort has been made to produce flax fiber in the United States. The world's commercial crop of flaxseed or linseed is grown in about equal proportions by the United States, Canada, Argentina, India, and Russia. In the United States, North Dakota, Montana, Minnesota, and South Dakota lead in production. In Canada, Saskatchewan is the chief producer. See *Cotton, Hemp, Jute, Manila Hemp, Sisal.*

Forget-me-not (*Myosotis*). Low, more or less hairy, branching herbs of the borage family. They bear alternate, entire leaves and small blue, pink, or white flowers in stemless, one-sided racemes. There are about 35 widely distributed species, several of which occur in the United States and Canada. Various species are cultivated for their delicately beautiful flowers, which long have been regarded as emblematic of friendship. Among the best known of these is the true forget-me-not (*M. scorpioides*). This plant is a native of Europe and Asia, now widely grown in gardens in temperate countries. It has escaped from cultivation and become naturalized from Newfoundland southwestward to Tennessee.

Foxtail Grass. A common name for various grasses. The true meadow foxtail (*Alopecurus pratensis*), an excellent European pasture grass, has become naturalized in eastern North America. Jointed foxtail (*Alopecurus geniculatus*), native of Europe and Asia, now widely introduced in moist soils, is highly prized by cattle. The yellow foxtail (*Setaria glauca*) and the green foxtail (*Setaria viridis*), both naturalized from the Old World and often called pigeon grass, are extremely abundant everywhere as field and wayside weeds.

Fuchsia (*fū'shĭ-ȧ*; *fū'shȧ*). A genus of climbing plants, shrubs, and trees of the evening-primrose family, named in honor of the botanist, Leonhard Fuchs. There are about 70 species, mostly native to tropical America. Several varieties are cultivated for their handsome flowers, which occur in many forms and colors.

Fungi (*fŭn'jī*). A large class of flowerless plants, comprising, with the *Algæ*, the lowest primary division of the plant kingdom, known as thallophytes. Fungi range in size from the minutest organisms known to threadlike masses several feet long. They are either *parasitic*, deriving their nutriment from living plants and animals, or *saprophytic*, deriving their sustenance from dead or decaying organisms.

It is estimated that there are more than 250,000 species of fungi, of which only about one-third have been described. Fungi are usually classed in five divisions: *Myxomycetes*, or slime molds; *Schizomycetes*, or bacteria; *Phycomycetes*, or alga-like fungi; *Ascomycetes*, or sac fungi, including molds and mildews; and *Basidiomycetes*, or basidium fungi, including rusts, smuts, puffballs, and mushrooms. Some authorities, however, place the slime molds in a separate class, distinct from the fungi; others regard them as animals (*Mycetozoa*) and group them with the protozoa.

Some fungi, such as truffles, morels, puffballs, and various mushrooms, are edible. Others, such

as the deadly amanita and the fly amanita, are most violent poisons. Many kinds are extremely destructive to grain, garden, and fruit crops, as, for example, the smuts, rusts, mildews, and molds. Numerous species, particularly the pathogenic bacteria, produce diseases in man and animals. Those fungi which transform dead animal and vegetable matter into food for living plants are highly beneficial. See *Bacteria, Mushrooms, Yeast.*

Garlic (*Allium sativum*). A bulbous-rooted perennial of the lily family, closely allied to the onion, and native to western Asia. Garlic has been cultivated since ancient times, being mentioned by Herodotus and in the Bible. It is grown for the root, which consists of several small bulblets popularly called "cloves." These have a powerful, onion-like odor and a pungent taste. In southern Europe, garlic is very generally used as a flavoring agent in cooking. See *Leek, Onion.*

Gentian (*jĕn'shăn*) (*Gentiana*). Herbs of the gentian family, native to cool temperate and arctic regions, and noted for their beautiful blue or sometimes yellow flowers. There are about 300 species, some 40 of which occur in North America. The yellow gentian (*G. lutea*), of alpine Europe, is valued for its medicinal root. The root of the soapwort gentian (*G. saponaria*), a blue-flowered species of the eastern United States, is similarly used. The fringed gentian (*G. crinita*), with a conspicuously fringed, bright blue corolla, is one of the most beautiful American wild flowers. It is found in moist meadows from Quebec to Minnesota and southward to Georgia. The closed gentian (*G. andrewsii*), of similar range, with a closed, somewhat bottle-shaped blue flower, is now cultivated in gardens.

Geranium. A genus of herbs belonging to the family of the same name. There are about 190 species, found in temperate regions, about 60 of which occur in North America. They bear regular flowers, usually pink, red, purple, or white, and palmately lobed or divided leaves, often with a pungent odor.

The Wild Cranesbill (*G. maculatum*), growing from Newfoundland to Manitoba and southward, with rose-purple flowers over an inch broad, is an attractive wild flower of woodlands in spring. The rootstock is used in medicine for its tonic and astringent properties. The Carolina Cranesbill (*G. carolinianum*), found throughout the continent, is a small, stout annual with deeply cleft leaves and bearing clusters of small pinkish flowers.

The hardy, handsome house and garden plants popularly known as geraniums have been developed from various species of *Pelargonium*, introduced from South Africa.

Giant Grubi (*Amorphophallus titanum*). A plant native to Sumatra which has the largest flower known. The flower, resembling a gigantic morning glory with fluted sides and ruffled edges, is from three to four feet across, deep maroon within and a light green outside. The flower is borne on a thick stalk which rises from a fleshy corm.

Ginger (*Zingiber officinale*). A herbaceous plant of the ginger family. It has been cultivated in the East Indies since time immemorial, and is now grown in the West Indies and other tropical countries for its fleshy pungent rootstock. This, when dried, is the ginger of commerce. The unscraped rootstock is known as black ginger and the scraped and peeled rootstock as white ginger. Candied ginger, a delicious sweetmeat, is made of the young rootstock preserved in sugar. Essences and sirups of ginger are used in flavoring. Various preparations are employed as a stimulant.

Ginkgo (*gĭngk'gō*; *jĭngk'gō*) (*Ginkgo biloba*). A beautiful tree, often called maidenhair tree, long grown around temples in China and Japan, now widely planted as an ornamental tree in all civilized countries. In the eastern United States it is cultivated as far north as the Great Lakes. It is slender and slow-growing, with a central shaft and widely spreading, ascending branches, and sometimes attains a height of about 100 feet. In form and appearance the fan-shaped, deciduous leaves strongly resemble those of the maidenhair fern. The filbert-like seed of its vile-smelling, plumlike fruit is parched and eaten by the Chinese.

In cultivation the ginkgo has been a familiar tree for many centuries. Its native country, however, was unknown to scientists until the tree was recently discovered growing wild in remote districts of western China. The ginkgo is the sole surviving representative of the numerous ancient gymnosperms called *Ginkgoales*, which were most abundant during the Jurassic period.

Ginseng (*jĭn'sĕng*) (*Panax*). A genus of small perennial plants of the ginseng family, whose roots are very highly esteemed as a medicine by the Chinese. The native East Asian species (*P. ginseng*), one to two feet high, bears five smooth leaves, inconspicuous flowers, and scarlet fruit. Roots which, when dried, assume the shape of the human form are said to have been sold for their weight in gold. The discovery, in 1716, of the very similar American ginseng (*P. quinquefolium*), native of the Northeastern states and Canada, soon led to a large export to China of the wild roots, which became increasingly scarce and valuable. All attempts to cultivate the American ginseng failed until 1885 when George Stanton grew it successfully at Apulia, N. Y.

Gladiolus. A genus of bulbous plants of the iris family. They are mostly natives of the Cape of Good Hope, whence many handsome-flowered species have been introduced into general cultivation. Southern Europe formerly furnished the world with gladiolus bulbs, but the United States now contributes by far the greater part of the supply. The plural of gladiolus is gladiola.

Goldenrod (*Solidago*). A genus of perennial herbs of the composite family. They bear a profusion of small, bright yellow flowers which blossom in late summer or early autumn. There are about 125 species, mostly native to North America, only one kind being found in Europe. They range in height from a few inches to 6 or 8 feet and grow in a great variety of situations, occurring in forests, swamps, prairies, along streams and roadsides, and on high plains and mountains. By reason of its beauty and wide distribution in the United States, the golden rod is styled the national flower. Several states have chosen it as a floral emblem.

Goldenseal (*Hydrastis canadensis*). A small, erect herb of the crowfoot family, called also orange-root, yellowroot, turmeric root, and puccoon. The plant grows about a foot high with a thick, yellow rootstock and palmately lobed leaves. It bears a solitary, greenish white flower, blossoming in April in its native woodlands in the eastern United States and Canada. Goldenseal is widely used in medicine as a tonic. The plant also yields a yellow dye.

Goldthread (*Coptis trifolia*). A beautiful little plant of the crowfoot family. It has tufted stems, evergreen leaves, white flowers, and a bright yellow, threadlike, bitter rootstock, from which a tonic medicine is extracted. It grows in damp woods and bogs from Newfoundland to Tennessee and northwestward to Alaska.

Gooseberry (*Ribes*). A genus of the saxifrage family embracing many species of prickly shrubs, native to the North Temperate Zone. These bear a nearly round, pulpy berry, usually about one-third of an inch in diameter, light green in color and very acid when immature, but usually purplish brown and sweet when fully ripe. The fruit of several species has been greatly improved by cultivation.

The European gooseberry (*R. grossularia*), which became generally cultivated in Germany and Holland about the year 1500, reaches perfection in England. Since 1890 it has been grown to a limited extent in the United States. The cultivated American gooseberry originated in Massachusetts about 1850 from a seedling of a common native species (*R. oxyacanthoides*). Gooseberries are used chiefly in making jam, preserves, tarts, and pies. See *Currant* (*Black* and *Red*).

Grape (*Vitis*). A genus of the vine family, containing many climbing, woody vines. They have large, usually toothed or lobed and somewhat heart-shaped leaves, small, greenish flowers, and globular, berry-like fruit borne in dense clusters. There are about 50 wild species, widely distributed in temperate countries. Several species, improved by cultivation, yield excellent fruit.

The European grape (*V. vinifera*), commonly called the "vine," native of the Mediterranean region, was one of the first fruits cultivated by man. It was grown by the ancient Egyptians, by the Lake Dwellers of the Bronze age in Italy, and by the Phœnicians, Hebrews, Greeks, and Romans, reaching China as early as 120 B. C. This grape shares leadership with the apple among the chief fruits of the temperate zone. The cultivation of the grape has become extensive in every continent,—table grapes, raisins, currants, and wine being important articles of commerce in many countries. France, Italy, and Spain combined produce about three-fifths of the world's supply of wine. Spain leads in production of raisins in the Old World; California stands first in the New World. In value, the products of the European grape grown in California amount to approximately half the total grape products of the United States.

The American grape is the most important native fruit developed in the New World. About 20 species of wild grapes are found in the United States and Canada. From several of these, various cultivated forms have been produced. By far the most important ones, such as the Concord and Worden, have been derived from the northern fox grape (*V. labrusca*). In fact, this wild grape has furnished more cultivated varieties than all other native species combined. Therefore, when taken together with its many valuable varieties, this species may properly be styled the American grape. Since 1860 the culture of the American grape, for table use and for making grape juice, has become extensive in the eastern United States and Canada, especially in New York, Ohio, Pennsylvania, Michigan, and Ontario.

Besides adding an excellent new fruit, the introduction of the American grape has proved of inestimable value to the entire grape growing industry. Its root is resistant to the phylloxera, a terribly destructive insect pest, which formerly ravaged the choicest vineyards of the Old World. Millions of oung American vines have been sent to various parts of the world to be top-grafted with the European grape. By replanting with European grapevines growing upon resistant American graperoots, the vineyards of the most important grape producing countries have been saved from impending destruction.

The American grape differs from the European, both in its manner of growth and in the character of the fruit. While the American grape is capable of enduring much colder climates than the European, the vines are more slender and slow-growing. In order to support the fruit, the American grapevine is usually trellised. The Old World vine, however, when properly pruned, develops a short, stout trunk which easily sustains a heavy load of ripened fruit. The American grape is very juicy, with a readily detachable skin, and the seeds are firmly embedded in the somewhat tough central pulp. The European grape has a firmly adhesive skin, less juicy but more uniformly tender pulp, and easily removable seeds.

By reason of containing much more sugar than the American grape, many Old World varieties can be made into raisins simply by drying them in the sun. Small, seedless varieties thus preserved are known as currants, a corruption of the name Corinth (Greece), where they have long been grown.

Grapefruit (*Citrus paradisi*). A small tree of the orange family, native to the East Indies, cultivated upwards of 2000 years in India and Malaysia for its excellent fruit. The tree closely resembles the orange in appearance, but the fruit is much larger and is usually borne in clusters somewhat like bunches of grapes, whence the name, grapefruit. It is extensively grown in most tropical countries, under various names, such as pomelo, pummelo, pompelmous, and shaddock. After its cultivation became established in Florida and California, about 1900, grapefruit soon rose to popularity in the United States. The growing of grapefruit has recently been extended into subtropical sections of southern Arizona, where fruit of excellent quality is produced. See *Citrous Fruits*, *Orange*.

Grasses (*Gramineæ* or *Poaceæ*). A very important family of flowering plants, embracing about 4500 species, widely diffused and abundant throughout the world. Several hundred of these grow in the United States and Canada. All are herbaceous except a few, such as the bamboo, which have woody stems. Most grasses have round or somewhat flattened, usually hollow stems, solid at the joints, and alternate leaves with tubular sheaths, usually split on the side opposite the blade. The fruit is a seedlike grain, called a *caryopsis*, with a groove on one side.

In temperate and cold regions, the true stems of the perennial grasses form a thick, interlacing network below the surface of the ground, which is called turf or sod. From this are sent up annual growths or culms, popularly but inaccurately called stems. In warm regions, the stems of the perennial grasses grow erect, like annual grasses, and, consequently, no true turf is formed. Grasses are of inestimable value, furnishing the chief food plants used by man and by domestic animals. The group includes blue grass, red top, timothy, millet, sorghum cane, Kafir corn, sugar cane, barley, rye, oats, rice, wheat, and corn.

Greasewood (*Sarcobatus vermiculatus*). A much branched, somewhat spiny shrub of the goosefoot family. It grows from 2 to 10 feet high, with fleshy, entire, sessile leaves. Greasewood is a characteristic plant of strongly alkaline and saline soils from Montana to Mexico. The name is given also to certain species of saltbush (*Atriplex*) and to various other plants.

Ground Ivy (*Glechoma hederacea*). A small, creeping perennial herb of the mint family, called also Gill-over-the-ground. It has nearly round or kidney-shaped leaves and bears rather large blue or violet flowers in axillary clusters. This plant, native to Europe, is now widely naturalized in damp, shady places in the eastern United States and Canada.

Ground Pine (*Lycopodium*). The name popularly given to various species of club mosses. They have long trailing stems and numerous narrow, evergreen leaves, usually arranged in several ranks. The erect fruiting spikes produce sulphur-yellow, highly inflammable spores. Several species occur in moist woods in the eastern United States and Canada. Ground pines are extensively used for Christmas decoration. Lycopodium powder, composed of the spores of various species, is used in making fireworks and in medicine.

Guava (*gwä'vȧ*) (*Psidium guayava*). A small tree of the myrtle family, with blunt leaves and white, fragrant flowers, native to tropical America. The guava was in cultivation for its delicious fruit from Mexico to Peru at the time of the Spanish

discovery of those countries, and is now widely grown in tropical regions. Cultivation of certain varieties is also well established in Florida and California. The smooth, yellow fruit, about the size of a hen's egg, is extensively used for making jellies. These are now exported in considerable quantities from the West Indies.

Guayule (*gwä-yōō'lā*) (*Parthenium argentatum*). A small, densely branched, spreading shrub of the composite family, native to western Texas, New Mexico, and northern Mexico. When dried this plant yields about 10 per cent rubber, produced chiefly from the bark. The plant may be successfully grown under cultivation, and when so grown yields a much larger percentage of rubber. The Department of Agriculture in 1942 made test plantings of about 75,000 acres in California, Arizona, and New Mexico with a view to further commercial production.

Hackberry (*Celtis*). Trees and shrubs of the elm family, widely distributed in temperate and tropical regions. There are about 60 species, some 13 of which occur in the United States.

The common hackberry (*C. occidentalis*) is a handsome tree, sometimes 130 feet high, with a trunk 3 feet in diameter. This tree has ovate, sharply serrate, roughish leaves, and bears small, dark purple, thin-fleshed, berry-like, sweet fruit, ripening in autumn. It grows in river valleys from Quebec to Oregon and southward to Florida and Texas. It is much planted as a shade tree. The wood is sparingly used in making furniture.

The Sugarberry (*C. mississippiensis*) is a medium-sized tree, common from Kentucky, Indiana, and Illinois southward. This species is often used as a street tree in the South.

Hawthorn (*Cratægus*). A large genus of shrubs or small trees of the rose family, closely allied to the apple. They are usually spiny, with white or pink clustered flowers, and bear a small red or yellow pome fruit. There are several hundred species and hybrids, chiefly native to the United States, Mexico, and the Andes region. Over 250 species are native to the United States. Those producing conspicuous fruit are often called red haws. Various species are popularly known as thorns; as, for example, the Round-leaved Thorn (*C. chrysocarpa*).

The English hawthorn (*C. oxyacantha*), with its numerous varieties, bearing small, deeply lobed leaves and handsome white flowers, is a valuable hedge and ornamental plant. It is widely cultivated in the eastern United States and Canada, and is becoming sparingly naturalized.

Hazelnut (*Corylus*). A genus of shrubs and small trees, of the birch family, which bear a sweet, edible nut enclosed in two enlarged leaflike bracts. There are about 7 species, all native to the northern hemisphere.

The common hazelnut (*C. americana*) is a shrub 3 to 8 feet tall, with light brown nuts enclosed in bracts commonly broader than high. It grows in thickets from Maine to Saskatchewan and south to Florida and Kansas. The similar beaked hazelnut (*C. rostrata*), with nuts enclosed in bracts prolonged into a somewhat tubular beak, is found from Nova Scotia to British Columbia and south to Kansas. The California hazelnut (*C. californica*) grows commonly 6 to 10 feet high, with nuts enclosed in densely hairy bracts extended into a fringed beak. It occurs along streams, west of the Sierra Nevadas.

The filbert (*C. avellana*), a native of the Old World, is extensively cultivated in Europe for its excellent nuts.

Heliotrope (*Heliotropium*). A genus of herbs or shrubs of the borage family. They have entire leaves and small blue or white flowers, usually in more or less curled spikes. There are about 125 species, natives of warm regions, many of which have fragrant flowers and are highly prized in cultivation. The Peruvian heliotrope (*H. peruvianum*) is a small shrub, about 2 feet high, with lilac-blue flowers. It is widely cultivated for its vanilla-like fragrance. The European heliotrope (*H. europæum*), with small white flowers, is now naturalized in the eastern United States.

Hemlock (*Tsuga*). A genus of tall pyramidal trees of the pine family, native to North America and eastern Asia. Four of the seven known species occur in the United States and Canada. The common hemlock (*T. canadensis*), usually 60 to 70 feet high, with a trunk 2 to 4 feet in diameter, and bearing scattered, linear, petioled leaves and small, pendulous cones, occurs in upland forests from Nova Scotia to Minnesota and south to Georgia and Alabama. The bark is extensively employed in tanning leather, and the wood, while inferior to pine and spruce, is much used for building. The much smaller Carolina hemlock (*T. caroliniana*) occurs in the Blue Ridge mountains from Virginia to Georgia.

The western hemlock (*T. heterophylla*), a graceful and valuable timber tree, often 200 feet high, with a trunk 6 to 10 feet in diameter, occurs near the coast from Alaska to central California. The wood of the western hemlock is far superior in commercial quality to that of all other hemlocks. It is heavy, easy to work, and in other respects compares favorably with pine and spruce. Western hemlock lumber is now used for interior finish and in the manufacture of doors. It lacks entirely the splintery quality of the common eastern hemlock.

The mountain hemlock (*T. mertensiana*), 20 to 90 feet high, with fleshy, densely crowded leaves spreading around the branchlets, grows on high mountains from Alaska to California. The soft, very light wood is not commercially used.

Hemp (*Cannabis sativa*). An erect annual of the mulberry family, native to Siberia. It grows from 4 to 20 feet in height, has palmate, usually four-fingered, finely toothed leaves, and greenish yellow flowers. The leaves and bracts contain a strong narcotic known as marihuana.

Hemp has been cultivated since prehistoric times for the strong, durable fiber contained in its stems, valuable for making rope, other cordage, and coarse cloth. It is now grown in immense quantities in Europe, Russia leading in production. While of local importance in Kentucky, Indiana, and California, hemp production in the United States has greatly declined, owing to the increasing use of jute, manila, and sisal. Hempseed is widely sold as food for cage birds, and hempseed oil is used in cooking.

Various fibers are commonly called hemp, although obtained from totally different plants, such as sunn hemp, sisal hemp, manila hemp, and bowstring hemp. From the flowering tops of the Indian hemp (*Cannabis indica*) is obtained the narcotic intoxicant known as hashish.

Henna (*Lawsonia inermis*). A shrub of the loosestrife family, native of tropical Asia. It has been cultivated as a dye plant in India, Arabia, and Egypt, since prehistoric times. The leaves yield an orange dye, extensively used in coloring hair and leather. Women in the Orient employ this dye to stain their nails. This custom dates back some 4000 years in Egypt, as is evidenced by pictures in ancient monuments and by mummies. The sweet scented flowers of the henna are used in perfumery and embalming.

Hickory (*Carya* or *Hicoria*). A genus of timber and nut trees of the walnut family. There are 43 species, varieties, and hybrids, all native to eastern North America. The wood of most species is heavy, strong, close-grained, and highly prized for many uses where strength and hardness are required. The fruit is a hard-shelled nut, usually of the size of a small walnut, and enclosed in a separate valved shell. In most species the nuts are sweet and edible.

The shagbark hickory (*C. ovata*) grows usually from 70 to 90 feet high. It has a straight trunk, 3 to 4 feet in diameter, and sheds its bark in long strips. This tree grows in rich soil from Quebec to Minnesota and southward to Florida and Texas. The wood is very highly valued and the sweet nut is the common hickory nut of the stores. Closely resembling the shagbark hickory, and with similarly valuable wood, is the Big Shellbark, or Kingnut (*C. laciniosa*), found in the Mississippi and Ohio valleys. This tree produces larger nuts than any other hickory.

The Pecan (*C. pecan*), sometimes 170 feet high with a trunk 6 feet in diameter, is native to the Mississippi valley. While the wood is less valuable than that of most hickories, the excellent nuts are a staple article of commerce, and many choice thin-shelled varieties are cultivated.

The Mockernut (*C. alba*), rarely 100 feet high, with close bark, heavy, hard wood, and sweet nuts, occurs on uplands from Ontario to Florida. The Pignut (*C. glabra*) sometimes attains a height of 90 feet. It has light gray bark, strong, tough wood, and a small nut, either bitter or sweet. This species grows on dry hillsides from Maine to Nebraska and southward to Florida and Texas. See *Walnut*.

Holly (*Ilex*). A genus of numerous shrubs and trees of the holly family, several of which have handsome evergreen foliage. There are about 280 species, mostly natives of the New World. Some 15 or more of these are found in the eastern and southeastern United States. A South American species furnishes the maté or Paraguay tea. Several hollies are widely planted for ornament.

The American holly (*I. opaca*) is a slow-growing tree, sometimes 40 to 50 feet high, with handsome, spiny, evergreen leaves and bright red berries, much used for Christmas decorations. It grows in rich woods from Maine to Texas, and is widely planted for ornament in the eastern United States. It is valued for its hard, white, fine-grained wood, used in cabinet work and wood engraving.

The Inkberry (*I. glabra*), a low shrub, from 2 to 4 feet high, with shining evergreen leaves and small black berries, grows in sandy soil, mainly near the coast, from Nova Scotia to Louisiana.

The evergreen leaves of the Dahoon (*I. cassine*), a native of the Southern states, are sometimes used for tea. The leaves of the Yaupon (*I. vomitoria*), another evergreen holly of the South, have long been used as an emetic. The brilliant red berries of both these plants are popular for Christmas decorations. See *Christmas Berry*.

Hollyhock (*Althæa rosea*). A perennial of the mallow family, native to India. It has a tall, unbranched stem, heart-shaped, wrinkled leaves, and large, showy flowers, which vary greatly in color. Numerous varieties are now cultivated for ornament in gardens. In Egypt the hollyhock is cultivated for its leaves, which, when young, are esculent and much used in Egyptian cookery.

Honey Dew Melon. A horticultural variety of the winter muskmelon (*Cucumis inodorus*), closely related to the Cassaba. It was introduced by John Gauger about 1911 into North America from southern France, where it is known as the White Antibes Winter. Mr. Gauger, who believed he had originated the species by cross breeding, gave it the name Honey Dew. The mature melon averages 5 or 6 pounds in weight, is 7 or 8 inches long, and about 6 inches in diameter. The rind is a creamy yellow when ripe, the flesh being a light green blending to white with a sweet taste. American production comes chiefly from the Imperial valley, California, and from Colorado.

Honey Locust (*Gleditsia triacanthos*). A handsome, thorny tree of the pea family, native to alluvial valleys from Ontario to Texas. It grows from 75 to 140 feet high with the trunk and limbs sometimes nearly covered with dense bunches of three-branched, sharp, strong thorns.

The tree bears conspicuous, broad, flat, beanlike pods 12 to 18 inches long, maturing in autumn. The bony seeds within these pods are surrounded by a sweet, jelly-like, edible pulp, whence the name honey locust and honey shucks. From the sugary pulp it is said that the Indians formerly fermented a much prized beverage. The honey locust has been widely planted in the eastern United States for hedges and as an ornamental tree. The red-brown, mahogany-like heartwood is suitable for cabinetwork. A thornless variety of this locust is occasionally found.

A similar southern species, the Water Locust (*G. aquatica*), is peculiar for its short, one-seeded pods. See *Locust Tree*.

Honey Plants. From the viewpoint of the beekeeper, plants that yield nectar accessible to the honeybee are honey plants. Many hundred species of North American plants are nectar secreting, but the truly important honey plants are few in number. In the United States and Canada the honey of commerce is derived mainly from alfalfa and various species of blackberry and basswood.

Among other valuable honey plants are buckwheat, important source of dark honey; white clover and alsike clover, ranking for quality among the best of all honey plants; various goldenrods, for autumn honey; mesquite, main source of honey in Texas; orange and palmetto, very important in Florida; red raspberry, important in the Northern states and in southern Canada; sage (*Salvia mellifera*), of great importance in California; also sourwood (*Oxydendron arboreum*), Spanish needles (*Bidens aristosa*), sweet clover, tupelo, and willow-herb (*Epilobium angustifolium*).

The importance of these plants, chiefly wild species, can be understood only when the extent of the honey crop is known. In the United States, this crop amounts annually to more than 200,000,000 pounds.

Honeysuckle (*Lonicera*). A genus of erect or twining shrubs of the honeysuckle family. There are about 160 species, nearly all native to north temperate regions, more than 20 of which are found in North America. Fully half the species are in cultivation as ornamental plants. The trumpet honeysuckle (*L. sempervirens*), a climbing evergreen shrub, native to low grounds from Maine to Texas, is much cultivated for its scarlet or yellow, highly fragrant flowers.

The woodbine honeysuckle (*L. periclymenum*), an Old World species, with pleasantly scented flowers, is often planted in gardens. The Italian honeysuckle (*L. caprifolium*), native of Europe and much resembling the woodbine honeysuckle, has run wild in the eastern United States. The Tartarian honeysuckle (*L. tatarica*), a large, smooth shrub, with pinkish white flowers, native of Asia, has escaped from cultivation from Maine to Ontario and southward, as has the climbing or trailing Japanese honeysuckle (*L. japonica*). In the Atlantic Coast region from New York to North Carolina the latter species has become a nuisance. See *Woodbine*.

Hop (*Humulus lupulus*). A perennial climbing vine of the mulberry family, with hairy stems and rough, deeply lobed leaves, native to northern America, Europe, and Asia. Since the early middle ages the hop has been extensively cultivated for the resinous, leafy bracts which surround the female flower cluster. When properly gathered and cured, these form the hops used in brewing. The first mention of hop gardens was made by Pepin, father of Charlemagne, in 768. Hop growing was introduced into the United States in 1629. While cultivation is confined to certain favorable localities, the United States contributes a substantial part of the world's commercial supply of hops. California, Oregon, and Washington

usually produce about five-sixths of the American crop, the remainder being grown mostly in New York and Wisconsin.

Horehound (*Marrubium*). A genus of perennial, white-woolly herbs of the mint family. They have wrinkled leaves, small, white or purplish flowers in dense axillary clusters, and bitter juice. About 40 species are native to the Old World. The common horehound (*M. vulgare*) has become so thoroughly naturalized in many parts of the United States and Canada as to have the appearance of a native plant. The plant possesses medicinal properties and is widely used as a remedy for coughs, either in an infusion, in a sirup, or in candy. Horehound was known to Pliny and Columella as a medicinal plant. Its present wide distribution throughout the world is thought to be due to emigrants, who, believing in its curative properties, carried it far and wide.

Horse-radish. A perennial herb of the mustard family, native to eastern Europe. It has been cultivated since the middle ages for its pungent root, which is extensively used as a condiment. While the cultivated form is seedless, the plant spreads rapidly by its long roots. It has become widely naturalized in the United States.

Horsetail (*Equisetum*). A genus of flowerless plants, closely related to the ferns and club mosses, called also horsetail rush and scouring rush. Some 25 species are known, widely scattered throughout the world, about half of which are found in the United States and Canada. They have slender, fluted, many-jointed stems, from a few inches to 10 or 15 feet in height, with whorled, similarly jointed branches and leaves.

The common horsetail (*E. arvense*) is dangerously poisonous to horses. In Vermont, where horse raising is extensive, the annual loss of many animals is attributed to this plant.

The living horsetails are nowhere numerous and are of but little economic value, though the rough, silicious stems of some species are used for scouring and polishing. They are, however, of interest as composing a very small remnant of a once exceedingly numerous and varied group of plants which flourished in the Paleozoic and Mesozoic ages. Some of these were treelike in size and made up part of the vegetation from which coal was formed. Fossil horsetails are abundant in the rocks as early as the Devonian period.

Huckleberry. A name popularly given to various small shrubs of the heath family. It is properly applied, however, only to certain species of *Gaylussacia*, particularly to the black huckleberry (*G. baccata*). This shrub grows usually from 1 to 3 feet high, with resinous leaves, green on both sides. It bears small pink or red flowers, and small, sweet but seedy, shining, black fruit. It grows in sandy woods from Newfoundland to Manitoba and southward to Georgia. The various species of *Vaccinium* which have bluish fruit with a grapelike bloom, often called huckleberry, are properly called blueberries. See *Blueberry*.

Hydrangea (*hī-drăn'jē-ȧ*). A genus of ornamental shrubs of the saxifrage family, native to America and eastern Asia. There are about 35 species, 4 of which grow wild in the eastern and southern United States. Many handsome varieties are in cultivation. A dwarf form (*H. hortensiana*) is extensively grown in greenhouses.

Hydroponics. The growing of plants, particularly vegetables, in water; called also tray agriculture, tank farming, and water culture.

Iceland Moss (*Cetraria islandica*). A lichen which grows abundantly in Iceland, Norway, and other northern countries and is much used for food. The plant, which is usually less than four inches in height, has the appearance of a moss. Iceland moss is gathered in large quantities and forms an article of commerce. It is dried and crushed into a powder from which, after its bitter quality has been reduced by soaking, a kind of bread is made. The dried plant is also boiled with water or milk until it becomes a jelly, forming a food for the sick. Preparations of Iceland moss are sometimes used in making paper and in weaving cloth.

Ice Plant (*Cryophytum crystallinum*). A very fleshy, watery herb of the carpetweed family, with trailing stems and showy flowers. It is remarkable for its greenish or reddish foliage, appearing as if frosted with particles of ice which glitter in the sun. The ice plant grows on southern California sea beaches, in the Mohave desert, and in the Canary Islands. Where abundant, the seeds are eaten as food and the ashes obtained by burning the plant in quantity are a source of carbonate of soda, used in soap and glass making. The ice plant is often planted in greenhouses as a curiosity.

Incense Cedar (*Libocedrus decurrens*). A handsome tree of the pine family. It grows at high elevations on the mountains from Oregon to Lower California, frequently attaining a height of 150 feet, with a trunk sometimes 7 feet in diameter. The slender branches and cypress-like leaves form a beautiful feathery crown. Where abundant, incense cedar is a valuable timber tree, the soft, durable, straight-grained, fragrant wood being much used for fence posts and telephone poles. The wood of the largest trees is usually riddled with what appear to be the galleries of a woodboring insect, but these galleries are caused by a little-known fungus. The tree is planted for ornament in the Middle Atlantic states.

Indian Paintbrush (*Castilleja*). A large genus of herbs of the figwort family, parasitic on the roots of other plants. They have alternate leaves and showy red, yellow, or white flowers, in dense, leafy, bracted spikes,—the conspicuous bracts often more brilliantly colored and larger than the flowers. There are about 50 species, mostly of the New World, about 35 of which occur in the United States and Canada. Several varieties have been successfully cultivated, and a beautiful Rocky Mountain species is the state flower of Wyoming.

Indigo (*Indigofera tinctoria*). A shrub of the pea family, probably native to India, long cultivated in the Orient as a dye plant. The blue dyestuff prepared from it was known to the Romans, who called it *indicum*. This is extracted by steeping with water and fermenting the plant, which is cut just before flowering. Although still important in India and Java, indigo culture has declined, owing to the increasing use of aniline dyes.

Iris. A genus of beautiful herbaceous plants of the iris family (*Iridaceæ*). They have creeping rootstocks, erect stems, equitant leaves, and conspicuously beautiful flowers, many of which are much prized in cultivation. There are about 100 species, mostly of the North Temperate Zone. Of these some 20 occur in North America.

The Blue Flag (*I. versicolor*), 3 feet high, with violet-blue flowers, variegated with yellow and white, is common in ma shes from Newfoundland to Manitoba and southward to Florida. An acrid resin from the rootstock is used in medicine. The Western Blue Flag (*I. missouriensis*) grows from 6 to 24 inches high, with very narrow leaves and pale blue, variegated flowers. It abounds in wet soil from South Dakota to Idaho and Arizona.

The Fleur-de-lis *I. germanica*) is a native of Europe, with large, very showy flowers, deep violet-blue, veined with yellow, brown, and sometimes white. This handsome iris is everywhere planted in gardens. From the rootstocks of this and other European species, the orris root used in perfumery is obtained. The fleur-de-lis is the national flower of France and the emblem of the city of Florence.

Ivy. A name used to designate various climbing, twining, or creeping plants. The English ivy (*Hedera helix*), which belongs to the ginseng family, is a native of Europe. It has been highly prized as an ornamental plant since the days of the Greeks and Romans. This beautiful ivy is now extensively grown for rock and wall cover in the United States. The Boston or Japanese ivy and the Virginia creeper, often called ivy and similarly used, belong to the grape family. The poison ivy belongs to the sumac family, and the ground ivy to the mint family.

Jack-in-the-pulpit (*Arisæma triphyllum*). A fleshy perennial of the arum family, called also Indian turnip, common in moist woods throughout eastern North America. The annual flowering stem, a foot or more high, springs from an intensely acrid, bulb-shaped corm and bears 1 or 2 leaves of 3 leaflets. The small flowers, which appear in early spring, are clustered at the base of an erect, club-like spadix, the "jack." This is surrounded by a hooded, often purple-striped spathe, open at the throat and curving over at the top in a broad flap. The whole floral arrangement is fancifully held to resemble a preacher in an old-fashioned pulpit with a sounding board above it.

By reason of its unusual form and color, the jack-in-the-pulpit is one of the best-known wild flowers in eastern North America. The fruit, which usually lasts until autumn, consists of a mass of bright scarlet berries. When properly cooked, the peppery corm loses its burning taste and becomes a nutritious vegetable. It was formerly used for food by the Indians.

Jasmine (*jăs'mĭn*) (*Jasminum*). Shrubs and climbers of the olive family, natives of southern Asia. There are about 100 species, several of which are much grown in gardens for their fragrant flowers, which yield the oil of jasmine used in perfumery.

Jessamine (*jĕs'ă-mĭn*) (*Gelsemium sempervirens*). A slender climbing vine of the logania family, occurring in woodlands near the Atlantic and Gulf coasts from Virginia to Texas. It has handsome, yellow, trumpet-shaped flowers, which exhale a fragrance similar to the true jasmine. All parts of the plant are extremely poisonous, the roots yielding the powerful drug, gelsemium.

Job's Tears (*Coix lachryma*). A tall, stout cereal of the Old World. It is closely related to corn and sometimes attains a height of 8 feet. It takes its name from the hard, shining, tearlike seeds. These have the appearance of bluish white porcelain and are used similarly to beads in making bracelets, necklaces, and rosaries. The plant is a native of India where it is cultivated to some extent for food. It is grown also in China on account of supposed medicinal properties. In Spain and Portugal, where it has become naturalized, flour is sometimes made from it. In the United States and in various other countries it is grown as a curiosity.

Judas Tree (*Cercis*). A genus of trees and shrubs of the pea family. They bear pink or rose-colored flowers which appear earlier than the broad, simple leaves. There are about 7 species, all native to north temperate regions.

The best-known species of *Cercis* from the Old World is the Judas tree (*C. siliquastrum*), a small tree common in Asia Minor and throughout the Far East. There is a tradition that Judas Iscariot hung himself upon a tree of this species which was standing near Jerusalem, this incident giving rise to the common name of the tree. The Judas tree is frequently planted for ornament in the Middle Atlantic states.

The Redbud (*C. canadensis*) is a widely branching tree, sometimes 50 feet high, with beautiful rose-colored flowers. It grows wild from Ontario to Nebraska and south to Florida and Texas, and is often planted for ornament. The Texas Redbud (*C. reniformis*), a similar tree, but with smaller kidney-shaped leaves, occurs in eastern Texas. The California Redbud (*C. occidentalis*) is a conspicuous shrub or small tree in California foothills from Mt. Shasta southward.

Jujube (*jōō'jōōb*) (*Zizyphus jujuba*). A spiny shrub or small tree of the buckthorn family, believed to be native to Syria. Since ancient times, the jujube has been cultivated in southern Europe for its wholesome, pleasantly flavored fruit. This ranges in size from that of an olive to that of a hen's egg. The tree blossoms in June and ripens its fruit in October or November. If to be eaten fresh, the fruit is gathered when it assumes a reddish brown color; if to be dried, the fruit is left on the tree until it darkens and becomes slightly wrinkled. The jujube was introduced into North Carolina in 1838 and is now sparingly grown in various warmer parts of the United States. It thrives best in the Southwest and in California.

Juniper (*Juniperus*). Pungently aromatic evergreen trees and shrubs of the pine family. They bear closely overlapping, awl-shaped or scalelike leaves, and a fleshy, berry-like fruit,—a modified cone—which is matured in from one to two seasons. There are some 40 species, widely scattered over the northern hemisphere from the arctic circle as far south as Ethiopia. When the trees are of sufficient size, the wood of the various junipers is suitable for many uses. The wood of most species is remarkable for its durability in the ground, that of red cedar being known to have resisted decay for more than 40 years.

About 15 species of juniper occur in North America. The common juniper (*J. communis*), usually a small shrub, is sometimes a tree 30 feet high. The leaves are rigid, awl-shaped, and prickly-pointed. As a shrub, this juniper grows from Greenland to Alaska and south to Pennsylvania and California, and also in the Old World. It attains the size of a tree only in southern Illinois and in certain parts of Europe. The berries of this species are used to flavor gin. Oil of juniper, extracted from the unripe fruit, is used in medicine.

The Red Cedar (*J. virginiana*) grows sometimes 100 feet high, with a trunk diameter of 5 feet. It bears scalelike, four-ranked leaves, and dark blue, sweetish fruit. This valuable tree is native to dry soil from Nova Scotia to South Dakota and southward to Georgia and Texas. The light but very durable, fragrant, red wood is much used for making lead pencils, clothes chests, and interior finish, also for fence posts and telegraph poles. The Rocky Mountain Red Cedar (*J. scopulorum*), a similar red-wooded species, 20 to 30 feet high, grows throughout the Rockies and northwestward to British Columbia. The durable wood makes the tree useful locally for posts and poles. The foliage is usually overcast with a whitish bloom, giving the leaves a bluish cast. On this account, the tree is becoming a popular ornamental with nurserymen of the Middle West.

The most remarkable species of all is the alligator juniper (*J. pachyphlœa*), so called from its distinctly checkered, thick bark. This juniper grows in the mountains from southwestern Texas through the southern Rockies into Mexico. It is a low, thick-trunked tree, sometimes 30 feet high, valuable locally for post timber and for fuel. The rarest of our native junipers is the drooping juniper (*J. flaccida*), a beautiful tree, 15 to 20 feet high, with long, weeping branches. Within the borders of the United States it is found only in the Chisos mountains of southwestern Texas, whence it extends southward into Mexico. Two other southern Rocky Mountain species, forming valuable fuel-wood growths, are the one-seed juniper (*J. monosperma*) and the Utah juniper (*J. utahensis*), the latter bearing the largest berries (half an inch in diameter) of all the junipers.

The Rock Cedar (*J. mexicana*), of Texas and Mexico, usually 20 to 30 feet high, is very similar in general appearance to the red cedar, but its wood is brown. The California juniper (*J. californica*), sometimes 40 feet high, with leaves in threes, bears a reddish fruit, eaten by the Indians.

Two exotic junipers are frequently planted in the United States for ornament. One is the Irish juniper (*J. communis hibernica*), native to the mountains of Ireland. It is a dense, pyramidal shrub, 6 to 10 feet high, with spreading, prickly, three-ranked leaves. The other is the Chinese juniper (*J. chinensis*), a small tree from Japan and China. In appearance it is somewhat similar to the red cedar, but the crown is more dense and of a yellow-green color, and the ends of the branches are drooping. See *Cedar*.

Jute (*Corchorus capsularis*). An annual plant of the linden family. It is native to southern Asia and has been cultivated since ancient times for its coarse fiber, which is the cheapest known. While introduced into many tropical countries and experimentally grown in Florida, the commercial culture of jute is of importance only in India. During the last century, production has increased enormously, both of jute fiber, used for coarse twine and cordage, and of jute cloth, called gunny, used for sacking and burlap. The fiber is made into wrapping paper and sometimes mixed with silk and wool in making cloth. In 1914 the yield of jute fiber in India exceeded four billion pounds. See *Flax, Hemp, Manila Hemp, Olona, Sisal*.

Kafir (*kăf'ẽr*) **Corn.** A variety of nonsaccharine sorghum, native to Africa. This plant has been cultivated for food since ancient times in the Old World. About 1885 it was introduced into the United States by the department of agriculture. Kafir corn is extensively grown in parts of Texas, Oklahoma, Kansas, California, and other dry regions, as a substitute crop for Indian corn. See *Sorghum Cane*.

Kale. A variety of cabbage developed by cultivation, differing from it in having open instead of solid heads of leaves. It is grown as a winter vegetable and as food for cattle. Kale patches are common in yards and gardens in Florida and other parts of the South. See *Cabbage*.

Kalmia. A genus of erect shrubs or small trees of the heath family, with thick, evergreen leaves and showy flowers in naked clusters. There are 6 species, all North American.

The Mountain Laurel (*K. latifolia*), called also calico bush, is a handsome shrub, 3 to 20 feet high, or sometimes a tree 40 feet high, with large, beautiful, pink or white flowers. It grows in rocky woods from New Brunswick to Ontario and south to Florida. The poisonous leaves are dangerous to many animals.

The Sheep Laurel (*K. angustifolia*), called also lambkill or wicky, is a small shrub 3 feet high, with purple or crimson flowers. The leaves have poisonous properties similar to those of the mountain laurel. The sheep laurel occurs from Newfoundland to Hudson bay and southward to Georgia and Michigan. See *Laurel*.

Kangaroo Apple (*Solanum aviculare*). A plant closely related to the potato, native to Peru, New Zealand, and Australia. The mealy, slightly acid fruit, which is eaten either raw or cooked, is used for food by the native peoples.

Kapok (*kā'pŏk*) (*Ceiba pentandra*). A Javanese tree of the silk-cotton-tree family, closely related to the mallows. It yields a silky fiber called kapok, used principally for stuffing pillows, cushions, and mattresses. The elasticity of the fiber, though rendering it unsuitable for spinning, prevents matting when it is used as a filler. Many thousand bales of kapok are exported from Java annually.

Kelp. The name applied to many dark brown seaweeds, especially to the various species of *Fucus* and *Laminaria* which, in northern Europe, are dried and burned for their ashes, also called kelp, formerly the principal source of iodine.

Kohl-rabi (*kōl'rä'bĭ; kōl'rä'bē*). A variety of cabbage, in which, instead of a head of densely packed leaves, there is a globular swelling of the stem, some 3 or 4 inches in diameter, just above the ground. Several leafstalks spring from this swollen part, adding to the peculiar appearance of the plant. The enlarged portion of the stem is cooked as a table vegetable, with uses very similar to those of the turnip. Kohl-rabi is cultivated like cabbage, and, though fairly popular in Europe, is not extensively grown in America. See *Cabbage*.

Kumquat (*kŭm'kwŏt*) (*Fortunella*). A genus of shrubs of the rue family, very closely related to the orange. There are several species, natives of Japan and China, some of which are now cultivated in the Gulf states and in California. The kumquat usually grows from 8 to 12 feet high, and bears white, fragrant flowers followed by oblong, orange-colored fruit, from 1 to 2 inches in diameter. While the delicious, refreshing fruit may be eaten raw as a dessert, it is used chiefly for making jellies, marmalades, and various preserves. See *Citrous Fruits*.

Lady's-slipper (*Cypripedium*). Leafy-stemmed herbs of the orchid family. They bear large, drooping, showy flowers, with a pouchlike lip, fancifully thought to resemble a slipper or a moccasin, whence the names, lady's-slipper and moccasin flower. There are about 20 species, native to north temperate regions. Of these, 9 are found in North America.

The showy lady's-slipper (*C. reginæ*) has large, white flowers, variegated with crimson. This species is one of the most beautiful of American wild flowers. It grows in swamps and woods from Newfoundland to Minnesota and south to Georgia. The yellow lady's-slipper (*C. parviflorum*), with pale yellow flowers marked by purple lines, occurs from Nova Scotia to Minnesota and southward. The small white lady's-slipper (*C. candidum*) is found in bogs in the eastern United States. The Moccasin Flower (*C. acaule*) is a small, almost stemless species with handsome pink flowers. It grows in sandy woods from Newfoundland to Manitoba and south to Tennessee. See *Orchids*.

Larch (*Larix*). A genus of tall trees of the pine family, with slender, deciduous leaves borne in clusters, and small, erect cones. There are 9 species, native to temperate and subarctic regions. Three of these occur in North America.

The American larch, or Tamarack (*L. laricina*), is usually 50 to 60 feet high, with a trunk diameter of 18 or 20 inches. It grows from Newfoundland and Labrador to Alaska and the arctic circle and south to Pennsylvania and Minnesota. This tree frequents swamps in the southern part of its range, and uplands in the northern. The heavy, strong, durable wood is used for fence posts, telegraph poles, and railway ties.

The western larch (*L. occidentalis*) is a valuable timber tree. It sometimes grows 250 feet high, with a naked, tapering trunk, 6 to 8 feet in diameter, surmounted by a short pyramidal head of small branches. It occurs from British Columbia to the Columbia River basin.

The alpine larch (*L. lyallii*), a little-known species, native to high mountain ranges in the northwestern United States and in British Columbia and Alberta, grows from 30 to 40 feet high. The woolly young shoots distinguish it from the western larch, one of the local names for the alpine larch being "woolly larch."

The European larch (*L. decidua*) is much planted for ornament and for timber in the eastern United States.

Larkspur (*Delphinium*). A genus of beautiful plants of the crowfoot family. They have palmately lobed or divided leaves and large, irregular, handsome flowers. There are about 125 species, native to north temperate regions, many of which occur in the United States and Canada. Several beautiful species, some of them extremely poisonous to cattle, grow in the Rocky Mountain region. The field larkspur (*D. ajacis*), native to Europe, and grown in gardens for its showy flowers, is naturalized in the eastern United States.

Laurel (*Laurus*). A genus of graceful shrubs and trees of the laurel family. There are but few species, all natives of the Old World. The best-known is the noble laurel (*L. nobilis*), a beautiful tree with lanceolate, leathery, shining leaves. It was called daphne by the ancient Greeks, and was sacred to Apollo. Heroes in war, illustrious poets, and victors in games, were crowned with wreaths made of the leaves and ripened berries, whence the terms "laureate" and "laureation."

The California laurel (*Umbellularia californica*), found in Oregon and California, is a handsome tree, sometimes 90 feet high, with a trunk 5 feet in diameter. It has lanceolate, aromatic leaves and bears an olive-like fruit. This tree yields the most valuable cabinet wood produced in the Pacific states. When soaked in water, the whitish wood becomes beautifully mottled. See *Kalmia*.

Lavender (*Lavandula officinalis*). A small plant of the mint family, native to Europe, with narrow leaves and pale lilac-purple flowers. It is widely grown for its aromatic oil, called the oil of lavender, used in medicine and perfumery.

Leaves, Color of. The green color of leaves is due to the presence of chlorophyll, which is necessary to the process of converting carbon dioxide into starch by means of sunlight. This process is called photosynthesis. Chlorophyll is chemically allied to blood in animals, but instead of iron it contains magnesium.

The color in aging leaves is due to carotinoids, which are yellow, and anthocyanins, which are red or purple. These substances are usually present in all leaves, but are masked by the more abundant chlorophyll. As chlorophyll breaks down in the autumn faster than it is built up, its diminishing amount permits the carotinoids and anthocyanins to appear. Leaves having a great preponderance of the former become pure yellow, like those of the tulip tree, willow, and sassafras. When anthocyanins predominate, the leaves become bright red or purple, as in the sumac, sweet gum, and oak. Frost is not necessary to the coloration of leaves in the autumn.

Leek (*Allium porrum*). A biennial plant of the lily family with a stem about 2 feet high, native to southern Europe. It is closely related to the onion, but is much milder to the taste and has a thickened stem base instead of a bulb. It is widely cultivated in Europe as a flavoring plant and has been used in cookery since Greek and Roman times. The leek has long been the national emblem of the Welsh. See *Garlic, Onion*.

Leguminous Plants (*Leguminosæ*). An immense natural group of flowering plants, commonly called the pea, bean, or pulse family. It comprises about 10,000 species, and, excepting the *Compositæ*, is the largest family of flowering plants.

The various species are widely diffused throughout the world but are most numerous in the tropics. Among them are many exceedingly useful plants, such as alfalfa, peas, beans, clovers, peanut, indigo, logwood, brazilwood, gum arabic, gum senegal, laburnum, calabar bean, copal, and cassia, together with many valuable timber trees and an immense number of ornamental plants.

Soil everywhere is usually greatly benefited by the growth of leguminous plants, especially the clovers, peas, beans, and alfalfa. This is due to the fact that nitrogen-fixing bacteria, which enrich soil, almost invariably are found upon their roots. For this reason, leguminous plants are the most valuable of all in the so-called rotation of crops.

Lemon (*Citrus Limon*). A small evergreen tree, 10 to 20 feet high, of the orange family. It is native to India, where cultivation for its valuable acid fruit dates back at least 2500 years. The lemon was grown very early in Iraq and was made known to the ancient Greeks by the Medes. The Arabs extended lemon culture into Africa and Europe about the time of the Crusades. Lemons are now extensively grown in Italy, Spain, and in various tropical and subtropical countries. In the United States, lemon culture is becoming increasingly important in Florida and southern California. Besides the world-wide use of the fruit as food and drink, citric acid, obtained from the juice, is employed in dyeing and calico printing; and lemon oil, extracted from the rind, is widely used for flavoring. See *Citrous Fruits, Lime*.

Lentil (*Lens culinaris*). A small annual of the pea family, native to western Asia and southern Europe, which produces flattened, lens-shaped, nutritious seeds. The lentil is one of the most anciently cultivated of the food plants used by man. It has been grown for more than 5000 years. Although less popular than peas and beans, lentils are extensively grown in Europe and Asia, and constitute a commercial crop in Egypt. Some varieties are sparingly cultivated in New Mexico and Arizona. The lenses used in optical instruments were so named from the resemblance of a double convex lens to the seed of this plant, *lens* being the Latin name of the lentil.

Lettuce (*lĕt'ĭs*) (*Lactuca sativa*). An annual or biennial of the composite family, with tender leaves and a milky juice. It is native to Mediterranean countries and was cultivated as a salad plant by the ancient Greeks and Romans. Lettuce is now grown in gardens throughout the world wherever the climate permits. Among the scores of varieties are those in which the leaves form a cabbage-like head, the cutting varieties in which the leaves are loosely arranged, and the romaine varieties in which the outer leaves are tied above the head in order to blanch the inner ones.

Lichens (*lī'kĕnz*). A group of flowerless plants, represented in all lands where vegetation exists. They grow on bare rocks, tree trunks, and on the surface of the ground, deriving their food from the air and water. They have no true roots, stems, or leaves, but are composed of variously-shaped expansions of vegetable tissue, known as thalli.

When somewhat leaflike in form, as is the case with many which grow on bark or wood, lichens are called *foliose*. If hardened and somewhat shell-like in texture, as, for example, those which cover rocks with various gray-green patterns, they are called *crustaceous*. If somewhat shrublike, as in case of those which occur in long bearded forms on trees or which densely carpet barren ground, they are called *fruticose*.

A lichen consists of two plants, a fungus and an alga, living together in a peculiar relation, called *symbiosis*. In this unique partnership the function of the blue or green alga is to produce the food for both plants, while the function of the fungus is to absorb water and afford protection for its companion. Some 4000 species of lichens have been described. They are most abundant in polar regions and on high mountains, where they cover vast areas of otherwise practically barren land. Lichens are common also in moist, temperate countries, and some occur in the tropics.

Some lichens, as Iceland moss, are used for human food, and others afford pasturage for the reindeer, caribou, and muskox. Litmus and other dyes are obtained from lichens. See *Algæ, Fungi, Iceland Moss, Reindeer Moss*.

Licorice (*lĭk'ô-rĭs*) (*Glycerrhiza glabra*). A perennial herb of the pea family, native to southern Europe and western Asia. It is cultivated for its

long, sweet, gummy root, which yields the licorice of commerce. The plant grows about 4 feet high and bears pinnate leaves, usually pale violet flowers in clusters, and burlike pods or fruits.

Licorice root is grown in several countries of the Old World, but the finest grades come from Italy and Spain. Pieces of the dried root, of about the length and thickness of a lead pencil, are sold for chewing. The extracted sweetish principle, when boiled down with starch and made into sticks or lozenges, is a popular remedy for coughs and colds. Licorice extract is also very widely used in flavoring tobacco, wines, liquors, cooling drinks, candy, and chewing gum, and to disguise the unpleasant taste of medicines. Usually over a half million dollars' worth of licorice root and extract is imported into the United States each year. Licorice grows readily in Louisiana and California but the crop has not been commercially profitable.

The American wild licorice (*G. lepidota*), the only native species, occurs in prairies from Hudson bay to Chihuahua, and westward to Washington. While an abundant and a hardy grower, the root lacks the characteristic sweetness of that of the Old World plant.

Lignum-vitæ (*lĭg'nŭm-vī'tē*) (*Guaiacum officinale*). A small tree of the caltrop or bean caper family, about 25 feet high and a foot in diameter, native to tropical America. It is noted for its extremely hard, heavy, dark colored, oily wood, which instantly sinks in water. As it weighs over 70 pounds to the cubic foot, it is 50 per cent heavier than ordinary oak and about three times as heavy as white pine. By reason of its great toughness and other wearing qualities, lignum-vitæ is extensively used for stern bushings in shipbuilding and also for tool handles, pulleys, bed and chair castors, and bowling balls. Gum guaiacum, a resin extracted from the wood, is valued in medicine. A species of lignum-vitæ (*G. sanctum*) occurs in southern Florida, where it is a small tree with white bark. The wood of this species has the essential characteristics of the preceding.

Lilac (*lī'lăk*) (*Syringa*). Smooth shrubs of the olive family. They have entire leaves and four-lobed flowers borne in dense terminal clusters. There are about 7 species, native to Asia and eastern Europe.

The common lilac (*S. vulgaris*), which bears pink-purple, fragrant flowers, is a native of Persia. It is one of the most popular of ornamental shrubs, both in Europe and in North America. The white lilac (*S. vulgaris alba*), with white, very fragrant flowers, the oldest variety of the common lilac, is much planted in the United States and Canada. Another delicately fragrant species, with pale lilac flowers, is the Persian lilac (*S. persica*), which grows wild from the Caucasus to Afghanistan. It is frequently planted in the Eastern States.

The Japanese lilac (*S. japonica*), which attains the size of a tree and bears yellowish flowers, is sometimes planted in New England. See *Syringa*.

Lily (*Lilium*). Tall, bulbous plants of the lily family (*Liliaceæ*). They usually have leafy stems and large, erect or drooping, showy flowers. There are about 45 species, natives of north temperate regions. Of these, about 15 occur in the United States and Canada.

The red lily (*L. philadelphicum*) has lanceolate leaves and erect, reddish orange flowers, 2½ to 4 inches high. It is found in the eastern United States and Canada. The western red lily (*L. umbellatum*) is very similar but has linear leaves and smaller flowers. It ranges from Ontario to British Columbia and Colorado. The southern red lily (*L. catesbæi*) has alternate, linear leaves and erect, solitary, scarlet flowers, 3 to 5 inches high. It occurs from Kentucky and Missouri to Florida.

The Canada lily (*L. canadense*), sometimes 5 feet high, has whorled leaves and from 1 to 16 nodding, yellow or red flowers. It grows in meadows from Nova Scotia to Minnesota and southward. The Turk's-cap lily (*L. superbum*) grows sometimes 8 feet high, with a large panicle of orange-yellow, nodding flowers, 2½ to 4 inches long. It is found from New Brunswick to Minnesota and southward to Tennessee. The Humboldt lily (*L. humboldtii*) grows from 6 to 12 feet high. This handsome species, with leaves in whorls of 10 to 20 each, and large, reddish orange flowers, is native to southern California.

The tiger lily (*L. tigrinum*) is a native of China, with orange colored flowers spotted with purple. It is widely cultivated in gardens and has become naturalized in many parts of the United States. The European orange lily (*L. bulbiferum*), with large, erect, showy flowers, and the white or Madonna lily (*L. candidum*), with large, erect, pure white flowers, both natives of the Old World, are much prized in gardens. The white trumpet lily (*L. longiflorum*), native to Japan, vigorous forms of which are known as Easter lily or Bermuda lily, is much grown in greenhouses.

The name "lily" is popularly applied to many plants which are not true lilies, such as mariposa lily (*Calochortus*), spider lily (*Tradescantia*), atamasco lily (*Atamasco*), water lily (*Nymphæa*), and snake lily (*Iris*). The "lily of the field" mentioned in the Bible is believed by some to be the beautiful dark red windflower (*Anemone coronaria*), native to Palestine and adjacent regions.

Lily of the Valley (*Convallaria majalis*). A beautiful ornamental plant of the lily family. It is a native of Asia, Europe, and the Allegheny region of the United States, and is now widely cultivated in various countries. From an underground rootstock the plant sends up two ovate or lance-shaped leaves and a slender raceme of small, white, drooping, bell-shaped flowers. All parts of the plant contain an acrid, bitter juice from which is extracted the poisonous alkaloid, convallarin.

Lime (*Citrus aurantifolia*). A small evergreen tree, rarely over 8 feet high, usually regarded as a variety of the lemon, widely grown in tropical countries. The tree bears a smooth, nearly round, intensely acid fruit, much smaller than a lemon, extensively used as a source of citric acid and for lime juice in beverages. The limes of the American markets are grown chiefly in Florida and the West Indies. See *Citrous Fruits*, *Lemon*.

Linden (*Tilia*). Forest trees of the linden or basswood family. They have sharply toothed leaves, small yellow or whitish flowers, and fibrous inner bark. There are about 20 species common in temperate regions, except western America and the Himalayas. Some 29 species and varieties occur in the eastern United States. The soft, straight-grained wood is used in cabinetmaking and for sounding boards of pianos. The tough inner bark is made into mats, cords, fish nets, and shoes. The flowers yield honey of unsurpassed flavor and delicacy, also lime-flower oil used in perfumery. Many species are extensively planted for shade and ornament.

The American linden, or Basswood (*T. americana*) 60 to 125 feet high, with a trunk 2 to 5 feet in diameter, grows in rich woods from New Brunswick to Manitoba and south to Texas. It is much planted for ornament in the eastern United States, as is the White Basswood (*T. heterophylla*) of the southeastern United States. The European linden, or Lime Tree (*T. europæa*), often grown in lawns and parks in the United States, may include two distinct species,—*Tilia vulgaris*, the tree bordering the famous avenue "Unter den Linden" in Berlin, and the Dutch linden (*T. platyphyllos*).

Litchi (*lē'chē'*) (*Litchi chinensis*). A large evergreen tree of the soapberry family, native to China, India, and the Philippines. It is extensively grown in many tropical countries for its excellent fruit, reputed to be one of the most delicious

known. The fruit consists of a nut about an inch in diameter, with a thin, rough, brittle shell surrounding a sweet pulp which encloses a hard, smooth seed. The pulp is eaten fresh, dried, or preserved. The dried fruit, called litchi nuts, is an article of commerce. The litchi has been sparingly introduced into Florida and California.

Live-forever (*Sempervivum*). Fleshy perennials of the orpine or stonecrop family, with thick, succulent leaves, usually in basal rosettes, erect flowering stems, and showy flowers. There are 40 species, mostly of the Old World. The common live-forever, called also houseleek (*S. tectorum*), is native to the Alps. It is widely grown in gardens, especially on rockwork, and has become naturalized in Massachusetts, New Jersey, and elsewhere. Broken portions of the stem, or leaves, preserve their vitality remarkably, taking root after long exposure, whence the name "live-forever."

Liverworts (*Hepaticæ*). One of the two primary divisions of the Bryophytes, or moss plants, the other division including the true mosses (*Musci*). The liverworts are moisture loving plants, some floating on the water, others growing on trees, damp earth, or rocks. The plant usually consists of a prostrate, flattened, green thallus, which develops rootlike structures (rhizoids) from its lower surface, and reproductive organs from its upper surface. There are three groups or orders: *Marchantiales*, with flat, green thallus disks, often reproducing by means of gemmæ or budding; *Jungermanniales*, frequently mistaken for mosses, in which the thallus bears two rows of small foliage leaves; and *Anthocerotales*, simple in structure, but with greatly elongated spore cases, which split into two valves.

Locust Tree (*Robinia*). A genus of trees or shrubs of the pea family. They have compound leaves and bear large clusters of showy flowers. There are about 8 species, all natives of North America and Mexico.

The common locust tree (*R. pseudacacia*) sometimes grows 80 feet high, with a trunk diameter of 3½ feet. It is sparingly found wild from Pennsylvania south to northern Georgia. Formerly much planted for ornament, this tree has become widely naturalized in the eastern United States. The exceedingly strong, heavy, durable wood is used in shipbuilding, for fence posts, and for treenails. Two forms of this species are popularly recognized, the yellow and the black locust. Botanically, they are not distinguishable, but the heartwood of one form is yellowish, "yellow locust," and that of the other is olive-brown, "black locust."

Two other species of *Robinia* are known, the New Mexican locust (*R. neo-mexicana*), of the southern Rockies, and the clammy locust (*R. viscosa*), of North Carolina, now widely naturalized in the eastern United States by cultivation. Both are small trees, useful only for ornament. See *Honey Locust*.

Loganberry. A valuable bramble fruit originated by Judge J. H. Logan, of Santa Cruz, California, in 1881. It is the result of a cross between a variety of the wild blackberry of California (*Rubus vitifolus*) and a cultivated red raspberry. When thoroughly ripe, the loganberry is of a purplish red color and very large, being one of the largest berries grown. In flavor and habits it shows the characteristics of both the blackberry and the raspberry. The loganberry is a fruit of constantly increasing commercial importance. It is grown from British Columbia to southern California, and especially in western Oregon, where its culture has become an extensive industry.

Loquat (*lō'kwŏt; -kwät*) (*Eriobotrya japonica*). A small tree of the rose family, native to Japan and China, now introduced into many subtropical countries. It grows about 12 feet high, with thick, clustered, evergreen leaves and fragrant, woolly, white flowers which blossom in the autumn. The oval or pear-shaped, yellow, subacid fruit, about an inch in diameter, ripens in early spring. In the Gulf States and in California, the loquat has become a popular home fruit, used chiefly for desserts and for making jellies. The large, pleasant tasting seeds are sometimes employed in cookery, especially for flavoring tarts and cakes.

Lotus. The name given by the Greeks to several different plants, the fruit of which was used for food, particularly a species of jujube (*Zizyphus lotus*) and the date plum (*Diospyros lotus*). The name was applied also to several beautiful species of water lily, especially the blue water lily (*Nymphæa cærulea*) and the Nile water lily (*Nymphæa lotus*), still highly prized by the Egyptians. The sacred bean of Hindu and Chinese mythology is *Nelumbo lotus*. In the United States the yellow water lily, or water chinquapin (*Nelumbo lutea*), much esteemed by the Indians, is called lotus.

Lupine (*lū'pĭn*) (*Lupinus*). Herbs, or rarely shrubs, of the pea family. They have alternate, digitate leaves, and showy, variously colored, pealike flowers in terminal clusters. There are over 100 species, native to temperate and warm regions, 70 of which occur in western North America, largely in California. The ancient Greeks and Egyptians grew lupines (*L. albus* and *L. termis*) for fodder and used the seeds for food. Many handsome species are cultivated for ornament. The Blue Lupine (*L. perennis*), the only native eastern species, grows in sandy soil from Maine to Minnesota and southward. The bitter seeds were used for food by the Indians.

Madder (*Rubia tinctorum*). A small perennial of the madder family, with weak stems and glossy leaves, beset with sharp prickles. It grows wild east and north of the Mediterranean. For twenty centuries it has been cultivated in Europe, the East Indies, and China, as a dye plant, yielding the valuable red dye, sometimes called Turkey-red. Since the introduction of aniline dyes, madder culture has been practically abandoned.

Madroña (*mȧ-drō'nyȧ*) (*Arbutus menziesii*). A large, handsome tree of the heath family, native to the Pacific coast from British Columbia to Mexico and to the Sierras of California. The madroña grows from 80 to 100 feet high, with a trunk diameter of from 4 to 7 feet. It bears large, lustrous, dark green leaves, often nearly white below, small, heathlike flowers, and bright orange-red fruit. The heavy, close-grained wood is sometimes utilized for furniture but mainly for making a special quality of charcoal used in the manufacture of gunpowder.

Two southwestern species are the Mexican madroña (*A. xalapensis*), 20 feet high, growing from western Texas into Mexico, and the Arizona madroña (*A. arizonica*), 40 to 50 feet high, which occurs in the mountains of southern Arizona and adjacent parts of Mexico. Both are beautiful trees with thick, glossy leaves, the former with brilliant orange-red fruit, and the latter with deep red fruit.

Magnolia. A genus of trees or shrubs of the magnolia family (*Magnoliaceæ*). They have aromatic bark, large, thick, entire leaves, handsome, fragrant flowers, conelike fruit, and fleshy, pendulous seeds. There are about 25 species, all ornamental, and natives of warm temperate regions. Seven species grow naturally in the United States, one of which, the cucumber tree, is an important timber tree.

The Large-leaf Umbrella Tree (*M. macrophylla*) grows from 30 to 50 feet high. It bears leaves 20 to 30 inches long and 10 inches wide and white flowers a foot in diameter. This tree is found native from North Carolina to Arkansas and southward. The Umbrella Tree (*M. tripetala*), 30 to 40 feet high, has leaves 20 inches long and creamy white flowers 5 inches deep. It grows wild from Pennsylvania to Arkansas.

The mountain or cucumber magnolia (*M. acuminata*), called also cucumber tree, grows from 60 to 90 feet in height. It has oval leaves about 8 inches long, and greenish yellow flowers 2 inches high. The reddish fruit somewhat resembles a small cucumber. This magnolia occurs from New York and Ontario southward to Alabama and Arkansas. The excellent close-grained wood is used for flooring and in cabinetmaking.

The laurel magnolia, or Sweet Bay (*M. virginiana*), 50 to 70 feet high, bears lustrous leaves 6 inches long, and creamy white, fragrant flowers 3 inches across. It is native to coast swamps from Massachusetts to Texas, and is widely planted for ornament.

Mahogany (*Swietenia mohagoni*). A valuable timber tree, of the mahogany family, native to tropical America, growing from southern Florida to Peru. In height it ranges from 60 to 100 feet and sometimes attains a diameter of 6 feet. It has pinnate leaves and bears panicles of small white, yellow, or reddish flowers. The rich, reddish brown wood is fine grained and capable of taking a high polish. For this reason, mahogany is one of the most highly prized materials used in cabinet work and for veneers, being very extensively employed in making furniture.

The wood of several much less valuable kinds of trees also is called mahogany. In the western United States two or three species of *Cercocarpus*, small trees of the rose family, with an exceedingly hard, red-brown wood, are known as mountain mahogany. The Kentucky coffee tree (*Gymnocladus dioica*), of the eastern United States, is sometimes called mahogany.

Maidenhair (*Adiantum*). A genus of graceful ferns with divided leaves and dark, slender, polished, shiny stems or stipes. There are about 175 species, chiefly tropical American, 3 of which grow in the United States. The common maidenhair (*A. pedatum*), one of the most beautiful of ferns, occurs in moist woods almost throughout North America. The Venus's-hair fern (*A. capillus-veneris*), more slender, and with black stipes, is found from Virginia to Florida and westward to California. The similar western maidenhair (*A. emarginatum*) is confined to the Pacific states. The so-called maidenhair tree, planted for ornament, is *Ginkgo biloba*, a native of China. See *Ginkgo*.

Mango (*Mangifera indica*). A tree of the sumac family, sometimes 40 feet high, with large, shining leaves and yellow or reddish flowers. It is a native of India, where it has been cultivated since very ancient times for its valuable fruit. In different varieties this ranges from the size of a plum to that of an apple, sometimes weighing a pound or more. The sweet or slightly acid ripe fruit is much prized as a dessert, and the unripe fruit is used for pickles and sauces. The nourishing seeds are sometimes roasted for food by native peoples. Mangoes are now grown in many tropical and subtropical countries, particularly in the West Indies, and, to a limited extent, in southern Florida and in California.

Mangrove (*Rhizophora mangle*). A small, bushy tree of the mangrove family. With its spreading branches and numerous aerial roots, it forms almost impenetrable thickets on the shores of Florida and many other subtropical and tropical countries. It is an important factor in protecting low tidal shores and in extending them into the ocean.

Manila Hemp (*Musa textilis*). A small, tree-like banana, native to the Philippine Islands. Though valueless for fruit, it is extensively cultivated as a fiber plant, particularly in Luzon. The stems yield an excellent fiber, called manila hemp, or abaca, of great value for cordage, fabrics, and paper making. This fiber has become an important article of export from the Philippines.

Manzanita (*măn'zà-nē'tà*) (*Arctostaphylos* or *Uva-Ursi*). A genus of shrubs or small trees of the heath family, with thick, evergreen leaves and small, white or pink flowers. They bear a small drupelike fruit, somewhat resembling a tiny apple, whence the Spanish name "manzanita." Many handsome species occur in the chaparral belt of the California mountains.

Maple (*Acer*). Trees or rarely shrubs, of the maple family, usually with watery and sometimes with sugary sap. They bear palmately lobed or pinnate leaves, small, usually inconspicuous flowers, and a winged fruit consisting of two samaras, joined at the base, each one-seeded. There are more than 100 species, widely distributed over the northern hemisphere. Of these, about 25 species and varieties are North American.

The sugar or rock maple (*A. saccharum*) is a large, handsome tree, sometimes 100 to 120 feet high, with a trunk often 3 to 4 feet in diameter. This tree, distinguished by its smooth, heart-shaped, lobed leaves and gray-brown bark, grows in rich woods from Newfoundland to Manitoba and southward to Florida and Texas. It is also widely planted for ornament, particularly on roads and streets. This species is the most valuable North American maple. The hard, fine-grained wood is much used in making furniture, in shipbuilding, in turnery, and for flooring and fuel. A beautiful bird's-eye form of the wood occurs and is highly prized for furniture. The sap, with that of the next species, is the chief source of maple sugar and sirup.

The black maple (*A. nigrum*), sometimes 80 feet high, very similar to the sugar maple and used for the same purposes, occurs from Montreal to South Dakota and southward. The leaves are thick, dull green above and somewhat hairy below, and the bark on old trees becomes almost black. The large-tooth maple (*A. saccharum grandidentatum*), conspicuous in mountain canyons of western Texas, New Mexico, and Arizona, is brilliantly colored in autumn.

The silver or soft maple (*A. saccharinum*) is a rapidly growing tree, 90 to 120 feet high. It has pale green, deeply lobed leaves which are silvery white below. This maple is found native from New Brunswick to South Dakota and south to Florida and Oklahoma. While the wood is soft and brittle, the tree is very widely planted for quick shade. A good quality of sugar, similar to that of the sugar maple, is sometimes made from its sap.

The red maple (*A. rubrum*), 80 to 120 feet high, has a tall and rather slender trunk, upright branches, and reddish branchlets. It grows in low or moist grounds from Quebec to Iowa and southward to Texas. The close-grained, light brown or reddish wood is much used for making chairs, woodenware, flooring, and for gunstocks. Excellent sugar and sirup are sometimes made from the sap.

The Box Elder, or ash-leaved maple (*A. negundo*), is a widely branching tree, sometimes 50 to 70 feet high. It is distinguished by its leaves, which are composed of from 3 to 5 leaflets. The wood is soft and brittle. This maple grows along streams from Vermont to Utah and southward to Florida and eastern Arizona. Sugar is sometimes made from its sap, and the tree is much planted for quick shade. The variety *californicum* is the California box elder, a broad-topped tree, 30 to 45 feet high, with leaves of three leaflets. Three or four garden varieties of this tree are cultivated.

The mountain maple (*A. spicatum*) is a bushy tree, sometimes 30 feet high. It bears three-lobed leaves and conspicuous clusters of flowers which appear after the leaves. This tree occurs from Quebec to Saskatchewan and southward in the mountains to Georgia. The striped maple, or Moosewood (*A. pennsylvanicum*), is usually shrubby but grows sometimes 30 to 40 feet high. The leaves have three long-pointed lobes at the summit, and

the bark is marked lengthwise by broad, pale stripes. It occurs native from Quebec to Minnesota and southward in the Blue Ridge mountains to South Carolina.

The broad-leaved maple (*A. macrophyllum*) is a handsome and valuable timber tree, 80 to 100 feet high. It bears bright yellow, fragrant flowers in long clusters, and dark green leaves sometimes 12 inches wide. This tree grows along streams near the coast from Alaska to southern California. The hard, straight-grained wood is used for the same purposes as that of the sugar maple. The vine maple (*A. circinatum*), usually a small tree, is often vinelike or even prostrate. It bears deeply lobed leaves and reddish flowers in pendent clusters. The range of this maple is from British Columbia to northern California. The dwarf maple (*A. glabrum*) is a low tree, but often shrubby, with small, upright branches, reddish twigs, and greenish flowers appearing just after the leaves. It grows in the mountains at 5000 to 6000 feet altitude, from New Mexico to Alaska.

Several foreign species are planted for ornament in the United States and Canada. The Norway maple (*A. platanoides*), of Norway and Switzerland, sometimes 100 feet high, with a dense crown and dark green leaves, is extensively grown in the East and in the Middle West. It is similar in foliage to the sugar maple, from which it is distinguished by a milky juice. A handsome red-leaved variety (*schwedleri*) is very widely planted.

The sycamore maple, or Plane Tree (*A. pseudoplatanus*), is an important timber tree in central and southern Europe and in Asia. It grows from 70 to 90 feet high and has sycamore-like leaves. This exotic maple is sparingly planted in America, as are several small cut-leaved varieties of the Japanese maple (*A. japonica*).

Marsh Mallow (*Althæa officinalis*). An erect, velvety hairy, herbaceous plant of the mallow family, 2 to 4 feet high, with ovate, three-lobed leaves. It is native to Europe and has become widely naturalized in the United States. The very mucilaginous roots are used in confectionery and in medicine. In France, its leaves, when boiled as a potherb, are much eaten.

Marsh Marigold (*Caltha*). A genus of beautiful marsh plants of the crowfoot family. They have fleshy stems, heart-shaped leaves, and handsome, yellow, white, or pink flowers. There are about 15 species, some 8 of which occur in North America. The common marsh marigold (*C. palustris*), often wrongly called cowslip, is abundant in northern Europe and Asia. It occurs frequently also in swamps and meadows from Newfoundland to Saskatchewan and southward to South Carolina and Nebraska. The marsh marigold is a conspicuous wild flower of early spring, at which season the leafy portion of the plant is often used as a potherb.

Maté (*mä'tā*; *mät'â*) (*Ilex paraguariensis*). A small tree, a holly species, native to Paraguay and southern Brazil. The dried leaves and shoots are used in South America for making a tealike beverage, also called maté. Gathering, drying, and preparing the leaves for the market is an important industry in parts of Paraguay and Brazil. From these countries several million pounds of cured maté leaves, called also Paraguay tea, are exported annually to other parts of South America. The stimulating effects of maté are due to the caffeine which it contains. As ordinarily used, maté is a milder beverage than tea or coffee. See *Cocoa, Coffee, Tea.*

May Apple (*Podophyllum*). A genus of erect herbs of the barberry family, with horizontal, poisonous rootstocks, large, shield-shaped, palmately lobed leaves, and solitary white flowers. There are four species, one of which is North American. The wild may apple, or mandrake (*P. peltatum*), has peltate leaves about a foot in diameter. The single, large, nodding flower, 2 inches broad, generally appears immediately between two leaves. This plant abounds in low woods from Quebec to Minnesota, southward to Florida and Texas, and also grows wild in Japan. The yellowish, fleshy fruit, about 2 inches long, is edible, though insipid. A purgative resin (podophyllin), much used in medicine, is extracted from the root.

Mayflower. A name given to various plants which blossom in May. In England the hawthorn (*Cratægus oxyacantha*) is commonly called may or mayflower; the cuckoo-flower (*Cardamine pratensis*) and the marsh marigold (*Caltha palustris*) are likewise so named. In New England the trailing arbutus (*Epigæa repens*) is usually known as mayflower, but, in other sections of the United States, the spring beauty (*Claytonia virginica*), the wood anemone (*Anemone quinquifolia*), the pasque flower (*Pulsatilla patens*), the pink azalea (*Azalea nudiflora*), and other plants are sometimes given the name. In New York State the hepatica, or liverleaf (*Hepatica triloba*), is called mayflower.

Mesquite (*měz-kēt'*) (*Prosopis*). A genus of thorny trees and shrubs of the pea family. They bear divided leaves, greenish white flowers in small dense clusters, and long, straight or sometimes twisted pods containing somewhat beanlike seeds. There are about 17 species widely distributed in warm arid regions. Of these, 3 are found in the southwestern United States.

The common mesquite (*P. juliflora*), usually 10 to 15 feet high, has a thick taproot which frequently penetrates to a depth of 50 or more feet. It grows from southern Kansas to southern California and southward to Chile and Argentina. The extremely heavy, close-grained, reddish wood is highly prized for fence posts, railway ties, fuel, and for many other uses. The long, beanlike pods, rich in sugar, supply Mexicans and Indians with nutritious food and are greedily eaten by domestic animals, especially by horses and by burros.

The screw-pod mesquite (*P. pubescens*) is a shrub or small tree, 10 to 25 feet high, somewhat similar to the common mesquite but with spirally coiled, screwlike pods. The screw-pod mesquite occurs from western Texas to Nevada, California, and southward. Both the foregoing are characteristic desert shrubs. Even when the bushy stem is only 2 or 3 feet high, the long, straight taproot may penetrate to the water level 60 feet or more below the surface. These woody roots are used for fuel in regions where no wood of fuel size grows above the ground.

Millet. The name given to various annual grasses cultivated for forage and for food, the most important being certain species of *Setaria*, called foxtail millets.

Common millet (*S. miliacea*), a native of Egypt and Arabia, has been planted since prehistoric times, and was known to the ancient Greeks and Romans. It is an important forage plant in Europe, Asia, and North America, being grown for hay or for soiling and silo purposes in every state in the United States and in the lower provinces of Canada.

Italian millet (*S. italica*), native to eastern Asia, has likewise been cultivated since remote antiquity. It is said to have been planted in China, by royal edict, as early as 2700 B. C. It is now widely grown in Europe, Asia, and America for forage. In the Old World, particularly in China and Japan, the seeds are much used for human food. In Europe and America the nutritious seeds are fed chiefly to poultry and other birds. See *Cereals, Grasses.*

Mints (*Labiatæ* or *Menthaceæ*). Aromatic herbs or shrubs of the mint family, mostly with four-sided stems, opposite leaves, and often strongly scented flowers. The family consists of about 3200 species of wide distribution throughout temperate and tropical regions. The foliage of various

mints contains fragrant essential oils, valued as stimulants, for flavoring purposes, and in perfumery. Peppermint, spearmint, and pennyroyal are very widely used, while lavender, spike, thyme, marjoram, basil, and sage furnish well-known oils and flavors. Patchouli, rosemary, and lavender are used in making perfumes. Horehound, ground ivy, dittany, balm, and various other mints enter into household remedies.

Mistletoe (*Phoradendron*). Small shrubs of the mistletoe family (*Loranthaceæ*), parasitic on trees. They have fleshy, evergreen leaves, brittle twigs, small flowers, and pearl-white, viscid, berry-like fruit. There are 157 known species, mostly American, 8 of which occur in the United States. Some of these species, in time, kill the trees which serve as their hosts.

The American mistletoe (*P. flavescens*) has dark green leaves and small, white berries. It grows on deciduous trees, particularly the tupelo, elm, and red maple, from New Jersey to Missouri and southward to Florida and New Mexico. The California mistletoe (*P. villosum*), with similar leaves, forms bushlike clusters on oaks in Pacific Coast valleys.

The European mistletoe (*Viscum album*), long used in Christmas festivities, is closely related to the American species. It is an evergreen bush, about 4 feet in height or length, with crowded branches and small, white, very sticky berries. While parasitic on many kinds of trees, in England and France it grows most abundantly on the apple. When it grew upon the oak, which was but rarely, the mistletoe was an object of veneration by the ancient Druids.

Moonflower (*Calonyction aculeatum*). A climbing plant of the convolvulus family, highly prized for its large, pure white, fragrant flowers which open in the evening and close before noon of the next day. Several handsome varieties are in cultivation.

Morning-glory (*Ipomœa purpurea*). A hardy climbing plant of the convolvulus family, native to Mexico. Many varieties are widely grown throughout the United States. The large, funnel-shaped, variously colored flowers open in the early morning and close during the heat of the day. In many localities it has become naturalized as a weed.

Mosses (*Musci*). A well-marked group of plants, standing next below the fern plants in development. They comprise, with the somewhat less highly organized liverworts, the primary division or subkingdom of plants known as bryophytes. The mosses are small, green plants with structures closely resembling and corresponding to the roots, stems, and leaves of the ferns and seed plants. They are adapted to an immense range of conditions, from almost aquatic to nearly arid, but are most common in cool and arctic regions. There are two chief divisions of mosses, the *Sphagnum* forms, which include the peat-forming mosses, and the *Bryum* forms, which embrace the true mosses.

While peat is of local importance, and various species of *Sphagnum* are used in packing and for surgeons' dressings, the mosses on the whole possess but slight economic value. See *Liverworts*.

Mountain Ash (*Sorbus*). Erect, handsome, ornamental trees of the rose family, closely related to the apple. They bear pinnately divided leaves, white flowers in large flat clusters, and bright red, berry-like fruit. There are about 10 species native to north temperate regions. Of these, 4 occur in North America.

The American mountain ash (*S. americana*), sometimes 30 feet high, grows from Newfoundland to Manitoba, southward to Michigan and along the Appalachian mountains to North Carolina. Various forms are cultivated for the brilliantly colored fruit which ripens in autumn. The western mountain ash (*S. americana sitchensis*) is a small tree or shrub with bright green leaves and large, handsome fruit. It occurs in moist ground from Labrador to Alaska and south to Maine, Michigan, and Utah. When planted for ornament it becomes a tree from 30 to 40 feet high.

The European mountain ash (*S. aucuparia*), called also rowan tree, is very similar to the American species. It is often cultivated in Canada and in the northern United States, where it has become sparingly naturalized.

Mulberry (*Morus*). A genus of trees of the mulberry family, growing in temperate regions. There are about 10 well-marked species with numerous varieties or races, widely distributed throughout America, Europe, and Asia.

The white mulberry (*M. alba*) is a native of Asia but has been naturalized in Europe and in the United States. Generally it is a short, low-branched tree. Its leaves form the favorite food of the silkworm. The tree was extensively planted in the United States in the first half of the 19th century, when an attempt was made to introduce silk culture. The fruits are too dry to be palatable. In Europe the foliage is fed to goats and sheep, and the wood is used for barrel staves. The inner bark furnishes a coarse fiber, a dye is obtained from the roots, and the root bark has medicinal value.

The black mulberry (*M. nigra*) came originally from Persia, but it has long been cultivated in Europe and America for its agreeable, black berries. The juice of the ripe berries has medicinal properties. Sometimes the leaves are fed to silkworms.

The red mulberry (*M. rubra*) is a native American tree found wild from Massachusetts to Nebraska and southward to Florida and Texas. This is the largest of the mulberry trees. Several varieties produce pleasant, reddish black berries, juicy and slightly acid. The dark yellow wood is coarse-grained, tough, and very durable. It is employed for fence posts, for making barrels, churns, and shoe lasts.

Mushrooms. Numerous fungi belonging to two large orders which include the agarics with related forms (*Hymenomycetes*) and the puffballs and their allies (*Gasteromycetes*). Together, these embrace some 40,000 species, widely distributed throughout the world.

Formerly the term mushroom was more generally given to the comparatively small number of forms then known to be edible, while the poisonous kinds, supposed to be exceedingly numerous, were called toadstools. However, since it has been discovered that the dangerous kinds are very few in number while the wholesome or harmless kinds may be counted by thousands, the name mushroom is becoming more and more frequently used for the entire group. Instead of referring to the deadly amanita and the fly agaric, the two most venomous American species, as toadstools, it is more common to call them "poisonous mushrooms," and to call the wholesome field agarics, the morels, and the puffballs "edible mushrooms."

Unfortunately, the poisonous kinds are very widely distributed and closely resemble some of the best edible species. Because of these facts, no one who is not an expert in distinguishing them should gather or use mushrooms for food.

Among the edible mushrooms are many which are greatly esteemed as table delicacies. Their food value, which is often vastly overestimated, is about equal to that of ordinary vegetables. The common mushroom (*Agaricus campestris*), found in fields and pastures, cultivated in Europe since the middle ages, is now widely grown for the market in the United States and other countries. The morels (*Morchella*), common in many parts of the United States and Europe, are highly prized for food, as are many other species, such as the ink cap (*Coprinus*), the parasol mushroom (*Lepiota*), the chanterelle (*Cantharellus*), the fairy ring mushroom (*Marasmius*), and various puffballs (*Lycoperdon*). A highly valued European species is the truffle (*Tuber*), which grows beneath the surface of the ground. See *Fungi*.

Muskmelon (*Cucumis melo*). An annual vine of the gourd family, native to India and Guinea, much prized for its fleshy fruit. In the Old World it has been cultivated for upwards of 2000 years, being depicted in an ancient Roman painting excavated at Herculaneum. In the United States the hard-shelled varieties, with furrowed rind and yellow flesh, are called "cantaloupes," and the soft-shelled varieties, with smooth, netted-veined rind and greenish flesh, are known as "nutmeg" melons. Both kinds, and also the recently introduced winter muskmelon, called the "cassaba" or "pineapple melon," are extensively grown. Muskmelons as a whole rank about fifth in acreage devoted to vegetables. See *Cassaba*.

Mustard (*Brassica*). A genus of plants belonging to the mustard family, with yellow flowers and narrow, beaked pods, containing small, pungent, oil-bearing seeds. Black mustard (*B. nigra*), native to Mediterranean countries, has been cultivated in Europe since ancient times for mustard oil. White mustard (*B. alba*), native to the same region, is grown in Europe, and sparingly in America, as a salad plant, as a condiment, and as a source of mustard oil. The ground seeds are used in medicine as a counterirritant, as a stimulant, and as an emetic.

The foregoing and various related species have become widely distributed as troublesome weeds, including the charlock (*B. arvensis*), hedge mustard (*Sisymbrium officinale*), tumble mustard (*S. altissimum*), hare's-ear mustard (*Conringia orientalis*), and garlic mustard (*Alliaria officinalis*). Hedge mustard is especially detested by truck gardeners because it harbors the clubroot fungus, injurious to cabbage and turnips.

Narcissus. A genus of bulbous plants of the amaryllis family. They bear one or more showy flowers on leafless scapes, the leaves being linear and basal. There are about 20 species, natives of the Old World, mostly blooming in early spring, several of which are very highly prized in cultivation.

The Daffodil (*N. pseudo-narcissus*), native to Europe, has a two-edged scape about a foot high, and bears a solitary, bright yellow flower. This plant has escaped from cultivation in the eastern United States. The poet's narcissus (*N. poeticus*), also native to Europe, with white flowers, has likewise become locally naturalized. The Jonquil (*N. jonquilla*) is much grown for its fragrant yellow flowers, used in making perfumes.

Nettle (*Urtica*). A genus of herbs of the nettle family. They have stinging hairs, opposite leaves, and very small axillary flowers. There are about 30 species, very widely distributed, several of which occur in the United States and Canada.

The tall nettle (*U. gracilis*) grows from 2 to 7 feet in height, with erect branches. It occurs in dry soil from Newfoundland to British Columbia and southward to Louisiana and Colorado. The stinging nettle (*U. dioica*), native to Europe, has a stout stem, 2 to 4 feet tall, densely beset with stinging hairs. This plant has become naturalized from Newfoundland to Colorado. The dwarf nettle (*U. urens*), 6 to 18 inches high, also naturalized from Europe, with stinging-bristly branches, is found almost throughout North America. Various related plants with more or less stinging hairs are also called nettles.

From the fiber obtained from the stems of various Old World nettles many kinds of cordage and cloth are made. The roots and leaves of certain species yield beautiful yellow and green dyes. In India the tubers produced by a native nettle are used for food.

Nutmeg (*Myristica fragrans*). A small evergreen tree of the nutmeg family, about 25 feet high, with shining leaves. It is a native o the Molucca islands, and has long been cultivated in the East Indies as a spice plant. It bears a golden yellow, pearlike fruit, the flesh of which is preserved and eaten as a sweetmeat. The seed is the nutmeg of commerce; from the seed-covering, mace is made. Upon being pressed, nutmegs yield a yellow fat, called nutmeg butter, or oil of mace. From this is obtained the oil of nutmeg, used in flavoring. Nutmeg culture has been successfully established in the West Indies and in Brazil.

Oak (*Quercus*). An important genus of trees or shrubs of the beech family. They bear lobed, toothed, or entire leaves, both deciduous and evergreen, small flowers, and a characteristic nutlike fruit, called an acorn. There are about 220 species, natives of the northern hemisphere. Of these, 138 species, varieties, and hybrids are found in North America. There are two distinct groups, white oaks and black oaks. Those of the first group mature their fruit in one season; those of the second group require two seasons.

Economically, the oaks are among the most valuable of hardwood trees. For many uses the strong, heavy, durable wood of various species is unsurpassed, especially in shipbuilding, mechanical construction, interior finish, floors, and for furniture. The bark of some species is widely used in tanning, while that of others yields dyestuffs and cork. The acorns of several oaks are articles of human food, particularly among the Indians, and since time immemorial have been used for fattening swine. In some regions, as on the Pacific coast of North America, the timber from native oaks is mostly of inferior quality. But in eastern North America and in Europe, the oak, on account of the staunch quality of its wood, is everywhere regarded as a symbol of strength and dependableness.

The white oak (*Q. alba*), a magnificent forest tree, sometimes 150 feet high, with a trunk diameter of 8 feet, is the most valuable American timber oak. It grows from Maine to Minnesota and southward to Florida and Texas.

Other eastern and southern oaks valuable for their timber include the post oak (*Q. stellata*), bur oak (*Q. macrocarpa*), chestnut oak (*Q. montana*), yellow oak (*Q. muhlenbergii*), swamp white oak (*Q. bicolor*), basket oak (*Q. prinus*), red oak (*Q. rubra*), overcup oak (*Q. lyrata*), and water oak (*Q. nigra*). In the same area, but of less importance for timber, are the scarlet oak (*Q. coccinea*), the Texas oak (*Q. texana*), the pin oak (*Q. palustris*), and the shingle oak (*Q. imbricaria*).

The bark of the black oak, or Quercitron (*Q. velutina*), a very common oak from Maine to Minnesota and southward, is used in tanning, as the source of the yellow dye called quercitron, and in medicine. The shingle or laurel oak (*Q. imbricaria*), usually 50 to 60 feet high, has lance-shaped, entire leaves. It grows from Pennsylvania to Wisconsin and southward to Georgia.

The southern live oak (*Q. virginiana*) is a widely branching tree, 40 to 60 feet high, with evergreen, usually entire, leaves. It grows from Virginia to Florida, Texas, Central America, and Cuba. The very heavy, tough wood was formerly much used in shipbuilding.

The maul oak (*Q. chrysolepis*), sometimes 60 feet high, with a trunk diameter of 5 feet, native to the Sierra Nevadas and the Coast Ranges, is the most useful timber oak of California. The Oregon oak (*Q. garryana*), sometimes 55 feet high, with a trunk diameter of 5 feet, occurs from British Columbia to California. Next to the maul oak, it is the most valuable western American timber oak.

The valley oak, or weeping oak (*Q. lobata*), grows from 40 to 75 feet tall, with a round-topped crown which is often broader than high. It is the most characteristic tree of the great California valleys. Not less conspicuous is the California blue oak (*Q. douglasii*) which covers the western foothills of the Sierras; its heavy cross-grained wood is used only for fuel. Its large acorns, and those also of the valley oak, are much used for feeding hogs.

The coast live oak (*Q. agrifolia*) grows usually from 20 to 40 feet high, with widespreading limbs and entire or spiny-toothed evergreen leaves. This tree is very abundant in the southern Coast Ranges of California. The scrub live oak (*Q. dumosa*), 2 to 8 feet high, with small spiny-toothed leaves, is a common chaparral shrub on the Pacific Coast. The most important tree of the oak group in California is the tan oak (*Lithocarpus densiflora*), which yields large quantities of excellent tanbark.

In recent years a dread disease, known as oak wilt and produced by a spore-bearing fungus, has infected thousands of native oak stands, from Nebraska eastward into Pennsylvania and from Michigan southward into Missouri. The oak wilt is spread by certain beetles and fruit flies that feed on the mats of fungal spores and then carry the disease to other stands. Measures taken to control the disease include surveys by airplane, cutting and killing the roots of infected trees, and burning the bark, branches, and twigs of such trees.

The British or European oak (*Q. robur*) is the most important European timber oak. It is native to nearly all parts of Europe, except the far north, and is the only oak growing wild in Great Britain.

Other important European and West Asian oaks are the holm or evergreen oak (*Q. ilex*), the Turkey oak (*Q. cerris*), the Valonia oak (*Q. ægilops*), the gall oak (*Q. lusitanica*), and the cork oak (*Q. suber*). See *Cork Tree.*

Oat (*Avena sativa*). An annual plant of the grass family, unknown in the wild state but probably native to eastern temperate Europe. It has been cultivated for about 4000 years, having been grown by the Lake Dwellers of the Bronze age, and used for food by the Germans at the time of Pliny. While not adapted to hot countries, the oat is a cereal of the first rank in northern regions. The world crop usually totals between four and five billion bushels, with the United States and Russia as the leading producers. The wild oat (*A. fatua*), usually regarded as a weed, has become an abundant and valuable pasture grass in California. See *Cereals, Grasses.*

Ocotillo (*ō'kō-tēl'yō*) (*Fouquieria splendens*). A thorny shrub of the tamarisk family, sometimes called candlewood. It branches at the base into several slender, intensely spiny stems, 10 to 25 feet high. These are leafy only near the top, and bear at their upper ends narrow clusters of bright scarlet flowers. The ocotillo is a characteristic shrub of rocky mesas and deserts from western Texas to California, and from its thorny appearance is often mistakenly called a cactus. Mexicans weave ocotillo stems into fences for confining chickens and pigs.

Oil Palm (*Elœis guineënsis*). A small tree, 20 to 30 feet high, native to west tropical Africa. The fruit is an immense cluster of orange colored, plumlike drupes, with a hard stone and an oily pulp. Palm oil, obtained from the fruit, is exported in large quantities from western Africa. The tree is now naturalized and cultivated in Brazil and the West Indies. See *Palm.*

Okra (*Hibiscus esculentus*). A soft-stemmed annual of the mallow family, called also gumbo. It is closely related to the shrubby althea of the gardens. Okra grows from 3 to 5 feet high, has crenate leaves, and bears sulphur colored flowers. These are followed by somewhat pyramid-shaped fruiting capsules or seed pods. In tropical countries, and also in the southern United States, the unripe, somewhat gummy seed pods are used in thickening soups. Okra is a native of tropical Africa, where it has been cultivated for many centuries. It reached Egypt about the year 1200, and is now widely grown in warm regions.

Olive (*Olea europea*). A small tree, with a low trunk, willow-like leaves, and yellow flowers, belonging to the olive family. It is a native of Asia Minor and bears a pulpy fruit with an oil-yielding seed of great economic value. Olive oil, widely used for salad dressings and in cooking, takes the place of butter in many countries and is used in medicine as "sweet oil." The pickled fruit, both ripe and green, is also an important article of commerce.

The olive was grown by the ancient Egyptians. It is mentioned in Homer's *Iliad* and in the Bible. Pliny states that the Romans began planting it about 600 B. C. It is much cultivated in dry countries, notably in southern Europe, Asia Minor, South Africa, and Australia. In the United States, olive culture has become established only in California, where it was introduced by the Spanish missionaries about 1770. Since time immemorial the olive branch has been regarded by many of the leading peoples as an emblem of peace.

Olona (*Touchardia latifolia*). A valuable fiber plant of the hemp group, indigenous only to the Hawaiian islands where it has long been cultivated by the native peoples. It is an erect shrub of the nettle family, with slender branches, large, thick leaves, and small flowers in globose clusters. The bark of the young branches contains a bast fiber which, weight for weight, is the strongest known, its tensile strength being about three times that of the best manila or about eight times that of hemp. Olona fiber is remarkably pliable and is easily woven by hand into cloth or cordage. It also possesses extraordinary durability in water. Fish nets and lines made from it are handed down from generation to generation as precious objects and are serviceable after a century of use. See *Hemp, Manila Hemp, Sisal.*

Onion (*Allium cepa*). A biennial plant of the lily family, with slender, hollow leaves, native to southwestern Asia. Since prehistoric times the onion has been cultivated for its pungent, bulbous root, used as a vegetable. It was grown by the ancient Egyptians, by the Greeks and Romans, and is now widely cultivated throughout the world. In the United States it is grown in every state, New York and Ohio usually leading in production. Bermuda onions, Spanish onions, and other foreign varieties are now extensively produced in the southern United States, particularly in Texas and California.

The wild onion (*A. cernuum*), which occurs from New York to British Columbia and southward to Kentucky and New Mexico, sometimes becomes a pestiferous weed. It invades pastures, and cattle feeding upon it produce milk with a marked onion-like flavor. See *Garlic, Leek.*

Orange (*Citrus aurantium*). A small evergreen tree of the orange family, with dark green, oval leaves, white, fragrant flowers, and large, golden yellow, pleasantly flavored fruit. Flowers and fruits in all stages are often found almost continuously on the same tree, but the great mass of fruit ripens at one time or season each year. The orange is a native of southern China, where its cultivation seems to have begun during the middle ages and thereafter spread to India. After about 1500, orange culture rapidly spread throughout warm regions.

The orange is now the most important citrus fruit, and is very extensively grown in Mediterranean countries, India, Japan, the East Indies, Jamaica, and Brazil. In the United States, California and Florida are the leading producers, though some oranges are grown in Louisiana, Texas, and Arizona. Important varieties in the United States are the seedless *navels*, grown in California, and the bronze colored *russets*, grown in Florida. The small, rich flavored *mandarin* orange has recently been introduced from China.

The chief use of the orange is as a dessert fruit. A refreshing drink is made of orange juice, and orange peel is used in making marmalades, in flavoring, and, when candied, as a confection. Bridal

wreaths are made from orange flowers. Orange-flower water and orange-leaf oil are ingredients in perfumes. The fine-grained, yellow wood is valued for turnery and inlaid work.

A deadly fungus disease, known as citrus canker, introduced on orange plants received from Japan, recently spread through the orange groves from Florida to eastern Texas. For several years it threatened to wipe out the orange industry of Florida. The states involved, as well as the Federal government, spent millions of dollars in stamping out this dread disease. See *Citrous Fruits*, *Tangerine*.

Orchids (*ôr'kĭdz*) (*Orchidaceæ*). A large group of perennial herbs comprising the orchid family. They have corms, bulbs or tuberous roots, sheathing, entire leaves, and irregularly shaped flowers. The flowers are composed of six segments and possess many curiously developed structures to aid in pollination by insects. There are more than 5000 species occurring throughout the world, except in arctic or very arid regions, but most numerous in the tropics. In cool temperate regions orchids grow in the soil, but in the tropics an immense number are epiphytes, perching on trees. Many produce strikingly beautiful flowers, which are highly prized for greenhouse cultivation. Among native North American orchids are the lady's-slippers, pogonias, lady's-tresses, twayblades, rattlesnake plantains, and the coralroot.

Oregon Grape (*Mahonia aquifolium*). A handsome small shrub of the barberry family, with prickly, shining, pinnate, evergreen leaves, yellow flowers, and clustered, acid, blue fruit, somewhat resembling small grapes. It grows wild from western Nebraska to British Columbia and Arizona, and is sparingly cultivated as an ornamental plant. It is called also ash-leaf barberry, holly-leaf barberry, or trailing mahonia, and is the state flower of Oregon.

Osage Orange (*Maclura pomifera*). A thorny tree of the mulberry family, sometimes 50 to 60 feet high, native to rich soil from Missouri and Kansas to eastern Texas. It has a milky sap, dark green, glossy leaves, and bears a hard, yellow, uneven-surfaced, inedible fruit, 4 to 5 inches in diameter, ripening in autumn. The exceedingly strong, heavy, elastic, lemon-yellow wood, prized for railway ties, fence posts, and wheel stock, was used by the Osages and other Indians for bows, whence the name *bois d'arc*. This tree has been widely planted for hedges, and the foliage is used to some extent as food for silkworms. The bark contains a flaxlike fiber, and the root yields a yellow dye, similar to that from fustic.

Palm (*Palmæ* or *Palmaceæ*). The palms form a great natural group or family containing about 150 genera and 1200 species. Nearly all are confined to the tropics where they form a striking and characteristic part of the vegetation.

A typical palm tree has a columnar, buttressed trunk, sometimes more than 100 feet high, crowned with a rosette of huge leaves. However, some palms have branching stems and others are only a few feet in height. Various rattan palms have rope-like stems and climb to heights of several hundred feet by means of hooked prickles.

The leaves are either *palmate*, as in the fan palms, or *pinnate* or feather-like, as in the date palm and the coconut palm. Some fan palms have leaves 30 feet long and 5 feet broad, while certain feather-leaved palms have leaves 50 feet long and 8 feet broad. The flowers grow in enormous clusters,—a single coco palm sometimes producing upwards of a half million blossoms. As to fruits, palms vary immensely. More or less fleshy berries and drupes are the most common forms. Many palm fruits are enclosed in a fibrous husk and often contain a hard nut.

With the exception of the grasses, the palms excel all other families of plants in economic importance. Sugar, wine, starch, oil, wax, and resins are obtained from various species. Others yield valuable fruits, fibers, and timber. Among the most valuable are the coconut palm, the date palm, and the oil palm. A few palms are native in temperate regions, one species (*Chamærops humilis*) growing in southern Europe.

In the southern United States, 10 species of native palms attain the size of trees; of these, 7 are confined to Florida. The Cabbage Palmetto (*Sabal palmetto*) often grows 30 to 40 feet high. The deeply divided leaves are 7 to 8 feet broad. This species grows along the coast from North Carolina to western Florida. The Texas Palmetto (*Inodes texana*), a beautiful, large palm, grows exclusively in the extreme southeast corner of Texas and southward into Mexico. It is much planted for ornament in Texas as far north as San Antonio. The royal palm (*Roystonia regia*) grows from 80 to 100 feet high. The handsome, closely pinnate leaves are 10 feet in length. This palm occurs sparingly in southern Florida and is a common tree in the West Indies. It is widely planted for ornament in tropical countries.

The desert palm, California fan palm, or Washington palm (*Washingtonia filamentosa*) grows from 20 to 75 feet high, with a trunk diameter of from 1 to 3 feet. The palmate leaves, 3 to 6 feet long, bear copious fibers or filaments at the ends of the leaf divisions. This interesting palm grows wild on the western margins of the Colorado desert in southern California, sometimes forming small groves near the mouths of canyons. It is now extensively cultivated for ornament in California, southern Europe, and other warm temperate regions. See *Coconut*, *Date Palm*, *Oil Palm*.

Palo Verde (*pă'lō vĕr'dā*) (*Cercidium floridum*). A small, intricately branched tree of the pea family. It grows from 15 to 20 feet high, with a short trunk, smooth, green bark, and minute leaves, which fall soon after appearing, leaving the tree leafless for most of the year. The bright yellow flowers are borne in axillary clusters and are followed by flattened, short, beanlike pods, 3 inches long. The palo verde is a characteristic tree along sandy washes in the Colorado desert of southern California, eastward into southern Arizona, and southward to Mexico.

Papaw (*pà-pâ'*; *pâ'pâ'*) (*Asimina triloba*). A shrub or low tree of the custard apple family. It grows from 10 to 40 feet high in deep, rich soil from Ontario and southern Michigan southward to Florida and Texas. The conspicuous leaves are from 10 to 12 inches long and from 4 to 6 inches wide. The plant bears dark red flowers, nearly 2 inches across, and banana-shaped, sweet, edible fruit, ripening in autumn. See *Papaya*.

Papaya (*pà-pä'yà*) (*Carica papaya*). A palm-like tree of the passion flower family, called also papaw, native to tropical America. It attains a height of 12 to 15 feet, bearing at the summit a crown of large, seven-lobed leaves, with the flowers and fruit below. The papaya is widely cultivated in tropical countries for its orange-yellow, melon-shaped fruit, 8 to 10 inches long, which the tree begins to bear in about a year after planting. The pleasantly flavored, fleshy fruit is eaten raw, cooked, or pickled. See *Papaw*.

Papyrus (*pà-pī'rŭs*) (*Cyperus papyrus*). A stout, reedlike sedge of the Nile valley. It grows from 3 to 10 feet high, and bears a large umbel of drooping flower clusters at the summit of the stem. From the pith of this plant, the ancient Egyptians prepared a kind of paper which they used extensively for manuscripts. Some of these manuscripts, called papyri, now existing are believed to be about 5000 years old. Shortly after the time of Alexander the Great, papyrus paper became the writing material of the Greeks. Later it was extensively used by the Romans for several centuries.

Parasitic (*păr'ă-sĭt'ĭk*) **Plants.** True plant parasites live in part or entirely within the tissues of other plants or animals, and derive their nutriment chiefly from them. Many species of fungi, including the rusts, smuts, mildews, leaf curl, blights, and tree-destroying, bracket-like forms, are parasitic upon other plants. Other fungi, such as the *Trichophyton*, grow in the human skin, producing the diseases known as ringworm, barber's itch, and similar affections. Many kinds of bacteria are always present in the skin and in the digestive organs of various animals. Among the higher, or seed plants, the dodder and rafflesia are true parasites. The mistletoes, which possess more or less green foliage, are only partly parasitic. Epiphytic plants, which merely perch on other plants, as do various orchids, are often wrongly called parasitic plants. See *Epiphytes*.

Parsley (*Petroselinum sativum*). A biennial plant of the carrot or parsley family. It is a native of southern Europe, and has been planted in gardens since the time of Charlemagne. While now widely grown in Europe and the United States as a flavoring plant and for garnishings, it is a relatively unimportant minor vegetable. Apiol, or oil of parsley, obtained from the seed, is used in medicine.

Parsnip (*Pastinaca sativa*). A biennial of the parsley or carrot family, native to northern Asia and Europe. It has been cultivated since the early middle ages for its thick, white, mucilaginous roots, used as a winter vegetable and for feeding cattle. The wild form, with a hard, acrid, somewhat poisonous root, occurs as a weed in the eastern United States and Canada.

Passion Flower (*Passiflora*). A genus of climbing, tendril-bearing vines with mostly alternate leaves and large, showy flowers. There are about 300 species, natives chiefly of tropical America, of which some 10 occur in the southern United States.

These plants were named passion flowers by early Spanish missionaries in America from a fancied resemblance of the parts of the flower to the instruments of Christ's Crucifixion. The fringe or corona was supposed to represent the crown of thorns, the three styles were the nails of the cross, and the five anthers were the marks of the wounds. Omitting Peter who denied and Judas who betrayed, the five sepals and the five petals were regarded as symbolizing the apostles.

The Passion Vine (*P. incarnata*) climbs to a height of from 10 to 30 feet. It has 3-lobed leaves and white flowers with a purple crown. The large, yellow, edible berry is sometimes called maypops. This vine grows from Virginia to Missouri and southward to Florida and Texas. Several tropical species of passion flower produce highly perfumed, delicate, dessert fruits, such as the granadilla, various curubas, the water lemon, and the sweet calabash.

Pea (*Pisum*). An important group of leguminous plants, of great value for food and forage. They are usually tendril-bearing, more or less climbing annuals, with pinnate leaves, white or reddish flowers, followed by straight pods bearing several rounded seeds.

The garden pea (*P. sativum*), a native of western Asia, has been cultivated since remote antiquity for its delicious unripe seeds, used as a table vegetable. It was grown by the Lake Dwellers of the Bronze age and by the ancient Greeks. While the garden pea is chiefly used as a green vegetable, the canning of peas has become an important industry. The numerous varieties belong mostly to two chief types,—those bearing *smooth* seeds, usually low growing, early fruiting plants, and those bearing *wrinkled* seeds, mostly tall, twining, late fruiting plants. A variety with tender, edible pods is called the sugar pea.

The field pea (*P. arvense*), a native of Italy, appears to have been first cultivated by the Greeks and Romans. It is now grown on a large scale in Europe for its dry seeds widely used as food, and for its green parts used to some extent for fodder. While widely grown for food in Canada, the field pea is not extensively cultivated in the United States, although it is locally planted as a forage and soiling crop. See *Leguminous Plants*.

Peach (*Prunus persica*). A small and freely branching tree of the rose family, closely related to the plum. It bears long, lance-shaped, somewhat drooping leaves, and handsome pink flowers which usually appear in advance of the leaves in early spring. Double-flowered forms with variously colored flowers are planted for ornament. The stone fruit, commonly somewhat smaller than an apple, varies greatly in size, color, and downiness of skin. It has a delicious fleshy pulp, containing, when fully ripe, about 9 per cent of sugar. The peach is used in large quantities as a table fruit, and is also extensively canned, dried, or otherwise preserved.

The peach is believed to be a native of China, where it has been cultivated since prehistoric times. About the year 100 it was introduced by way of Persia to the Greeks and Romans, who called it the Persian apple. It is now widely grown in warm temperate regions, particularly in Asia, Europe, and North America. Peaches, unexcelled in quality and productiveness, are produced in various sections from Connecticut to California and southward to Texas and Florida. In the United States the peach ranks second only to the apple as an orchard fruit. California, Georgia, New York, and Ohio are the states which usually lead in production.

Some 300 varieties of the peach are grown in North America. Popularly, these are grouped in two classes, *freestones* and *clingstones*, although these freely merge into each other. According to Price, all the numerous varieties may be separated into five races, the Peen-To, the North China, the South China, the Spanish, and the Persian. The greater part of those commonly grown for the market belong to the Persian strains. Various smooth-skinned varieties are known as *nectarines*. See *Almond*, *Apricot*, *Plum*.

Peanut (*Arachis hypogœa*). An annual plant of the pea family, native to Brazil, called also ground nut, earth nut, pindar, and goober. It has a stout, hairy stem, 1 to 2 feet high, spreading branches, and leaves of 3 somewhat beanlike leaflets. The bright yellow flowers are followed by wrinkled pods containing 1 to 4 nutlike, edible seeds. In its manner of fruiting, the peanut is remarkable. When the petals have fallen, the flower stalk bends downward, pushing the growing pods into the ground, where they develop and ripen below the surface.

In South America, the peanut has been cultivated since prehistoric times for its nutritious seeds. About 1500 it was introduced into Africa where it is extensively grown by the native peoples. Its cultivation has now spread to all warm regions. In the United States, the peanut is a crop of increasing commercial importance as far north as Virginia.

While rich in food elements—fats, carbohydrates, and protein—peanuts are eaten chiefly as a confection, or semiluxury, rather than as a regular article of diet. Large and increasing quantities are made into peanut oil and peanut butter and regularly used for food.

Pear (*Pyrus communis*). A small tree of the rose family, closely related to the apple. It bears glossy, pointed leaves, white flowers in umbel-like clusters, and an oblong pome fruit, usually much larger at its outer or blossom end. The fruit is sweeter, juicier, and more me'ting than the apple, from which it differs also in having grit cells. Among dessert fruits the pear ranks high, and it is extensively used for canning and preserving.

The pear is a native of Europe. It was cultivated by the Lake Dwellers of the Bronze age, and is mentioned by ancient writers, including Homer, Theophrastus, and Pliny. While the pear is widely

grown in temperate countries, its cultivation is most important in France and in the United States. It usually stands fourth among American orchard fruits, being outranked by the apple, the peach, and the plum. Pears are most extensively grown in California, New York, Washington, Michigan, and Georgia. See *Apple, Quince.*

Peony (*pē'ō-nĭ*) (*Pæonia*). Large, herbaceous or somewhat shrubby plants of the crowfoot family, mostly native to the Old World. Several species are widely cultivated for their large, beautiful flowers. The common peony (*P. officinalis*), native to southern Europe, is the most widely grown species. It produces large, red, pink, or white flowers in early summer. The white peony (*P. albiflora*), native to Siberia, is much cultivated for its white or pink, fragrant flowers. The tree peony (*P. moutan*), 3 or 4 feet high, is a native of Japan. It produces very large flowers of many colors. The wild peony (*P. brownii*), a fleshy plant about a foot high, with brownish red, leathery flowers, grows in the foothills of the Sierra Nevada and the Coast Ranges.

Pepper (*Piper nigrum*). A climbing shrub of the pepper family, native to India. It bears small red berries, which, when dried, form the black pepper of commerce. White pepper is the seed from which the skin and fleshy parts of the fruit have been removed. The plant has been cultivated since remotely ancient times. Hippocrates, the great Greek physician, used pepper as a medicine about 400 B. C. During the middle ages pepper was one of the most highly esteemed and costly of spices. It is still the most widely used of all spices and is grown in large quantities in the East and West Indies and other tropical countries.

Red pepper (*Capsicum annuum*) is a small annual of the nightshade or potato family, native to Brazil, much planted in gardens in temperate as well as in warm regions. Large-fruited kinds furnish peppers for pickling, while the seeds yield the red pepper, or cayenne pepper, also called "capsicum." Mild forms of red pepper, called "paprika," yield the various condiments known by that name.

Peppermint (*Mentha piperita*). An aromatic plant of the mint family, native to Europe. It is a small perennial which grows 1 or 2 feet high, with oval, pointed, dark green leaves, and small, bluish white flowers, clustered in spikes. The pungent, volatile oil, obtained from the dried leaves by pressure and distillation, has long been used for flavoring candies and in medicine. Hippocrates, the famous Greek physician, who lived about 450 B. C., praised the virtues of this mint, as did Aristotle, Theophrastus, and other great writers of antiquity.

Commercial cultivation for producing peppermint oil is chiefly carried on in Japan and the United States. Michigan, which for a long period grew most of the American crop, was, in 1925, surpassed by Indiana, while Oregon ranked third.

Pepper Tree (*Schinus molle*). An evergreen tree, about 20 feet high, known also as the Peruvian mastic tree and the pea tree. It belongs to the sumac family and is a native of tropical South America. It bears long, resinous, drooping branches, small, narrow, pinnate leaves, and yellowish white flowers. The fruits, which are bright red and aromatic, are borne in graceful pendent clusters. They are about the size of peppercorns and, in Chile, are used as a substitute for pepper. Its rounded top and drooping branches make the pepper tree desirable as an ornamental for lawns and parks.

Introduced into California, the pepper tree quickly became popular there. But orange growers found that it was used as a host plant by certain scale insects very injurious to orange orchards. Further planting of pepper trees was then discouraged, and, in orange growing districts, thousands of the planted trees were cut down.

Perennials. Those plants whose duration of life continues for more than two growing periods are called perennials. They are thus distinguished from annuals, which have one growing period, and from biennials, which have two growing periods.

Persimmon (*pĕr-sĭm'ŭn*) (*Diospyros*). A genus of trees or shrubs of the ebony family. They have very hard, sometimes exceedingly valuable wood, broad leaves, and a juicy, berry-like fruit. There are about 160 species, mostly natives of the tropics, 2 of which occur in the southern United States.

The common persimmon (*D. virginiana*), usually from 30 to 50 feet high with a trunk one foot in diameter, sometimes attains a height of 100 feet. The large, thick, ovate leaves are dark green above and pale beneath. This handsome tree grows wild from Connecticut to Iowa and southward to Florida and Texas. The plumlike, reddish yellow fruit is about an inch long. When ripe, it is usually sweet and edible, especially after frost has acted upon it, but is very astringent when green. The heavy, dark-colored wood is used in turnery. The Texas persimmon (*D. texana*) is a small, densely branched tree common in western Texas and adjacent Mexico.

The Japanese persimmon (*D. kaki*), 10 to 40 feet high, is highly prized and extensively cultivated in China, Korea, and Japan. The excellent fruit, which is several times larger than that of the native American species, somewhat resembles the tomato in appearance and the apricot in flavor. Japanese persimmons are now successfully grown in the southern United States from Virginia to California. See *Ebony.*

Petunia (*pē-tū'nĭ-ȧ*). A genus of hairy, somewhat sticky, branching herbs of the potato family. They have entire leaves, and bear solitary white, violet, or purple flowers. There are about 12 species, all natives of South America. The white petunia (*P. axillaris*) and the violet petunia (*P. violacea*), native to Brazil, are widely cultivated in innumerable varieties for their beautiful flowers. Both of these species have become somewhat naturalized in the eastern United States.

Phlox (*flŏks*). A genus of perennial herbs of the phlox family. They have opposite, entire leaves and bear large purple, red, or white flowers in terminal clusters. There are about 40 species, native to North America and northern Asia, many of which are widely cultivated in gardens. Some 35 species occur wild in various parts of North America.

The garden phlox (*P paniculata*) grows from 2 to 6 feet high, with floral clusters, often a foot long, composed of pink, purple, or white flowers. It is native to woods from Pennsylvania to Illinois and southward. This phlox is much planted in gardens in the northern and eastern states, where it freely escapes and runs wild.

The Wild Sweet William (*P. maculata*), 1 to 3 feet high, usually bears pink flowers. It occurs in moist woods from Connecticut to Minnesota and southward to Florida, and is often cultivated.

Pine (*Pinus*). A genus of handsome, cone bearing trees of the pine family. The evergreen, narrow, linear or needle-shaped leaves are usually borne singly or in bundles of 2, 3, or 5, surrounded by a basal sheath. The fruit is a woody cone, maturing at the end of the second or, rarely, of the third season. There are about 100 species, natives of the northern hemisphere, of which some 35 are found in North America.

Pines grow in various situations from sea level to altitudes of 10,000 feet throughout the North Temperate Zone. A few occur on mountains in the tropics. In size they range from small shrubs to lofty trees. The wood is white or yellow, straight-grained, and that of some species is very durable. It varies greatly in hardness and is always more or less resinous. The pines form by far the most numerous group of coniferous trees and are immensely valuable for lumber, pitch, tar, turpentine,

and various resins. Economically, they are the most important group of timber trees, their nearest rivals being the oaks. The pines fall naturally into two groups,—white pines, with little resin in the wood and with 5 leaves in a cluster, and pitch pines, with more or less heavy resinous wood and with 2 or 3, exceptionally 4, leaves in a cluster.

The white pine (*P. strobus*), in England called Weymouth pine, is one of the most valuable timber trees of North America. It often grows 100 feet high, with a straight stem 3 to 5 feet in diameter. The slender leaves are borne in clusters of fives. The range of this pine is from Newfoundland to Manitoba and southward to northern Georgia. The wood is white, practically free from resin, and remarkably straight-grained. The western white pine (*P. monticola*), occurring from northwestern Montana to California, is a similar tree in size and in the value of its wood.

The sugar pine (*P. lambertiana*), a magnificent Pacific Coast species, is the largest of American pines. This handsome tree occasionally attains a height of 150 to 300 feet and a trunk diameter of 12 feet. It bears rigid leaves, 4 inches long, in 5-leaved clusters, and cones 11 to 24 inches in length. The sugar pine grows on mountains from Oregon to Lower California, being most abundant on the west slopes of the California Sierras. It is highly valued for lumber.

The long-leaved pine (*P. palustris*), called also yellow or Georgia pine, ranks high in value among American timber pines, where strength is a requisite quality. It grows near the coast from Virginia to Texas, attaining a height of 120 feet and a trunk diameter of 3 feet, with leaves sometimes 14 inches long in 3-leaved clusters. The hard, very strong, yellowish, resinous wood is used for construction. The long-leaved pine is one of the two southern pines that yield the turpentine and rosin of commerce in the United States. The slash pine (*P. caribæa*) is second only to the long-leaved pine in the production of naval stores. The timber, however, is less valuable because of its coarser grain.

The red pine (*P. resinosa*), wrongly called Norway pine, is found from Nova Scotia to Manitoba and south to Minnesota and Pennsylvania. It usually grows 70 to 80 feet high, with a trunk 2 or 3 feet in diameter, dark green leaves, in 2-leaved clusters, and red-brown bark. The close-grained, pale red wood is highly valued for construction timber.

The western yellow pine (*P. ponderosa*), called also bull pine, is the most abundant and valuable western timber species. It is found throughout a wide range from western Nebraska to British Columbia and Lower California. It is an imposing tree, sometimes 150 to 230 feet high, with a trunk 5 to 8 feet in diameter. The cinnamon-red bark is usually broken into large squarish plates.

The lodgepole pine (*P. contorta*) is a slender tree, usually 70 to 80 feet high. It bears yellow-green leaves, 2 inches long, in 2-leaved clusters, and small prickly cones. This is a common species of pine from the valley of the Yukon in Alaska, southeastward through the high Rockies to New Mexico and Arizona and in the Cascades and Sierras to southern California. The lodgepole pine takes its name from its former use by the Indians in building their tepees or lodges. It is much used for ties and for telegraph and telephone poles.

Of the Old World pines the so-called Scotch pine (*P. sylvestris*) is the most important. This is a 2-leaved species which occurs in immense forests in Europe. It is the chief timber pine of that continent and the only species of pine native to Great Britain. In the eastern United States it is often grown for ornament. Planted in the Nebraska national forest, naturally a treeless, sandy waste, the Scotch pine is proving useful in reforesting that section of western Nebraska.

The Austrian pine (*P. austriaca*), a 2-leaved species common in southern Austria, is a handsome timber pine sometimes 120 feet high. It is planted for ornament and increasingly for forest purposes in the eastern United States. See *Piñon.*

Pineapple (*Ananas sativus*). A perennial plant of the bromelia family, native to tropical America. It grows from 2 to 4 feet in height, producing at the base a rosette of stiff, sword-shaped leaves. From the center of the rosette rises the single, large, fleshy, scaly-coated fruit 4 to 10 inches long. The fruit is surmounted by a cluster of leaves similar to those forming the basal rosette. In appearance, the fruit, which weighs from 4 to 20 pounds, resembles a huge pine cone, whence the name pineapple.

At the time of the Spanish discovery of that region, cultivation of the pineapple was well established in tropical America. Since then it has extended to many warm countries, especially Hawaii and Puerto Rico. The fruit is shipped long distances to market, and quantities are canned.

Piñon (*pē-nyōn′*; *pĭn′yŏn*) (*Pinus*). The Spanish name for two species of nut pines native to the southwestern United States and northern Mexico. They bear large, sweet, edible, oily seeds, ½ to ¾ of an inch long, much used for food by the Indians and the Mexicans, and now often sold in the markets. Both species are small, usually bushy trees, with one or two short, incurved leaves in each leaf sheath. The more important of these is the Rocky Mountain piñon (*P. edulis*), a 2-leaved species which forms large open forests from Colorado and Utah south to Mexico. The single-leaf piñon (*P. monophylla*) grows on desert slopes from Utah to California and southward. The wood of the piñons is locally used for mine-props and for light traffic railway ties. See *Pine.*

Pistachio (*pĭs-tā′shĭ-ō*; *pĭs-tä′-*) (*Pistacia vera*). A tree of the sumac family, native to Persia and Syria, and anciently cultivated in western Asia. It is now widely grown in Mediterranean countries, and also to some extent in southern California, for its small, thin-shelled nuts. These are often called green almonds and are highly prized for flavoring, for oil, and for coloring confectionery and ice cream. A native wild species, recently discovered in southwestern Texas, is the Texas Pistach Tree (*P. texana*).

Pitcher Plant (*Sarracenia*). A genus of peculiar insectivorous marsh herbs of the pitcher plant family. They have urn-shaped leaves and large, nodding flowers. There are about 8 species, natives of eastern and southern North America. The hollow leaves secrete a fluid in which various insects are trapped, decomposed, and finally transformed into plant food.

The common pitcher plant, or Sidesaddle Flower (*S. purpurea*), has purple-veined leaves, sometimes a foot long, and bears a single, large, purple or yellow flower. This interesting plant grows in peaty bogs from Labrador to Alberta and southward to Florida and Iowa. Mosquitoes sometimes breed in the water contained in the pitchers. The Trumpetleaf, or Watercup (*S. flava*), called also trumpets, has trumpet-shaped leaves 1 to 3 feet long, and bears a solitary yellow flower 2 to 3 inches wide. This striking species occurs in bogs from Virginia to Louisiana.

Many species of *Nepenthes*, natives of eastern Asia and the East Indies, bear a pitcher-like organ at the end of the leaves. These plants are now widely cultivated in greenhouses, and are commonly called pitcher plants. In these Old World species the pitcher-like organs usually have lids to keep out the rain, and are provided with downwardly pointing hairs which permit insects to crawl inside but prevent their escape. Some species secrete a sort of digestive fluid which acts upon the bodies of the entrapped insects.

In Australia there is a pitcher plant (*Cephalotes follicularis*) less well known but quite as interesting as the lid-bearing Nepenthes. See *Sundew, Venus's Flytrap.*

Plane Tree (*Platanus*). A genus of large trees with exfoliating bark, native to temperate regions, so named because of their broad leaves and spreading form. There are about 8 species, 3 of which are North American.

The American plane (*P. occidentalis*), commonly called Sycamore, grows sometimes 170 feet high with a basal diameter of 14 feet. It is probably the largest deciduous tree in the United States. It occurs along streams from New Hampshire to Ontario and Nebraska and southward to Florida and eastern Texas. The wood, long a favorite material for tobacco boxes, oxen-yokes, and butchers' blocks, is now largely used for cheap furniture and occasionally for interior finishing. The similar but smaller California sycamore (*P. racemosa*) grows from the Sacramento valley southward to Lower California. The still smaller Mexican sycamore (*P. wrightii*) occurs in southern New Mexico and Arizona.

The handsome Oriental plane (*P. orientalis*) was planted for shade by the ancient Greeks and Romans. The London plane (*P. acerifolia*), a supposed hybrid, is the tree that is frequently grown for ornament in the eastern United States and in California, Oregon, and Washington.

Plum or **Prune** (*Prunus domestica*). A small tree of the rose family, closely related to the cherry, peach, and apricot. It grows usually from 10 to 20 feet in height, and bears a profusion of white blossoms, which appear in early spring, before or with the oval, pointed leaves. The fruit is thick-fleshed, with a flattened, pointed stone and with a smooth skin covered with a whitish bloom.

The plum is a native of southwestern Asia where it has been cultivated since ancient times. The Romans prized the fruit highly. It is now widely grown in temperate regions, and, in the United States, ranks next to the apple and peach as an orchard fruit. Among the best-known varieties are the damson, greengage, Lombard, and Burbank, and various kinds of prunes.

Commercially, the prune is by far the most important variety of the European or *domestica* plum. It contains so large an amount of sugar that the fruit may be dried in the open air without first removing the skins or stones. France, Spain, Turkey, Portugal, Germany, and Jugoslavia produce prunes as do also various parts of South America and Australia. Prune growing was introduced into California in 1856 and the first large orchard was planted at San Jose in 1870. The Pacific states now produce more prunes than the whole of Europe.

The Japanese plum (*P. salicina*), supposed to be a native of China, ranks next in importance to the European plum. It was introduced into the United States in 1870 and has become popular, especially in the South. Many of the orchard plums grown in the eastern United States are selected varieties of native American species, chiefly of the common wild plum (*P. americana*), the Canada wild plum (*P. nigra*), the wild goose plum (*P. hortulana*), and the Chickasaw plum (*P. angustifolia*). There are several other native species, including the beach plum (*P. maritima*), a small shrub found on or near sea beaches from New Brunswick to Virginia, and also the sand plum (*P. pumila*), of the Great Lakes region, a straggling shrub which grows on sandy or rocky shores. See *Cherry*, *Peach*.

Poison Ivy (*Rhus* or *Toxicodendron*). The name popularly given to several small shrubs of the sumac family, the entire herbage of which is more or less poisonous to the touch. They usually bear dark green, trifoliate leaves, small, greenish flowers, and a whitish, berry-like fruit.

The common poison ivy (*R. toxicodendron*) is found from Nova Scotia to British Columbia and south to Florida and Texas. When young, it is a low, woody plant but later becomes a high climbing vine. It bears dark green leaves composed of 3 ovate, entire or slightly toothed leaflets.

The Poison Oak (*R. quercifolia*), of the Southern States, is a small branching shrub, 3 feet high, with 3 somewhat hairy, lobed or deeply toothed leaflets. The Western Poison Oak (*R. obtusiloba*), common throughout California, usually an erect shrub, 4 to 5 feet high, has 3 roundish, variously lobed leaflets, similar to oak leaves but smaller.

The Poison Sumac, Poison Elder, or Poison Dogwood (*R. vernix*), a shrub or small tree, sometimes 25 feet high, grows in swamps throughout eastern North America. It has somewhat ashlike or elderlike, pinnate leaves, composed of from 7 to 13 smooth, pointed leaflets.

The foliage and other parts of each of the foregoing will cause the painful inflammation of the skin known as ivy poisoning. An efficient remedy is to bathe the affected parts with a 5 per cent solution of potassium permanganate. To prevent poisoning when exposure is anticipated, the skin should be washed with a strong solution of ferrous sulphate in water, which should be allowed to dry on the skin. See *Ground Ivy*, *Sumac*, *Virginia Creeper*.

Pollen. The male element of flowering plants. A fine granular or powdery yellow substance, produced and borne within the blossom by the delicate filaments called stamens. Pollination is the transfer of the pollen from the male stamen to the female pistil. The pollen is carried by the wind, by insects such as bees and butterflies, by birds, notably the hummingbird, by snails, or, in the case of some plants, by water. Fertilization occurs when the pollen grain, having germinated, produces a tube which penetrates down through the flower pistil to the ovule or egg at the bottom. This usually takes only a few days or a few hours, but often a much longer period elapses. In this way the seed originates.

Pomegranate (*pŏm'grăn'ăt*; *pŭm'-*) (*Punica granatum*). A thorny shrub or small tree of the myrtle family, native to western Asia. It bears glossy leaves, red, waxlike flowers, and a large, globular, yellow or rose-colored fruit. This is sometimes 5 inches in diameter, with a leathery rind enclosing numerous seeds, each separately encased in a juicy pulp. For its sweet or subacid fruit the pomegranate has been widely cultivated in warm regions throughout historic times. It is depicted in ancient Assyrian and Egyptian sculptures, and is believed to have been introduced into southern Europe by the Carthaginians. The pomegranate is sparingly grown in southern Florida, Texas, California, and tropical America.

Poplar (*Populus*). Large, fast-growing trees of the willow family. There are about 37 species, natives of the northern hemisphere. Of these, some 31 species and varieties grow in North America. While of little value for lumber, several species are used for pulp wood, for making woodenware, and are extensively planted for ornament.

The Aspen, or Quaking Asp (*P. tremuloides*), sometimes 100 feet high, with tremulous leaves, grows from the Arctic circle to Mexico, and from Labrador to California. It has a greater range than any other North American tree. The Large-toothed Aspen (*P. grandidentata*), 60 feet high, occurs in the eastern United States and Canada.

The Common Cottonwood, or necklace poplar (*P. deltoides*), sometimes 100 feet high, with a trunk diameter of 8 feet, grows from Quebec to Alberta and south to Florida and New Mexico. The Swamp Cottonwood (*P. heterophylla*), 80 or 90 feet high, with large downy leaves, abundant in the Gulf states, furnishes the lumber known as black poplar.

The balsam poplar, or Tacamahac (*P. tacamahacca*), 80 feet high, with very resinous buds, grows from Newfoundland to Oregon and northward to the Arctic circle. The Balm of Gilead (*P. candicans*), grown as a shade tree, is a cultivated variety of the balsam poplar. The Black Cottonwood (*P. trichocarpa*), often 200 feet high, with a trunk 8 feet in diameter, grows from Alaska to southern California. It is the largest broad-leaved tree native

to the Pacific coast of North America. The wood is much used for barrel staves and woodenware and for pulp.

The white poplar (*P. alba*), of the Old World, the black poplar (*P. nigra*), native of Asia, and the Lombardy poplar (*P. nigra*, var. *italica*), of southern Europe, are much planted for ornamental purposes. Most poplars have thick, handsome foliage, little subject to insect attack, and are very useful as quick-growing shade trees. However, as the penetrating, broomlike roots frequently destroy sewers, the planting of poplars in cities is often discouraged or forbidden.

Poppy (*Papaver somnijerum*). An annual, bristly herb of the poppy family, with large, showy, red, yellow, or white flowers. It is a native of the Mediterranean region, where it has been cultivated since remote antiquity, having been grown by the ancient Swiss Lake Dwellers and by the Greeks and Romans. Its seeds are used for food and for making poppy oil, used like olive oil. The dried sap is the source of opium from which morphine is obtained. Cultivation for the production of opium is very extensive in India, China, Turkey, and Egypt. In the United States the poppy is known chiefly as a garden flower.

Potato (*Solanum tuberosum*). A perennial plant of the potato family, native to the mountains of tropical America from Chile to Mexico. It grows from 1 to 3 feet high, with smooth, herbaceous stems and somewhat fleshy, divided leaves. At the top of the stems it bears white or purple flowers, about an inch wide, and a small, globular, purplish fruit or seed ball, about equal to a gooseberry in size. The plant produces, entirely distinct from the roots, numerous tubers or underground stems. These contain accumulations of starch which serve as food for the new plants which grow from the buds or eyes. Under cultivation the tubers become much enlarged, forming a staple article of food in temperate regions.

The potato was in wide cultivation from Chile to Colombia at the period of the Spanish conquest. It was introduced into Europe by the Spaniards early in the 16th century, into England by Sir Walter Raleigh in 1585, and into Virginia about the same date. Next to Indian corn, the potato is the most important contribution of the Americas to the food plants of the world.

The total annual production exceeds five billion bushels, Germany, Russia, Austria, France, Great Britain, and the United States being the chief producing countries.

Privet (*Ligustrum*). A genus of shrubs or small trees of the olive family. They have opposite, entire leaves and white flowers borne in terminal clusters. There are about 35 species, all found in the Old World. The common privet (*L. vulgare*), native to Europe and Asia and long cultivated for ornament, has become naturalized in the eastern United States. The so-called California privet (*L. ovalifolium*), native to Japan, is one of the best varieties for hedges.

Pumpkin (*Cucurbita pepo*). An annual vine of the gourd family with rough, slightly lobed leaves and large yellow flowers. It is a native of temperate North America and was in wide cultivation by the Indians at the period of earliest discovery by Europeans. The vine sometimes exceeds 20 feet in length and its fleshy, deep yellow fruit normally weighs from 15 to 40 pounds. It is planted extensively as a food for cattle and as a vegetable used in making pumpkin pies. A fixed oil, obtained from pumpkin seeds, is used in medicine for expelling tapeworms.

Quassia (*kwŏsh'ĭ-à*; *kwăsh'-*). A group of trees and shrubs of the ailanthus family, natives of warm regions. The extremely bitter root and wood of certain kinds, especially *Quassia amara* of tropical America, are used in medicine.

Quince (*Cydonia oblonga*). A shrub or small tree of the rose family, closely allied to the apple. It has crooked branches and bears large, solitary white or pink flowers. The hard, acid fruit, which in appearance resembles a large yellow apple, cannot be eaten raw. It is, however, widely used in Europe and America for flavoring and for making preserves, marmalades, and jellies.

The quince is a native of Iran and has been in cultivation since a very ancient period, being mentioned in the writings of Plutarch and Pliny. It is a minor orchard fruit and is not grown in large quantities. The largest American orchards are located in western New York. See *Apple*, *Pear*.

Radish (*răd'ĭsh*) (*Raphanus sativus*). A small annual or perennial plant of the mustard family, with lobed leaves and pink flowers. It is a native of temperate Asia and since very ancient times has been cultivated in gardens from China to Europe for its pungent, fleshy root, eaten raw as a relish. Mention is made of the radish in Chinese records dating back to about 1100 B. C. It is now in universal use as a table vegetable throughout the United States and is widely grown in many other countries. In California, the radish, like the mustard in the Eastern States, has become a common field and roadside weed.

Rafflesia (*ră-flē'zhĭ-à*; *-zĭ-à*). Remarkable parasitic plants of the East Indies, which attack various vines of the grape family. The only visible part of a rafflesia consists of a huge flower. A species native to Sumatra (*R. arnoldii*) bears a flower three feet in diameter, expanding from a mammoth bud that develops directly from the woody stem of the plant upon which the parasite lives. The flower has the appearance of decomposing flesh and exhales a carrion-like odor which attracts carrion insects. These bear pollen from one plant to another and thereby probably produce cross-fertilization.

Ragweed (*Ambrosia*). A genus of mostly troublesome weeds of the composite family. Their copious wind-borne pollen is the principal excitant of hay fever in late summer and autumn. The chief offender, the common ragweed (*A. artemisiifolia*), with finely cut leaves, infests waste places and cultivated ground. The giant ragweed (*A. trifida*), with large 3-parted leaves, grows in moist, low ground.

Ramie (*răm'ē*) (*Bœhmeria nivea*). An East Indian shrub, 5 to 8 feet high, often called China grass, though it is not a grass but a nettle. Its erect stems furnish a valuable fiber which is stronger than hemp and nearly equal to silk in fineness, pliability, and luster. While experimentally grown in the United States, it is extensively produced only in India and in China. The fiber is highly esteemed for cordage, nets, various fabrics, and in making bank note paper. See *Hemp*, *Manila Hemp*, *Nettle*, *Olona*.

Raspberry, Black (*Rubus occidentalis*). A small, thorny shrub of the rose family, native to the eastern United States and Canada. It bears deep green, trifoliate leaves which are woolly whitened beneath, large white flowers, and a black, juicy, well flavored, somewhat cap-shaped berry. When ripe, this readily separates from the fruiting receptacle, whence the popular name "black cap." Since its introduction into cultivation in 1832, the black raspberry has become an important bush fruit of the United States, ranking third to the strawberry among the so-called small fruits. It is marketed fresh as a table fruit and is extensively canned and preserved. The yellow-fruited raspberry (*R. occidentalis*, forma *pallidus*) occurs wild.

Raspberry, Red (*Rubus idœus*). A small, prickly shrub of the rose family, native to northern Europe and Asia. It has been long and extensively cultivated in Europe for its excellent fruit, but as

yet is rather sparingly grown in the United States. A variety of the native American red raspberry (*R. strigosus*), almost equal in quality and somewhat hardier, is the form most cultivated in America. It is highly prized for making jams and preserves.

Red Snow (*Sphærella nivalis*). A microscopic, one-celled plant, belonging to the algæ, which forms crimson patches on the snow in arctic and alpine regions. The plant thus produces the so-called "red snow" noted by travelers in Greenland and various other frigid districts. See *Algæ*.

Reindeer Moss (*Cladonia rangiferina*). An erect branching lichen, a few inches in height, which covers vast areas of ground in arctic regions. It is the principal food of the reindeer, and forms pasturage for other arctic animals, such as the barren ground caribou and the muskox. In parts of Norway fresh, crisp reindeer moss is sometimes eaten as human food. See *Lichens*.

Resurrection Plant (*Anastatica hierochuntica*). A small herb of the mustard family, native to Arabia, called also Jericho rose. When the seeds have ripened and the foliage has become dry, the branches roll up so that the plant assumes a globular form. Upon being moistened, the branches and leaves unfold, become greenish, and assume for a time the appearance of the growing plant. Various mosslike selaginellas which display similar qualities are sometimes called resurrection plants.

Rhododendron. A large genus of trees and shrubs of the heath family, found in northern temperate regions. There are about 200 species, many of which are noted for their beautiful flowers and evergreen foliage. Several species, together with very numerous hybrids, are highly prized in cultivation.

The great rhododendron (*R. maximum*), called also great laurel and rose bay, and the similarly handsome Mountain Rose Bay (*R. catawbiense*) are abundant in the Allegheny and the Appalachian region. They have large, dark green, shining leaves, and umbellate clusters of pale red or white blossoms, spotted with red or yellow. The great rhododendron, which has been adopted as the floral emblem of West Virginia, is often cultivated, as is also the mountain rose bay.

The western rhododendron (*R. californicum*) is an elegant shrub, 6 to 10 feet high, with shining, leathery leaves, sometimes 6 inches long, and beautiful rose-colored flowers. It grows in open woods from British Columbia to California and is the state flower of Washington. See *Azalea*.

Rhubarb (*Rheum rhaponticum*). A fleshy perennial of the buckwheat family, native to China, commonly called pieplant or wine plant. It has very thick rootstocks from which rise large heart-shaped leaves on flattened, fleshy leafstalks, from 1 to 3 feet long. Rhubarb has been long and extensively cultivated in the Old World as a vegetable, as an ornamental foliage plant, and for the medicinal properties of the root. In the United States it is grown chiefly for its acid leafstalks which are stewed for sauces and pies, made into preserves, and sometimes used in making rhubarb wine.

Rice (*Oryza sativa*). An annual plant of the grass family, 2 to 5 feet high. It is a native of India and has been cultivated since remote antiquity as a cereal grain. Rice is mentioned in Chinese records dating back to about 2800 B. C. It is grown in immense quantities in southeastern Asia, where it affords sustenance to about a third of the human race. Rice is also produced in many other warm and moist regions. Usually, rice is produced only where the land can be flooded during the growing season, but in some districts flooding is not required.

In the United States the cultivation of rice began in the Carolinas about 1700. It is now a crop of importance in Louisiana, Texas, Arkansas, California, and Hawaii. Canada rice (*Zizania aquatica*), the wild rice of North American swamps, while producing a grain of good quality, is not adapted for cultivation. It is, however, important as food for wild ducks. See *Cereals*, *Grasses*.

Rose (*Rosa*). Erect or climbing shrubs with prickly stems, pinnate leaves, and large, handsome, usually fragrant flowers, which vary in color from red to pink, yellow, and white. There are numerous wild species, all natives of the northern hemisphere, many of which have been long cultivated.

Centuries of floriculture have developed an immense number of varieties which are widely grown in temperate regions. Many of these are greatly prized for their remarkable beauty of form and color and for their delicate fragrance, especially in Europe and America. Just as the chrysanthemum is the favorite flower of the Orient, the rose holds the place of highest esteem in the Western world. It is the most important of cultivated flowers, and is probably grown in more gardens than any other plant. Except for ornamental purposes, roses are of slight commercial importance. The fruit of some varieties is made into preserves, and attar of roses, used in perfumery, and rose water are made from the flowers.

There are two chief groups of cultivated roses,—those which flower but once a year, usually early in summer, sometimes called early roses, and those which bloom more than once, including the perpetual, summer, and autumn roses. Among the summer-flowering roses are the brier, evergreen, damask, French, multiflora, alba, and Provence roses. Among the perpetual varieties are the tea, moss, musk, Bourbon, China, Ayrshire, hybrid tea, hybrid perpetual, and perpetual brier roses. Popular florists' varieties, used for cut flowers, are the red American beauty, the crimson liberty, the cherry-red Ulrich Brunner, the yellow pearl of the garden, the white bride, and the pink bridesmaid roses.

Some 20 species of wild roses grow in North America. The prairie rose (*R. setigera*) has climbing stems, leaves of 3 leaflets, and rose-pink flowers which soon turn white. It is found native from Ontario to Wisconsin and south to Florida and Texas, and is naturalized as far east as Connecticut. The prickly rose (*R. acicularis*), with very spiny stems, leaves of from 5 to 9 leaflets, and large solitary flowers, grows from Quebec to Alaska and south to Colorado. The smooth rose (*R. blanda*), usually lacking prickles, with flowers 3 inches broad, grows from Newfoundland to Saskatchewan and south to New Jersey and Missouri. In its range it is usually the most common wild rose.

The pasture rose (*R. virginiana*), sometimes 6 feet high, with slender spines, few or solitary flowers, which are sometimes double, is found from Newfoundland to Wisconsin and south to Louisiana. It is the commonest wild rose of the eastern United States and Canada. The swamp rose (*R. palustris*), sometimes 8 feet high, with stout recurved spines and clustered flowers, occurs from Nova Scotia to Minnesota and south to Florida and Mississippi. The California rose (*R. californica*), 3 to 5 feet high, sparsely prickled, with flowers in terminal clusters, often forms thickets along creeks on the Pacific coast.

The Cherokee rose (*R. sinica* or *R. lævigata*) is a native of China and Japan now widely cultivated in mild climates. In the southern United States this rose has become thoroughly naturalized, often running wild along roadsides. It is a handsome, high-climbing species, with slender, prickly branches, smooth, shining leaves, usually of 3 leaflets, and large, solitary, white or rarely rose-colored flowers.

Rose Family (*Rosaceæ*). A large natural group of herbs, shrubs, and trees, comprising about 1800 species, very widely distributed throughout the world. It contains many of the most valuable fruits and a large number of the most highly prized

flowering plants, ornamental shrubs, and trees in cultivation. The list of fruits belonging to this family includes the almond, apple, apricot, nectarine, peach, pear, plum, quince, blackberry, loganberry, raspberry, and strawberry. The list of ornamental plants contains the flowering almond, cherry laurel, mountain ash, hawthorn, medlar, and innumerable kinds of roses.

Some authorities regard this large group as comprising three plant families, namely, the apple family (*Malaceæ* or *Pomaceæ*), the peach family (*Amygdalaceæ*, *Drupaceæ*, or *Prunaceæ*), and the rose family proper (*Rosaceæ*). In this division the apple family consists of trees or shrubs which produce a pome fruit, such as the apple, crab apple, pear, mountain ash, and hawthorn. The peach family consists of trees or shrubs which produce a stone fruit, such as the peach, cherry, and plum. The rose family, as thus restricted, comprises herbs, shrubs, or trees which usually produce dry fruits, though some of these fruits are modified into berries, as the blackberry, raspberry, and strawberry, and into fleshy hips, as in case of the rose.

Rubber Tree (*Hevea braziliensis*). A tree of the spurge family, with leaves of three leaflets, small greenish flowers, and capsular, three-sided fruits. It is native to the Amazon valley, but is successfully grown in other tropical regions. In 1940, 97 per cent of the world's rubber came from Malaya and the East Indies and less than two per cent from the Amazon. Rubber is produced from the milky juice, or latex, of this tree. This juice is not the true sap, but a secretion which does not seem to be necessary to the life of the plant. The rubber tree grown as an ornamental house plant is an East Indian species of fig (*Ficus elasticus*). See *Rubber*.

Rye (*Secale cereale*). An annual plant of the grass family, native to northeastern Europe. It is the least ancient of the important cereals. This grain was unknown to the ancient Greeks and Romans, but probably was cultivated north of the Danube before the beginning of the Christian era.

Rye is the hardiest of the cereals, withstanding a wide range of climatic conditions. Besides its cultivation as a food crop, it is sometimes grown as a cover crop and for green manuring. The long, smooth, flexible straw is used in making hats, mats, and paper, for stuffing mattresses and horse collars, and for various packing purposes. In Europe, rye straw is used for thatching houses.

As a food, rye is less nutritious than wheat but superior to barley. It is the chief ingredient in the black bread which is a staple food of northern Europe. In the United States, rye flour is mixed with wheat flour in making rye bread. Among the cereals rye stands fifth, being outranked by wheat, corn, rice, and oats. Russia produces about half of the world's crop of rye, and Germany and Poland grow most of the remainder. See *Cereals*, *Grasses*.

Sagebrush. The name given to various shrubby species of *Artemisia*, of the composite family, native to the plateau regions of the Rocky mountains and westward. They have somewhat hoary leaves, contain a bitter juice, and emit a sagelike odor. The common sagebrush (*A. tridentata*) usually grows from 2 to 5 feet high but sometimes reaches 12 feet. The small, silvery, wedge-shaped leaves are mostly three-toothed at the upper end. This shrub is immensely abundant on high, dry plains, being especially so in Nevada, which is called the sagebrush state. Unlike the greasewood and other shrubs characteristic of alkaline plains, sagebrush usually grows on fertile soils, needing only sufficient water to insure crop production.

Saguaro (*sä-gwä'rō*) (*Carnegiea gigantea*), called also suwarro, giant cactus, or monument cactus. A columnar tree of the cactus family, 15 to 60 or more feet high, with a stout woody trunk attaining a diameter of 2 feet, sometimes unbranched, when it has the appearance of a fluted column. Usually there are 2 or 3 candelabra-like branches above the middle; more rarely there are many branches which rise like organ pipes from near the base. There are no foliage leaves, the ribbed green bark functioning in their stead. Large white flowers are borne along the ribs of the stem. These are followed by crimson, edible fruit.

The saguaro is one of the most remarkable trees in America, its singular appearance making it an extraordinary feature in the desert landscapes of southern Arizona and Sonora, Mexico. It is found also in limited areas in southeastern California See *Cactus*.

Salad Plants. Vegetables whose green parts are used raw as articles of human food. There are three groups, the piquant or warm, the bitter, and the neutral salads. The piquant salads include cress, nasturtium, water cress, and mustard. With the bitter salads are grouped endive, chicory, dandelion, celery, and lettuce. The neutral salads include corn salad and bland forms of lettuce.

Sandalwood (*Santalum album*). A small tree of the sandalwood family, native of India. It is much prized for its close-grained, persistently fragrant wood, extensively used for making chests, boxes, and small ornamental articles. Various somewhat similar woods are also called sandalwood.

Sand Lily (*Leucocrinum montanum*). A small stemless plant of the lily family, with long narrow leaves and delicate white flowers, somewhat resembling those of the narcissus. It is abundant on high plains and foothills of the Rocky Mountain region.

Sapodilla (*săp'ô-dĭl'à*) (*Achras sapota*). A large evergreen tree of the sapodilla family, with hard, reddish, durable wood and evergreen foliage. It is a native of Central America and tropical South America, where it was in wide cultivation for its luscious, apple-shaped fruit at the time of the Spanish discovery. It is now much grown in other tropical regions. The tree also yields chicle, extensively used for making chewing gum.

Sassafras. Handsome trees of the laurel family, with aromatic foliage and bark. There are only two known species, one North American, the other Asiatic. The sassafras or Ague Tree (*S. albidum*), usually a shrub or a small tree from 20 to 50 feet high, sometimes attains a height of 125 feet and a trunk diameter of 7 feet. It has a rough bark, entire, mitten-shaped, or three-lobed leaves, all forms of which are often borne upon the same twig, and yellow flowers followed by small dark blue fruit. Sassafras grows in sandy soil from Maine to Michigan and Kansas and southward to Florida and Texas. The fleshy, pungent bark of the root, used in household medicine for making sassafras tea, yields the oil of sassafras employed in flavoring and in perfumery. See *Spicebush*.

Seed Dispersal. The dispersal of seeds is accomplished by four chief agencies: wind, mechanical propulsion, animals, and water. Seeds scattered by the wind include those with fluffy tufts, such as the dandelion or thistle; winged seeds, as the maple and elm; and the tumbleweeds, the stem and branches of which may be rolled along by the wind. The touch-me-not and many other pod-bearing plants scatter their seeds mechanically when the dry pod bursts. Others, such as the burdock, attach themselves to animals by hooks and other clinging devices. Many adhere with mud to the feet of wading birds and may thus be conveyed thousands of miles. Water is instrumental in dispersing many seeds having structures adapted for floating. Walnuts, for example, are frequently carried by streams, and coconuts drift over great expanses of water.

Seed Plants (*Spermatophyta*). The highest of the four great primary divisions of the plant kingdom. They differ from the other groups by the production of seeds. The seed plants, called also spermatophytes, are grouped in two distinct divisions of very unequal size,—the Angiosperms,

which produce seeds inclosed in vessels or seed cases, and the Gymnosperms, which produce naked seeds.

The angiosperms embrace the true flowering plants, characterized by the ordinary conspicuous flower. There are about 140,000 known species of angiosperms. These comprise most of the conspicuous vegetation of the world. They are divided into two very distinct groups, Dicotyledons and Monocotyledons.

Dicotyledons have two or more seed leaves or cotyledons in the seed, net-veined leaves, five- or four-parted flowers, and wood fibers arranged in a ring around the pith. Examples are the common trees, such as the oak, elm, and maple, and familiar herbaceous plants, such as buttercups, roses, peas, violets, mints, and sunflowers.

Monocotyledons have one seed leaf or cotyledon in the seed, parallel-veined leaves, three-parted flowers, and wood fibers scattered throughout the pith. Typical monocotyledons are the pondweeds, aroids, grasses, palms, orchids, and lilies.

The gymnosperms, which number about 500 living species, include the conifers, the cycads, the gnetums, and the ginkgo.

Sego Lily (*Calochortus nuttallii*). A small plant of the lily family, closely allied to the tulip. It has a slender stem springing from a coated bulb, narrow leaves, and strikingly beautiful white flowers streaked with lilac and variously dotted with yellow and purple. It grows in dry soil from South Dakota to New Mexico and west to California and Washington. The early followers of Brigham Young are said to have regarded the edible roots of this plant much as the Jews looked upon the manna which saved them from starvation in the wilderness. The sego lily has figured largely in the history of the Mormon Church in Utah, where it has been formally adopted as the state flower.

Sensitive Plants. Certain species of mimosa, with finely divided leaves, whose leaflets, when lightly touched, fold together in pairs. Upon ruder treatment many nearby leaflets similarly fall together, and, in a short time, the leafstalk itself droops, so that the entire leaf has a withered appearance. If left at rest, the leafstalk soon rises and the leaflets again unfold. The sensitive pea (*Cassia nictitans*), which grows from Maine to Kansas and Texas, and the sensitive brier (*Schrankia uncinata*), of the Southern states, also exhibit similar behavior.

Sequoia (*sē-kwoi'ȧ*). A genus of mammoth evergreen trees of the pine family. They have immense columnar trunks which bear short branches near the top, small oval cones, exceedingly thick bark, and extraordinarily durable, light, reddish wood. There are only two living species, both of imposing stature and narrow geographic range.

The California Big Tree (*Sequoia* or *Sequoiadendron giganteum*) grows in limited areas, or groves, some 26 in number. These are found along the western slope of the Sierra Nevada, at 5000 to 8000 feet altitude, from Placer county to Tulare county, a distance of about 250 miles. Mature trees are about 275 feet high and from 30 to 35 feet in diameter at the flaring, buttressed base, above which the diameter is about 25 feet. The largest standing specimen measures 325 feet in height. A shattered fallen tree, known as the "Father of the Forest," is estimated to have been more than 400 feet high. The red-brown, fibrous bark is from 1 to 2 feet thick. While fanciful estimates of much greater longevity have been made, lumbered specimens show annual rings indicating an age of from 1100 to 2400 years. Although soft and coarse-grained, the reddish wood is extensively made into lumber on account of its remarkable lasting qualities.

The California Redwood (*Sequoia sempervirens*) is a similar but more slender tree. It attains a height of from 200 to 340 feet, with a trunk diameter of 10 to 15 feet, rarely 28 feet, at the thickened base. This tree grows only within the summer fog belt near the ocean from the vicinity of Monterey, California, to the southern borders of Oregon, in an area about 450 miles long and from 1 to 40 miles wide. The age of mature trees is from 500 to 1300 years. This redwood is of great value as a timber tree. The light, soft, straight-grained wood, free from resin and remarkably durable, is suitable for an immense variety of uses, from shingles to interior finishing lumber.

The scientific name *Sequoia* was given in honor of Sequoyah, the noted Indian chief who invented the Cherokee alphabet. See *Big Trees*.

Serviceberry (*Amelanchier*). A genus of shrubs or trees, natives of north temperate regions, closely related to the apple. There are about 25 species, chiefly North American. The best-known is the American serviceberry (*A. canadensis*), called also shadbush and juneberry, found in dry woodlands from Nova Scotia to Minnesota and southward to Florida and Louisiana. It is a medium-sized tree, often cultivated for its early flowers. These appear usually about the time of the shad runs. The sweet, reddish purple fruits vary in size—some being as small as currants while others are as large as cherries. Tool handles and parts of machines are often made of the hard, brown wood.

Sesame (*sĕs'ȧ-mē*) (*Sesamum indicum*). An annual hairy herb of the pedalium family. It is a native of the Sunda islands, where it has been cultivated since ancient times for its oil-bearing seeds. Sesame was introduced into India about 1000 B.C., into Egypt about 500 B.C., and is now widely grown in many tropical countries. The bland, long-keeping oil obtained from its seeds is used for food, like olive oil, and as a cosmetic. The Hindus make a highly nutritious meal from the parched and ground seeds.

Shamrock. A species of hop clover (*Trifolium minus*) is generally regarded as the true shamrock, or national floral emblem of Ireland. Various other plants with small leaves divided into three leaflets, such as the white clover (*Trifolium repens*), the bird's-foot clover (*Lotus corniculatus*), and the wood sorrel (*Oxalis*), are associated with the national badge. It is said that St. Patrick made use of the shamrock to illustrate the doctrine of the Trinity.

Sisal (*Agave sisalina*). A fleshy-leaved perennial of the amaryllis family, closely related to the century plant, native to tropical America. It has long been cultivated in Mexico for its fiber, which is second only to manila hemp in quality. Large quantities are now grown in Yucatan for export to the United States. It is extensively made into binding twine used in harvesting grain, and into various kinds of cordage, coarse cloth, and bags. See *Century Plant*, *Flax*, *Hemp*, *Manila Hemp*, *Olona*, *Ramie*.

Soap Plants. Various plants, belonging to many different families, which contain the poisonous principle, *saponin*. The bruised stems, bark, roots, leaves, or fruits of such plants form a lather in water and may be used like soap for cleansing purposes. Among these are the common soapwort or bouncing Bet (*Saponaria officinalis*), found along roadsides in Europe and America, and the somewhat similar cowherb (*Vaccaria*). The leaves and roots are the parts used for washing, but the reddish bark of the root sometimes stains white articles.

In the southwestern United States and adjoining parts of Mexico, several plants, called by the general name *amole*, are used for soap. Well-known examples are the small agave (*A. heteracantha*) and the soaproot (*Ornithogalum pomeridianum*). The latter plant, which belongs to the lily family, has a bulb from 1 to 4 inches in diameter, which is the part used for cleansing. In California the Indians throw the finely pounded bulb into small ponds,

stupefying the fish so that they may be easily captured. Among other western soap plants are the zygadene (*Zygadenus fremontii*) and the mountain lily (*Leucocrinum montanum*) which are used by the Indians, especially for washing the hair.

Sorghum Cane (*Sorghum saccharatum*). A tall annual of the grass family. It is a native of tropical Africa, cultivated since remote antiquity in Egypt, India, and China. Ages of husbandry have developed many valuable varieties, now widely grown throughout the world. These fall in two groups: (1) the *saccharine*, embracing the sorghum canes grown for making molasses and sirup and for fodder; (2) the *nonsaccharine*, including Kafir corn, durra, rice corn, Jerusalem corn, and broom corn, grown for grain, fodder, and broom fiber.

Spanish Moss (*Tillandsia usneoides*). A peculiar perching plant of the pineapple family, called also New Orleans moss. It has threadlike, grayish stems, covered with small scales, and small, solitary flowers. The plant hangs in festoons from various trees in the Southern States, especially from the live oak. From the fibery stems of the Spanish moss is obtained much of the so-called "hair" extensively employed in making mattresses and furniture. The stems of the plant are also widely used for packing.

Spicebush (*Lindera Benzoin*). A small, graceful shrub of the laurel family, closely related to the sassafras. The spicebush, called also feverbush, is common in moist woods in the eastern United States and Canada. It grows from 4 to 20 feet high, with fragrant twigs and foliage, and bears small, bright yellow flowers and scarlet berries. See *Sassafras*.

Spinach (*Spinacia oleracea*). A small, fleshy-leaved annual of the goosefoot family. It is a native of western Asia, and was anciently cultivated by the Medes and Persians. The plant was introduced into China about 150 B. C., and into Europe about the 15th century. It is now in wide and increasing use as a potherb.

The so-called New Zealand spinach (*Tetragonia expansa*) is a small annual of the carpetweed family, native to seacoasts of Australasia. This plant was first brought to England from New Zealand in 1771 by Captain Cook. It has proved valuable as a salad plant in dry, hot climates, and is sparingly grown in the United States.

Spiræa (*spī-rē'à*). Handsome shrubs of the rose family, usually with small, finely toothed leaves and white or pink flowers borne in clusters. There are about 70 species, natives of north temperate regions, of which about 20 are North American. The Meadowsweet (*S. latifolia*), with white flowers, grows from Newfoundland to Saskatchewan and south to Virginia. The Hardhack (*S. tomentosa*), with woolly leaves and pink flowers, is frequent in swamps from Nova Scotia to Manitoba and south to Georgia. Several hardy foreign species with showy flowers, as, for example, the Bridal Wreath (*S. hypericifolia*), are very widely cultivated.

Spruce (*Picea*). A genus of evergreen coniferous trees with linear, four-sided, spreading leaves, and pendulous cones. There are about 18 species, natives of north temperate and subarctic regions. Eight of these are North American.

The white spruce (*P. canadensis* or *P. glauca*) sometimes attains a height of 150 feet and a trunk diameter of 4 feet. It grows from the northern limit of forests in Alaska southeastward to New York and Montana. This tree is highly valued for lumber and for pulp wood.

The Engelmann white spruce (*P. engelmanni*) often reaches a height of 150 feet and a trunk diameter of 5 feet. This species forms great forests from Alberta and British Columbia southward to New Mexico and Oregon. The wood is extensively used for ties and lumber.

The tideland or Sitka spruce (*P. sitchensis*), usually about 100 feet high, with a trunk 3 feet in diameter, occasionally grows 200 feet high, with a trunk 16 feet in diameter. This giant spruce occurs along the coast from Alaska to northern California. The wood is highly valued for lumber and during the World War was used extensively in making wings for airplanes.

The black spruce (*P. mariana*), commonly 20 to 30 feet high, grows sometimes 100 feet high. It is native to swamps from the Arctic circle southward to Alberta, Michigan, and North Carolina, attaining its largest size in Saskatchewan. This tree is the source of spruce gum, and the wood is used in making paper pulp.

The red spruce (*P. rubens*), usually about 80 feet high, grows from Nova Scotia south to North Carolina. It is used for lumber, sounding boards, and paper pulp. The blue spruce (*P. pungens*), 80 to 150 feet high, grows near streams on high mountains in Colorado, Utah, and Wyoming. Varieties with very blue foliage are widely planted for ornament in America and Europe, the Koster blue spruce being the most popular form.

The Norway spruce (*P. Abies*) is a handsome, rapidly growing tree, sometimes 150 feet high, with large cones. It is the most important timber spruce of Europe and is widely planted for ornament in the eastern United States and Canada.

The demand for pulp wood has caused the denudation, in the northeastern United States and in the adjacent portions of Canada, of great areas that were formerly covered by dense spruce forests. See *Douglas Fir*.

Squash (*Cucurbita*). A tendril-bearing, vinelike plant, the large fleshy fruit of which is a much used garden vegetable. There are several species, natives of warm climates but widely grown as annuals in all temperate regions. They have large, rough leaves, on long, hollow, juicy stalks, and large yellow flowers. The hard fruits, which in structure are immense berries, occur in a great variety of forms and sizes.

The summer squashes (*C. pepo*) are usually varieties with small fruits, maturing early in the season. These include the scallop, called also "simlin" and "symbling" in southern markets, the pattypan, and the crookneck squashes. The winter squashes mature late in autumn, just before frost. If gathered when fully ripe and handled without bruising, they may be safely stored in dry, cool cellars for several months. The Canada crookneck (*C. moschata*), the China squash, and the cushaw squash belong to another important group.

Strawberry (*Fragaria*). A group of perennial trailing herbs of the rose family, natives of temperate regions, and extensively grown for their fruit. Strawberries are low-growing plants with slender runners which root at the joints, forming new plants. They have divided leaves of three-toothed leaflets, and white flowers. The numerous seeds (akenes) are borne on the surface of a red, greatly enlarged, fleshy receptacle. This fleshy portion forms the edible part of the fruit, the so-called berry.

Garden strawberries are mostly crosses or hybrid forms derived from three wild species,—the European strawberry (*F. vesca*), the American strawberry (*F. virginiana*), and the Chile strawberry (*F. chiloensis*). Cultivation of the strawberry has been established in Europe for about 500 years. In America, the culture of this fruit dates from the introduction of Hovey's strawberry in 1834. Strawberries are now grown from Florida to Alaska, and constitute the leading small fruit crop of the United States.

Sugar Cane (*Saccharum officinarum*). A perennial of the grass family. It grows from 8 to 12 feet high, with many-jointed stems containing a sweet, juicy pith. The plant is now unknown in the wild state but is believed to have been a native

of the East Indies. Until the recent great development of the sugar beet, sugar cane was the only extensive source of sugar. Anciently cultivated in India, it was brought to Europe during the Crusades, and is now grown in all warm regions, especially in the East and West Indies, Brazil, Mexico, Hawaii, and Louisiana. The plant, which rarely bears seeds, is reproduced by cuttings. A plantation lasts from six to ten years. See *Grasses, Sorghum Cane, Sugar.*

Sumac (*sū'măk; shōō'măk*) (*Rhus*). A group of trees or shrubs of the sumac family, many of which are of commercial value. More than 100 species are found in temperate and warm regions, some 15 occurring in North America.

The staghorn sumac (*R. typhina*), of the eastern United States and Canada, with crooked branches, sometimes grows 40 feet high. The dried and powdered leaves were once used in tanning leather, as were both the leaves and bark of the mountain sumac (*R. copallina*) which grows from Maine to Minnesota and south to Florida and Texas. The smooth sumac (*R. glabra*), a small shrub, common from Minnesota eastward and southward, was also sometimes used in tanning.

Among the most important Old World sumacs are the Venetian sumac (*R. cotinus*), called also smoke tree, cultivated for its wood and leaves used in dyeing and tanning; the elm-leaved sumac (*R. coriaria*), valued for its very acid fruit, used as a condiment; the Japanese Varnish Tree (*R. vernicifera*), from which lacquer and candle oil are obtained, and the Australian sumac (*R. rhodanthema*), which yields a very highly prized cabinet wood. See *Poison Ivy.*

Sundew (*Drosera*). A genus of small insectivorous plants of the sundew family. About 85 species are known. Of these, 7 are North American. They are low, bog herbs with small leaves spread out around the base of the slender flower stem. This bears a one-sided cluster of small, usually whitish or pinkish flowers. The leaves are everywhere clothed with viscid, glandular hairs. When irritated, these sticky hairs fold up, entrapping insects and digesting them through the action of enzymes secreted by the plant. The glands of the leaves exude drops of a clear glutinous fluid. These glitter in the sunshine like dewdrops, whence the name sundew. See *Pitcher Plant, Venus's Flytrap.*

Sunflower (*Helianthus*). A genus of tall, mostly perennial herbs of the composite family, comprising some 60 species, nearly all native to the United States. These plants are so named because of their gorgeous flower heads which are encircled by long, bright yellow, petal-like rays. When blossoming, the flowers of some species turn toward the sun.

The common sunflower (*H. annuus*) is a robust annual, long cultivated as a food plant by the American Indians. It is now extensively grown in India, Egypt, and Russia for its oil-bearing seeds. In the United States, the sunflower, though often planted for ornament, is only sparingly grown for seed production and for green fodder.

The Jerusalem Artichoke (*H. tuberosus*), native to the Ohio valley, was formerly widely cultivated by the Indians. It is now grown for its immense tubers, which, in the United States, are used chiefly for feeding swine and, in France, for making alcohol.

Sweet Flag (*Acorus calamus*). An erect plant of the arum family, with long, aromatic rootstocks and sword-shaped leaves. It grows in swamps in Asia, Europe, and eastern North America. The pleasant-scented root is used in confectionery, in perfumery, and in medicine.

Sweet Gum (*Liquidambar styraciflua*). A tall forest tree allied to the witch-hazel family, called also red gum, star-leaved gum, liquidambar, bilsted, and alligator tree. It occurs from Connecticut to Missouri and south to Guatemala, and is remarkable for the fragrant balsam, or gum, it exudes. The wood is hard and takes a high polish but is liable to check and warp. As an ornamental tree the sweet gum has few superiors.

Sweet Pea (*Lathyrus odoratus*). A highly prized garden annual of the pea family, native to Europe. It has been cultivated since ancient times for its beautiful fragrant flowers. Centuries of garden culture have developed an immense variety of sweet peas, differing greatly in form, size, color, and fragrance.

Sweet Potato (*Ipomœa batatas*). A creeping perennial vine of the convolvulus family. It is closely related to the morning-glory and is highly prized for its sweet, edible root. The plant is unknown in the wild state and authorities are not agreed as to whether it was originally native to tropical America or to the East Indies. The sweet potato was anciently grown in China, was in cultivation in the West Indies before the Spanish discovery of America, and is now the most widely used vegetable in tropical and subtropical countries. In the United States it ranks next to the potato among root vegetables. It is an important crop in the South and is grown for home use as far north as New Jersey and southern New York.

Syringa (*sĭ-rĭng'gà*) (*Philadelphus*). Shrubs of the saxifrage family, called also mock orange. There are about 50 species, 25 of which occur in North America. They are mostly of medium size, 6 to 10 feet high, with simple, petioled, opposite leaves, and large, white, orange-like flowers.

The garden syringa (*P. coronarius*), a native of Europe, with sweet-scented, clustered flowers 1 to 1½ inches broad, is extensively planted for ornament in the eastern United States and Canada. The scentless syringa (*P. inodorus*), native of hilly thickets from Virginia to Mississippi, with odorless, usually solitary flowers about 1 inch broad, is widely planted as a garden shrub, as is also the large-flowered kind (*P. grandiflorus*), which grows wild from Virginia to Florida and Missouri. The western syringa (*P. lewisii*), a mountain species, 3 to 6 feet high, with reddish branches and flowers 1½ inches broad, grows on stream banks and hills from Montana and British Columbia to Oregon. This beautiful syringa has been chosen the state flower of Idaho. See *Lilac.*

Tallow Tree. The name given to various trees which yield an oily or resinous substance suitable for making candles and soap. Among the best-known is the Chinese tallow tree (*Sapium sebiferum*). By crushing and boiling the seeds a hard, white, vegetable tallow is obtained. Since time immemorial in China this substance has been a standard candle making material. The leaves yield a black dye and the stems produce a resin-like copal used in making varnishes. This handsome tree is now cultivated and somewhat naturalized in the Carolinas and the Gulf states. In China the wood is used for furniture and for printing blocks. See *Candleberry.*

Tamarind (*Tamarindus indica*). A handsome tree of the pea family, 70 to 80 feet high, native to India, now extensively cultivated in tropical countries for its fruit. It bears large seed pods which are filled with an acidulous juicy pulp, especially prized for making cooling drinks. The pods and also various preparations of the pulp with sugar or sirup are articles of commerce in many warm regions. In India the tree is grown not only for the fruit pulp but also for the astringent seeds, for the leaves which yield dyestuffs, and for the wood used as timber. The tamarind is grown to some extent in southern Florida where it has become sparingly naturalized.

Tangerine (*Citrus nobilis*). A small, hardy, early variety of the orange, derived from the mandarin orange. The fruit differs from the common orange in its flatter shape and very tender rind

which separates upon the slightest pressure. When fully ripe the tangerine has a peculiarly luscious flavor and a fine fragrance. Small quantities of tangerines are grown in Florida and California. See *Citrous Fruits, Orange.*

Taro (*tä'rō*) (*Colocasia antiquorum*). A perennial of the arum family, native to India and Polynesia. It has been cultivated since ancient times for its large tuberous roots, 12 to 16 inches long, which are a staple food in the Pacific islands. Taro reached China about 100 B. C. and has long been grown in India and Egypt. In Hawaii the cooked root is fermented, the resulting product being called poi. The youn leaves are used as a potherb, like spinach or chard.

Tea (*Thea sinensis*). A small evergreen tree of the tea family, native to southeastern Asia. The young leaves of this plant, when properly gathered and cured, become the tea of commerce. In its natural state the tea tree grows sometimes 30 feet in height. It bears long, narrow, somewhat willow-like, leathery leaves and beautiful cream-white or rose-tinted flowers, followed by woody capsules or pods, each containing three round seeds.

To increase the leaf production, the tree is pruned to the form of a much branching shrub from 2 to 4 feet high. The first crop is ready to pick in the third year after planting, and the full crop, sometimes 400 pounds per acre, is established about 5 years after planting. The difference in color and taste between *green* and *black* teas is due to the mode of preparation. In making black tea the leaves are wilted and allowed to ferment before they are subjected to a firing or quick drying process. In making green tea the leaves, as soon as gathered, are withered by steaming in perforated pans, thus retaining the green color, and then are roasted in pans for five minutes. They are next dropped on bamboo mats and rolled by hand, after which they are dried quickly over charcoal fires. Old leaves are often deficient in color and are treated with prussian blue or indigo.

In China, the culture of the tea plant is prehistoric, being mentioned in records dating back to 2700 B. C. In Japan, tea culture dates from the early middle ages. In India and Ceylon, however, tea growing, which has become very extensive, was not begun until about 1870. Japan, including Formosa, produces the most tea; China ranks second in production; and India and Ceylon, third.

The stimulant and tonic properties of tea are due to the presence of theine, an alkaloid identical in chemical composition with caffeine, the active principle in coffee, cocoa, and maté. Tea is used by a greater number of people than is any other beverage. China, Japan, England, Russia, the United States, Canada, and Australia are the leading tea consuming countries. In England several times as much tea as coffee is consumed; in the United States these proportions are reversed. See *Cacao, Camellia, Coffee, Maté.*

Teak (*Tectona grandis*). A valuable timber tree, belonging to the verbena family, native to southeastern Asia. It is a magnificent tree, sometimes 150 feet high and 8 feet in diameter, with large leaves 10 inches long, small, white flowers, and oily seeds encased in hard, bony nuts. The handsome, durable, golden brown wood is so heavy that it sinks in water unless well seasoned. It somewhat resembles mahogany to which it ranks next in market value among commercial hard woods. Teak is extensively used for furniture, wood carving, house building, and shipbuilding. While the immense natural forests have been largely exhausted, teak plantations under British governmental protection have been established in India and Burma.

Tea Oil Tree (*Camellia sasanqua*). A shrub of the tea family, native to China, where it is extensively cultivated. The oil pressed from its seeds is widely used in Chinese cookery. The seed cake remaining after the removal of the wholesome, edible oil, contains the poisonous principle, saponin. As this lathers water, the seed cake is used as a mild soap for washing delicate fabrics. When the bruised seeds or seed cakes are thrown into fish ponds or rivers, the poisonous saponin stupefies fish, so that they rise to the surface and are readily caught. Gardeners' varieties of this beautiful tree are planted for ornament in the United States. By horticulturists, the tea oil tree and several species of *Thea*, now in extensive cultivation, are commonly known as camellias. See *Camellia.*

Thistle. The common name for various prickly or spiny plants of the composite family, many of which are widely distributed as weeds. Of these, the Canada thistle (*Cirsium arvensis*), native of Europe, is one of the most troublesome. The milk thistle (*Silybum marianum*) is a coarse biennial now found from the Atlantic to the Pacific. The white-blotched leaves are sometimes used as a salad or boiled as a potherb. The Scotch thistle (*Onopordon acanthium*), with cottony or woolly leaves, common in the Atlantic states, is said to be the emblem of Scotland. The blessed thistle (*Cnicus benedictus*), with yellow flowers, native of Asia, formerly of high repute for medicinal purposes, has become established in the United States.

Besides the foregoing introduced kinds, there are many native species, such as the common pasture or bull thistle and the tall swamp thistle, which rarely, if ever, become abundant as weeds.

Timothy Grass (*Phleum pratense*). A valuable cultivated grass, native to Europe, sometimes called cat's-tail. It has an erect, slender stem, from 1 to 3 feet high. This bears at the top a dense, cylindrical spike of closely packed flowers, resembling in form that of the common cat-tail of the marshes, but much smaller. This grass was named for Timothy Hanson, who is said to have brought the seed into the Carolinas about 1720. It is often planted with clover and now forms an important part of the hay crop of the eastern United States and Canada.

Tobacco (*Nicotiana tabacum*). A large-leaved annual of the potato family. It is a native of the Peruvian region, now extensively cultivated in many parts of the world. The plant grows from 2 to 5 feet in height, has ovate or lanceolate, pointed leaves, 1 to 3½ feet long, and bears clusters of showy, white or pink, tubular flowers. The leaves, after being prepared by drying and various curing and manufacturing processes, are used for smoking, chewing, and as snuff. Usually the leaves are dried separately or on the stalk, tied in bundles, and placed together in heaps to induce the fermentation by which the various aromas and flavors are developed.

Tobacco for smoking has been in almost universal use among the Indians since ancient times. Tobacco pipes, which are abundant in Aztec tombs, are found also in the remains of the Mound Builders. Tobacco was introduced into France in 1559 by Jean Nicot, whence the scientific name of the plant, *Nicotiana*, and the name of its active principle, *nicotine.* In 1585 Sir Francis Drake took tobacco to England, where Sir Walter Raleigh soon after made pipe smoking fashionable. In America, tobacco culture began with the earliest settlement of Virginia.

The United States is the chief tobacco raising country, producing over a third of the world's crop. Cuba produces the best cigar tobacco, though most Havana cigars are made in Florida by Cubans from raw material imported from the island.

Tomato (*tō-mā'tō*; *tō-mä'tō*) (*Lycopersicon esculentum*). An annual plant of the potato family, native to the Andean region. The fleshy, acidulous fruit is highly prized as a vegetable. Varieties were in cultivation in Peru at the time of the Spanish discovery of that country. The tomato was formerly called the love apple and was long regarded as

poisonous. It is now widely cultivated in temperate regions and is grown more extensively than any other vegetable for canning.

Trumpet Vine (*Campsis radicans*). A climbing shrubby vine of the bignonia family, native to the southern United States. It sometimes grows 40 feet in length, has pinnate leaves, and bears scarlet or orange-yellow, trumpet-shaped flowers 2½ inches long. These are followed by fruiting pods 6 inches long, containing winged seeds. The trumpet vine is highly prized in cultivation, and was once the state flower of Kentucky.

Tulip (*Tulipa*). Hardy, bulbous, early blooming plants of the lily family. They have broad leaves and large, solitary, brilliantly colored flowers. There are about 45 species, natives of Asia and southern Europe. Most cultivated varieties have been derived from a West Asian species (*T. gesneriana*) which was brought to Germany by Gesner in 1559. Nearly 2000 varieties, presenting an immense range of forms and colors, are now catalogued.

Tulip Tree (*Liriodendron tulipifera*). A handsome and valuable tree of the magnolia family, known also as yellow poplar and whitewood. Its columnar trunk attains a height of 60 to 190 feet and a maximum diameter of 10 feet. It bears large, smooth, more or less deeply lobed leaves, and showy, tuliplike, greenish yellow flowers, about 2 inches deep and orange colored within. The fruit, a dry light brown cone, some 3 inches long, sheds its winged seeds in the autumn. This tree, now widely planted for ornament, grows native in rich soil from New England to Lake Michigan and southward to Florida and Louisiana. The soft yellowish wood is much used for cabinet making and interior finish. In Indiana the tulip tree is the state tree.

Tumbleweeds. Various annuals, abundant in prairie regions, which scatter their seeds when the dry matured plants, after being uprooted, are rolled or tumbled from field to field by the wind. Among these are the Russian thistle, the tumbling pigweed, the winged pigweed, and the bugseed.

Tung Tree (*Aleurites cordata*). A tree of Chinese origin producing an oil used in making varnishes, paints, and plastics. The oil comes from five large oil-rich seeds embedded in each fruit, which is about the size of a small apple. The leaves are heart-shaped, tung being a Chinese word for heart. The flowers, borne in close clusters, are bell-shaped, marked with pink or deep yellow in the throat. The tree reaches a height of 40 feet, spreading to about the same width. It begins to produce when five years old. The cultivation of tung trees is a rapidly growing industry along the northern coast of the Gulf of Mexico and eastward to the Atlantic.

Tupelo (*tū'pē-lō*) (*Nyssa*). A genus of large trees or, rarely, shrubs of the dogwood family, natives of America and Asia. Seven species are known, four occurring in the United States.

The Water Gum (*N. biflora*), known also as water tupelo and black gum, is a swamp tree growing near the coast from New Jersey to Louisiana. Its maximum height, 120 feet, is attained in southern Louisiana. The yellowish white wood, though soft, is very tough and difficult to split on account of its twisted grain.

The Black Gum (*N. sylvatica*), called also tupelo gum, sour gum, yellow gum, pepperidge, and stinkwood, is found in rich swampy soil from Maine to Ontario and southward to Texas and Florida. In the mountain regions of Georgia and Tennessee it reaches a height of 110 feet with a trunk diameter of 4 feet. This tree is esteemed for ornamental planting, but it requires moist land.

Tupelo Gum (*N. aquatica*), a swamp-loving tree, called also cotton tupelo, ranges from Virginia to Florida and westward to Texas. It attains a maximum height of about 100 feet and a trunk diameter of 4 feet. The wood is used for crates and boxes.

The Ogeechee Lime (*N. ogeche*), called also Ogeechee plum, gopher plum, and sour tupelo, is a slender tree inhabiting swamps in South Carolina and Florida. It occasionally attains a height of 60 feet, with a trunk diameter of 2 feet. The fruits, which resemble olives in size and shape, are bright red, thick fleshed, juicy, and sour. They are sometimes preserved in sugar. The wood is coarse-grained and weak, but difficult to split.

Turnip (*Brassica rapa*). A biennial plant of the mustard family, very closely related to the cabbage. It has a flattened, white-fleshed root, crowned with a close tuft of hairy leaves. During the second season, a flowering stem, a foot or more high, rises from the center of the leaves. This bears yellow, mustard-like flowers and tiny seeds. The wholesome, edible root is widely used in cool countries as a spring and autumn vegetable and also for feeding dairy cattle and other live stock.

The Swedish turnip, or rutabaga (*B. campestris*), has a somewhat globular, yellow-fleshed root with a more or less elongated neck, bearing smooth, cabbage-like leaves. It is extensively grown in northern regions as a winter vegetable and as a stock food.

Both the common turnip and the rutabaga are believed to be natives of eastern Europe or western Asia, where they have been cultivated since prehistoric times.

Upas (*ū'pȧs*) **Tree** (*Antiaris toxicaria*). A tree of the mulberry family, native to Java, the Philippine Islands, and adjoining regions. The intensely poisonous, milky juice is used by the Malays for tipping arrows. According to a widely repeated myth, there is a poison-vale in Java in which the exhalations from the upas trees are so virulent as to destroy all animal life. It is now believed that the presence of noxious gases in volcanic valleys on the island caused the destruction long wrongly ascribed to the upas tree.

Vanilla. A robust, high-climbing orchid, native to the tropics. It has bright green, fleshy leaves, large, fragrant, greenish white flowers, and a pod-like fruit, opening along the side. The slender, bean-like pods, about 8 inches long, contain a sweet, aromatic, oily pulp and small black seeds. From these fruits, after careful drying, is extracted the vanilla widely used in flavoring and in perfumery. The vanilla of commerce is obtained chiefly from *Vanilla fragrans*, found wild from Mexico to Peru and also widely cultivated. See *Orchids*.

Venus's Flytrap (*Dionœa muscipula*). A remarkable insectivorous plant of the sundew family. It grows wild only in the sandy savannas of North Carolina. The plant bears a slender scape of white flowers. This flowering stem is encircled at the base with hairy, traplike leaves which close suddenly upon insects alighting on them. By means of secretions from the glandular surface of the leaf, portions of the insects thus caught are assimilated as food. This process requires about 14 days, after which the hinged, jawlike portion of the leaf reopens and is ready to capture another insect. After functioning in this manner a few times, the leaf withers and dies. See *Pitcher Plant, Sundew*.

Verbena. A genus of herbs or sometimes shrubs of the vervain family. They have mostly opposite leaves and variously colored flowers. There are about 100 species. With the exception of one species found in Europe, all the verbenas are natives of the New World. Of these, more than 20 occur wild in the United States and Canada. Many coarser-leaved kinds, with narrow spikes of small flowers, usually called vervain, are common weeds. The large-flowered kinds have many handsome representatives in cultivation. The sweet-scented verbena (*V. teucrioides*), native to Brazil, is widely grown for its pinkish white flowers, which are fragrant at night.

Viburnum (*vī-bûr'nŭm*). A large genus of shrubs or trees of the honeysuckle family. They have entire, toothed or lobed leaves, and white, or rarely pink, flowers in dense compound clusters. There are about 100 species, widely distributed throughout the world, comprising many beautiful shrubs cultivated for ornament.

Some 20 species are found in the United States and Canada. Among the best known are the high Bush Cranberry (*V. opulus*), which grows across the continent, and also in Europe and Asia. The red, edible, acid fruit somewhat resembles the cranberry. The Snowball or Guelder Rose of the gardens is a cultivated form with large globular clusters of sterile flowers. The sweet viburnum, called also nannyberry, or wild raisin (*V. lentago*), is a handsome shrub or small tree. It bears beautiful, fragrant flowers, and bluish black, sweet, edible fruit. This species is found from Quebec to Saskatchewan and southward to Georgia, Kansas, and Colorado. The very similar Black Haw (*V. prunifolium*) has a more southern range.

The Wayfaring Tree (*V. lantana*), of Europe, is often cultivated in America. The very similar Hobblebush, or Witch Hobble (*V. alnifolium*), with large round leaves, grows from New Brunswick to Michigan and southward. The Dockmackie (*V. acerifolium*), the Arrowwood (*V. dentatum*), and the Witherod (*V. cassinoides*), of similar range to hobblebush, are handsome shrubs. The Laurustinus (*V. tinus*), prized by the ancient Romans, is a highly valued ornamental plant, suitable for hedges. It is widely grown in California and other mild climates.

Violet (*Viola*). Small herbs of the violet family, which bear delicately beautiful flowers that appear in early spring. In many species, these showy blossoms are succeeded later by inconspicuous flowers which never open, but which produce abundant seeds. In color the flowers range from pure white to various shades of yellow, blue, violet, pink, or purple, and are often variously streaked or tinted. There are two chief groups,—the leafy-stemmed violets and the stemless violets.

Violets usually grow in moist situations and are among the best known and most highly prized plants of our native flora. Many kinds are planted in gardens, and two species, the Pansy (*V. tricolor*) and the sweet violet (*V. odorata*), both natives of the Old World, are very extensively cultivated. The bird's-foot violet (*V. pedata*), which grows wild from Massachusetts to Minnesota and south to Florida and Louisiana, is the parent of several handsome garden varieties.

The early blue violet (*V. palmata*) is the wild okra of the Southern states. Its mucilaginous leaves are largely used by the colored population in making soups.

There are about 300 species of violets, widely distributed throughout the world. Of these, about 75 species are native to North America, north of Mexico, nearly 50 being found wild in the northeastern United States and Canada.

Virginia Creeper (*Parthenocissus quinquefolia* or *Ampelopsis quinquefolia*). A handsome, woody vine of the grape family. It has climbing or trailing stems, large, palmately divided leaves, and dark blue, berry-like fruit. It grows wild from Quebec to Saskatchewan and southward to Cuba and Mexico, and is often planted for ornament. The Virginia creeper is sometimes wrongly called woodbine and is often mistaken for poison ivy. From the latter it is easily distinguished by observing the leaves. The leaves of the poison ivy consist of *three* leaflets, while the leaves of the Virginia creeper have *five* leaflets. See *Poison Ivy*.

Wahoo (*wä-hōō'*; *wä'hōō*) (*Euonymus atropurpureus*). A shrub or small tree of the staff-tree family, 6 to 25 feet high, called also burning bush or spindle tree. This tree grows in woodlands from Ontario to Florida and westward to Oklahoma and Nebraska. It bears clusters of small purple flowers, followed by deeply lobed fruiting arils which enclose the seeds. The bright red fruit, which persists after the leaves have fallen, is used for winter decoration. See *Climbing Bittersweet*.

Walnut (*Juglans*). Handsome trees of the walnut family, with dark-colored wood. They have compound leaves, which emit a balsamic odor when bruised, and bear hard-shelled nuts enclosed in fleshy husks. Ten species are found in North and South America, Europe, and Asia, all of which produce sweet, edible nuts. Four species are native to the United States.

The black walnut (*J. nigra*) is a magnificent tree, sometimes 150 feet high, with a trunk diameter of 4 to 6 feet. It occurs in rich soils from Massachusetts to Minnesota and southward to Florida and Texas. It has been lumbered almost to extinction for its exceedingly valuable wood. This is used for furniture, interior finishings, gunstocks, and shipbuilding.

The Butternut, or white walnut (*J. cinerea*), is usually a short-trunked, widely branching tree, from 50 to 75 feet high. It grows from New Brunswick to South Dakota and southward to Georgia and Arkansas. The soft, light brown wood is used for interior finishings of houses and for furniture. The bark and husks of the fruit furnished the yellow dye for woolens used in making the "butternut jeans" of pioneer days.

The rock or Mexican walnut (*J. rupestris*) is a small tree or shrub of stony stream banks from Texas and Arizona, south to Mexico. It bears a deeply grooved, hard-shelled, very sweet nut, the size of a hickory nut. The West Texas form of this species (var. *minor*) has nuts about the size of a large pea. The California walnut (*J. californica*), a graceful tree with a smooth, round nut, grows from the Sacramento valley to the Santa Ana mountains. Horticulturally, it plays a very important part in the walnut growing industry. On the Pacific coast this native species is universally used as a stock on which to graft the finer varieties of the English walnut, thereby greatly increasing the hardiness and productivity of the latter.

The English walnut (*J. regia*), a native of Asia, was cultivated in ancient times in Iran. Thence it was early brought to southern Europe, later to England, and, in the 19th century, to America. The nut was greatly esteemed by the ancient Greeks and Romans, the classic name *Juglans* meaning "Jupiter's acorn" or "nut of the gods." Centuries of cultivation have produced many excellent varieties of the nut, which is now commercially grown in immense quantities in various countries. In California, where cultivation of the English walnut is becoming very extensive, the crop normally exceeds 50 million pounds per annum. The wood of the English walnut is of great value for gunstocks and in veneering.

Water Hyacinth (*Eichhornia speciosa*). A floating aquatic of the pickerel weed family. It is a native of tropical South America, widely cultivated in Europe and elsewhere as an ornamental plant. Its large leaves form rosettes which sometimes rise 2 feet above the surface. From the center of the leaves springs a cluster of showy flowers. The plant multiplies with great rapidity. Within a few years after its introduction, it sometimes chokes large streams so as to impede navigation. The obstruction of the St. John's and other rivers in Florida and of various inland waters in California and in South America, illustrates the danger of planting the water hyacinth to beautify streams.

Water Lily (*Nymphaea*). A genus of aquatic perennial herbs of the water lily family. They have roundish, shield-shaped, or heart-shaped leaves which float on the surface of the water. Both leaves and flowers grow from thick rootstocks imbedded in the mud of ponds or sluggish streams. The leafstalks and flower stalks sometimes attain a length of several feet, varying with the depth of the water.

The sweet-scented water lily (*N. odorata*) has fragrant flowers from 3 to 6 inches in diameter, mostly white but sometimes pinkish or even deep pink. It occurs throughout the eastern United States and Canada. The white water lily (*N. tuberosa*), with tuberous rootstocks, has large, pure white flowers, 4 to 9 inches in diameter, which are nearly scentless. This species is most abundant in the region of the Great Lakes. The yellow pond lily (*Nuphar advena*), closely related to the water lily, has yellow flowers tinged with green or brown. It is found from Labrador to Utah and southward.

The starchy seeds and rootstocks of various kinds of water lilies are used for food by native peoples in many districts of Asia, Africa, Australia, and tropical America. In North America, the Indians formerly included the water lily among their food plants.

Watermelon (*Citrullus vulgaris*). An annual vine of the gourd family, native to tropical Africa. It has been cultivated since very ancient times for its large, refreshing fruit, which weighs from 20 to 50 pounds and upwards. In structure, the fruit is really a huge berry with a hard, green, usually variegated rind. This encloses a pink or red pulp with a copious, sweet, watery fluid and numerous seeds. The watermelon is extensively grown in warm regions, particularly in South Russia and in the southern United States. Of the pulp of the ripe fruit, water comprises about 93 per cent and sugar about 2 per cent.

Wheat (*Triticum*). The most valuable and widely useful of the cereal grasses. It is an erect annual, with a hollow, jointed stem, usually from about 2 to 4 feet high, and long flat leaves. It bears at the summit a series of flowering spikelets, each consisting of from 2 to 8 flowers, closely crowded together in a dense, cylindrical, usually bearded head. In this are produced the starchy, gluten-bearing, nutritious seeds, everywhere highly prized for human food.

Wheat is unknown in the wild state but is believed to have been originally a native of the Euphrates region in southwestern Asia. Its cultivation antedates all recorded human history. It was grown by the Lake Dwellers of Switzerland, by the ancient Egyptians, and, as early as 2700 B. C., by the Chinese. Through ages of careful husbandry, wheat has been developed into the most highly esteemed bread plant in western civilization and the most extensively used cereal grain in the world.

While wheat is grown in large quantities in some warm climates, as in Egypt, India, and California, the world's chief supply is produced from 39° to 60° north latitude and from 24° to 40° south latitude. Though a hardy plant, wheat is not grown successfully so far north as barley, oats, or rye. Where the climate is sufficiently mild, wheat is usually sown during the autumn and matures early in the following summer. This is known as *winter wheat.* Where the winters are more severe, wheat is sown in the spring and is harvested after midsummer. Such a crop is called *spring wheat.* Wheat grown in somewhat dry climates is superior in quality to that produced in humid regions.

Of the many varieties of wheat, the true bread wheats are by far the most valuable. This group includes the hard and the soft winter wheats, the hard spring wheats, the white wheats, and the early wheats. The soft winter wheats are produced in the eastern United States, northern Europe, parts of Asia, Australia, and Argentina. The hard winter wheats are grown in the Mississippi valley and the Rocky Mountain region, in western Asia, and in southeastern Europe. The hard spring wheats are cultivated in Minnesota, North and South Dakota, and other northern plains of the United States, in the prairie provinces of Canada, in eastern Russia, and in southwestern Siberia. The white wheats are grown in western Asia, Australia, and along the Pacific coast of North and South America. The early wheats are produced in Australia, India, Japan, and the southern United States.

Besides the standard bread wheats, universally used for making flour, other important varieties are: the club or square head wheat; the poulard wheat; the durum wheat, the hardest known, used in making macaroni; Polish wheat; one-seeded wheat; emmer; and spelt.

In value, the world crop of wheat surpasses that of all other cereals. The total yield usually exceeds four billion bushels, of which Europe, with Russia and France leading, produces about one-half, and the United States about one-fourth. Other important wheat growing countries are Canada, India, and Argentina. See *Cereals, Grasses.*

Wild Flowers, American. The eighth edition (1950) of *Gray's Manual of Botany* by M. L. Fernald, covering the flowering plants and ferns of central and eastern United States and adjacent Canada, enumerates 5523 native and introduced species. Small's *Flora of the Southeastern United States* describes more than 6300 species. Rydberg's *Flora of the Rocky Mountains and Adjacent Plains* enumerates about 5900. The flora of the Pacific slope embraces some thousands of species.

Many of the plants of one region are found in the adjacent regions and some are common to all parts of the continent. Consequently, the enumerations mentioned contain a large number of duplications. Each major region, however, has many characteristic plants which usually do not occur in the adjoining regions. Examples of wild flowers representative of the chief floral regions north of Mexico are given in the accompanying table.

REPRESENTATIVE AMERICAN WILD FLOWERS

NORTHEASTERN UNITED STATES AND SOUTHEASTERN CANADA

(Manitoba to northern Kansas and eastward)

Adder's-tongue . . . . . (*Erythronium americanum*).
Alnemone, or Windflower . . (*Anemone*, various species).
Asters . . . . . (*Aster*, numerous species).
Black-eyed Susan . . . . . (*Rudbeckia hirta*).
Boodroot . . . . . (*Sanguinaria canadensis*).
Bluebells . . . . . (*Mertensia virginica*).
Blue Flag . . . . . (*Iris versicolor*).
Bunchberry . . . . . (*Cornus canadensis*).
Cardinal Flower . . . . . (*Lobelia cardinalis*).
Columbine, Red . . . . . (*Aquilegia canadensis*).
Coneflower . . . . . (*Rudbeckia*, various species).
Crane's-bill . . . . . (*Geranium maculatum*).
Dogwood, Flowering . . . . . (*Cornus florida*).
Dutchman's-breeches . . . . . (*Dicentra cucullaria*).
Gentian, Fringed . . . . . (*Gentiana crinita*).
Goldenrod . . . . . (*Solidago*, various species).
Harebell . . . . . (*Campanula rotundifolia*).
Hepatica . . . . . (*Hepatica acutiloba, americana*).
Jack-in-the-pulpit . . . . . (*Arisæma triphyllum*).
Jewelweed . . . . . (*Impatiens capensis, pallida*).
Lady's-slipper . . . . . (*Cypripedium*, various species).
Lily, Wild . . . . . (*Lilium*, various species).
Marsh Marigold . . . . . (*Caltha palustris*).
Moccasin Flower . . . . . (*Cypripedium acaule*).
Oswego Tea . . . . . (*Monarda didyma*).
Pitcher Plant . . . . . (*Sarracenia purpurea*).
Rose, Wild . . . . . (*Rosa*, various species).
Spring Beauty . . . . . (*Claytonia virginica*).
Squirrel Corn . . . . . (*Dicentra canadensis*).
Trailing Arbutus . . . . . (*Epigæa repens*).
Turtlehead . . . . . (*Chelone glabra, lyoni*).
Twinflower . . . . . (*Linnæa borealis*).
Violets . . . . . (*Viola*, many species).
Virgin's-bower . . . . . (*Clematis virginiana*).
Wake-robin . . . . . (*Trillium*, various species).
Water Lily . . . (*Nymphæa, Nuphar*, various species).
Wood Betony . . . . . (*Pedicularis canadensis*).

SOUTHERN UNITED STATES

(Virginia to Oklahoma and southward, largely excluding the plants of the Northern states which extend southward)

Azaleas . . . . . (*Rhododendron*, various species).
Black Snakeroot . . . . . (*Cimicifuga racemosa*).
Bluebonnet . . . . . (*Lupinus texensis*).
Colicroot . . . . . (*Aletris farinosa*).
Cup Plant . . . . . (*Silphium perfoliatum*).

REPRESENTATIVE AMERICAN WILD FLOWERS—Con.

SOUTHERN UNITED STATES—Con.

Cypress Vine . . . . . (*Ipomœa quamoclit*).
Fetterbush . . . . . (*Andromeda floribunda*).
Forestiera . . . . . (*Forestiera acuminata*).
Great Laurel . . . . . (*Rhododendron maximum*).
Hydrangea . . . . . (*Hydrangea arborescens*).
Indian Pink . . . . . (*Spigelia marilandica*).
Jessamine, Yellow . . . . . (*Gelsemium sempervirens*).
Leather Flower . . . . . (*Clematis viorna*).
Loblolly Bay . . . . . (*Gordonia lasiantha*).
Magnolia . . . . . (*Magnolia*, various species).
Malvaviscus . . . . . (*Malvaviscus drummondii*).
Maypop . . . . . (*Passiflora incarnata*).
Meadow Beauty . . . . . (*Rhexia virginica*).
Mountain Laurel . . . . . (*Kalmia latifolia*).
Redroot . . . . . (*Ceanothus americanus*).
Rose, Cherokee . . . . . (*Rosa lævigata*).
Salvia, Wild . . . . . (*Salvia coccinea*).
Sneezeweed . . . . . (*Helenium tenuifolium*).
Spanish Bayonet . . . . . (*Yucca filamentosa, baccata*).
Spiderwort . . . . . (*Tradescantia virginica*).
Sweet Bay . . . . . (*Magnolia virginiana*).
Tree Orchis . . . . . (*Epidendrum*, various species).
Trumpet Vine . . . . . (*Bignonia radicans*)
Unicorn Plant . . . . . (*Martynia louisiana*).
Wistaria . . . . . (*Wistaria frutescens*).
Yellowwood . . . . . (*Cladrastis lutea*).

GREAT PLAINS

(Saskatchewan to western Texas)

Blanket Flower . . . . . (*Gaillardia aristata*).
Blazing Star . . . (*Liatris* or *Lacinaria*, various species).
Compass Plant . . . . . (*Silphium aristatum*).
Coneflower, Purple . . . . . (*Brauneria angustifolia*).
Golden Aster . . . . . (*Chrysopsis villosa*).
Golden Pea . . . . . (*Thermopsis rhombifolia*).
Indian Parsnip . . . . . (*Cymopterus glomeratus*).
Loco Weed . . . . . (*Aragallus lamberti*).
Mallow, Red . . . . . (*Malvastrum coccineum*).
Pasque Flower . . . . . (*Anemone patens nuttalliana*).
Pomme de Prairie . . . . . (*Psoralea esculenta*).
Prairie Clover . . . . . (*Petalostemon purpureum*).
Rose, Prairie . . . . . (*Rosa*, various species).
Sand Lily . . . . . (*Leucocrinum montanum*).
Shooting Star . . . . . (*Dodecatheon multiflorum*).
Spring Aster . . . . . (*Townsendia sericea*).
Sunflower, Wild . . . . . (*Helianthus*, various species).
Vetchling . . . . . (*Lathyrus ornatus*).
Western Dandelion . . . . . (*Agoseris glauca*).
Wild Licorice . . . . . (*Glycerrhiza lepidota*).

ROCKY MOUNTAIN REGION

(Alberta to New Mexico and Arizona)

Arnica . . . . . (*Arnica*, various species).
Beardtongue . . . . . (*Pentstemon*, numerous species).
Bitterroot . . . . . (*Lewisia rediviva*).
Columbine, Blue . . . . . (*Aquilegia coerulea*).
Deer's-tongue . . . . . (*Frasera speciosa*).
Evening Primrose . . . . . (*Oenothera*, various species).
Globe Flower . . . . . (*Trollius albiflorus*).
Golden Currant . . . . . (*Ribes aureum*).
Indian Paintbrush . . . . . (*Castilleja*, various species).
Moss Campion . . . . . (*Silene acaulis*).
Mountain Pink . . . . . (*Douglasia nivalis*).
Mountain Primrose . . . . . (*Primula parryi*).
Prickly Poppy . . . . . (*Argemone mexicana*).
Red Heather . . . . . (*Phyllodoce empetriformis*).
Sand Verbena . . . . . (*Abronia fragrans*).
Sego Lily . . . . . (*Calochortus nuttallii*).
Syringa . . . . . (*Philadelphus lewisii*).
Turkey Beard . . . . . (*Xerophyllum tenax*).
Umbrella Plant . . . . . (*Eriogonum*, various species).
White Heather . . . . . (*Cassiope mertensiana*).

PACIFIC NORTHWEST

(Including Oregon, Washington, British Columbia, and southeastern Alaska)

Aconite . . . . . (*Aconitum columbianum*).
Blue-eyed Mary . . . . . (*Collinsia tenella*).
Currant, Red Flowering . . . . . (*Ribes sanguineum*).
Fireweed . . . . . (*Epilobium angustifolium*).
Flowering Dogwood, Western . . . . . (*Cornus nuttallii*).
Gum Plant . . . . . (*Grindelia oregana*).
Hellebore, White . . . . . (*Veratrum californicum*).
Leopard Lily . . . . . (*Fritillaria lanceolata*).
Miterwort . . . . . (*Tellima grandiflora*).
Oregon Grape . . . . . (*Mahonia aquifolium*).
Pearly Everlasting . . . . . (*Anaphalis occidentalis*).
Rattlesnake Plantain . . . . . (*Peramium decipiens*).
Rhododendron, Western . . (*Rhododendron californicum*).
Salal . . . . . (*Gaultheria shallon*).
Salmonberry . . . . . (*Rubus spectabilis*).
Star Flower . . . . . (*Trientalis latifolia*).
Sweet Coltsfoot . . . . . (*Petasites speciosa*).
Valerian . . . . . (*Valeriana sitchensis*).
Wood Orchis . . . . . (*Piperia elegans*).
Yerba Buena . . . . . (*Micromeria chamissonis*).

CALIFORNIA

(Largely excluding the plants of the Pacific Northwest which extend southward)

Baby Blue-eyes . . . . . (*Nemophila insignis*).
Bird's-eyes . . . . . (*Gilia tricolor*).
California Poppy . . . . . (*Eschscholtzia californica*).
Chamisal . . . . . (*Adenostoma fasciculatum*).
Christmas Berry . . . . . (*Heteromeles arbutifolia*).
Cream Cups . . . . . (*Platystemon californicus*).
Farewell-to-spring . . . . . (*Godetia amoena*).
Golden Stars . . . . . (*Bloomera aurea*).
Ice Plant . . . . . (*Mesembryanthemum crystallinum*).
Larkspur, Scarlet . . . . . (*Delphinium nudicaule*).
Lupine . . . . . (*Lupinus*, many species).
Manzanita . (*Arctostaphylos* or *Uva-ursi*, various species).
Mariposa Tulip . . . . . (*Calochortus luteus*).
Miner's Lettuce . . . . . (*Montia perfoliata*).
Mission Bells . . . . . (*Hesperoyucca whipplei*).
Monkey Flower . . . . . (*Mimulus*, various species).
Owl's Clover . . . . . (*Orthocarpus versicolor*).
Pink Paintbrush . . . . . (*Orthocarpus purpurascens*).
Sierra Primrose . . . . . (*Primula suffrutescens*).
Snow Plant . . . . . (*Sarcodes sanguinea*).
Tidytips . . . . . (*Layia platyglossa*).
Whispering Bells . . . . . (*Emmenanthe penduliflora*).
White Sage . . . . . (*Audibertia polystachya*).
Wild Buckwheat . . . . . (*Eriogonum fasciculatum*).
Yerba Santa . . . . . (*Eriodictyon californicum*).
Zygadenus . . . . . (*Zygadenus fremonti*).

Willow (*Salix*). A genus of woody-stemmed plants of the willow family, closely related to the poplar, aspen, and cottonwood. There are nearly 200 species, found in most countries of the world except Australia. About half of all the known species of willows occur in North America, some 20 of which attain the size of trees.

In size, willows vary from tiny, herblike forms only 1 or 2 inches high, found in the arctic regions, to handsome trees 50 to 120 feet high, of temperate countries. As a rule, willows have narrow, lance-shaped, sharply pointed leaves, tough, bitter bark, and soft, white, brittle wood. The small blossoms, usually greenish, are borne in dense clusters called aments, or catkins, the male and female flowers being found on different trees. The small seeds, which are furnished with a long silky down, are often carried great distances by the wind.

Willows usually inhabit the banks of streams, and other low, moist grounds. However, they occur also in similar ground on the alpine summits of mountains, and quite generally in arctic and sub-arctic regions. Their range is from near the extreme northern limit of flowering plants southward to Chile and South Africa. They grow rapidly and have many large roots. These penetrate long distances through moist soil and bind it together with a network of fibers, thus preventing the banks of streams from being worn away.

While the willow is not of great commercial importance, few trees have more varied uses. Because of their rapid growth, various species are planted for hedges, shade and ornamental trees, windbreaks, and quick timber. The wood is used in cabinetwork, for making baseball bats and tool handles, and for wood pulp and charcoal. The bark is used in tanning and yields the bitter crystalline compound *salicin*, used in medicine. Baskets and wickerwork are woven from the young shoots, called osiers, produced by certain species of willows. Osier culture is important in low wet lands in England, France, Belgium, and the Netherlands. Osiers are grown to some extent in the United States, particularly in western New York, southeastern Michigan, and Maryland.

The most important of all the species is the white willow (*S. alba*), found throughout Asia and Europe and widely planted in America. It sometimes

reaches the height of 90 feet. The black willow (*S. nigra*), commonly 30 to 40 but sometimes 120 feet high, with a trunk 3 feet in diameter, is the largest and commonest native willow of North America. It occurs from New Brunswick to Manitoba and Florida, west to California. Except the aspen, the black willow has a more extensive range in North America than any other tree. The pussy or glaucous willow (*S. discolor*), usually a shrub but sometimes 25 feet high, is common on stream banks in the Eastern States and Canada. It bears white, silky, flowering catkins, called "pussy willows," which appear before the leaves very early in spring. The weeping willow (*S. babylonica*), a native of Asia, and the crack willow (*S. fragilis*), a European species, have been widely planted in America.

Winterberry (*Ilex verticillata*). A small shrubby species of holly; called also black alder or Christmas berry. It grows in swamps and on wet banks of streams in the northeastern United States and in adjacent parts of Canada. The oval, pointed leaves turn black in autumn and, after the first severe frosts, soon wither and fall. The greenish white flowers, borne in axillary clusters, blossom in early summer. These are followed by brilliant scarlet berries, about the size of peas. When mature in late autumn, the short-stalked berries are so crowded on the branches that they appear as if arranged in rings (verticillate). The handsome fruit remains on the shrub during winter, furnishing food to various species of birds. Fruit-bearing branches of the winterberry are often sold by city florists for winter decorations.

The smooth winterberry (*I. lævigata*), which occurs near the coast from Maine to Florida, is a beautiful shrub, similar to the black alder. The orange-colored berries, however, ripen earlier, are borne on longer stalks, and are much less crowded on the branches. See *Holly*, *Inkberry*.

Wintergreen (*Gaultheria procumbens*). A small, creeping, evergreen plant of the heath family, known also as checkerberry and partridge berry. It has shining leaves, white, recurved flowers, and bright red, spicy, berry-like fruit. The plant abounds in woods, especially under evergreen trees, in the northern United States and Canada. It yields the oil of wintergreen, much used for flavoring, for perfumery, and in medicine. Various species of *Pyrola* and *Chimaphila* are also called wintergreen.

Winter's Bark (*Drimys winteri*). An evergreen tree of the magnolia family, native to mountains and highlands from Mexico to Patagonia. The bark, which has a very pungent and astringent taste and a peculiar odor, is used as a tonic and as an antiscorbutic. In Brazil and in other South American countries, winter's bark is highly prized as a remedy for scurvy. There are many commercial substitutes for the drug, much so-called winter's bark being obtained from entirely different West Indian trees.

Wistaria (*wĭs-tā'rĭ-à*). A genus of climbing shrubs of the pea family, named in honor of Caspar Wistar, but often spelled *Wisteria*. They have divided leaves and beautiful bluish flowers in drooping clusters. Some species are among the most handsome ornamental climbers. The American wistaria (*W. frutescens*) grows wild in marshy grounds from Virginia to Florida. It attains a length of 30 to 40 feet, and bears fragrant bluish purple flowers. This native climber is sometimes cultivated. The Chinese wistaria (*W. sinensis*), the finest and most popular cultivated species, has showy blue flowers. It is much used as a climber over arbors and the walls of houses.

Witch-hazel (*Hamamelis virginiana*). A large shrub or small tree, related to the sweet gum, with wavy-toothed leaves somewhat like those of the hazel. It grows from 15 to 25 feet high in low woods from Nova Scotia to Minnesota and southward to Florida and Texas. The witch-hazel blossoms late in autumn, the profuse yellow flowers appearing in showy clusters while the leaves are falling. The fruit, a two-seeded, woody capsule which ripens during the ensuing summer, has the peculiar property of shooting its seeds to a considerable distance.

A fluid extract, prepared from the leaves, called "witch-hazel" or "hamamelis," is used as a tonic and as a lotion. It does not, however, possess any known therapeutic value. Great virtues have long been popularly ascribed to a forked branch of this shrub when used as a divining rod for locating water and minerals, whence the name witch-hazel.

Woodbine. A popular name for the European honeysuckle (*Lonicera periclymenum*). The evergreen honeysuckle (*L. caprifolium*) is sometimes styled the American woodbine. Various other honeysuckles and several entirely different twining plants are likewise known as woodbine. For example, in New England, the Virginia creeper, and, in the Southeastern States, the yellow jessamine, are called woodbine, as is, in various districts, the hedge bindweed. See *Honeysuckle*, *Jessamine*, *Virginia Creeper*.

Woodruff (*Asperula odorata*). A small herb of the madder family, commonly called sweet woodruff, native to many parts of Europe. It has a weak but usually erect stem, 5 to 10 inches high, which bears 4 or 5 whorls of lance-shaped leaves, from 6 to 8 in a whorl, and small white flowers. The plant grows in shady woods, and, when dried, has a pleasing fragrance. It makes an agreeable herb tea and is usually one of the ingredients of the so-called "May drink," widely popular in Germany. The Germans in the United States substitute for woodruff the sweet-scented bedstraw (*Galium triflorum*), a closely related and somewhat similar plant, common in rich woodlands.

Dyer's woodruff (*A. tinctoria*), a native of Europe and of Siberia, is a perennial herb with reclining stems bearing whorls of 4 or 6 linear leaves and whitish flowers. In Dalmatia and in various other districts the root is used to some extent as a substitute for madder.

Wormwood (*Artemisia absinthium*). A perennial herb of the composite family, native to Europe and to northern Asia and introduced into the United States and Canada. It has an erect, somewhat woody stem, from 2 to 4 feet high, bearing silvery gray, much divided leaves and small heads of yellowish flowers arranged in racemes. The plant is somewhat aromatic, and all parts, especially the leaves, are intensely bitter.

Formerly wormwood was widely used as a tonic, as a vermifuge, and to protect garments from moths. It is now cultivated to some extent as the source of a bitter aromatic oil used in the preparation of absinthe, a strong alcoholic liquor made chiefly in France. Wormwood is mentioned in the Bible as a symbol of bitterness. The name wormwood is applied also to various other species of *Artemisia*. See *Sagebrush*.

Yam (*Dioscorea*). Twining, herbaceous plants of the yam family, natives of the tropics. They have heart-shaped leaves, small whitish flowers, winged seeds, and very large, tuberous roots. Various species are cultivated for food in warm regions, especially in China, India, and the East and West Indies. The starchy roots are used like the sweet potato, though somewhat coarser fleshed and less palatable. They usually contain an acrid principle which disappears upon cooking. The winged yam (*D. alata*) has immense roots which sometimes attain a weight of 100 pounds. The West Indian yam (*D. sativa*), with smaller roots than the preceding, is grown in southern United States.

Yarrow (*Achillea millefolium*). A small perennial of the composite family, native throughout the northern hemisphere. It was anciently named for

Achilles, to whom legend ascribed the discovery of its virtues. It has a somewhat woolly stem, finely dissected leaves with bitter aromatic taste and odor, and white, pink, or purple flowers borne in a flat-topped cluster. Both the leaves and the flowers are used in medicine, as a stimulant and tonic. The leaves, formerly in high repute for the treatment of wounds, are said to be still so employed in Scotland.

Yeast (*Saccharomycetes*). Yeast plants are single-celled fungi, of microscopic size. They are characterized by a peculiar method of reproduction known as budding, by which, under favorable conditions, they multiply with enormous rapidity. Numerous species live in plant juices or other liquids containing sugar in solution. They secrete a peculiar substance, called an enzyme, which causes the sugar to split into alcohol and carbon dioxide. This process is known as alcoholic fermentation. For many centuries yeasts have been cultivated for the production of beer and for making bread. In the form of compressed yeast, the plant is used as a means of supplying to the human diet certain necessary vitamines. See *Fungi*, *Vitamines*.

Yellowroot (*Xanthorrhiza apiifolia*). A low shrub of the crowfoot family; known also as shrub yellowroot, native to the southern United States. The long roots, the rootstock, and the bark are bright yellow. The root, which is intensely bitter and astringent, is used as a tonic. At the top of the short stem are borne numerous pinnate leaves. These are crowded together near the summit, giving the plant somewhat the appearance of a fern. In autumn, the foliage becomes brilliantly colored. The small wine-colored flowers are arranged in slender, elongated clusters. The name yellowroot is applied also to the goldenseal and to various other plants having yellow roots. See *Goldenseal*.

Yellowwood, American (*Cladrastis lutea*). A beautiful tree of the pea family, known also as Kentucky yellowwood, yellow ash, yellow locust, and gopher wood. This tree, native to rich soils, especially along mountain streams, from western North Carolina to Missouri, is widely cultivated for ornament in the eastern United States. It attains a maximum height of about 50 feet, with a trunk diameter of 3½ feet. The tree bears divided leaves of 5 to 11 leaflets, and showy white flowers in large clusters. The bark is used in medicine and yields a yellow dye. The yellow, strong, hard but brittle wood is sometimes used for making gunstocks. The name yellowwood is applied to various other species of trees.

Yew (*Taxus*). A genus of evergreen trees or shrubs of the yew family (*Taxaceæ*), somewhat related to the pine and hemlock. They have flat, linear leaves, appearing as if in two ranks, a fleshy, cup-shaped, red fruit, nearly enclosing the bony seed, and purplish, thin bark. There are about 7 species, natives of the North Temperate Zone. Of these, 3 occur in North America.

The European yew (*T. baccata*) is a medium-sized, long-lived forest tree, highly prized for its hard, strong, elastic wood, formerly used in making bows. The American yew, or Ground Hemlock (*T. canadensis*), is a low, straggling shrub, usually 1 or 2 feet high and seldom over 5 feet high. It grows in woods from Newfoundland to Manitoba and south to New Jersey and Iowa. The western yew (*T. brevifolia*), a tree sometimes 80 feet high, with a trunk occasionally 4 feet in diameter, occurs from British Columbia to California. The hard, flexible, bright red wood is used for tool handles and machine bearings. The Indians of the northwest coast made from it their best bows and also canoe paddles. The Japanese yew (*T. cuspidata*), an ornamental tree, is gaining favor in this country, especially in its dwarf forms.

The stinking yew, or California Nutmeg (*Torreya californica*), which closely resembles the true yews, is a handsome tree, usually 35 to 50 feet high. It has a straight trunk about 3 feet in diameter, with rigid, bristle-pointed leaves, and a fleshy, plumlike or olive-like fruit. The hard, fine-grained, lemon-yellow wood is very durable.

Yucca (*yŭk'ȧ*). A genus of large plants of the lily family. They have rigid, sharp-pointed leaves, and large nodding flowers sometimes borne in huge terminal clusters. There are about 16 species, natives of North and Central America.

Adam's Needle (*Y. filamentosa*) is a showy species, much cultivated for ornament. It grows wild in sandy soil from Maryland to Louisiana. This plant bears an edible fruit called datile. The Spanish Bayonet (*Y. baccata*) has stout-pointed leaves and dark purple, edible fruit. It occurs native from Texas to California and southward.

The Joshua Tree (*Y. brevifolia*), so named by the Mormons, sometimes grows from 30 to 40 feet high, with a woody trunk 3 feet in diameter. It is a weirdly branching species, characteristic of the Mohave desert, and extending eastward to Utah.

The so-called Mission Bells (*Y. whipplei*) is a handsome plant of the southern California chaparral. It is almost stemless, with numerous rigid, spiny, basal leaves. At flowering time it bears aloft an immense cluster, sometimes 15 feet high, of fragrant, creamy white, somewhat bell-shaped, drooping blossoms.

Zamia (*zā'mĭ-ȧ*). A genus of cycads found only in the tropics and subtropics of the western hemisphere. There are about 30 species, ranging from Florida to Chile. They usually have short, thickened stems, densely covered with persistent leaf bases, and surmounted by a crown of large pinnate leaves. In old plants the central portion of the stem often contains much starch, from which a kind of sago or arrowroot is made.

From the tuberous rootstocks of the Coontie (*Z. pumila*), which grows in low grounds in Florida, the Seminole Indians prepared a favorite starch food. This was later used by the whites and called Florida arrowroot. The misleading name "sago palm" has been given to this plant.

Zanthoxylum (*zăn-thŏk'sĭ-lŭm*). A genus of prickly trees or shrubs of the rue family, with divided leaves and small greenish flowers. There are about 150 species, natives chiefly of tropical regions. Of these, 4 occur in the United States.

The Prickly Ash (*Z. americanum*), usually 6 to 10 feet high but sometimes 25 feet high, bears its leaves and flowers in axillary clusters. It is found wild from Quebec to South Dakota and southward to Virginia and Kansas. The Southern Prickly Ash, Toothache Tree, or Pepperwood (*Z. Clava-Herculis*), usually 25 or 30 feet high but sometimes 50 feet high, bears its flowers in terminal clusters. This very prickly tree grows along streams from Virginia to Texas. The bark and fruit of both the foregoing species have powerful stimulant and tonic properties.

The Satinwood (*Z. flavum*), called also yellowwood, is a small evergreen tree of southern Florida and the West Indies. The hard, yellow wood takes a satiny polish and is in demand for making furniture and tool handles. A smaller, shrubby, nearly spineless species (*Z. coriaceum*) occurs in southern Florida and in Cuba.

Zinnia (*zĭn'ĭ-ȧ*). A genus of herbs and half-shrubs of the composite family. There are about 20 species, natives of mountainous regions from southern Colorado to Chile, but most numerous in Mexico and in Central America. Generally, zinnias have opposite, undivided leaves and bear showy heads of flowers. Several species have become popular in cultivation. Of these, the best-known is the garden zinnia (*Z. elegans*). This is an erect annual, usually about 18 inches high, bearing large, handsome flowers which exhibit a great range of colors. There are both single and double forms, the heads of which often exceed 3 inches in diameter. Zinnias are hardy, thrive on great variety of soils, and bloom profusely from midsummer until frost.

TEST QUESTIONS

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Give several illustrations of the practical results arising from the use of the microscope in the study of plants and animals 858
To what is the success of science due? What is a working hypothesis? Name some conspicuous examples of such hypotheses . . 858
Point out the characteristics of the scientific attitude 858
Discuss the general application of scientific methods in practical affairs 858

PHYSIOGRAPHY

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Describe the air movement in the anticyclone. What weather changes may accompany the anticyclone? 859
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What happens to the energy dissipated when work is done against frictional forces? . . . 931
What is temperature? What is the connection between temperature and heat flow? . . . 931
Describe the construction of a mercury-in-glass thermometer. What are the "fixed points" of a thermometer? 932
Describe two common temperature scales, and explain how to convert from one scale to the other 932
Why is a cold milk bottle likely to break when hot water is poured into it? 933
Contrast the behavior of water with that of other substances as regards its thermal expansion. How does the expansion of gases compare with that of liquids? 933
What is meant by absolute zero? What is the temperature of absolute zero on the Centigrade scale? 933
Define the calorie and the British Thermal Unit. Which is larger, and by how much? 933
How is the heat of combustion of a fuel determined? 933
What are the two specific heats of gases? Which is larger and why? 934
Describe a gas, as pictured by the kinetic theory of gases. What, according to this theory, is heat energy? What is temperature? 934
How are the freezing and boiling points of water affected by changes in pressure? Are all materials affected by pressure in the same way? What is regelation? 934
Describe briefly three methods of transfer of heat. Which of these methods require the presence of matter for transfer to take place? 935
What is the "greenhouse" effect? 935
Discuss the conversion of work into heat, and the conversion of heat into work. Can either of these conversions take place with 100% efficiency? 935

Wave Motion and Sound

Name the two general types of wave motion. Give an example of each 936
What is meant by the term wave length? . . . 936
What is meant by the frequency in wave motion? 936
How is wave speed related to wave length and frequency? 936
What is meant by constructive interference of waves? By destructive interference? 936
What is the law of reflection for wave motion? 936
What is meant by refraction? Why does it occur? 936
What is meant by diffraction? Upon what factors does it depend? 936
Through what kinds of media may sound waves be sent? 937
How can it be shown that a medium is required for the propagation of sound? 937
Describe a situation which shows that sound waves all travel with the same speed, regardless of frequency 937
List some properties of sound which illustrate that sound is a wave motion 937
What causes an echo? 937
What is the physical difference between those sounds called noise and those called musical sounds? 937
The pitch of a musical sound depends upon what physical property? 937
What are overtones? What subjective property of sound do they affect? 937

Light

Who first conceived of light as a wave motion? 937
Why did Newton favor the particle theory of light? 937
How were Newton's objections to the wave theory overcome? 937
What kind of wave motion is light? Who receives credit for the development of the theory? 937
What was the ether? Is the ether considered necessary? 937
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Explain the formation of shadows in terms of light rays 938
Give some examples of the refraction of light . 938
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Why does a prism break white light into colors? What is this called? 939
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Give an example of interference of light . . . 940
How do polaroid glasses remove glare? . . . 940

Electricity

Distinguish between electrostatics and electrodynamics 940
What is a coulomb? What is an electric current? In what units is it measured? 940
What is the difference in structure of conductors and insulators? 941
What distinguishes an alternating from a direct current? 941
What is meant by electromotive force? by potential difference? 941
What is Ohm's Law? 941
Define volt, ohm, kilowatt, and kilowatt hour 941
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What is a magnetic field? What is the connec-

tion between magnetism and electricity? . . 943
Describe the behavior of bar magnates. How can the action of a magnet be explained in terms of the behavior of atoms? 944
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What is an induced electromotive force? Of what use is it? 944

Modern Physics

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What are isotopes? 945
List and describe various elementary particles 945
How are X-rays generated? What is the order of magnitude of their wave lengths? 946
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Explain what is meant by nuclear chemistry and indicate its effect upon modern chemistry 950
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Give the chemical formula of common salt; of water; of sulphuric acid; of nitric acid; of ammonia 956
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What is a salt? Name three salts 957
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In what human gland is iodine normally found? 962
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How important is heredity and environment to an understanding of a particular personality? 998
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Describe what is meant by a mental conflict . 1001
What purpose does a defense mechanism serve in the mental life of an individual? 1001
Discuss two of the techniques used in the treatment of mental illness. 1002

BIOLOGY

State a broad definition of biology. Point out the subject matter of this science as commonly understood 1003
Discuss the meaning, development, and present character of the doctrine of evolution. 1003–1004
Summarize the chief points of Mendel's law . 1004

ZOOLOGY

Define zoology; enumerate the chief divisions of this science. Point out the advantages arising from the use of scientific names for animals 1005
Account for the name of the adjutant. What article of commerce is obtained from all the species of the adjutant? 1006
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Indicate the general and the common meaning of the term cattle 1017
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By what striking characteristics are cuckoos distinguished? 1021–1022
What useful product is obtained from the cuttlefish? 1022
Summarize the habits of the white-tailed deer. 1022
Name several animals that belong to the dog family. From what species is the domestic dog believed to have sprung? 1022–1023
Discuss the history of animal domestication. How many animals are now considered domesticated? 1023
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Why are earthworms found on sidewalks in the morning after a heavy rain? How do earthworms aid in the improvement of soil? . . 1024
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Describe the appearance and some habits of the hedgehog 1032
Indicate the habitats of the most common varieties of herons 1032
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Point out some changes in the characteristics of the hog or pig due to domestication. Give two reasons for the high value of the hog in food production 1033
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Point out the distinguishing characteristics of the mammals 1040
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Discuss the economic value of the ox. How many species are included in the ox family? . 1047

Summarize the processes of oyster culture . . 1047
Discuss the former great numbers and the extermination of the passenger pigeon. Outline the history of the rearing and use of peacocks 1048
Describe the pearl and point out the chief sources from which pearls are obtained . . 1048
Describe the nesting habits of the penguin; of petrels; of pheasants; of the phœbe . . . 1049
How do pigeons feed their young? Name several familiar American species of pigeons . 1049–1050
Describe the platypus 1050
To what animal is the name polecat properly applied? 1050
Upon what does the porcupine feed? 1050
Discuss the characteristics of the primates; of the protozoans. Name important examples of each class 1051
Describe the peculiar nesting habits of the python 1051–1052
Describe the chief species of rabbits, in respect to appearance and habits 1052
Point out some interesting habits of raccoons. 1052
Name some interesting characteristics and habits of ravens 1053
Discuss the usefulness of the reindeer . . 1053–1054
Explain the application of the term reptiles . 1054
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Describe the characteristics of rodents; of the ruminants 1055
For what is the sable valued? 1055
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Discuss the combating of the destructive San Jose scale. Characterize the scale insects in general 1056
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Describe the nesting habit of sea turtles. Compare the chief species and their uses . . . 1057
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What are swifts? Describe the swordfish; indicate its value 1062
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Point out the dangerous character of the trichina 1064
Compare the chief varieties of trout . . 1064–1065
To what family does the turkey belong? What are vampires? 1065
Enumerate the chief species of warblers . . 1066
Describe the nests of the two great classes of wasps; of the weaver bird 1067
Point out the important products derived from the whale 1067–1068
Discuss the habits of wolves. For what are wolf skins used? 1068
Tell a popular legend attaching to the woodchuck 1069
Describe the special adaptations of the bill, tongue, feet, and feathers of woodpeckers. . 1069
Point out the economic value of the yak. 1069–1070
Describe the habits of the two varieties of yellowlegs 1070
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Define botany. Explain the subject matter treated under the various main divisions of botany 1071
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Explain the botanical term annual 1073
Of what country is the apple a native? the apricot? 1073
Name three aquatic plants. Under what other names is the trailing arbutus known? . . . 1073
What portion of the following plants is used for food: artichoke? asparagus? avocado? 1073–1074
Describe the general character of the organisms called bacteria 1074–1075
For what purposes is bamboo commonly used? Indicate the food value of bananas 1075
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Account for the recent important development of the beet raising industry 1076
Name several kinds of so-called big trees. In what localities are they found? 1076
Why was the scientific name *Lewisia* given to bitterroot? 1077
Discuss the cultivation of blackberries and blueberries 1077
Summarize the uses to which the wood of the blue gum and that of the box tree are put. Enumerate the products derived from the bottle tree; from the breadfruit 1078
Of what region is buckwheat a native? Indicate the history and the extent of cabbage cultivation 1079
Show how the cactus adapts itself to arid conditions. Discuss the food values of some types of cactus 1079–1080
Describe the following flowering plants: California poppy; camellia; carnation. Point out the uses of the carrot and of carthamin. 1080
Whence was the cassaba melon introduced into America? Give evidence for ancient cultivation of the castor oil plant. Discuss the cultivation of cauliflower 1081
Describe the century plant. What products are derived from this and similar species? . . . 1082
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Discuss the history of plant cultivation . . . 1086
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Describe endive and indicate its use 1088
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Describe the eucalyptus and point out some of its commercial values 1088
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Indicate the antiquity of fig production and the growth of the industry in America 1089
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Indicate the range of growth of the forget-me-not; of foxtail grass 1089
Discuss the various types of fungi and their uses 1089–1090
Describe the gentians; varieties of geranium. 1090

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Mathematics

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MATHEMATICS

MATHEMATICS

INTRODUCTION

Any careful discussion of the evolution of mathematical thought must differentiate between the *concepts* of mathematics and the *symbols* of mathematics. Primitive men recognized differences in the sizes of objects and in the numbers of things in various sets. In many ways the impact of the physical world upon the mind of man brought mathematical *ideas* into existence. A desire to communicate these ideas to other men led to the invention of mathematical *symbols*. The careful reader of these pages will note that, for the most part, material presented here deals with the *ideas* of mathematics rather than with mathematical symbolism alone.

HISTORICAL NOTES

The early development of arithmetic was given direction by economic needs. As stable governments evolved and trade flourished, it became necessary to keep accurate numerical records. The art of reckoning became a necessity for certain government officials and tradesmen.

The demands of architecture and man's interest in astronomy (motivated by his desire to reckon time accurately) fostered the growth of geometrical ideas. The Egyptians applied much practical geometric knowledge to problems of land surveying and to the erection of the pyramids. The Babylonians advanced geometrical knowledge considerably as they studied the heavens.

Greek Mathematics. Until the rise of Greek civilization the development of mathematics was dominated by practical considerations. The rise of Greek influence dates from Thales (640–546 B.C.), a merchant of Miletus. Thales carried back to Greece from his business trips to Egypt much of the mathematical knowledge of the Egyptians. In the hands of the Egyptians, this knowledge was more or less a body of unrelated practical rules. Nowhere is the Greek genius manifested more clearly than in the reorganization and extension of the mathematics they inherited from Egypt. The Greeks were able to see mathematics as a body of ideas that exists by itself, apart from the physical world. In their search for relationships between mathematical concepts, they invented the process of *mathematical abstraction*. To the Egyptians a straight line was a tightly stretched rope. To the Greeks the taut rope was only a model of a straight line. The lines and circles of Greek geometry were idealizations of physical objects, abstract entities that had existence in the minds of men.

The Greeks discovered that, if they assumed only a few properties for their idealized mathematical objects, points, lines, and circles, then the application of logical reasoning to these assumptions produced all the practical geometric knowledge of the Egyptians and vastly more. Euclid (about 300 B.C.) organized in *The Elements* the Greek mathematical knowledge that had accumulated since the time of Thales. *The Elements* is a collection of thirteen *Books* dealing with plane geometry, solid geometry, and the theory of numbers. That part best known is the treatment of plane geometry found in the first six books. Here a great number of propositions is deduced from only ten assumptions.

The Greek attitude toward mathematics influenced their thinking in other areas as well. We find in Greek philosophy, as exemplified by Socrates and Plato, an insistence that precise definitions be formulated and that fundamental assumptions be clearly stated. Aristotle brought this point of view to the study of all science. Aristotelian logic is still studied in modern universities.

Archimedes (287–212 B.C.) applied his tremendous knowledge of geometry to the study of mechanics, formulating laws of the lever, pulleys, and screws. Using geometric reasoning, he deduced propositions in mechanics and hydrostatics from his basic laws just as Euclid deduced purely geometrical theorems from his axioms. Employing ideas that owe their origin to the great Greek geometer Eudoxus, Archimedes developed methods of problem solving that are essentially the techniques of modern calculus, whose invention at the hands of Newton and Leibnitz was not to come until 1800 years later.

Hindus and Arabs. The Hindus absorbed much of the mathematical knowledge of Babylon and Greece and made independent contributions to arithmetic, algebra, and geometry. Brahmagupta (about 598 A.D.) and Bhaskara (born 1114 A.D.) were famous mathematicians of the Hindu school.

The Arabs also came under Greek influence and did much to preserve the results of Greek scholarship. From the 9th to the 13th century, the courts of the Mohammedan princes were the seats of remarkable scientific activity. In particular we owe our present day system for writing numbers to the Arabs. Our numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are modifications of the Arabic numerals introduced into Europe during the Middle Ages. The Arabian system of numeration lends itself much more readily to computation than does the Roman. Prior to the introduction of computation with Arabic numerals, European business men performed their calculations upon the abacus and recorded the results in Roman numerals. With the introduction of the Arabic system of numeration, it became feasible to teach techniques of computation to large numbers of people.

The Renaissance in Europe. From the decline of Greek influence until the end of the Middle Ages Western Europe made few mathematical contributions. But with the Renaissance came a rediscovery and extension of Greek mathematics. For the first time algebra overtook geometry. The Italian mathematicians Tartaglia, Cardano, and Ferrari developed algebraic ideas to the point that they could solve algebraic equations of 3rd and 4th degree. The French mathematician Descartes used the powerful algebraic tools that had been developed and invented analytic geometry, a discipline that utilizes algebraic techniques in the study of geometry. In turn analytic geometry paved the way for the invention of the differential and integral calculus by Newton and Leibnitz. The stage was being set for modern mathematics.

The 18th and 19th Centuries. The invention of the Calculus placed in the hands of mathematicians tools that enabled them to solve problems of vastly greater difficulty than those considered by the ancients. For the first time mathematicians possessed techniques powerful enough to describe accurately all types of physical phenomena. During the 18th and 19th centuries, the application of the Calculus to problems of physics, mechanics, and astronomy absorbed the energies of the greatest mathematicians. Man's ability to describe the universe in mathematical language influenced the rise of the age of reason. If the apparently chaotic motion of the universe, from the moon and the planets to submicroscopic particles, can be explained and accurately predicted by mathematical computations, then perhaps all happenings in the universe are subject to mathematical explanation. Perhaps

man himself and his institutions are subject to basic laws which, properly understood, will lead to man's mastery over his environment. So reasoned 18th century man. The picture of man as a puny and helpless creature buffeted by the winds of chance was replaced by the picture of man as a giant of intellect who would lay bare all the secrets of the universe and conquer his world by pure reason. Paralleling advances in the sciences, engineering, medicine, and economics supported this faith.

The mathematics of the 18th and 19th centuries was physically oriented. It was magnificently successful. It was at once the handmaiden and the Queen of the Sciences. It represented the highest triumph of logical reasoning. There is little wonder that in the rush to new conquests relatively little attention was given to the foundations of mathematics. Euclid reigned supreme in the classroom. The axiomatic method, created by the Greeks, had been linked with the experimental laboratory with phenomenal results. But even during this period of remarkable progress there was a growing spirit of unrest among mathematicians, a dawning recognition that not yet was the house of mathematics in order. The goal set by Euclid and accepted by mathematicians was that each body of mathematics should be developed from clearly stated basic assumptions. Once these axioms were stated, the mathematical theory was to be developed by logical reasoning alone. But as mathematicians inspected the basic ideas of the calculus, it became apparent that this branch of mathematics was not based upon clearly formulated assumptions. During the last half of the 19th century, the attention of more and more mathematicians was drawn to weaknesses in the foundations of the house of mathematics, and by the close of the century, a mammoth remodeling project was under way.

The Precursors of Modern Mathematics. Perhaps the single event that did more than any other to motivate investigations into the foundations of mathematics was the invention of Hyperbolic Non-Euclidean geometry. The recognition that it is possible to construct geometries other than the geometry of Euclid came independently, first to the German Karl Friedrich Gauss, and then some years later to the Hungarian Johann Bolyai, and the Russian Nicolai Lobachevsky. For centuries the axioms of Euclid had been looked upon as self evident truths. The German philosopher Immanuel Kant, had based much of his metaphysics upon the assumption that there are in the field of philosophic thought certain immutable, a priori truths. And in justification of this point of view, he had pointed at one certain body of self evident truths—the axioms of Euclid's geometry. And now Bolyai and Lobachevsky published work upon a geometry that agreed with Euclid's in all axioms save one. This geometry rejected the famous 5th postulate of Euclid which assures us that in the Euclidean plane and through a given point not on a line ℓ there is *no more than one line* parallel to line ℓ. In its place Bolyai and Lobachevsky postulated (as had Gauss earlier) that through such a point there are *at least two distinct lines* neither of which intersects the given line ℓ.

The published work on non-Euclidean geometry quickly drew attention to deep questions in the foundations of mathematics. What is truth in mathematics? What fundamental assumptions underlie the use of logic in mathematical proof? How do we judge the validity of a proof in mathematics?

The German mathematicians, among them Weierstrass and Dedekind, initiated researches that were soon to place calculus upon a firm foundation. There was a resurgence of interest in geometry. German and Italian mathematicians brought to bear upon Euclidean geometry the powerful searchlights of mathematical insight and sophistication that had been accumulating for centuries. In the light of this penetrating analysis chinks were discovered in the hitherto impenetrable armor of Euclid. It was seen that the axioms of Euclid not only were not self evident truths but also failed to provide a suitable basis for the logical development of Euclidean geometry. It became apparent that in his proofs Euclid employs many unstated assumptions.

For some time mathematicians despaired of ever formulating a small set of axioms from which the theorems of Euclidean geometry could be rigorously proved. But in 1899 the German, David Hilbert, published a little book on the Foundations of Geometry that had far-reaching consequences. This book contained the substance of lectures Hilbert had given at the University of Göttingen. Here was published for the first time a suitable set of axioms for Euclidean geometry. Hilbert's work convinced mathematicians that it was fruitful to contemplate questions of mathematical consistency.

MODERN MATHEMATICS

Modern mathematics may be said to date from Hilbert. The years that have passed since the beginning of the 20th century have been golden ones. Vast numbers of problems, unsolved by previous generations of mathematicians, have been successfully attacked. Whole new areas of mathematical investigation have been opened. In the realm of pure mathematics abstract algebra, topology, and algebraic geometry are currently attracting much attention. In applied mathematics the invention of electronic computers that can perform as many as 250,000 basic additions in one second has revolutionized the role of mathematics in everyday affairs. The mathematical theory of probability and statistics has found wide application in the social sciences as well as in the natural sciences.

MATHEMATICS EDUCATION

Arithmetic was first taught in the elementary schools of Europe and the United States in order to meet the needs of commerce. Other mathematics, and for many years this meant only geometry and a little algebra and trigonometry, was taught in secondary schools and universities for the primary purpose of providing mental discipline.

Within recent years a quiet revolution in the teaching of mathematics has become firmly established in American schools and has had considerable impact upon European mathematics education. During the late 1950's and early 1960's. major national American mathematics organizations combined forces in an unprecedented educational effort to make available to elementary and secondary schools at all grade levels new text materials that reflect the spirit of modern mathematics. The work of these organizations has had sharp influence upon authors of commercial school texts and the quality of mathematics books available for school use has rapidly improved.

The old philosophy of mathematics teaching embraced the assumption that the kinds of mathematical problems pupils would need to solve in adult life was pretty well known. A strong tendency developed to categorize the uses of mathematics, list the particular skills needed, and drill for memorization of basic facts and mechanical application of techniques. Using mathematics became a matter of choosing correct formulas and substituting numbers into the formulas.

In recent years a strong and irreversible trend has become established in the applications of mathematics. More and more man's responsibilities in mathematical applications are on a higher intellectual level, the planning of computational procedures, the programming of electronic computers, and the like. The new mathematics programs recommended by learned organizations still demand complete mastery of basic computational skills, but these skills are seen as simply a by-product of a program that places primary emphasis upon the *ideas* of mathematics and upon *logical reasoning.*

ARITHMETIC

The word arithmetic is derived from the Greek *arithmos*, meaning number. The study of arithmetic consists of a study of *properties* of numbers, *techniques* of computation, and social *applications* of computational skills. In a well-planned arithmetic program, these three facets of arithmetic instruction are skillfully blended so that each supports the other. All computational techniques are validated by the basic properties of numbers. In order to understand significant applications of arithmetic, the student must combine a firm understanding of number properties with insight into the social situation that motivates the application. This requires that social applications of arithmetic be judiciously chosen so that they fall within the range of student interest.

In this section on arithmetic, primary emphasis is placed upon number properties themselves. Several applications are presented, but it is expected that the reader of these pages will be chiefly interested in gaining an understanding of the principles of arithmetic and how these principles may be applied. In particular this section should be especially helpful to those parents who wish guidance in the task of helping their children master necessary arithmetical knowledge.

Basic Pre-Number Concepts

In many ways as each child learns number concepts he recapitulates the experience of the human race as he passes through stages of knowledge that closely parallel the evolution of mathematical thought in the mind of man. Over a period of many centuries during prehistoric times, primitive man abstracted number concepts from sets of physical objects. Long before man had a spoken or written language, he must have had well formed mathematical concepts such as *more than, less than, the same number as*. These concepts are drawn by today's children from their contemplation of sets of physical objects just as they were obtained by primitive man. The basic pre-number concept used in effecting the abstraction of these basic conconcepts is that of *one-to-one correspondence*.

A one-to-one correspondence between two sets is a pairing of the objects in the sets such that each object in the first set is paired with just one in the second and each object in the second is paired with just one object in the first. A child who places a hand over each eye discovers by this one-to-one correspondence that he has just as many hands as eyes. If two small children are given different numbers of candies, then even though they may not be able to count, they may be able to recognize which child has the more by matching one-to-one the pieces of candy in one set with only a part of the other set.

Two sets that can be matched one-to-one are said to *have the same number*. Note that one need not be able to count in order to compare the numbers of two sets. If a first set can be matched one-to-one with part (not all) of a second set, then the number of the first set is *less than* the number of the second and the number of the second set is *greater than* the number of the first. Teachers of beginning arithmetic have always relied heavily upon sets of physical objects in order to develop number ideas. Modern texts in arithmetic simply place these set theoretical ideas clearly in the open. The following definitions and symbolism are helpful in discussing ideas relating to sets.

A *set* is any collection of things. The things in a set are called *elements* of the set. The elements of a set may be either physical objects or abstract ideas. An element of a set is said to *belong* to the set. When discussing sets and their elements, it is usual to represent sets by capital letters and their elements by small letters. The statement that element a *belongs to* set S is phrased symbolically as

$$a \in S$$

Note that an element belonging to a set may itself be a set. The set of baseball players known as the *Detroit Tigers* belongs to the set of teams known as the *American League*.

Two techniques are used to indicate just what things belong to a set. We may list names of the members of the set within curly braces, separating names by commas. This is the *roster* method for describing a set. The symbolism

$$A = \{\text{Julius Caesar, the moon, } 4\}$$

indicates that exactly these three designated objects are in set A. Note that one of these objects, the number 4, is not a physical object but rather an abstract mathematical concept. The second method for describing a set is to write within the curly braces a description of some property. The things in the set are then understood to be just those objects that possess the designated property. For example, we may write

B = {all living human beings more than 40 years old}

C = {all odd whole numbers}

A variant of this latter symbolism used in some arithmetic texts is slightly more pretentious but no more meaningful.

B = {x : x is a human being and x is more than 40 years old}

C = {x : x is an odd whole number}

This last sentence is read, "C is the set of all x such that x is an odd whole number."

If sets A and B have exactly the same elements, then the sets are *equal*. We write A = B and read this as "Set A is equal to set B." For example, if

A = {1, 3, 5, 7, 9}

B = {x : x is an odd whole number less than ten}

then A = B. Note that there is only the *one* set. It happens that we have chosen for this one set two different names, A and B. It should be emphasized that modern mathematical usage dictates that the equals sign "=" be used in only this way. Every statement of equality, such as $7 = 4 + 3$ is simply an assertion that the two symbols (in this case the symbols "7" and "4 + 3") are names for the same object.

If every element that belongs to set A also belongs to set B, then set A is a *subset* of set B. We symbolize the sentence, "A *is a subset of* B" as

$$A \subset B$$

This relationship is also denoted by writing

$$B \supset A$$

and this latter is read "B *includes* A."

If we agree that such a sentence as

X = {all living men more than 20 feet tall}

defines a set, then we must admit that there is a set which contains no elements whatever. It is convenient to make this agreement. This distinguished set is referred to as the *null* set or *empty* set. It is traditionally denoted by the symbol $\varnothing$.

The elements of two or more sets may be grouped to form a set, the *union* of the sets in question. For example, if A is the set of even numbers larger than 1 and less than 10, and if B is the set of multiples of 3 larger than 2 and less than 8, then

$$A = \{2, 4, 6, 8\} \qquad B = \{3, 6\}$$

and the *union* of sets A and B is the set

$$\{2, 3, 4, 6, 8\}$$

The union of two sets A and B is denoted by the symbol

$$A \cup B$$

An element belongs to this set if and only if it belongs to A or to B (possibly to both).

One may also form from two sets A and B a set called the *intersection* of the sets and denoted by

$$A \cap B$$

This set consists of just those elements that belong to both sets. If A and B are the sets of the preceding example

$$A \cap B = \{6\}$$

since 6 belongs to both sets and is the only element that does so.

If two sets S and T have no common elements, then

$$S \cap T = \varnothing$$

and the sets are said to be *disjoint.*

Numbers and Operations

The concepts of *sets, one-to-one correspondence, union of sets, intersection of sets,* etc. are properly referred to as pre-number concepts because they can be employed to formulate definitions of numbers and of operations upon numbers. It is not appropriate to give all these definitions here. We remark only that one may *define* the number *zero* to be the empty set, the number *one* to be the set that has for its only element the number zero (that is, the empty set) and the number *two* to be the set that contains just the numbers zero and one.

$$0 = \varnothing; \quad 1 = \{0\}; \quad 2 = \{0, 1\}$$

It is clear how these definitions are continued. This procedure, which almost amounts to lifting oneself by one's bootstraps, enables us to define an infinitude of whole numbers. Each set of numbers previously defined serves to define a new number.

Each set has associated with it a number, *the number of the set.* The number of a given set can be matched one-to-one with the set itself. For example, since the set of letters in the word *herd* can be matched one-to-one with the set $4 = \{0, 1, 2, 3\}$ as shown below

$$\begin{array}{l} S = \{h, e, r, d\} \\ \qquad\ \downarrow\ \downarrow\ \downarrow\ \downarrow \\ 4 = \{0, 1, 2, 3\} \end{array}$$

we say that 4 is the number of this set. To *count* the numbers of a set S is to establish a one-to-one correspondence between the elements of the set S and a subset of the set of all numbers in such a way that the *number* of set S is determined. A child who counts by touching in turn the objects of a set and reciting, "*one, two, three* . . . ," is simply establishing such a correspondence. For example, one may count the number of letters in the word *herd* by establishing the one-to-one correspondence below

$$\begin{array}{c} \{h, e, r, d\} \\ \downarrow\ \downarrow\ \downarrow\ \downarrow \\ \{1, 2, 3, 4\} \end{array}$$

Note that the counting is done in such a way that 4, the number of the set, is matched with the last object in the set. The sets {1}, {1,2}, {1,2,3}, . . . serve as *standard* counting sets. Their role in counting is much the same as the role of standard units of measure in measuring. Each set of physical objects can be matched one-to-one with just one of the above standard counting sets.

Just as set theory serves to present a precise definition of counting, so can it be used to define the basic arithmetic operations, addition and multiplication of whole numbers. By the set of whole numbers, we mean the set W of infinitely many elements.

$$W = \{0, 1, 2, 3, \ldots\}$$

Consider how a very young child adds. Asked to find the sum of 4 and 3, he may

1) Count off 4 fingers on one hand
2) Count off 3 fingers on the other hand
3) Bring these two sets together
4) Count the total.

Steps 1) and 2) are applications of the idea *one-to-one correspondence.* The child uses his ability to count to find two sets, one having 4 for its number and the other 3. In step 3) he forms the union of these two sets. In step 4) he reapplies his counting skill. Note that an abstract mathematical problem was formulated: *Find the sum of* 4 *and* 3. In order to solve this problem, the child turned to a physical model (two sets of physical objects), manipulated these physical sets, and deduced the answer to his abstract mathematical problem. In later life the child will operate in a reverse fashion. When faced with a problem in the physical world, he will set up an abstract mathematical model for the problem, manipulate the mathematical model, and arrive at a solution for his physical problem. The physical problem may be one of determining the trajectory of a space projectile. The manipulation of the mathematical model may consist of using a computer to process certain data.

A formal definition of addition of whole numbers is presented below.

If a and b are any two whole numbers, let A and B be disjoint sets whose numbers are respectively a and b. The whole number $a + b$, the *sum* of a and b, is the number of the set $A \cup B$.

There are two set theoretic ways to define multiplication. Both definitions play a role in modern arithmetic programs. Readers will be familiar with the definition that presents multiplication as *repeated addition.* We interpret 3×4 as the sum of three 4's.

$$3 \times 4 = 4 + 4 + 4$$

Hence, the product of 3 and 4 is computed by finding three sets A, B, and C, no two having common elements and with each set containing 4 members. The number 3×4 is then by definition the number of the union of these sets

$$A \cup B \cup C$$

The second definition presents multiplication as an operation in its own right, independent of the addition operation. It is best described by an example. Imagine a girl selecting a skirt-blouse combination from a collection of 3 skirts and 4 blouses. How many choices has she? If we denote the skirts by 1, 2, 3 and the blouses by a, b, c, d, clearly the rectangular array below describes all possible choices.

	a	b	c	d
1	(1,a)	(1,b)	(1,c)	(1,d)
2	(2,a)	(2,b)	(2,c)	(2,d)
3	(3,a)	(3,b)	(3,c)	(3,d)

The pair (2,c) in the second row and third column represents her possible choice consisting of skirt 2 and blouse c. The rectangular array of 3 rows and 4 columns contains 12 pairs.

The second definition of multiplication generalizes the above example. If a and b are any whole numbers, we choose two sets A and B whose numbers are respectively a and b. We construct the set of all pairs that can be formed such that in each pair the first element is selected from A and the second from B. We call this set the *product set* of A and B and denote it by

$$A \times B$$

The number of this new set $A \times B$ is by definition the *product* of numbers a and b.

Subtraction and division of whole numbers are defined in terms of addition and multiplication. To subtract 4 from 12 is to find the number that may be added to 4 to give 12.

Since $8 + 4 = 12$, $12 - 4 = 8$.

In the addition equation $8 + 4 = 12$ the numbers 8 and 4 are referred to as *addends* and the number 12 as the *sum.* In the subtraction equation $12 - 4 = 8$ the 4 and 8 are properly called addends and the 12 their sum. To solve a subtraction problem, such as $84 - 12 = n$ is to determine a missing addend. The utilization of this consistent language, *addend, addend, sum,* in the discussion of both subtraction and addition simplifies the language and focuses attention clearly upon fundamental ideas. The ancient terminology of *subtrahend, minuend,* and *remainder* is of little value in discussing the operation of subtraction.

Just as subtraction is defined in terms of addition, so division of whole numbers is defined in terms of multiplication. To divide 12 by 4 is to find the number that must be multiplied by 4 to give 12.

Since $3 \times 4 = 12$, $12 \div 4 = 3$

In the multiplication equation $3 \times 4 = 12$ the numbers 3 and 4 are referred to as *factors* and the number 12 as the *product.* In the division equation $12 \div 4 = 3$ the 3 and 4 are properly called factors and the 12 their product. To solve a division

problem such as $84 \div 12 = n$ is to determine a missing factor. The use of this consistent language, *factor, factor, product* in the discussion of both division and multiplication simplifies the language.

The foregoing discussion refers to *exact division* of whole numbers. One must consider also division of whole numbers with a remainder. The number 5 is not a factor of 37 but we have the relationship $37 = (7 \times 5) + 2$

We say that when 37 is divided by 5 the *quotient* is 7 and the *remainder* is 2. To divide a first number A by a second B is to determine whole numbers q and r such that $A = (q \times B) + r$ and $r < B$ Only when $r = 0$ is B a factor of A.

Properties of the Operations

Modern arithmetic teaching differs from arithmetic instruction of the past in that it places emphasis upon four basic properties of the fundamental operations, addition and multiplication. The student who understands these basic properties finds that they provide him with powerful tools for furthering his understanding of arithmetic. Imaginative students of arithmetic have always had an intuitive grasp of these four principles and have utilized them with varying degrees of effectiveness. Clear recognition of these principles makes them even more effective as learning aids. We list these principles with brief comments upon their significance for arithmetic instruction.

1. *The commutative principle.* Neither the sum nor the product of two numbers depends upon the *order* of the addends or factors. In symbols, if *a* and *b* are any whole numbers, $a + b = b + a$ and $a \times b = b \times a$

A four year old child may well discover this principle, noting that instead of computing $2 + 8$ by counting, 3, 4, 5, 6, 7, 8, 9, 10, he may start at 8 and count, 9, 10. Reversing the order of the addends shortens his work. Years later he may observe that instead of computing 8×2 as the sum of eight addends of 2 he may instead add two 8's. Reversing the order of the factors shortens his work.

2. *The associative principle.* If three whole numbers are to be combined by either addition or multiplication, and if the order of the terms is not to be changed, then there are two ways to *group* the numbers. These two groupings yield the same sums and products. In symbols:

$$(a + b) + c = a + (b + c);$$
$$(a \times b) \times c = a \times (b \times c).$$

Many children discover the associative principle for addition before starting to school. For example, a child who adds 7 to 9 by taking one from the 7 and putting it with the 9, thus getting 10 and 6, is using this principle

$$9 + 7 = 9 + (1 + 6) = (9 + 1) + 6 = 16.$$

Essentially the commutative and associative principles enable students to break large numbers apart and work systematically with their components. In working with young children one can easily guide them into the effective employment of these principles. Thus new number facts may be quickly deduced from old ones. For example, a student who knows that $5 + 5 = 10$ and uses this knowledge to deduce that $5 + 6 = 11$ (because it is one more than $5 + 5$) is using associativity to develop his own original techniques of problem solving.

3. *Properties of the numbers 0 and 1.* The number 0 is *the identity element* for addition. The number 1 is *the identity element* for multiplication. If zero is added to any number *a* the sum is "identically" that number. If any number *a* is multiplied by 1, the product is "identically" that number. In symbols:

$$a + 0 = 0 + a = a; \quad a \times 1 = 1 \times a = a.$$

These properties of the numbers 0 and 1 deserve heavy emphasis. The reader might check back to the earlier set theoretic definitions of addition and multiplication and verify that these properties are consequences of the definitions.

4. *The distributive principle.* In multiplying two numbers, either number may be broken into a sum of two addends, these multiplied separately, and the partial products combined. In symbols:

$$a \times (b + c) = (a \times b) + (a \times c)$$
$$(a + b) \times c = (a \times c) + (b \times c)$$

A student who computes the product 3×12 by thinking, "Three 10's are thirty; three 2's are six," is using this principle.

$$3 \times 12 = 3 \times (10 + 2) = (3 \times 10) + (3 \times 2)$$
$$= 30 + 6$$

This principle may be combined with knowledge of simple multiplication facts to deduce more difficult facts. For example,

$$4 \times 7 = (2 + 2) \times 7 = (2 \times 7) + (2 \times 7)$$
$$= 14 + 14 = 28.$$

As has been pointed out in this section, the four principles listed here are useful tools in the elemental task that confronts students in their early school years—the task of learning basic number combinations. Number combinations are more easily learned when the student has rational techniques for deducing sums and products rapidly and is not solely dependent upon memorization. Eventually the basic facts of the addition and multiplication tables must be memorized and responses must be automatic. Most (but not all) children are aided in this memorization process by judiciously selected periods of drill. However, a good program in arithmetic will always give first priority to arithmetic activities that lead the student to develop his powers to reason logically. Placing emphasis upon the above four principles encourages logical reasoning.

In subsequent sections we shall see that these principles are related to the computational techniques taught in arithmetic classes. These principles are applicable to fractions as well as to whole numbers and all special computational methods are validated by these few principles.

Computing With Whole Numbers

Our techniques for adding, subtracting, multiplying, and dividing whole numbers depend upon two things—our base ten system of numeration inherited only a few centuries ago from the Arabs, and the ageless basic principles listed in the foregoing section. It should be emphasized that the basic principles are properties of *numbers*, not properties of *symbols*.

$$V + III = III + V; \quad 5 + 3 = 3 + 5.$$

In our base ten numeration system the writing of the symbol 347 implies that we are considering a set of objects partitioned into subsets in a very special way. There are

3 subsets of 100
4 subsets of 10
7 subsets of 1

When we ask a student to give a sum, such as $8 + 6$, we are really asking that he do two things: That he

1) regroup the objects in the two sets according to the grouping methods implicit in our base ten numeration system
2) write a special base ten symbol to describe this grouping.

A student who replied that $8 + 6$ is $7 + 7$ would not be grouping the sum as we requested. A student who wrote the symbol "10 4" might understand that $8 + 6 = 10 + 4$ but he would fail to exhibit an understanding of our base ten symbolism. A student who computes the sum by visualizing the movement of two objects from the set of 6 to the set of 8 and then writes the symbol "14" exhibits complete understanding.

Early practice in addition should stress grouping by tens and hundreds.

$$6 + \overbrace{3 + 4 + 7} + \overbrace{8 + 2} = 30$$

$$\overbrace{60 + 30 + 40} + \overbrace{70 + 80 + 20} = 300$$

Note that the commutative and associative prin-

ciples justify the rearrangement of the addends indicated above.

The example below, worked in two ways illustrates that *carrying* in addition is a short cut technique. Note that in the solution on the left the addends are regrouped. The units and tens are added separately and then combined. The solution on the right uses *carrying* to abbreviate the work.

47	$^{2}47$
58	58
69	69
24	174
150	
174	

Quite a few subtraction techniques are taught in various schools. The two most common methods are the *decomposition* (subtractive) method and the *Austrian* (additive) method. The two examples below, one *without borrowing* and one *with borrowing*, illustrate the decomposition method. In each case, the short cut is shown on the left and the expanded explanatory version on the right.

476	400 + 70 + 6
352	300 + 50 + 2
124	100 + 20 + 4
824	700 + 110 + 14
587	500 + 80 + 7
237	200 + 30 + 7

In the second example above the student "borrows" one 10 from the 20 and one 100 from the 800. Actually he breaks up (decomposes) the number 824 into the sum of 700, 110 and 14 as shown on the right. Once this decomposition has been effected, the answer is easily obtained.

We illustrate the Austrian (additive) method of subtraction, using the same example, 824 − 587. One thinks of 824 as the sum of two addends, one of which is 587. The problem is to determine the missing addend. This missing addend may be computed in three steps:

587	We see that by adding 7, 30, and
7	
594	200 to 587 the sum 824 is obtained.
30	
624	Hence the missing addend is 237 and
200	
824	824 − 587 = 237.

When the Austrian method is taught a short cut is developed as below. We show the three stages of the short cut computation. What the student *thinks* is written in italics on the right.

824	*7 plus 7 is* 14. *Write* 7 *and*
9	
587	*carry the* 1 *to the* 8; *that's* 9
7	(487 + 7 = 594)
824	9 *plus* 3 *is* 12. *Write* 3 *and*
69	
587	*carry the* 1 *to the* 5; *that's* 6.
37	(594 + 30 = 624)
824	
69	
587	6 *plus* 2 *is* 8
237	(624 + 200 = 824)

Other rationales for subtraction are just as acceptable as the two illustrated above. What is basic for the successful teaching of subtraction is that students understand the mathematical and logical concepts that are employed. Considerable effort has gone into educational research aimed at determining whether one special subtraction technique is superior to another from the standpoint of ease in teaching and pupil achievement. There is no evidence that any one technique is preferable to another. Usually within one school system all teachers teach the same subtraction technique, but even this is not essential.

Techniques for multiplication depend upon repeated application of the distributive, associative, and commutative principles. The distributive principle is of central importance. For example, in computing the product 23×24 one thinks first of this as $(20 + 3) \times 24 = (20 \times 24) + (3 \times 24)$ Now, each of these two multiplications breaks into two parts

$$20 \times 24 = 20 \times (20 + 4) = (20 \times 20) + (20 \times 4)$$
$$3 \times 24 = 3 \times (20 + 4) = (3 \times 20) + (3 \times 4)$$

In other words, four separate multiplications must be performed and these partial products are summed. Before using the standard short cut for such multiplication problems, students should write out all partial products as shown below on the left. The short cut, presented on the right, is then seen to be simply a matter of combining some of these partial products mentally

24	24
23	23
12 = 3 × 4	72 = 3 × 24
60 = 3 × 20	480 = 20 × 24
80 = 20 × 4	552 = 23 × 24
400 = 20 × 20	
552 = 23 × 24	

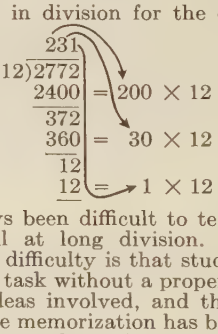
Since solving a division problem is a matter of determining a missing factor, the distributive principle is of chief importance in justifying the techniques used in division. The example $2772 \div 12$ illustrates this use of the distributive principle.

$$2772 \div 12 = [2400 + 360 + 12] \div 12$$
$$= [(200 \times 12) + (30 \times 12) + (1 \times 12)] \div 12$$

We seek a number such that 12 multiplied by this number is $(200 \times 12) + (30 \times 12) + (1 \times 12)$ By the distributive principle this number is

$$200 + 30 + 1$$

Below is shown a modified arrangement of the short cut used in division for the example above.



It has always been difficult to teach students to become skillful at long division. The principal reason for this difficulty is that students have been brought to the task without a proper understanding of the basic ideas involved, and then a technique based upon rote memorization has been forced upon them. Modern mathematics programs build carefully up to a solid understanding of the short cut methods that are employed. For example, in his initial contact with division, a student might calculate the number of 12's in 48 as below, subtracting until a remainder of zero results and then counting the number of 12's subtracted. The problem might be formulated as:

"With 48¢ how many 12¢ candy bars can be purchased?" The student computes as below:

	48	He thinks
He writes	12	
	36	After buying *one* candy bar
	12	
	24	I have 36¢ left.
	12	
	12	After *two*, 24¢, etc.
	12	
	0	

The next step in building up to the complex skill needed in long division is to subtract several multiples of the divisor at each subtraction. For example,

$$\left.\begin{array}{l} 276 \\ \underline{120} = 10 \times 12 \\ 156 \\ \underline{120} = 10 \times 12 \\ 36 \\ \underline{36} = 3 \times 12 \end{array}\right\} \quad 276 \div 12 = 23$$

It is clear how skills and understandings are gradually strengthened by this approach until the average student can solve difficult long division problems with a high degree of accuracy.

Short Cut Techniques

Many computational short cuts can be developed by judicious application of the basic principles. We describe a few below. Any two digit number with final digit 5 can be squared quickly. Consider the product 75×75.

$$(75 \times 75) = (70 + 5) \times (70 + 5) = (70 \times 70) + (10 \times 70) + (5 \times 5) = 70 \times (70 + 10) + (5 \times 5) = (70 \times 80) + (5 \times 5) = 5600 + 25 = 5625$$

This process applied to 65×65 would lead to the result $65 \times 65 = (60 \times 70) + 25$

In general to square a number ending in 5, multiply the number of tens by that number increased by 1 and attach "25."

$95 \times 95 = \mathbf{90}\,\overset{\frown}{25}$ $(9 \times 10 = 90)$
$105 \times 105 = \mathbf{110}\,\overset{\frown}{25}$ $(10 \times 11 = 110)$
$245 \times 245 = \mathbf{600}\,\overset{\frown}{25}$ $(24 \times 25 = 600)$

Products involving 25, 50, and 75 are easily computed since $4 \times 25 = 100$, $2 \times 50 = 100$, and $4 \times 75 = 300$. For example,

$48 \times 25 = 12 \times (4 \times 25) = 1200$
$28 \times 50 = 14 \times (2 \times 50) = 1400$
$24 \times 75 = 6 \times (4 \times 75) = 1800$

It is easy to multiply by numbers near 100 and 1000. With a little practice, many such products may be computed mentally.

$87 \times 101 = 87 \times (100 + 1) = 8787$
$67 \times 99 = 67 \times (100 - 1) = 6700 - 67 = 6633$
$423 \times 1002 = 423 \times (1000 + 2) = 423000 + 846 = 423846$
$517 \times 999 = 517 \times (1000 - 1) = 517000 - 517 = 516483$

It is possible to combine all partial products mentally in a multiplication problem, writing the product immediately below the factors. We illustrate this short cut technique by two examples.

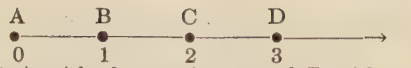
1st step	2nd step	3rd step
3 4 5 2 **8**	3 4 5 2 **6 8**	3 4 5 2 **1 7 6 8**
$2 \times 4 = 8$	$2 \times 3 = 6$; $5 \times 4 = 20$; $20 + 6 = 26$; Write the 6 and carry 2	$5 \times 3 = 15$ plus 2 to carry, 17

423 524 **2**	423 524 **52**	423 524 **652**
1 to carry	1 to carry	3 to carry

423 × 524 → **1652** (2 to carry); 423 × 524 → **221652**

RATIONAL NUMBERS

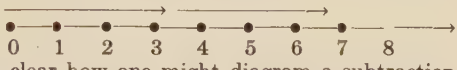
Whole numbers sufficed for the first primitive applications of arithmetic, but as civilization became more complex other numbers were needed. Fractions (rational numbers) were invented to meet the need for a number system to handle problems of measurement. Accurate measurement of distances and angles depends upon subdivision of the chosen units. Perhaps the simplest overview of the set of all rational numbers is obtained by thinking of an endless ray from a point A through a second point B



Label point A with the number 0 and B with 1. Imagine continuing to lay off distances BC, CD, . . . on this ray equal to distance AB. This produces an infinite sequence of points labeled

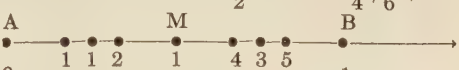
0, 1, 2, 3, . . .

With each whole number is paired one point on the ray. This collection of points paired with the whole numbers is called the *whole number line.* On this line we can make geometric interpretations of whole number addition, subtraction, multiplication, and division. For example, the addition fact $3 + 4 = 7$ is illustrated on this line pictorially as shown below.



It is clear how one might diagram a subtraction fact. The multiplication fact $3 \times 4 = 12$ is pictured by showing that three segments of length 4 combine to form one of length 12. The division fact $20 \div 4 = 5$ may be pictured by showing that it takes 5 segments of length 4 to cover a 20 unit segment. Alternatively, if a 20 unit segment is divided into 4 parts of the same length each part has length 5. Students are benefited by the ability to visualize the set of whole numbers as an endless sequence of equally spaced points on a line.

With this geometric picture of the whole numbers before us, it is easy to justify the invention of new numbers to match other points of the line. Imagine inserting between each pair of whole number points equally spaced points subdividing each segment of unit length into 2, 3, 4, 5, . . . subintervals. The points of bisection are labeled $\frac{1}{2}$, $1\frac{1}{2}$, $2\frac{1}{2}$, . . . The points of trisection are labeled $\frac{1}{3}$; $\frac{2}{3}$, $1\frac{1}{3}$, $1\frac{2}{3}$, . . . etc. Each point has many different fraction labels. Note that the point bisecting AB below is labeled not only $\frac{1}{2}$ but also $\frac{2}{4}$, $\frac{3}{6}$, etc.



$\frac{2}{4}$ *One* point M
$\frac{3}{6}$ *One* rational number
Many fraction names

This fact, that each rational number has infinitely many fraction names, complicates the task of mastering the arithmetic of the rational numbers. Rules for adding and multiplying rational numbers must be so formulated that the result does not depend upon the particular fractions chosen to represent the numbers.

For convenience we make the natural agreement, suggested by the number line, that

$$1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \ldots$$
$$2 = \frac{4}{2} = \frac{6}{3} = \frac{8}{4} = \ldots$$

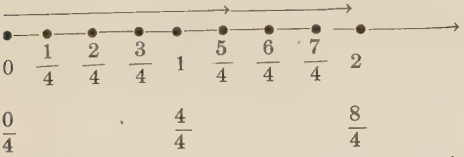
The formulation of the definitions of addition, multiplication, subtraction, and division of rational numbers, the development of computational skills, and the application of these skills to significant problems is the heart of the arithmetic program in grades 5 through 8. The definitions of operations with rational numbers are motivated by two basic considerations.

1) The operations should be so defined that they serve useful purposes. (2) The operations should be so defined that the four basic principles that govern computation with whole numbers also hold in calculations with rational numbers.

Definitions of Addition and Multiplication of Rational Numbers

If we require that the rule for adding fractions be formulated in such a way that addition becomes a useful tool for computing the lengths of segments, our technique is dictated to us by the number line.

$$\frac{5}{4} \quad + \quad \frac{3}{4} \quad = \quad \frac{8}{4}$$



$$\frac{0}{4} \qquad \frac{4}{4} \qquad \frac{8}{4}$$

As the diagram above suggests, it is convenient to agree that in adding fractions with equal denominators we simply add numerators.

$$\frac{a}{b} + \frac{c}{b} = \frac{a + c}{b}$$

If two fractions have unequal denominators, we replace them by fractions representing the same numbers and having equal denominators. For example,

$$\frac{3}{4} = \frac{9}{12} \quad ; \quad \frac{5}{6} = \frac{10}{12}$$

Hence,

$$\frac{3}{4} + \frac{5}{6} = \frac{9}{12} + \frac{10}{12} = \frac{19}{12}$$

In general, if $\frac{a}{b}$ and $\frac{c}{d}$ are any rational numbers

$$\frac{a}{b} = \frac{a \times d}{b \times d} \quad ; \quad \frac{c}{d} = \frac{c \times b}{d \times b}$$

and so

$$\frac{a}{b} + \frac{c}{d} = \frac{a \times d}{b \times d} + \frac{c \times b}{b \times d} = \frac{(a \times d) + (c \times b)}{b \times d}$$

Fractions that represent the same number are *equivalent* fractions. The set of all fractions equivalent to one fraction is called an *equivalence class*. For example,

$$\left\{\frac{3}{4}, \frac{6}{8}, \frac{9}{12}, \cdots\right\} \text{ and } \left\{\frac{5}{6}, \frac{10}{12}, \frac{15}{18}, \cdots\right\}$$

are equivalence classes of fractions. Each equivalence class contains one *lowest terms* fraction. The lowest terms fractions in the equivalence classes above are $\frac{3}{4}$ and $\frac{5}{6}$. To *reduce* a fraction to lowest terms is to find the lowest terms fraction in its equivalence class. Every fraction in the equivalence class above which contains $\frac{3}{4}$ has the form $\frac{3 \times a}{4 \times a}$ for some whole number **a.**

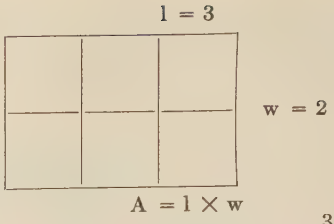
There is a simple method for determining whether two fractions are equivalent. Note that $\frac{3}{4} = \frac{15}{20}$ and $3 \times 20 = 4 \times 15$. This illustrates the general principle

$$\frac{a}{b} = \frac{c}{d} \text{ if and only if } a \times d = b \times c.$$

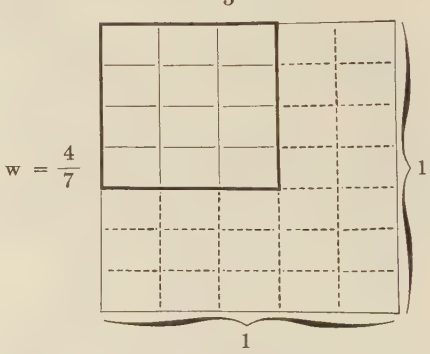
The rule for multiplying fractions may be stated symbolically as $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$

In words: the numerator and denominator of the product are respectively the products of the numerators and denominators of the factors. A clear motivation for the above definition of multiplication of fractions is given by the geometric illustration below.

If the length and width of a rectangle are whole numbers, the area of the rectangle is the product of these numbers.



Now consider a rectangle of length $\frac{3}{5}$ and width $\frac{4}{7}$. We require that the rule for multiplying fractions be so formulated that $\frac{3}{5}$ by $\frac{4}{7}$ rectangle is pictured embedded in a unit square.



Counting rectangular regions above, we see that each small rectangle is $\frac{1}{35}$ of the area of the unit square. The $\frac{3}{5}$ by $\frac{4}{7}$ rectangle contains 12 of these small rectangles and so we assign to this rectangle the area $\frac{12}{35}$. The point to be emphasized is that by *defining* $\frac{3}{5} \times \frac{4}{7}$ to be $\frac{3 \times 4}{5 \times 7}$, we get a product that *is* the area of the $\frac{3}{5}$ by $\frac{4}{7}$ rectangle.

From the definitions given above for addition and multiplication of rational numbers, it can be verified that the four basic principles, the *commutative* principle, the *associative* principle, the *distributive* principle and the properties of 0 and 1 hold for rational numbers.

Subtraction and Division of Rational Numbers.

Subtraction and division of rational numbers are defined in terms of addition and multiplication. To subtract one rational number from another is to determine a *missing addend.*

$$\frac{7}{5} - \frac{4}{5} = \frac{3}{5} \text{ because } \frac{3}{5} + \frac{4}{5} = \frac{7}{5}.$$

To *divide* one rational number by another is to determine a *missing factor.*

$$\frac{12}{35} \div \frac{4}{7} = \frac{3}{5} \text{ because } \frac{3}{5} \times \frac{4}{7} = \frac{12}{35}.$$

Properties of the subtraction and division operations and the associated computational techniques are consequences of these definitions and the basic principles that govern addition and multiplication. As an illustration we develop below the familiar rule for division—*invert the divisor and multiply.*

Note that $\frac{3}{5} \times \frac{5}{3} = 1$, $\frac{7}{11} \times \frac{11}{7} = 1$, and in general, if $a = 0$, $\frac{a}{b} \times \frac{b}{a} = 1$. We say that the fraction $\frac{b}{a}$

is formed by *inverting* the fraction $\frac{a}{b}$. If the product of two rational numbers is 1, each is said to be the *reciprocal* of the other.

Now consider a division problem, as, for example,

$$\frac{7}{12} \div \frac{3}{5}$$

By the definition of division we are searching for the missing factor $\frac{a}{b}$ such that $\frac{a}{b} \times \frac{3}{5} = \frac{7}{12}$.

We determine this missing factor in two easy steps.

Note that $\frac{5}{3} \times \frac{3}{5} = 1$ and $\frac{7}{12} \times 1 = \frac{7}{12}$

Hence, $\frac{7}{12} \times \left(\frac{5}{3} \times \frac{3}{5}\right) = \frac{7}{12}$

By the associative principle it follows that

$$\left(\frac{7}{12} \times \frac{5}{3}\right) \times \frac{3}{5} = \frac{7}{12}$$

Hence, the missing factor is $\frac{7}{12} \times \frac{5}{3}$ and it follows that

$$\frac{7}{12} \div \frac{3}{5} = \frac{7}{12} \times \frac{5}{3}$$

Note that we have used in this development

1. The *definition* of division
2. The concept *reciprocal* of a number
3. The *property* of 1
4. The *associative* principle

These concepts properly combined enable one to *understand* the mysterious rule "invert and multiply."

Generalizing the above example we can say:

Since $$\left(\frac{a}{b} \times \frac{d}{c}\right) \times \frac{c}{d} = \frac{a}{b}$$

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$

Mixed number notation. Old fashioned terminology in the teaching of arithmetic made much use of such terms as *mixed numbers*, *proper fractions*, *improper fractions*, etc. This is a useless language that mildly retards learning because it diverts attention from important to unimportant concepts. This ancient language emphasizes the *appearance* of *symbols*. Modern language emphasizes the *properties* of the arithmetical objects which the symbols represent. It is *not* important that a student know that the symbol $3\frac{2}{5}$ is called a mixed number. It is important that he understand that this symbol is an abbreviation for a sum.

$$3\frac{2}{5} = 3 + \frac{2}{5}$$

The student who understands the distributive principle and who knows that $3\frac{2}{5} = 3 + \frac{2}{5}$ has no difficulty with a problem like $4 \times 3\frac{2}{5}$. He simply sees this as $4 \times \left(3 + \frac{2}{5}\right)$ and applies his knowledge.

Addition in mixed number notation is an application of commutativity and associativity.

$$2\tfrac{1}{4} + 3\tfrac{1}{2} = \left(2 + \tfrac{1}{4}\right) + \left(3 + \tfrac{1}{2}\right)$$

$$= (2 + 3) + \left(\tfrac{1}{4} + \tfrac{1}{2}\right) \text{ etc.}$$

Inequalities. The rational numbers can be *ordered*. That is, a relation *greater than* can be defined so that for any two distinct rational numbers one is greater than the other. The symbolic statement $a > b$ is an abbreviation for the assertion a *is greater than* b. If $a > b$ we say that b *is less than* a and abbreviate this as $b < a$.

To say that $a > b$ means that a is the sum of b and a *nonzero* rational number. In other words, something must be added to b to give a. For example,

since $7872 = 7842 + 30$, $7872 > 7842$

since $\frac{1}{4} = \frac{1}{5} + \frac{1}{20}$, $\frac{1}{4} > \frac{1}{5}$

From these definitions of *greater than* and *less than*, it follows that

if $a > b$ and c is any number, $a + c > b + c$
if $a > b$ and $b > c$, then $a > c$
if $a > b$ and $c > d$, then $a + c > b + d$
if $a > b$ and $c > 0$, then $a \times c > b \times c$

There is a simple technique for deciding which of two rational numbers is the greater. Note that

$\frac{17}{12} > \frac{7}{5}$ and $17 \times 5 > 12 \times 7$

$\frac{17}{12} > \frac{41}{29}$ and $17 \times 29 > 12 \times 41$

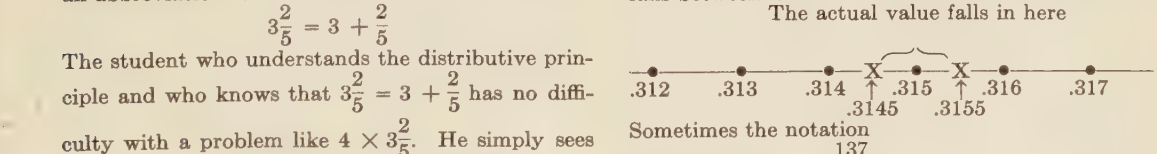
In general

$\frac{a}{b} > \frac{c}{d}$ if and only if $a \times d > b \times c$.

Decimal Symbolism. It should be emphasized that the use of decimal and per cent symbolism for rational numbers involves no new numbers and no new general principles. The numbers are the same. The new symbols, decimal and per cent symbols, are introduced entirely for the sake of convenience. In most cases this symbolism is used to furnish approximations to certain rational numbers. A ball player with 137 hits in 435 times at bat has a *batting average* of exactly $\frac{137}{435}$. For convenience the rational number $\frac{315}{1000}$ is used to replace this number. By agreement we write this last number as .315 and refer to the symbol as a *decimal symbol*. It is clear that decimal symbols are easier to print than are fraction symbols. Moreover, when several numbers are to be compared, it is easier to compare the decimal approximations to these numbers. For example, if a second ball player has 123 hits in 391 times at bat, it takes considerable calculation to decide which of the numbers, $\frac{137}{435}$ and $\frac{122}{391}$ is the larger. However, when the decimal approximations to these numbers are given, the comparison is easy.

$$\frac{137}{435} = .315\ldots; \quad \frac{122}{391} = .312\ldots$$

It is understood, when a decimal approximation like .315 is presented in a situation like this, that the true value lies closer to .315 than to either .314 or .316. If we refer to the number line below we see that this amounts to asserting that the actual value falls between .3145 and .3155



Sometimes the notation

$$\frac{137}{435} \approx .315$$

is used rather than $\frac{137}{435} = .315$. The symbol $\approx$ is read *is approximately equal to*.

The use of decimal notation for rational numbers may be thought of as discarding all rational numbers except those that can be represented by fractions whose denominators are powers of ten. Each nonzero decimal is the sum of a whole number (possibly zero) and a decimal less than 1. These latter may be listed as below.

.1, .2, . . ., .9, .01, .02, . . ., .99, .001, .002, . . .
.999, .0001, . . .

The basic skills that must be developed in order to use decimal notation effectively are

1. Approximating rational numbers by decimals
2. Adding, subtracting, multiplying, and dividing using decimal notation.

Of course, the approximation of rational numbers by decimals requires an understanding of properties of inequalities for rational numbers. For example,

$$\frac{1}{7} = \frac{10}{70} = \frac{7}{70} + \frac{3}{70} = \frac{1}{10} + \frac{3}{70} = .1 + \frac{3}{70}$$

$$\frac{1}{7} = \frac{10}{70} = \frac{14}{70} - \frac{4}{70} = \frac{2}{10} - \frac{4}{70} = .2 - \frac{4}{70}$$

We see that

$$\frac{1}{10} < \frac{1}{7} \text{ and } \frac{1}{7} < \frac{2}{10}$$

and if we approximate $\frac{1}{7}$ by tenths we shall use .1 or .2. Since $\frac{1}{7}$ differs from .1 by $\frac{3}{70}$ and from .2 by $\frac{4}{70}$, the chosen approximation is .1.

An approximation of $\frac{1}{7}$ to the nearest hundredth may be computed in the same way.

$$\frac{1}{7} = \frac{100}{700} = \frac{98}{700} + \frac{2}{700} = \frac{14}{100} + \frac{2}{700} = .14 + \frac{2}{700}$$

$$\frac{1}{7} = \frac{100}{700} = \frac{105}{700} - \frac{5}{100} = \frac{15}{100} - \frac{5}{100} = .15 - \frac{5}{100}$$

A long division technique for computing decimal approximations is described below.

```
   .1
  ---
7)1.0      Since the remainder 3 is
   7       less than half of 7, the
  ---      chosen approximation is .1
   3
  .14
  ---
7)1.00     Since 2 is less than half
   7       of 7, the approximation is
  ---      .14
   30
   28
  ---
    2
  .142
  ----
7)1.000    Since 6 is greater than half
   7       of 7, the approximation is
  ---      .143
   30
   28
  ---
    20
    14
  ---
     6
```

Any computational problem formulated in decimal notation can be solved by translating to fractional symbolism, computing according to rules for fractions, and then translating back to decimals. For example,

A) $.3 + .4 = \frac{3}{10} + \frac{4}{10} = \frac{7}{10} = .7$

B) $.3 - .21 = \frac{3}{10} - \frac{21}{100} = \frac{30}{100} - \frac{21}{100} = \frac{9}{100} = .09$

C) $.3 \times .24 = \frac{3}{10} \times \frac{24}{100} = \frac{72}{1000} = .072$

D) $.12 \div .3 = \frac{12}{100} \div \frac{3}{10} = \frac{4}{10} = .4$

E) $.417 \div .086 = \frac{417}{1000} \div \frac{86}{1000} = \frac{417}{86} \approx 4.85$

Note that when problems are solved as in the examples above, there is no need to formulate rules for the location of decimal points. The study of decimal notation usually includes the development of techniques for getting correct answers without reliance upon the fraction symbols. Such techniques, memorized without understanding, are relatively valueless.

Example C above illustrates why, in multiplication of decimals, "the number of places in the product is the sum of the places in the two factors." The numbers .3 and .24 are respectively 1- and 2-place decimal symbols. Their product, written as .072, is a 3-place decimal.

Example E illustrates the rule of "shifting decimal points" in division. The quotient of .417 and .086 is seen to be the same as the quotient of 417 and 86. The problem $.417 \div .086$ may be replaced by the equivalent problem $417 \div 86$. Similarly the quotient $.231 \div .0084$ may be shown to be equal to $2310 \div 84$. Each decimal point is shifted 4 places to the right.

Rounding Off. One speaks of *rounding* a decimal to the nearest tenth, hundredth, etc. For example, .4382 lies between .438 and .439. Since it is closer to .438, we say that *rounded to the nearest thousandth* it is .438. Rounded off to the nearest hundredth, .4382 is replaced by .44. One may round off 3.475 to the nearest hundredth either as 3.47 or as 3.48.

Per Cent Notation. Per cent notation is in a sense a special case of decimal notation. However, problems of per cent notation are complicated because it is often combined with fraction and decimal notation. One encounters not only such symbols as 12% and 472%, but also $\frac{3}{5}$%, 2.41%, etc. All difficulties with per cent notation may be removed, however, by applying the basic definition below.

If a is any rational number

$$a\% = a \times \frac{1}{100}$$

Applying this definition to the four numbers above we have

$$12\% = 12 \times \frac{1}{100} = \frac{12}{100} = .12$$

$$472\% = 472 \times \frac{1}{100} = \frac{472}{100} = 4.72$$

$$\frac{3}{5}\% = \frac{3}{5} \times \frac{1}{100} = \frac{3}{500} = .006$$

$$2.41\% = \frac{241}{100} \times \frac{1}{100} = \frac{241}{10{,}000} = .0241$$

With the above definition one can convert all problems formulated in per cent symbols to equivalent problems employing either fraction or decimal notation. However, it is useful to develop certain skills in the use of per cent notation per se. For example, since 1% = .01, one may compute 1% of any number (written in decimal form) by moving the decimal point two places to the left.

$$1\% \text{ of } 7432 = .01 \times 7432 = 74.32$$

If 1% of a number is known, then the number is obtained by multiplying this fractional part by 100, that is by moving the decimal point two places to the right.

If 1% of N is 8.642, then N = 864.2

Certain fraction equivalents of special per cents should be memorized, as

50%	$= \frac{1}{2}$	$16\frac{2}{3}\%$	$= \frac{1}{6}$
$33\frac{1}{3}\%$	$= \frac{1}{3}$	$12\frac{1}{2}\%$	$= \frac{1}{8}$
25%	$= \frac{1}{4}$	10%	$= \frac{1}{10}$
20%	$= \frac{1}{5}$	5%	$= \frac{1}{20}$

Decimal and fraction equivalents for any per cent may be computed from the basic definition.

Fractions and decimals are converted to per cents by *multiplying* by 100. This is again a consequence of the basic definition. For example,

$$\frac{3}{5} = \left(\frac{3}{5} \times 100\right) \times \frac{1}{100} = \left(\frac{3}{5} \times 100\right)\%$$

$$.712 = (.712 \times 100) \times \frac{1}{100} = (.712 \times 100)\%$$

Significant Digits and Scientific Notation. We say that all physical measurements of distance are *approximations*, because if the instruments of measurement are sufficiently precise, different measurements of one object result in different numerical results. Similarly, it is unrealistic to suppose that a census figure like 3,478,162 presents the exact

population of a city. Hence, in situations like these, where numbers refer to properties of the physical world, it is customary to introduce the terminology *significant digits*. If an exact count has been made of the enrollment in a school, it may be reported precisely as 1457. In this case all four digits are said to be significant. If it is clear that only an approximation is being reported, as for example when a figure of 14,000 is given for the population of a city, then not all of the digits are significant. It is understood, when an approximation like 14,000 is reported, that the exact number is thought to be closer to 14,000 than to either 13,000 or to 15,000. Hence, the digits 1 and 4 are said to be significant. However, if it should be reported that the population is 14,000 *to the nearest hundred*, then it is being asserted that the population is nearer 140 hundreds than either 139 hundreds or 141 hundreds. In this case the first three digits 1, 4, and 0 in the number 14,000 are said to be significant and the last two zeros are not.

If a measurement is given as .0035, then only the digits 3 and 5 are significant. A measurement reported as .0030 would have only one significant digit if reported as being correct to the nearest thousandth, but it would have two significant digits if correct to the nearest ten thousandth. However, the measurement 1.003 has 4 significant digits. Knowing the number of significant digits in a reported number gives one insight into the care with which the number was computed.

In everyday usage of significant digit terminology there is sometimes ambiguity. In scientific work where it is essential that there be no misunderstanding, a notation known as *scientific notation* is employed. Each approximation is presented as the product of a first number between 1 and 10 and a second number that is a *power* of ten. The number of digits in the first factor is the number of significant digits. For example, the populations of four cities might be presented as

4×10^6; 2.8×10^6; 1.20×10^6; 2.000×10^6

These approximations contain 1, 2, 3, and 4 significant digits respectively. The first figure, 4×10^6, reports that the population of this city falls between 3,500,000 and 4,500,000. The second reports a population between 2,750,000 and 2,850,000; the third between 1,195,000 and 1,205,000; the fourth between 1,999,500 and 2,000,500. These figures are asserted by the manner in which they are reported to be accurate to the nearest million, hundred thousand, ten thousand, and thousand respectively.

Avogadro's number, the number of molecules in a *gram molecule* of any substance, is now after many years of careful measurements reported as

$$6.0238 \times 10^{23}$$

This reflects the belief of scientists that this number has been computed to the nearest *ten quintillion* and that in a given gram molecule of any substance there are between

602,375,000,000,000,000,000,000 and
602,385,000,000,000,000,000,000 molecules.

The Integers (Signed Numbers). One of the characteristics of modern arithmetic programs is that certain topics formerly reserved for treatment in advanced mathematics courses are introduced in simplified form in the early grades. This is true of topics in set theory, geometry, algebra, and probability. It is not unusual for a chapter on the integers to be included in the 6th or even 5th grade arithmetic program.

In order for such a topic to be meaningful, it is essential that students have a firm understanding of the basic principles mentioned earlier, for it is these principles which dictate methods of computing with the integers. The integers are obtained by inventing new numbers to match the whole numbers 1, 2, 3, . . . These new numbers are denoted by -1, -2, -3, . . . and are referred to as *the negative of* 1, *the negative of* 2, etc. By agreement each of these new numbers adds to its whole number mate to produce a sum of zero.

$1 + (-1) = 0$; $2 + (-2) = 0$; $3 + (-3) = 0$ etc.

This new set of numbers, consisting of the whole numbers together with these new numbers, is called the set of *integers*. We denote this set by I.

$$I = \{0, 1, -1, 2, -2, \ldots\}$$

The new numbers are called *negative integers* and the nonzero whole numbers are called *positive integers*. The number zero is said to be neither positive nor negative.

Rules of computation for the integers are determined as soon as one agrees to accept the familiar associative principle, commutative principle, distributive principle, and properties of 0 and 1. For example,

Since $4 + (-4) = 0$

$$6 + (-4) = (2 + 4) + (-4) = 2 + [4 + (-4)] = 2 + 0 = 2$$

Note the use of associativity in the computation above.

In order to calculate a sum like $(-4) + (-2)$ a preliminary observation must be made. *The only integer that adds to 6 to give zero is the integer -6.* Hence, if we can show that $6 + [-4 + (-2)] = 0$ it follows that $-4 + (-2) = -6$. Employing the associative principle and our ability to compute the sum $6 + (-4)$ we have

$6 + [-4 + (-2)] = [6 + (-4)] + (-2) = 2 + (-2) = 0$

Since the number $(-4) + (-2)$ adds to 6 to give zero, it *is* the number -6.

$$(-4) + (-2) = -6$$

A sum like $(-8) + 5$ is now easily computed. By an argument like the one above it may be shown that

$$-8 = (-3) + (-5)$$

Hence,

$(-8) + 5 = [(-3 + (-5)] + 5 = (-3) + [(-5) + 5] = -3 + 0 = -3$.

The development of rules for multiplication of integers requires the use of the distributive principle. For example, using the distributive principle and the property of zero that $a \times 0 = 0$ we show that $2 \times (-4) = -8$.

The proof is effected by showing that the sum of $[2 \times (-4)]$ and 8 is zero.

$8 + [2 \times (-4)] = (2 \times 4) + [2 \times (-4)] = 2 \times [4 + (-4)] = 2 \times 0 = 0$

Since $2 \times (-4)$ adds to 8 to yield 0, it *is* the negative of 8. Note the utilization of the distributive principle.

The final case that occurs in the multiplication of integers is the determination of the product of two negative numbers. Using the ideas above, it may be shown that the product of two negative integers is a positive integer. We illustrate this by showing that the product of -2 and -4 is 8. The idea of the proof is to show that

$$(-8) + [(-2) \times (-4)] = 0$$

If this can be done then, knowing that 8 is the only number that adds to -8 to give zero, we will know that $(-2) \times (-4) = 8$. The calculation which completes the proof is shown below. We use the fact that $-8 = 2 \times (-4)$ and then rely upon the distributive principle and the property of 0.

$(-8) + [(-2) \times (-4)] = [2 \times (-4)] + [(-2) \times (-4)] = [2 + (-2)] \times (-4) = 0$

Subtraction and division of integers are defined in terms of the addition and multiplication operations in the natural way.

Since $8 + (-3) = 5$, $5 - (-3) = 8$

Since $(-3) \times (-4) = 12$, $12 \div (-4) = -3$

Subtraction involves the determination of a missing addend, division the determination of a missing factor.

Any segment of mathematical knowledge can be presented simply as a mass of rules to be memorized. Mathematics taught in this form has very little long range value. The overall effect of such teaching is undoubtedly harmful. When mathematics is prop-

erly presented as a coherent body of significant ideas, students have an opportunity to develop firm understandings. The arithmetic of the integers is a case in point. One can simply hand students rules for computing with the integers. It would be better to omit the integers from the elementary curriculum than to present them in this fashion. However, when the arithmetic of the integers is related to the basic principles that govern whole number computation, the study of this topic can strengthen the entire arithmetic program.

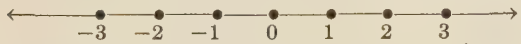
Ordering the Integers. It is intuitively clear that 5 *is greater than* 3 because a set with 5 things in it contains more objects than a set of 3 things. But no such comparison of physical sets is available to enable us to determine which of the integers -3 and -5 is the greater. We settle this matter with a precise definition.

To say that a first integer a is *greater than* a second integer b means that some *positive* integer must be added to b to give a.

As a consequence of this definition

$$0 > -1, \text{ since } 0 = -1 + 1$$
$$-1 > -2, \text{ since } -1 = -2 + 1$$
$$-2 > -3, \text{ since } -2 = -3 + 1 \text{ etc.}$$

This order relation suggests picturing the integers on a line as shown below

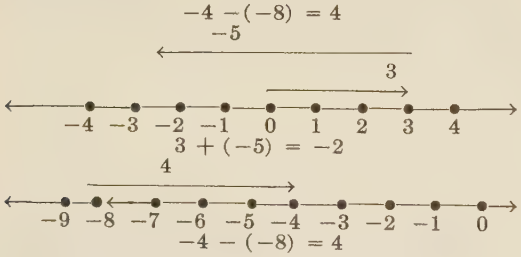


Just as for whole numbers, our agreement to picture the integers on a line enables us to give geometric descriptions of the addition and subtraction operations. In some presentations of the integers, these geometric relationships are taken as the starting point of the study of addition and subtraction of integers. The diagrams which follow present geometric interpretations of the addition fact

$$3 + (-5) = -2$$

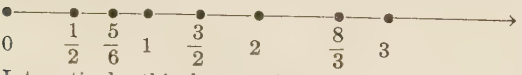
and the subtraction fact

$$-4 - (-8) = 4$$



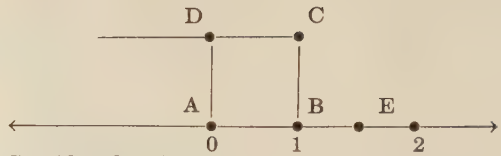
Note that the second diagram shows that 4 must be added to (-8) to give -4.

The Real Numbers. A careful study of the rational number system is the chief concern of the elementary mathematics curriculum. A superficial consideration of the rational number line suggests that not only does each rational number have a point on the line, but also *each point of the line has paired with it some rational number.*



Interestingly this last conjecture is false. If all rational numbers are matched with points of a line in the usual way, there still remain points unmatched with numbers. The numbers invented to complete the number line by providing number mates for these extra points are called *irrational numbers.* The total collection consisting of all rational and irrational numbers is the set of *real numbers.*

Over 2000 years ago the Greek mathematicians recognized that the rational number system is incomplete in the sense described above. This discovery of the Greeks came about in the following way. Consider a unit square ABCD with diagonal AC as shown below.



Consider the circle with center A and radius AC. This circle cuts the number line at a point E between 1 and 2 such that segments AC and AE have the same length. By the Pythagorean theorem (or as is clear from the sketch) the area of the square erected on diagonal AC is 2. By an ingenious argument the Greek mathematicians showed that there is no rational number whose square is 2. Hence, the point E on the number line is not matched with any rational number.

The geometric considerations above suggest the invention of a new number whose square is 2. We denote it by the symbol $\sqrt{2}$, call it *square root of* 2, and refer to it as an *irrational* (not rational) number. Note that the invention of this one new irrational number leads at once to infinitely many new numbers. Imagine laying off segments repeatedly on the number line of length equal to that of AE

The lengths of AE, EF, FG, . . . are $\sqrt{2}$. Now the point F cannot be a rational point, for if the length of AF were a rational number, the length of AE would be half of a rational number and hence itself rational—which it is not. Similarly, G is not matched with a rational number, nor is any of the infinitely many points in this sequence.

In the same way we can see that $1 + \sqrt{2}$ is irrational, and in general if x and y are any rational numbers such that $y \neq 0$, the number

$$x + y \times \sqrt{2}$$

is an irrational number.

Other irrational numbers are needed. There is no rational number whose square is 3. There is no number among the irrational numbers of the type $x + y \times \sqrt{2}$ whose square is 3. Hence, we invent a new irrational number whose square *is* 3. and denote it by $\sqrt{3}$. We have still no number whose square is 5, 7, 11, 13, . . ., no number whose cube is 2, 3, 5, 7, . . ., etc. After inventing square roots, cube roots, fourth roots, fifth roots, . . . of all necessary numbers, we find that still other irrational numbers are needed. The set of numbers described above does not suffice to represent the circumference of a circle of diameter 1. The number invented for this purpose is given the special symbol π (pi). Rational approximations to this number have been computed to 100,000 decimal places. Familiar rational approximations are $\frac{22}{7}$ and 3.1416. The first 40 decimal places for π are given by

3.1415926535897932384626433832795028841971. . .

The interested reader can find the first 4000 decimal places for π printed in *The Lore of Large Numbers* by Philip J. Davis published by Random House.

Very few numbers are dignified, as is π, by ascribing to them a special name. Two other famous numbers are denoted by the special symbols **e** and γ (gamma). The number **e** is important in the theory of logarithms. It is an irrational number

$$\mathbf{e} = 2.71828 \ldots$$

The number γ, known as Euler's constant, is defined in a rather complicated fashion that we shall not describe here. Its first few decimals are given by

$$\gamma = .577215664 \ldots$$

Interestingly it is not known whether Euler's constant is rational or irrational.

Our approach to irrational numbers and the full set of real numbers has been geometric. It is possible to approach the topic of irrational numbers from purely arithmetic considerations. One begins by observing that every rational number has a repeating decimal representation.

$\frac{1}{3} = .333\ldots\ldots$ 3 repeats

$\frac{3}{7} = .428571\overline{428571}$ $\overline{428571}$ repeats

$\frac{39}{74} = .772\overline{727}\ldots$ $\overline{27}$ repeats

$\frac{1}{17} = .\overline{0588235294117647}\ldots$ The indicated block repeats

$\frac{1}{8} = .125000$ Zero repeats

One can see that every rational number does indeed have a *repeating decimal* representation by contemplating the division process by which the decimal is calculated for a rational number. For example, to express $\frac{8}{13}$ as a decimal, one divides 8 by 13 as below.

$$
\begin{array}{r}
.615384 \\
13\overline{)8.000000} \\
\underline{7\,8} \\
20 \\
\underline{13} \\
70 \\
\underline{65} \\
50 \\
\underline{39} \\
110 \\
\underline{104} \\
60 \\
\underline{52} \\
80
\end{array}
$$

Since we are dividing by 13 no more than 13 different remainders, 0, 1, 2, . . ., 12 can be obtained. Eventually one of these remainders recurs and the repeating cycle is determined. In the example above one gets the six distinct remainders 2, 7, 5, 11, 6, 8. Now the 2 recurs, and so $\frac{8}{13}$ as a decimal repeats in blocks of six digits. It is clear that regardless of the size of the denominator of any fraction, this division process must lead finally to a remainder that recurs.

A slightly more complicated argument must be made to establish that each repeating decimal represents a rational number. For example

$$.1666\ldots\ldots = \frac{1}{6}$$

$$.50925\overline{925}\ldots\ldots = \frac{55}{108}$$

$$.\overline{052631578947368421}\ldots = \frac{1}{19}$$

as the reader can check. But once it is known that every rational number has a repeating decimal and every repeating decimal has a rational number, then one is faced with the reality that there certainly are *non repeating decimals*, hence numbers which are not rational. For example, the number

.101001000 100001 . . . .

where the strings of zeros increase in length by one, clearly does not repeat and so does not represent a rational number.

The discussion above has established that no irrational number has a repeating decimal representation. As a consequence we see that decimal representations for numbers known to be irrational like $\sqrt{2}$, $\sqrt{3}$, $\sqrt{7}$, π, etc., do not repeat. For example, the first few digits for $\sqrt{2}$ are 1.414 . . . and for e are 2.718281828

One might jump to the conclusion that the first decimal repeats the block of digits $\overline{14}$ and the second $\overline{1828}$. This is impossible, however, since neither number is rational; and in fact the next digits are given by

$\sqrt{2} = 1.4142\ldots$ $\quad e = 2.7182818284\ldots$

Calculations with real numbers obey the same basic principles as do calculations with rational numbers. For example, using the associative and commutative principles one can show that

$$\sqrt{2} \times \sqrt{3} = \sqrt{6}$$

One needs to know that $\sqrt{6}$ is the only positive real number whose square is 6. Now since $(\sqrt{2} \times \sqrt{3}) \times (\sqrt{2} \times \sqrt{3}) = (\sqrt{2} \times \sqrt{2}) \times (\sqrt{3} \times \sqrt{3}) = 2 \times 3 = 6$, it follows that the square of the number $(\sqrt{2} \times \sqrt{3})$ is 6 and hence it is the number $\sqrt{6}$. The ability to calculate correctly with irrational numbers, as illustrated above, is essential in advanced mathematics courses. In numerical applications irrational numbers are usually replaced by appropriate rational approximations.

Numerations Systems With Bases Other Than Ten. It is a biological accident that man's numeration system is based upon grouping by tens. If man had evolved with eight rather than ten fingers, he would undoubtedly have grouped by eights. We consider briefly the theory of number representation in other bases.

Recall that the base ten numeral 3412 is an abbreviation for the sum

$(3 \times 10^3) + (4 \times 10^2) + (1 \times 10) + (2 \times 1)$

Each number, in our base ten numeration system, is presented as a sum of ones, tens, hundreds, thousands, ten thousands, etc. For a numeration system based upon five, one would group by ones, fives, twenty-fives, one-hundred-twenty-fives, etc. We write 3412_5 for

$(3 \times 5^3) + (4 \times 5^2) + (1 \times 5) + (2 \times 1)$

The symbol, 3412_6 represents

$(3 \times 6^3) + (4 \times 6^2) + (1 \times 6) + (2 \times 1)$

Note that

$$3412_5 = 482_{10}$$
$$3412_6 = 800_{10}$$

The basic principles underlying calculation in other base numeration systems are the same as for base ten, for the properties described by these principles are properties of the numbers and operations, not properties of the symbols we write to denote numbers. Our memorized addition and multiplication number facts are geared to grouping by tens. We have memorized that $6 + 7$ is $10 + 3$ and that 6×7 is $(4 \times 10) + 2$. If we used a base eight numeration system, our memorized responses would reflect grouping by eights. In learning the basic facts of base eight arithmetic, we would use freely the commutative, associative, and distributive principles. For example,

$7 + 6 = 7 + (1 + 5) = (7 + 1) + 5 = 15_8$

$4 \times 6 = 4 \times (2 \times 3) = (4 \times 2) \times 3 = 30_8$

In addition problems, we would watch for opportunities to group by eights rather than tens as the problem below illustrates

$$
\begin{array}{r}
^{2}47_8 \\
52_8 \\
36_8 \\
41_8 \\
\hline
25_8 \\
\hline
245_8
\end{array}
$$

In subtraction one would borrow one eight, or eight eights (one sixty-four) etc.

$$
\begin{array}{rl}
\phantom{^{6}}100 & \\
{}^{6}714_8 & 714_8 = 600_8 + 100_8 + 14_8 \\
\underline{336_8} & \underline{336_8 = 300_8 + 30_8 + 6_8} \\
356_8 & 300_8 + 50_8 + 6_8
\end{array}
$$

Multiplication and division examples in base eight notation are worked below.

$$\begin{array}{r} 53_8 \\ 36_8 \\ \hline 402 \\ 201 \\ \hline 2412_8 \end{array} \qquad \begin{array}{r} 36_8 \\ 53_8\overline{)2412_8} \\ 201 \\ \hline 402 \\ 402 \\ \hline \end{array}$$

Whereas the decimal symbol .352 represents the sum of 3 tenths, 5 hundredths, and 2 thousandths, the base eight symbol $.352_8$ represents the sum of 3 eighths, 5 sixty-fourths, and 2 five hundred twelfths. The base ten fraction symbol $\frac{17}{100}$ represents seventeen hundredths, and the base eight symbol $(17/100)_8$ represents fifteen sixty-fourths. However, just as

$.1 \times .1 = .01$ in base ten numeration

$.1_8 \times .1_8 = .01_8$ in base eight numeration

One can acquire special insight into the problems students face in learning arithmetic facts and in developing computational skill by practicing computation in numeration systems employing bases other than ten.

Number Theory. Number theory, one of the most ancient branches of mathematics, is a study of properties of the integers. Many interesting properties of numbers were known to the early Greek mathematicians, and most of the facts mentioned in this section fall into this category. Basic to the study of number theory is the concept of *prime number*. These are the positive integers which have exactly two positive factors. Note that this definition excludes 1 from the set of primes since its only factor is itself. Every positive integer other than 1 has at least two factors, namely 1 and itself. Those that have more than these two factors are called *composite numbers*. There are 25 primes less than 100.

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97,. . .

The series of primes suggests many problems of number theory, some easily solved and some which have defied all attempts of solution. As one goes farther and farther out in the sequence of natural numbers primes become scarcer. For example, no number between 89 and 97 is prime; no number between 113 and 127 is a prime. These examples provide respectively strings of 7 and 13 consecutive whole numbers, none of which is prime. Indeed, in the sequence of natural numbers there are strings of consecutive numbers of arbitrary length which consist entirely of composite numbers. For example, the number $1000! + 1 = (1000 \times 999 \times 998 \times \ldots \times 2 \times 1) + 1$ has the property that the next 999 consecutive numbers are all composite. Applying the distributive principle one sees that the first of these 999 numbers has 2 for a factor, the next 3, the next 4, and so on. Similarly the number

$$1{,}000{,}000! + 1$$

is followed by 999,999 numbers, none of which is a prime.

This astonishing fact, that gaps of arbitrary length without primes exist in the sequence of whole numbers, suggests the possibility that perhaps there is a largest prime. Perhaps from some point on all remaining whole numbers are composite. The Greek mathematicians showed that this is not the case by proving that beyond each prime number there lies still a greater prime number.

Each composite number has a unique factorization as a product of primes. For example,

$$12 = 2^2 \times 3;\ 7097 = 7^2 \times 11 \times 13$$

and no other factorizations of these numbers as the products of prime numbers is possible. The actual determination of the prime factors of a given large number is essentially a laborious trial and error procedure. Tables of all primes less than 10,000,000 have been constructed. There are about 600,000 such primes.

The number 2 is the only even prime. All other even numbers have 2 as a factor, and are composite. Hence, the pair of primes 2, 3 furnishes the only example of two consecutive numbers, both of which are primes. All other prime pairs must differ by at least 2. Two primes whose difference is 2, and so are as close together as possible, are called *twin primes*. The pairs (3, 5), (5, 7), (11, 13), (101, 103) are examples of twin primes. An unsolved problem of number theory is the question of whether there are infinitely many of these pairs. It is believed that there are, but we seem to be as far away from a proof as were the mathematicians of 2000 years ago. There is a whole series of unsolved problems of this type. Some pairs of primes differ by 4,

(3, 7), (7, 11), (13, 17), . . .

some by 6,

(7, 13), (11, 17), . . .

some by 8,

(11, 19), (29, 37), . . .

some by 10,

(3, 13), (7, 17), (13, 23), . . ., etc.

One can ask the same question as for the twin primes. Are there infinitely many prime pairs differing by 4? by 6? by 8? by an arbitrary even number? In general mathematicians believe that the answer is yes, but proofs are at the present beyond us.

An interesting conjecture was made by the mathematician Charles Goldbach in 1742. He suggested that every even integer larger than 4 is the sum of two odd primes. For example,

$6 = 3 + 3;\ 8 = 3 + 5;\ 10 = 3 + 7;\ 12 = 5 + 7;$ etc.

Despite enormous efforts in the 200 intervening years by many excellent mathematicians, the truth or falsity of Goldbach's conjecture has not yet been settled. It is known that every even integer larger than

$$10^{350{,}000} = \overbrace{1000\ \ldots\ldots\ 00}^{\text{350,000 zeros!}}$$

is the sum of *four* odd primes. This fantastic result emphasizes that strange and powerful techniques have been developed by modern mathematicians.

We list below a few useful definitions and some interesting number properties:

Even Numbers. A number is *even* if it is divisible by 2.
EXAMPLES: 0, 2, 4, 6.

Odd Numbers. A number is *odd* if it is not divisible by 2.
EXAMPLES: 1, 3, 5, 7.

Square Numbers. A number is a *square* if it is the product of some number by itself.
EXAMPLES: $1 = 1^2,\ 4 = 2^2,\ 9 = 3^2$.

Cubes. A number is a *cube* if it is the third power of a number.
EXAMPLES: $1 = 1^3,\ 8 = 2^3,\ 27 = 3^3$.

Triangular Numbers. A number is *triangular* if it is the sum of consecutive integers beginning with 1.
EXAMPLES: $3 = 1 + 2,\ 6 = 1 + 2 + 3,\ 10 = 1 + 2 + 3 + 4$.

Perfect Numbers. A number is *perfect* if it is the sum of all its positive divisors excluding itself.
EXAMPLES: $6 = 1 + 2 + 3,\ 28 = 1 + 2 + 4 + 7 + 14$.

Abundant Numbers. A number is *abundant* if the sum of its divisors, excluding itself, is greater than the number.
EXAMPLES: $12 < 1 + 2 + 3 + 4 + 6,\ 18 < 1 + 2 + 3 + 6 + 9$.

There are interesting tests for divisibility of numbers by given factors. For example a number is even (divisible by 2) if and only if its final digit is even. Hence a number is odd if its terminal digit is odd. We list below several **divisibility** rules.

DIVISIBILITY BY 3: A number is divisible by 3 if and only if the sum of its digits is divisible by 3.

DIVISIBILITY BY 4: A number is divisible by 4 if and only if its units' digit plus twice its tens' digit is divisible by 4.

DIVISIBILITY BY 5: A number is divisible by 5 if and only if its units' digit is divisible by 5.

DIVISIBILITY BY 6: A number is divisible by 6 if and only if it is divisible both by 2 and by 3.

DIVISIBILITY BY 7: A number is divisible by 7 if and only if (3 × units' digit) + (2 × tens' digit) − (1 × hundreds' digit) − (3 × thousands' digit) − (2 × ten thousands' digit) + (1 × hundred thousands' digit) is divisible by 7. If there are more digits the sequence of multipliers 3, 2, −1, −3, −2, 1 is repeated.

Example: 53,620,182

$(3 \times 2) + (2 \times 8) - (1 \times 1) - (3 \times 0) - (2 \times 2) + (1 \times 6) + (3 \times 3) + (2 \times 5) = 6 + 16 - 1 - 0 - 4 + 6 + 9 + 10 = 42$

Since 42 is divisible by 7, so is the original number.

DIVISIBILITY BY 8: A number is divisible by 8 if and only if its units' digit + (2 × tens' digit) + (4 × hundreds' digit) is divisible by 8.

DIVISIBILITY BY 9: A number is divisible by 9 if and only if the sum of its digits is divisible by 9.

DIVISIBILITY BY 10: A number is divisible by 10 if and only if its last digit is zero.

DIVISIBILITY BY 11: A number is divisible by 11 if and only if units' digit − tens' digit + hundreds' digit − thousands' digit, etc. is divisible by 11.

DIVISIBILITY BY 12: A number is divisible by 12 if and only if it is divisible both by 4 and by 3.

DIVISIBILITY BY 13: As for 7 one applies to the digits in order the sequence of multipliers 10, −4, −1, 3, 4, 1 repeating as often as necessary.

Squares: A square number must have its last non-zero digit 1, 4, 5, 6, or 9. However, even if the terminal digit is 1, 4, 5, 6, or 9 the number need not be a square. In order to be certain one must extract the square root. Another partial test is to sum all digits in the number, sum all the digits in this sum, etc. repeating until one digit is obtained. If the final sum is 2, 3, 5, 6 or 8 the number is not a square. If it is 1, 4, 7, or 9 it *may* be.

EXAMPLES: 41,325,621 − 24 − 6 *not* a square
32,936,121 − 27 − 9 *perhaps* a square

It is known that every number is either itself a square or is the sum of no more than 4 squares.

EXAMPLES: $7 = 2^2 + 1^2 + 1^2 + 1^2$
$43 = 5^2 + 3^2 + 3^2$
$2{,}116{,}155 = 913^2 + 865^2 + 731^2$

Every square number is the sum of two triangular numbers.

Cubes: There is no easy test for cubes. If one sums the digits repeatedly until a single digit is obtained, then if the number is a cube the answer will be 1, 8, or 9. But if the answer is 1, 8, or 9 the number may still not be a cube.

EXAMPLES: 325,417,924 − 37 − 10 − 1 *perhaps*
413,587,964 − 47 − 11 − 2 *no*

Triangular Numbers: A number N is triangular if and only if 8N + 1 is a square. Every number is either triangular or is the sum of no more than 3 triangular numbers.

Perfect Numbers: Euclid shows in Book IX of his *Elements* a method for constructing even perfect numbers. Consider the sequence 1, 2, 4, 8, 16, 32, . . . If the sum of a certain initial segment of these numbers is a prime, then the product of this prime by the last number is perfect.

EXAMPLES: 1 + 2 = 3, 3 is prime, so 2 × 3 is perfect
1 + 2 + 4 = 7, 7 is prime, 4 × 7 is perfect
1 + 2 + 4 + 8 = 15, 15 is not prime, 8 × 15 is not perfect
1 + 2 + 4 + 8 + 16 = 31, 31 is prime, 16 × 31 is perfect

Euclid's method gives all even perfect numbers. It is not known whether there are any odd perfect numbers. Neither is it known whether there are only finitely many even perfect numbers or infinitely many.

Abundant Numbers: There are abundant numbers such that the sum of their factors is more than twice the number itself (Example: the sum of the factors of 2160 excluding 2160 is 5280). There are abundant numbers such that the sum of their factors is more than three times the number itself, more than four times, more than five times, and so on indefinitely.

Greatest Common Divisor and Least Common Multiple

The *greatest common divisor* (gcd) of a set of two or more numbers is the largest number that is a factor of every number in the set. For example, 6 is the gcd of 12 and 18. If two numbers have a gcd of 1 the numbers are said to be *relatively prime*. Neither 9 nor 25 is a prime number but they are relatively prime to one another since their gcd is 1.

If two numbers are factored into primes, it is easy to determine their gcd. For example

$504 = 2^3 \times 3^2 \times 7$ and $540 = 2^2 \times 3^3 \times 5$

The only primes dividing both numbers are 2 and 3. Since 2^2 and 3^2 are the largest powers of 2 and 3 which divide both numbers, the gcd is $36 = 2^2 \times 3^2$.

An elegant procedure known as the *Euclidean algorithm* may be used to determine the gcd of two integers. The example below illustrates this technique. Suppose that it is desired to determine the gcd of 48,840 and 42,809. Dividing 48,840 by 42,809 a remainder of 6031 is obtained. Now 42,809 is divided by 6031 and this process is continued until a zero remainder is obtained. The work is arranged below.

$$\begin{aligned} 48840 &= (1 \times 42809) + 6031 \\ 42809 &= (7 \times 6031) + 592 \\ 6031 &= (10 \times 592) + 111 \\ 592 &= (5 \times 111) + 37 \\ 111 &= 3 \times 37 \end{aligned}$$

The last division by 37 results in remainder zero and hence 37 is the gcd of 48840 and 42809.

The *least common multiple* (lcm) of a set of two or more numbers is the *smallest* number that has every number in the set as a factor. For example, 36 is the lcm of 12 and 18. The lcm of any two numbers may be found by dividing the product of the two numbers by their gcd. For example, 12 × 18 = 216. The gcd of 12 and 18 is 6; and 216 ÷ 6 = 36 is the lcm of 12 and 18.

One reduces a fraction to *lowest terms* by dividing numerator and denominator of the fraction by their gcd. In adding two fractions one chooses a common denominator. The smallest common denominator for two fractions is simply the lcm of their denominators.

PYTHAGOREAN TRIPLES AND FERMAT'S LAST THEOREM

We close this section with a brief discussion of the most famous unsolved problem of number theory, Fermat's last theorem. A Pythagorean triple is a triple of natural numbers a, b, c, such that

$$a^2 + b^2 = c^2$$

There are infinitely many such triples

3, 4, 5; 5, 12, 13; 7, 24, 25; 9, 40, 41; . . .
8, 15, 17; 20, 21, 29; 36, 27, 45; 56, 33, 65; . . .
12, 35, 37; 28, 45, 53; 48, 55, 73; 72, 65, 97; . . .

These are called Pythagorean triples since they are lengths of sides of right triangles for which the Pythagorean theorem holds: *The square on the hypotenuse is the sum of the squares on the sides.* A formula for all Pythagorean triples was known to the Greeks. If m and n are chosen integers such that m > n, one is odd and the other even, and they are relatively prime to one another, then the numbers a, b, c given by

$a = 2 \times m \times n$; $b = m^2 - n^2$; $c = m^2 + n^2$

form what is called a primitive Pythagorean triple. Every Pythagorean triple is either one of these primitive triples or is proportional to it. For example, by taking m = 2, n = 1, one gets the familiar 3, 4, 5 right triangle. The Pythagorean triple 9, 12, 15 is not given by the formula, but this triple is proportional to 3, 4, 5 with constant of proportionality being 3.

Now a generalization of Pythagorean triples suggests itself. One seeks numbers a, b, c such that $a^3 + b^3 = c^3$ or $a^4 + b^4 = c^4$ or $a^5 + b^5 = c^5$ etc. Shortly before his death, the French mathematician

Fermat remarked that he had found a marvelous proof that except for $n = 2$ the equation $x^n + y^n = z^n$ has no solution in positive integers. To this day mathematicians have been unable to verify that Fermat's theorem is true. It is known that none of the equations

$x^3 + y^3 = z^3$; $x^4 + y^4 = z^4$; . . .; $x^{3999} + y^{3999} = z^{3999}$

have solutions in integers. That is, the sum of two cubes is never a cube; the sum of two fourth powers is never a fourth power; and so on for all numbers less than 4000. But the general theorem remains beyond our reach.

Although number theory has little direct practical application, yet it has had strong influence upon the development of mathematics. The subject is surprisingly difficult but yields elegant unexpected results. It is little wonder that Karl Friedrich Gauss, one of the greatest mathematicians of all time referred to the theory of numbers as the Queen of mathematics.

PROBABILITY

With the help of some elementary set theory, one can easily develop several of the basic principles of probability. Because of the importance of statistics in everyday life, there is a growing tendency to introduce into the arithmetic curriculum a few of the concepts of probability that are fundamental for statistics.

The simplest problems of probability deal with situations in which one and only one of several possible events will occur, and it is judged that all events are equally likely to happen. Examples of this are: tossing a fair coin, rolling an honest die, drawing a card from a complete and unmarked deck. In the first case we say that 2 equally likely events can happen and that the probability of each is $\frac{1}{2}$. In the second and third we say that individual events have probability $\frac{1}{6}$ and $\frac{1}{52}$ respectively.

In order to analyze problems dealing with probabilities, it is convenient to construct *sample spaces*. A sample space for an experiment is a set that has in it one element for each outcome of the experiment. For example, if a penny and a nickel are to be tossed, then there are 4 possible outcomes. A convenient sample space is given below.

{HH, HT, TH, TT}

The symbol TH represents the event of the penny falling tails and the nickel heads, and the other symbols have corresponding interpretations.

If a die is to be rolled a convenient sample space is

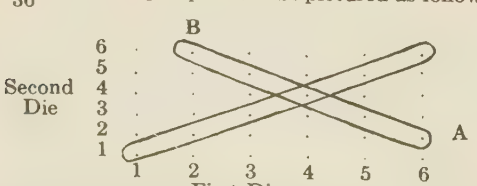
{1, 2, 3, 4, 5, 6}

A sample space for the roll of two dice would contain thirty-six elements. A convenient one is

{(1, 1), (1, 2), . . . (1, 6), (2, 1), . . . (6, 6)}

where a symbol like (3, 4) represents the event of the first die falling 3 and the second 4.

In each of the above examples, it is natural to assume that any one of the events denoted by an element of the sample space is just as likely to occur as any other. Hence, in the last example we would assign to each element in the sample space for the experiment of rolling two dice the probability $\frac{1}{36}$. This sample space can be pictured as follows:

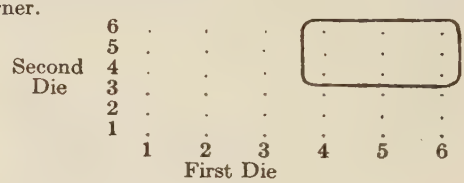


The dot labeled A represents the pair (6, 2), that is, the event of throwing a 6 on the first die and a 2 on the second. The dot labeled B represents the pair (2, 6), a different event.

The diagram above is useful for reading off the solutions to problems. For example each of the dots that represents the throwing of a double lies along the diagonal from lower left to upper right. These dots are circled. The probability of throwing a double is seen to be $\frac{6}{36}$ or $\frac{1}{6}$. The other circled array of dots represents the ways the dice could fall to give a total of 8. We see that the probability of throwing an 8 is $\frac{5}{36}$.

The probability that a throw of the dice will result in a double *or* a total of 8 is computed by forming the *union* of these two sets. Since there are 10 points in the union, this probability is $\frac{10}{36}$. The probability that a throw will result in a double *and* a total of 8 is computed by forming the *intersection* of these two sets. This probability is of course $\frac{1}{36}$.

We illustrate the difficult concept of *conditional probability* by one example. Suppose a friend throws two dice, looks at them and tells you truthfully that on one of the dice there is a number smaller than 4. Now we ask for the probability that a double has been thrown. Applying the first information that he has given us we can delete from our sample space the set of 9 dots in the upper right-hand corner.



We know that one of the remaining 27 events has occurred. To each of the 27 elements in our new sample space, we assign the probability $\frac{1}{27}$. Since 3 of these sample space elements represent the throw of double, the probability that a double has been thrown is $\frac{3}{27}$.

INTEREST

The charge made for the use of money is referred to as *interest*. The money borrowed is called the *principal;* that which is repaid, the sum of principal and interest, is called the *amount;* the *rate of interest* per unit of time is the ratio of the interest for that period of time to the principal borrowed. For example, if \$60 is the interest charge for borrowing a principal of \$1000 for one year, then the *rate of interest per year* is $60 \div 1000$ or 6%. If \$2.50 is charged as interest upon a \$100 loan for one month, then the *rate of interest per month* is $2.50 \div 100 = 2.5\%$.

Using the symbols I, P, A, R, as abbreviations for *interest*, *principal*, *amount*, and *rate per unit of time*, respectively, and using T to denote the number of units of time for which the money was borrowed, the following formulas are basic in interest problems.

$$A = P + I$$
$$I = P \times R \times T$$

Replacing I in the first equation by its value given in the second equation and factoring one has

$$A = P \times (1 + R \times T)$$

As an application of these ideas, if \$250 is borrowed for 4 months at a 2% per month rate, then the interest charge and the total amount due at the end of the four-month period are given by

$$I = \$250 \times .02 \times 4;\ A = \$250\ (1.08)$$

If any three of the four numbers I, P, R, T are known, the fourth is easily computed.

COMPOUND INTEREST

When money is borrowed for a considerable length of time without payment of interest, it is customary to add the interest charge periodically to the principal. When this is done, the principal increases and interest is charged upon the interest that has been added to the original principal. For example, if \$1000 has been borrowed for 2 years at 5% per year, then at the end of the first year the \$50 interest charge is added to the \$1000 and at the end of the second year interest is computed upon the \$1050. The calculations are given below using the basic formula $A = P \times (1 + R \times t)$

$\$1000 \times (1.05) = \$1050$, amount at end of 1st yr.

$\$1050 \times (1.05) = \$1102.50$, amount at end of 2d yr.

This method of computing interest upon interest is referred to as the *compound interest* method as opposed to the *simple interest* method in which interest is computed upon the original principal alone. Note that at simple interest the amount due in the example above at the end of two years would have been

$$\$1000 \times (1.10) = \$1100$$

The \$2.50 difference is the interest charge upon the \$50 of first year interest.

Under compound interest the principal is multiplied by a constant factor at the end of each interest period. For example, if the interest rate is stated as 6% per year compounded *semi-annually*, then each six months interest is computed and added to the old principal. For example, if \$2500 is borrowed for 2 years at this rate, the amounts owed at the end of 6 mos., 1 yr., 1 yr. 6 mos., and 2 yrs. respectively are

$$\$2500 \times (1.03); \ \$2500 \times (1.03)^2;$$
$$\$2500 \times (1.03)^3; \ (\$2500) \times (1.03)^4$$

The following table describes the growth of money invested at a compound interest rate.

COMPOUND INTEREST TABLE

YEARS	4%	5%	6%	7%	8%
1	1.040000	1.050000	1.060000	1.070000	1.080000
2	1.081600	1.102500	1.123600	1.144900	1.166400
3	1.124864	1.157625	1.191016	1.225043	1.259712
4	1.169859	1.215506	1.262477	1.310796	1.360489
5	1.216653	1.276282	1.338226	1.402552	1.469328
6	1.265319	1.340096	1.418519	1.500730	1.586874
7	1.315932	1.407100	1.503630	1.605782	1.713824
8	1.368569	1.477455	1.593848	1.718186	1.850930
9	1.423312	1.551328	1.689479	1.838459	1.999005
10	1.480244	1.628895	1.790848	1.967151	2.158925
11	1.539454	1.710339	1.898299	2.104852	2.331639
12	1.601032	1.795856	2.012197	2.252192	2.518170
13	1.665074	1.885649	2.132928	2.409845	2.719624
14	1.731676	1.979932	2.260904	2.578534	2.937194
15	1.800944	2.078928	2.396558	2.759032	3.172169
16	1.872981	2.182875	2.540352	2.952164	3.425943
17	1.947901	2.292018	2.692773	3.158815	3.700018
18	2.025817	2.406619	2.854339	3.379932	3.996020
19	2.106849	2.526950	3.025600	3.616528	4.315701
20	2.191123	2.653298	3.207136	3.869685	4.660957

At simple interest \$1 invested at 4%, 5%, 6%, 7%, or 8% doubles in 25, 20, $16\frac{2}{3}$, $14\frac{2}{7}$, and $12\frac{1}{2}$ years respectively. Referring to the table one sees that at compound interest these times are approximately 18, 15, 12, 11, and 9 years. The reader might verify that the number 1.191016 entered in the 6% column on line 3 is $1 \times (1.06)^3$, that is, the amount of \$1 invested for 3 years at 6% per year compounded annually.

Problem: If \$2000 is invested for 15 years at 6% compounded annually, calculate the interest earned.

Solution: The total amount, principal plus interest is given by

$$\$2000 \times (1.06)^{15}$$

From the table, we get the approximate value of $(1.06)^{15}$ namely 2.396558. Hence the total amount at the end of 15 years is

$$\$2000 \times (2.396558) = \$4793.12$$

This includes the \$2000 original principal, so the interest earned is \$2793.12.

INSURANCE

The mathematics of insurance is a combination of probability theory and compound interest calculations. In the usual insurance situation, the insured party makes a periodic payment (*premium*) to an insurance company. In return he is issued an *insurance policy*, a promise to pay certain amounts in the event of death, illness, or loss by fire, theft, etc. From premiums received an insurance company pays its operating expenses and invests the balance. These periodic investments accumulate at compound interest. Most insurance policies combine aspects of saving and protection. Although the principles underlying insurance calculations are simple, the actual computations by which premium rates are determined are extremely complex. Insurance actuaries are necessarily skilled mathematicians. We give below an illustration of a simplified insurance situation.

The American Experience Mortality Table shows that of 100,000 persons living at age ten, 749 can be expected to die before age 11. Suppose, then, that 100,000 ten-year old children buy life insurance policies of \$1000 each for one year. The company can expect to pay \$749,000 in death benefits during the year, so if \$7.49 is collected from each of the 100,000, the premiums may be expected to just about balance the death claims paid. Of course in actual practice the premium rate must be set higher than \$7.49 per thousand in order to pay operating costs.

Note that in the language of probability the probability that a 10-year old child will die before reaching age 11 is .00749 and the basic insurance rate is \$7.49 per thousand. This probability of death within a year rises quite slowly and reaches .01378 at age 50, hence the basic insurance cost at age 50 is \$13.78 per thousand. At age 65 the probability of dying before reaching age 66 is .04013 (out of 100,000 persons alive at age 65, 4013 can be expected to die within a year), and so the basic insurance cost for the 66th year of life is \$40.13 per thousand. However, insurance is not ordinarily sold upon a sliding scale. An average premium is computed so that premiums remain constant during the life of the policy.

TAXES

With rising incomes and rising governmental costs a steadily increasing percentage of the total population is directly taxed to support governmental functions. Most tax income is derived from personal income taxes. Each taxpayer is permitted to make certain deductions from his gross income. His personal income tax is then computed upon the balance. A hypothetical income tax situation is considered below.

Problem: John Smith is married and has three dependent children. He earns \$10,000 per year. He is eligible to deduct \$200 for contributions to charities and religious organizations, \$400 for interest paid on his house mortgage, \$300 for state sales taxes, \$50 for gasoline tax and car licenses, \$350 for local taxes, \$100 for losses he has suffered during the year because of uninsured damage done to his car in an accident, \$100 for medical expenses in excess of 3% of his income, and \$600 for each of the five members of his family. Total deductions are \$4500. His tax is computed on the \$5500 balance according to the following table:

On the first \$1000, 14% or	\$140.00
On the second 1000, 15% or	150.00
On the third 1000, 16% or	160.00
On the fourth 1000, 17% or	170.00
On the remaining 1500, 19% or	285.00
Total	\$905.00

Since taxes of \$1000 have been collected in advance by withholding from his paycheck, he receives a refund of \$95.00.

STOCKS AND BONDS

Stock, or **Capital Stock,** represents the amount contributed by stockholders to carry on the business of a corporation, company, or firm.

Share is one of the equal parts into which capital stock is divided.

Par value of stock is its face value. The par value of one share is usually $100. Some stocks, however, have no par value.

Market value of stock is the sum for which it will sell. This price may be above or below the par value, where a par value is specified on the face.

Stock is **at par** when it sells for its face value; stock is **above par,** or at a **premium,** when it sells for more than its face value; stock is **below par,** or at a **discount,** when it sells for less than its face value.

Dividend is the sum paid to stockholders from the profits of the business. It is usually computed on the par value of a share.

Preferred stock is stock upon which a certain specified dividend is payable from the company's profits before any of the profits are available for dividends on the remainder of the shares. The remaining shares constitute the **common stock.**

Bond is a term currently used to denote a document representing one of a number of parts of a debt payable to the holders of the bonds. Bonds are usually issued in denominations of $1000, $500, or $100. A bond differs from a share of stock in the following ways: (1) a bond is a contract, generally secured by a mortgage, to pay a definite sum, known as the par value, at a definite time, while stock is not an unconditional promise to pay any sum; (2) a bond bears interest, while stock normally pays dividends; and (3) a bond always has a par value, while many stocks have no par value.

Brokerage is the fee or compensation paid to a broker for his services in buying or selling stocks or bonds.

When a broker buys stock for a customer, the brokerage must be *added* to the quoted price in order to determine the actual cost of the shares; when a broker sells for a customer, the brokerage must be *subtracted* from the quoted price in order to determine the proceeds of the sale.

Brokerage charges were formerly calculated at a certain rate per cent on the par value of stocks or bonds, but under current practices the computation of commissions is not such a simple process. The charges for commissions are based on several factors, such as, in the case of bonds, the purchase price in relation to the par value of the bond, the number of years to run, and the number of bonds bought or sold, and, in the case of stocks, the price per share and whether the stocks are bought in 100-share units, or odd lots. Since there is such a large number of classifications we will make no attempt to present all of them, but will select certain applications of both stocks and bonds and will give some problems to illustrate the practices which are presented.

The commission charges given in the bond table below are for a $1000 bond, and the selling prices are at the specified per cent of the par value of the bond. Thus the value of bonds in the range "At 1 but under 10" would be from $10 to $99.99. For example, the purchase price of a bond bought at 9.6 would be .096 × $1000 = $96.

BONDS

Price	Commission per bond. 1 or 2 bond orders	3 bond orders	4 bond orders	5 or more bond orders
Selling under 1	$1.50	$1.20	$0.90	$0.75
At 1 but under 10	2.50	2.00	1.50	1.25
At 10 and above	5.00	4.00	3.00	2.50

STOCKS

To determine the minimum non-member (of New York stock exchange) commission on stocks selling at $1.00 per share or above, the formula, or table, below may be used. The constitution of the New York Stock Exchange provides for a minimum commission but the formula for determining this minimum will not be given here.

Amount of Money Involved	Commission
Under $100	As mutually agreed
$100 to $1,999	1% plus $5.00
$2,000 to $4,999	½% plus $15.00
$5,000 and above	1/10% plus $35.00

Odd Lot, $2 less.

(1) To Find the Amount of Dividend.

Problem. A stock company whose shares have a par value of $100 declares a dividend of 5%. What dividend does *A* receive who owns 57 shares?

Solution.—

$100 × 57 = $5700, stock.
$5700 × .05 = $285, dividend.

or

$100 × .05 = $5, dividend per share.
$5 × 57 = $285, total dividend.

(2) To Find the Rate of Dividend or Installment to be Paid.

Problem. The capital of a company is $500,000. The receipts for one year are $67,000, and the expenses are $103,000. If stockholders are assessed, what will be the rate of assessment?

Solution.—

$103,000 − $67,000 = $36,000, loss.
$36,000 ÷ $500,000 = $.072 = 7⅕%, rate.

(3) To Find the Cost of Bonds at a Given Quotation.

Problem. Find the cost of 20 bonds quoted at 98, the denomination of the bonds being $1000.

Solution.—

$1000 × .98 = $980, market value of bond.
Brokerage on one $1000 bond = $2.50.
$980 + $2.50 = $982.50, cost of 1 bond.
$982.50 × 20 = $19,650, cost of 20 bonds.

(4) To Find the Commission Charges on Stocks and the Purchase Price.

Problem. Find the commission on 100 shares of stock selling at 42½. What is the price?

Solution.—

$4250, money involved.

1% on first	$2000 =	$20.00
½% on	$2250 =	$11.25
plus		$ 5.00, for round lot.
		$36.25, commission.

or, from the formula,

½% of $4250 =	$21.25
plus	$15.00
	$36.25, commission.
$4250 + $36.25 =	$4286.25, price of 100 shares.

The price given does not include taxes, which have to be added.

Problem. Find the commission on 20 shares of stock selling at 34⅛. What is the price?

Solution.—

$682.50, money involved.

1% of $682.50 =	$6.83
plus =	$5.00
	11.83
less	2.00, for odd lots.
	$9.83, commission.
$682.50 + $9.83 =	$692.33, price of 20 shares of stock.

Federal tax is to be added to the price given.

MENSURATION

MENSURATION is a branch of applied mathematics dealing with the calculation of lines, surfaces, and volumes from measured data. In the following section are given the areas of plane figures, together with formulas relating to their dimensions and properties; the surfaces and volumes of solids are also treated in the same manner. Practically all of the problems of measurement met with in everyday experience may be solved by an adaptation of the formulas here given. The formulas, as far as possible, follow the notation given in the figures. Where this is not possible, an explanation is given at the beginning of each set of formulas.

The reader is reminded that, in using these formulas, the product of the measures of two dimensions of a plane figure gives the measure of the area in square units, and that the product of the measures of the three dimensions of a solid gives the measure of the volume of the solid in cubic units.

The satisfactory use of this section demands a knowledge of the operations of arithmetic, such as may be obtained from the preceding section. In many cases, also, the various rules will be understood more easily if the reader has become familiar with the principles given in the sections entitled *Algebra* and *Geometry*, which appear farther on in this department.

The following general method of using the data here given is recommended:

1. Represent by a sketch the problem to be solved, showing the dimensions in the sketch in the same proportions that they bear in the problem.

2. Select from the figures in this section the one similar to the sketch thus obtained.

3. Replace the letters used in the figure with the measurements stated in the problem.

4. Select the formula in which the dimension to be found is shown at the left of the equality sign.

5. Substitute for each letter given in the formula the corresponding dimension of the problem, and perform the indicated operations. Remember that multiplication signs are seldom given in formulas. The formula $A = ab$ is translated $A = a \times b$. Unless otherwise specifically stated, all dimensions must be measured by the same unit; for example, feet and inches must be changed to either feet or inches.

MENSURATION OF PLANE SURFACES

TRIANGLES

A **triangle** is a plane figure formed by three straight lines which intersect by twos in three points. Each of these three points is the *vertex* of the angle formed by the two *sides* of the triangle which intersect in it.

Triangles are usually classified in two ways:

1. Classification based on the sides;

An **equilateral triangle** is a triangle in which the three sides are equal.

An **isosceles triangle** is a triangle having two equal sides.

A **scalene triangle** is a triangle having no two sides equal.

2. Classification based on the angles;

A **right-angled triangle** is a triangle having a right angle.

An **acute-angled triangle** is a triangle in which all of the angles are acute.

An **obtuse-angled triangle** is a triangle which has one obtuse angle.

The **base** is the side upon which the triangle appears to rest. Any side may be used as base.

The **vertex** of a triangle is the vertex of the angle opposite the base. Since a triangle may be placed with any side as the base, in reality the vertex of any angle may be regarded as a vertex of the triangle.

The **altitude** of a triangle is the perpendicular distance from the vertex to the base. It may be necessary to extend the base to meet the perpendicular.

The **median** is the line drawn from the vertex of a triangle to the middle of the opposite side.

The area of any triangle is equal to half the product of the base and the altitude. In the following formulas, a, b, and c have been used to designate the sides of the triangle, h its altitude, and A its area. In the right-angled triangle the altitude is equal to a.

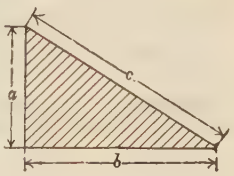
RIGHT-ANGLED TRIANGLE

$$A = \frac{ab}{2}.$$

$$c = \sqrt{a^2 + b^2}.$$

$$b = \sqrt{c^2 - a^2}.$$

$$a = \sqrt{c^2 - b^2}.$$



Problem. The sides a and b of a right-angled triangle are 24 and 10 inches, respectively. What is the area, and what is the length of the hypotenuse c?

Solution.

$$A = \frac{ab}{2} = \frac{24 \times 10}{2} = 120 \text{ square inches.}$$

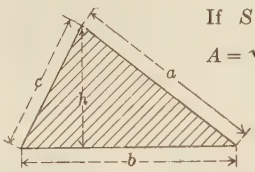
$$c = \sqrt{a^2 + b^2} = \sqrt{24^2 + 10^2} = \sqrt{676} = 26 \text{ in.}$$

ACUTE-ANGLED TRIANGLE

$$A = \frac{bh}{2} = \frac{b}{2}\sqrt{a^2 - \left(\frac{a^2 + b^2 - c^2}{2b}\right)^2}.$$

If $S = \frac{1}{2}(a + b + c)$, then

$$A = \sqrt{S(S-a)(S-b)(S-c)}.$$



Problem. If $a = 22$ inches, $b = 24$ inches, and $c = 18$ inches, what is the area of the triangle?

Solution.

$$A = \frac{24}{2}\sqrt{484 - \left(\frac{484 + 576 - 324}{2 \times 24}\right)^2}$$

$$= 12\sqrt{484 - \frac{2116}{9}} = 189.3 \text{ sq. in.}$$

Or,

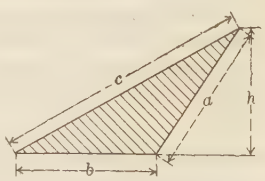
$$S = \tfrac{1}{2}(22 + 24 + 18) = 32.$$

$$A = \sqrt{32 \times 10 \times 8 \times 14}$$

$$= \sqrt{35840} = 189.3 \text{ sq. in.}$$

OBTUSE-ANGLED TRIANGLE

Problems involving this figure are solved by the same formulas and in the same manner as those which involve the acute-angled triangle.



In order to indicate the length of the altitude in a sketch, it is customary to extend the base, b, to meet the perpendicular, h, dropped from the vertex of the triangle.

QUADRILATERALS

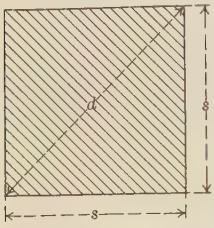
A **quadrilateral** is a plane figure of four sides and four angles.

A **diagonal** of a quadrilateral is a straight line that joins two opposite vertices.

SQUARE

A **square** is a quadrilateral all of whose sides are equal and all of whose angles are right angles.

A = area, s = side, d = diagonal. The diagonal divides the square into two right-angled triangles. Therefore, according to the Pythagorean theorem,



$d^2 = s^2 + s^2 = 2s^2$. $\therefore d = s\sqrt{2}$.

$A = s^2$.

$A = \frac{1}{2}d^2$.

$s = 0.7071\,d = \sqrt{A}$.

$d = 1.414s$

$= 1.414\sqrt{A}$.

Problem. The side, s, of a square is 14 inches. What is the area, and what is the length of the diagonal, d?

Solution. Area $= A = s^2 = 14^2 = 196$ sq. in. Diagonal $= d = 1.414s = 1.414 \times 14 = 19.80$ inches.

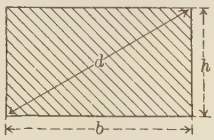
Problem. The area of a square is 196 square inches. What is the length of the side?

Solution. $s = \sqrt{A} = \sqrt{196} = 14$ inches.

RECTANGLE

A **rectangle** is a quadrilateral all of whose angles are right angles.

A = area; b = base, or length; h = altitude, or width; d = diagonal. The diagonal divides the rectangle into two right-angled triangles. Therefore, according to the Pythagorean theorem, $d^2 = b^2 + h^2$.



$A = bh$.

$A = b\sqrt{d^2 - b^2}$

$= h\sqrt{d^2 - h^2}$.

$d = \sqrt{b^2 + h^2}$.

$b = \sqrt{d^2 - h^2} = A \div h$.

$h = \sqrt{d^2 - b^2} = A \div b$.

Problem. A rectangle measures 11.5 inches by 15 inches. What is its area?

Solution. Area $= bh = 15 \times 11.5 = 172.5$ sq. in.

Problem. The height, h, of a rectangle is 11.5 inches and its area is 172.5 square inches. What is the length of the base, b, and of the diagonal, d?

Solution. $b = A \div h = 172.5 \div 11.5 = 15$ in.

$d = \sqrt{b^2 + h^2} = \sqrt{132.25 + 225}$

$= \sqrt{357.25} = 18.90$ inches.

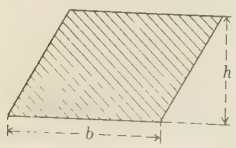
PARALLELOGRAM

A **parallelogram** is a quadrilateral with opposite sides parallel and equal. Rectangles, squares, rhombi, and rhomboids are all parallelograms.

A **rhombus** is an equal-sided parallelogram whose angles are not right angles.

A **rhomboid** is a parallelogram whose adjacent sides are not equal and whose angles are not right angles.

A = area, b = base, h = altitude. The dimension h must always be measured at a right angle to the dimension b.



$A = bh$.

$b = A \div h$.

$h = A \div b$.

Problem. The base, b, of a parallelogram is 24 inches. The height, h, is 9 inches. What is the area?

Solution. Area $= bh = 24 \times 9 = 216$ sq. in.

Problem. The area of a parallelogram is 216 square inches. The base is 24 inches. What is the height?

Solution. $h = A \div b = 216 \div 24 = 9$ inches.

TRAPEZOID

A **trapezoid** is a quadrilateral which has two of its sides parallel.

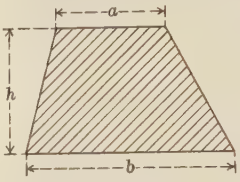
The **legs** are the nonparallel sides.

The **bases** are the parallel sides.

The **mid line** of a trapezoid is a straight line joining the mid-points of the legs.

An **isosceles trapezoid** is a trapezoid whose legs are equal.

The **altitude** of a trapezoid is the perpendicular distance between the parallel sides.



A = area, a = one base, b = other base, h = altitude.

$$A = \frac{(a + b)\,h}{2}.$$

Problem. The lengths of the parallel sides of a trapezoid are 20 and 30 feet, and the height is 12 feet. What is the area?

Solution.

$$A = \frac{(a+b)\,h}{2} = \frac{(20 + 30)\,12}{2} = \frac{600}{2} = 300 \text{ sq. ft.}$$

The areas of many irregular figures may be obtained by drawing a series of parallel lines across the given figure, thus dividing the figure into a series of trapezoids. The area of each trapezoid is then computed separately and the total area is obtained by addition. This process is simplified by the *Trapezoidal Rule*, provided the parallels are equally spaced, which may be stated as follows:

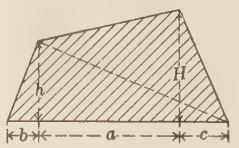
To half the sum of the lengths of the first and last parallels add the sum of the lengths of all intermediate parallels, and multiply this result by the common distance between the parallels.

The reader is referred to the article on *Chain Surveying* for a specific illustration of the foregoing rule.

TRAPEZIUM

A **trapezium** is a quadrilateral having no two sides parallel.

A = area; a, b, and c are line-segments of the base; h and H are perpendiculars to the base.



$$A = \frac{(H + h)\,a + bh + cH}{2}.$$

A trapezium may be divided, as shown, by the diagonal line into two triangles. It may be divided also into two triangles and a trapezoid by the perpendiculars h and H. The formula shown above is based on the latter arrangement. The reader is referred to the article on *Chain Surveying* for an illustration of the triangle method of computing the area of a trapezium. Care must be taken to measure the height of each triangle at a right angle to its base.

Problem. The dimensions of a trapezium are: $a = 11$ feet, $b = 2$ feet, $c = 3$ feet, $h = 6$ feet, $H = 9$ feet. What is the area of the trapezium?

Solution.

$$A = \frac{(9+6)\,11 + (2\times6) + (3\times9)}{2} = 102 \text{ sq. ft.}$$

OTHER PLANE FIGURES

CIRCLE

A **circle** is a closed curved line all of whose points lie in a plane and are equally distant from a point within called the **center.** The perimeter, or length, of a circle is called the **circumference.**

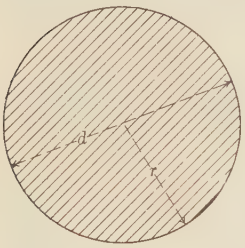
The **area** of a circle is the area of the plane surface enclosed by the circle.

A **radius** of a circle is a straight line drawn from the center to the circle.

A **diameter** of a circle is a straight line passing through the center of the circle and terminated at both ends by the circle.

The ratio of the circumference to the diameter is expressed by the Greek letter π, pronounced pī; an approximate value of this ratio, or of π, is 22/7. A more accurate value, which is very generally used, is 3.1416. The value of π cannot be expressed exactly but may be computed to any desired number of decimal places. To 15 decimal places the value of π reads 3.141592653589793.

A = area, C = circumference, d = diameter, r = radius.



$$A = \pi r^2 = 3.1416\, r^2$$
$$= \frac{\pi d^2}{4} = 0.7854\, d^2.$$
$$C = 3.1416 d = 6.2832 r.$$
$$r = C \div 6.2832$$
$$= \sqrt{A \div 3.1416}$$
$$= 0.5642 \sqrt{A}$$
$$= 0.1592\, C.$$
$$d = C \div 3.1416$$
$$= \sqrt{A \div 0.7854}$$
$$= 1.1284 \sqrt{A}$$
$$= 0.3184\, C.$$

The diameter of the circle is the dimension usually given. The formula $A = 0.7854\, d^2$ is another way of stating that the area of a circle equals .7854 times the area of the circumscribing square.

Problem. A 15-inch circle is cut from a 15-inch square of metal which weighs 1 pound, 8 ounces. What is the area of the circle and what is its weight?

Solution.

$A = 0.7854 d^2 = 0.7854 \times 15 \times 15 = 176.7$ sq. in.

The weight is 78.54% of 1.5 pounds, or 1.17 + pounds.

Problem. The area of a circle is 44.2 square inches. What is its diameter?

Solution. $d = 1.128 \sqrt{A} = 1.128 \sqrt{44.2}$
$= 1.128 \times 6.65 = 7.5$ in.

Note.—Since the area is here given to only one decimal point, no advantage of accuracy is to be gained by using the value of $2\sqrt{\pi}$ to more than two decimal places, that is, 1.13. But, when very exact measurements are available, it is customary to perform the calculation using for these measurements numbers correct to one decimal place more than accuracy would seem to require. For this reason the value 1.128 is used rather than 1.13 or 1.1284.

ELLIPSE

An **ellipse** is a closed plane curve so constructed that the sum of the distances from any point on the curve to two fixed points within, called the *foci*, is a fixed length.

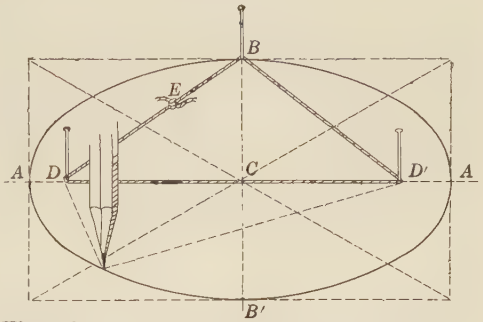
A **diameter** of an ellipse is any line passing through the point midway between the *foci* and terminated at each end by the curve.

The **major axis** of an ellipse is its greatest diameter, or its length.

The **minor axis** of an ellipse is its shortest diameter, or its width.

To Construct an Ellipse.

Draw a rectangle whose length and breadth are equal respectively to the major and the minor axis of the ellipse to be drawn. Drive a pin at the middle of the upper line at B. Then locate the points D and D' by striking an arc of radius AC with the center at B. Drive pins at D and D' and adjust a loop of thread passing around the points B, D, and D'. Remove the pin B and replace it by a pencil point; then, by moving the pencil so as to keep the string taut, the complete ellipse may be drawn within the bounding rectangle.

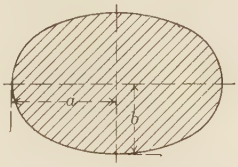


The points D and D' are the foci, and the sum of the distances from the foci to any point of the curve is constant and is equal to the length of $DB + BD' = AA'$, the length of the major axis.

Many interesting applications in scientific work feature ellipses. The ellipse is of especial interest because the orbits of the planets are approximately elliptical.

If a plane cuts all of the elements of a right circular cone (or cylinder) and is not perpendicular to its axis, the curve of intersection will be an ellipse.

A = area, a = half of major axis, b = half of minor axis.



$A = \pi ab$
$= 3.1416\, ab$, approximately.

Like the circle, the area enclosed by the ellipse is approximately equal to 78.54% of the area of the circumscribing rectangle.

To obtain the perimeter of an ellipse it is necessary to evaluate an elliptic integral.

Problem. What is the area of the largest ellipse that can be drawn on a card measuring 7 inches by 10 inches?

Solution.

$A = 3.1416 \times 3.5 \times 5 = 54.98$ sq. in.

REGULAR POLYGONS

A **polygon** is a plane, closed figure having many angles and sides.

A **regular polygon** is a polygon all of whose sides and angles are equal. If any one of its dimensions is known, the area and other dimensions may be determined approximately by use of the table below.

A = area of polygon.
R = radius of circumscribed circle.
r = radius of inscribed circle.
s = length of one side.

Table of Regular Polygons

No. of Sides	Area	Area	Area	Radius of Circumscribed Circle	
3	$0.433\, s^2$	$1.299\, R^2$	$5.196\, r^2$	$0.577\, s$	$2.000\, r$
4	$1.000\, s^2$	$2.000\, R^2$	$4.000\, r^2$	$0.707\, s$	$1.414\, r$
5	$1.720\, s^2$	$2.378\, R^2$	$3.633\, r^2$	$0.851\, s$	$1.236\, r$
6	$2.598\, s^2$	$2.598\, R^2$	$3.464\, r^2$	$1.000\, s$	$1.155\, r$
7	$3.634\, s^2$	$2.736\, R^2$	$3.371\, r^2$	$1.152\, s$	$1.110\, r$
8	$4.828\, s^2$	$2.828\, R^2$	$3.314\, r^2$	$1.307\, s$	$1.082\, r$
9	$6.182\, s^2$	$2.893\, R^2$	$3.276\, r^2$	$1.462\, s$	$1.064\, r$
10	$7.694\, s^2$	$2.939\, R^2$	$3.249\, r^2$	$1.618\, s$	$1.052\, r$

Problem. What is the area of a regular octagon each of whose sides is 5 inches long?

Solution. $A = 4.828 \times 5 \times 5 = 120.7$ sq. in.

Problem. If a circle is drawn to circumscribe the regular octagon of the preceding problem, what will be its radius?

Solution. $R = 1.307 \times 5 = 6.535$ in.

MENSURATION OF SOLIDS

SOLIDS WHOSE SURFACES ARE PLANE AREAS

A **solid** has three dimensions.

If a solid is bounded by surfaces, all of which are plane areas, the bounding plane surfaces are called **faces.** The **edges** of the solid are the lines produced by the intersection of the planes which form the faces, and the **vertices** are the points of intersection of the edges. The dimensions of the solid are usually denoted as length, breadth, and thickness.

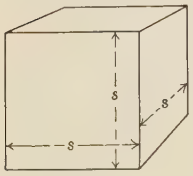
The **volume** of a solid is the volume of the space enclosed by its surfaces, and is expressed by the number of cubic units that it contains.

CUBE

A **cube** is a solid bounded by six squares.

A **diagonal** of a cube is a straight line joining two opposite vertices which do not lie in the same face.

V = volume; s = length of edge; d = diagonal.



$V = s^3$.

$s = \sqrt[3]{V}$.

$d = 1.732s$.

Problem. The side of a cube measures 5½ in. What is its volume?

Solution. $V = 5\frac{1}{2} \times 5\frac{1}{2} \times 5\frac{1}{2} = 166\frac{3}{8}$ cu. in.

Problem. The volume of a cube is 120 cubic inches. What is the length of its side?

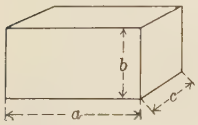
Solution. $s = \sqrt[3]{120} = 4.93 +$ inches.

Note.—The reader is referred to the article on *Logarithms* for the most convenient method of computing a cube root.

RECTANGULAR SOLID

A **rectangular solid** is a solid bounded by six rectangles. A rectangular solid is also called a **rectangular parallelepiped** and is, of course, a cube if all the faces are squares.

V = volume; a, b, and c are the lengths of the edges.



$V = abc$.

$a = \frac{V}{bc}$; $b = \frac{V}{ac}$; $c = \frac{V}{ab}$.

Problem. What is the volume of a rectangular box measuring 2 inches by 4 inches by 8 inches?

Solution. $V = 2 \times 4 \times 8 = 64$ cubic inches.

Problem. A box 10 inches by 12 inches is designed to hold a cubic foot. What is the height?

Solution. $b = \frac{1728}{10 \times 12} = 14.4$ inches.

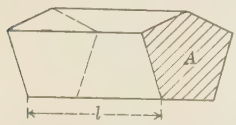
PRISM

A **prism** is a solid whose two ends, or bases, are equal, similar polygons parallel to each other and whose sides are parallelograms.

A **parallelepiped** is a prism whose bases are parallelograms.

The **length** or **altitude** of a prism is the perpendicular distance between the bases.

V = volume, A = area of the base, l = length or altitude. $V = Al$.



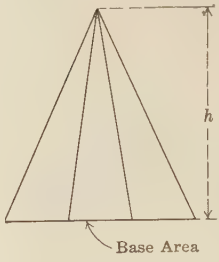
The area of the base, A, is found by the use of the formulas given under plane figures. The length, l, must be measured perpendicularly to the base.

Problem. A prism having for its base a triangle whose area is 10.5 square inches has a length of 9 inches. What is its volume?

Solution. $V = 10.5 \times 9 = 94.5$ cubic inches.

PYRAMID

A **pyramid** is a solid whose base is a polygon and whose faces are triangles meeting at a point, called the *vertex.*



V = volume.

h = height.

A = area of base.

$V = A \times \frac{1}{3}h$.

Determine the area of the base by consulting the proper figure as given above, or, if the base is a regular polygon, consult *Table of Regular Polygons* under *Other Plane Figures.*

Problem. A pyramid having a height of 6 inches has a base formed by a regular hexagon, each of whose sides measures 1 inch. What is the volume of the pyramid?

Solution.

Area of hexagon $= 1 \times 1 \times 2.598 = 2.598$ sq. in.

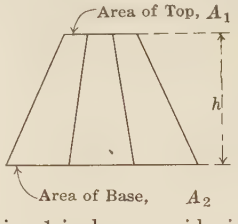
Volume of pyramid $= \frac{2.598 \times 6}{3} = 5.20$ cu. in.

FRUSTUM OF A PYRAMID

The **frustum** of a pyramid is the portion of the pyramid next the base, formed by cutting off the top by any plane parallel to the base. The surface resulting from this cutting is one of the two bases of the frustum.

The **altitude** of a frustum is the perpendicular distance between the planes of its bases.

V = volume, A_1 = area of upper base, A_2 = area of lower base, h = altitude.



$V = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 \times A_2}\right)$.

Problems of this character may easily be solved by the prismoidal formula described later in this section.

Problem. The pyramid in the previous problem having an altitude of 6 inches and a base measuring 1 inch on a side is cut off 2 inches from the top. What volume remains?

Solution (1). The small pyramid formed by the cut is similar in every way to the large pyramid. Consequently, as the small pyramid has a height of 2 inches, or ⅔ the height of the larger pyramid, the length of a side of the smaller base will be ⅔ that of a side of the larger base, or ⅓ inch. Therefore the volume of the smaller removed pyramid = $\frac{1}{3} \times 2\ (\frac{1}{3} \times \frac{1}{3} \times 2.598) = 0.19$ cu. in.

Then the volume of the frustum remaining = $5.20 - 0.19 = 5.01$ cu. in.

Solution (2). Using the formula, we have

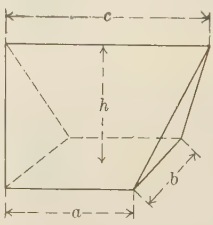
$A_1 = \frac{1}{3} \times \frac{1}{3} \times 2.598 = 0.29$ sq. in.

$A_2 = 2.60$ sq. in.

$V = \frac{1}{3}(2.60 + 0.29 + \sqrt{0.29 \times 2.60}) = 5.01$ cu. in.

WEDGE

A **wedge** is a solid having a base that is a parallelogram, and four other plane faces, two of which are triangles.



V = volume.

h = height.

c = sharp edge.

a and b = sides of base, a being parallel to c.

$V = \frac{(2a + c)bh}{6}$.

This formula is true for rectangular bases only. Other shapes of wedges should

be solved by the prismoidal formula described later in this section.

Problem. A wedge whose height is 8 inches has a sharp edge measuring 9 inches and a rectangular base whose dimensions are 4×6 inches. The sharp edge is parallel to the 6-inch sides. What is the volume of the wedge?

Solution. $V = \dfrac{(12 + 9) \times 4 \times 8}{6} = 112$ cu. in.

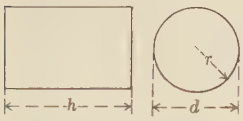
In case $a = c$, as in an ordinary wedge, the formula becomes $V = \dfrac{abh}{2}$.

SOLIDS WITH SOME OR ALL SURFACES CURVED

CYLINDER

A **right circular cylinder** is a solid bounded by a uniformly curved lateral surface, its ends being equal and parallel circular areas. There are other classifications of cylinders; in particular there are many cylinders, such as tanks for gasoline, whose bases are bounded by ellipses.

V = volume, r = radius of circular base, d = diameter of circular base, h = length, or altitude.



$V = 3.1416\, r^2\, h$
$= 0.7854\, d^2\, h.$
Area of side (lateral surface) $= 3.1416 dh.$
Area of end (base) $= 0.7854 d^2.$

Problem. What is the volume of a cylindrical tank whose length is 6 feet and whose diameter is 4.5 feet? What is the area of the metal in the side and in one end?

Solution.
$V = 0.7854 \times 4.5 \times 4.5 \times 6 = 95.426$ cu. ft.
Surface $= (0.7854 \times 4.5 \times 4.5) + (3.1416 \times 4.5 \times 6) = 100.73$ sq. ft.

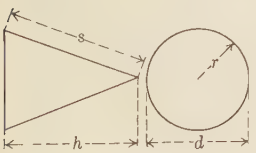
CONE

A **right circular cone** is a solid whose base is a circular area and whose curved lateral surface tapers uniformly to a point, called the **vertex.**

The **altitude** of a cone is the perpendicular distance from its vertex to its base.

The **slant height** of a cone is the distance from the vertex to any point in the circumference of the base.

V = volume, A = area of lateral surface, h = altitude, s = slant height, d = diameter of circular base, r = radius of circular base.



$V = \dfrac{h}{3}(3.1416\, r^2)$
$= 1.0472\, r^2\, h$
$= 0.2618\, d^2\, h.$
$A = 3.1416\, rs.$
$s = \sqrt{r^2 + h^2}.$
$h = \sqrt{s^2 - r^2}.$

Problem. A conical flower holder has a slant length of 6 inches and a diameter of 3 inches. Determine the area of the metal surface and the volume.

Solution.
$r = \dfrac{d}{2} = \dfrac{3}{2} = 1.5$ in.
$h = \sqrt{36 - 2.25} = 5.81$ in.
$V = 0.2618 \times 3 \times 3 \times 5.81 = 13.69$ cu. in.
$A = 3.1416 \times 1.5 \times 6 = 28.27$ sq. in.

FRUSTUM OF A CONE

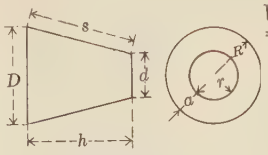
The **frustum** of a cone is the portion of a cone included between the base and the plane of a section, or cut, made through the cone, parallel to the base. The surface resulting from this section is one of the two bases of the frustum.

The **altitude** of a frustum is the perpendicular distance between the bases.

The **lateral surface** of a frustum is the portion of the surface of the frustum included between the bases.

The **slant height** is the shortest distance along the lateral surface from one base of the frustum to the other.

V = volume, A = area of lateral surface, D = diameter of lower base, d = diameter of upper base, R = radius of lower base, r = radius of upper base, $a = R - r$, s = slant height, h = altitude.



$V = 1.0472\, h\, (R^2 + Rr + r^2)$
$= 0.2618\, h\, (D^2 + Dd + d^2).$
$s = \sqrt{h^2 + a^2}.$
$A = 3.1416\, s\, (R + r)$
$= 1.5708\, s\, (D + d).$

Problem. Find the volume and the metal area of a pail 10 inches deep, the top diameter being 9 inches and the bottom diameter being 7.5 inches.

Solution. $V = 0.2618 \times 10 \times (81 + 67.5 + 56.25) = 536.0$ cu. in. $= 2.32$ gallons capacity.

$a = \dfrac{9}{2} - \dfrac{7.5}{2} = .75$ in.
$s = \sqrt{100 + .5625} = 10.03$ in.
$A = 1.5708 \times 10.03(9 + 7.5) = 259.95$ sq. in.
Area of base $= .7854 \times 7.5^2 = 44.18$ sq. in.
Total area $= 259.95 + 44.18 = 304.1$ sq. in.

SPHERE

A **sphere** is a solid bounded by a uniformly curved surface, every point of which is equally distant from a point within, called the **center.**

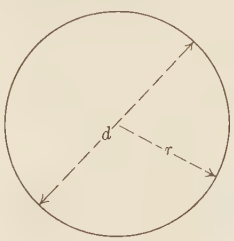
A **radius** of a sphere is a straight line joining the center with any point on the surface.

A **diameter** of a sphere is a straight line passing through the center and terminated at both ends by the bounding surface.

A **hemisphere** is one of the two equal parts into which a sphere may be divided by a plane passing through the center.

A **great circle** is a circle that divides the surface area of a sphere into two equal parts, and is formed by the intersection of the surface of the sphere by a plane passing through the center.

V = volume, A = surface area, r = radius, d = diameter.



$V = \dfrac{4\pi r^3}{3} = \dfrac{\pi d^3}{6}$
$= 4.1888\, r^3$
$= 0.5236\, d^3.$
$A = 4\pi r^2 = \pi d^2$
$= 12.5664\, r^2$
$= 3.1416\, d^2.$
$d = 1.2408 \sqrt[3]{V}$
$= 0.5642 \sqrt{A}.$

The volume formula, $V = \dfrac{\pi d^3}{6}$, states in algebraic language that the sphere occupies 52.36% of the circumscribing cube. Similarly, the formula $A = 4\pi r^2$ states that the area of the convex surface of the sphere is equivalent to the sum of the areas of four great circles.

Problem. Find the volume and the weight of a cast iron ball 4 inches in diameter if 1 cu. in. of cast iron weighs 0.26 lb.

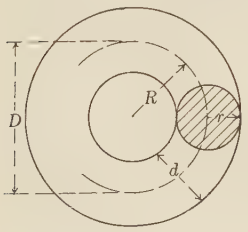
Solution.
Volume $= 0.5236 \times 4 \times 4 \times 4 = 33.51$ cu. in.
Weight $= 33.51 \times 0.26 = 8.7$ lb.

TORUS OR RING

A **torus** is a solid generated by the revolution of a circular area of radius r about an axis in the plane

of the circle and situated at a distance R from its center, where $R > r$.

V = volume, A = surface area, D = average diameter of torus at its equator, that is, one half the sum of the diameter of the outside circumference and the diameter of the hole encircled. In other words, D is the diameter of the circle generated by the center of the revolving circle. d = diameter, and r = radius, of the circular cross section of the body of the torus, or r is the radius of the revolving circle. R = average radius of the torus = D/2.



$$V = 2\pi^2 Rr^2 = 19.739\,Rr^2 = \frac{\pi^2}{4}\,Dd^2 = 2.4674\,Dd^2.$$

$$A = 4\pi^2 Rr = 39.478\,Rr = \pi^2 Dd = 9.8696\,Dd.$$

Problem. Find the volume and the surface of a ring, the inner diameter being 3 inches and the outer diameter being 4 inches.

Solution. If the inner and outer diameters are 3 in. and 4 in. respectively, the corresponding radii are 3/2 and 4/2, or 1.5 in. and 2 in. The diameter or thickness of the solid part of the ring, d, will therefore equal $2 - 1.5 = 0.5$ in.

$d = 0.5$ in.

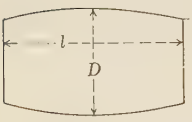
$D = \frac{3+4}{2} = 3.5$ in., the average of the internal and external diameters.

$\therefore V = 2.4674 \times 3.5 \times 0.5 \times 0.5 = 2.16$ cu. in.

$A = 9.8696 \times 3.5 \times 0.5 = 17.27$ sq. in.

BARREL

V = volume.
D = greatest diameter.
d = diameter of head.
l = length.
$V = 0.26\,l\,(2D^2 + d^2)$, approximately.



Problem. The length of a barrel is 26 inches, its greatest diameter is 19½ inches, and its head diameter is 16½ inches. Find the volume.

Solution. $V = 0.26 \times 26 \times (2 \times 19.5 \times 19.5 + 16.5 \times 16.5) = 6.76 \times (760.5 + 272.25) = 6981+$ cu. in.

This is probably a standard barrel, as an error of ¼ inch in measurement would account for the difference between the volume found and the standard volume, or 7056 cu. in.

PRISMOIDAL FORMULA

The prismoidal formula affords a method of calculating accurately the volume of many regular solids and of calculating the approximate volume of many irregular solids. It may be used, for example, to determine the volume of a frustum of a cone or a pyramid, of a segment of a sphere, of a wedge, or of a conoid, which last figure has a form similar to a rifle bullet. It serves also as a method of determining the cubic contents of a tank with flaring sides, of a pail or a barrel, and of piles or heaps of material. The end surfaces must be parallel (one may be a point or a line), and the area of a section midway between these must be determined.

V = volume.
h = length of solid.
A_1 = area at one end of the solid.
A_2 = area at the other end of the solid.
A_m = area of the mid section.

$$V = \frac{h}{6}\,(A_1 + 4\,A_m + A_2).$$

Problem. What is the approximate volume of a pile of coal 6 feet high whose base measures 10 feet by 12 feet? The mid section measures 6 feet by 7½ feet. The top area is assumed to be 0, since theoretically it is a point or line. However, in most cases a larger number could be used.

Solution. $V = \frac{6}{6}\,(0 + 4 \times 45 + 120) = 300$ cubic feet. Supposing the coal were stove size, red ash anthracite, its weight would be 300×52.5, or 15,750 pounds. See table of *Weights of Various Substances.*

FORMULAS

An equation which expresses algebraically some arithmetical or scientific rule is called a **formula,** and the expression of this formula in words is called a rule. Since these formulas hold true for whatever numbers the letters represent, the process of evaluating the formula consists in substituting, for the letters of the formula, the quantities mentioned in the problem, using the same unit of measurement employed in the formula. Metric measures cannot always be used in formulas based on English units; for example, distances must be expressed in feet, inches, or meters, as the formula indicates. Oftentimes it is possible to combine all the constant figures into one coefficient, thereby greatly reducing the amount of computation. It should be noted that all formulas are in the algebraic form and that when two letters are placed together the sign of multiplication is implied.

Following is a list of some of the formulas used in the sciences, engineering, and business. The reader is referred to the preceding paragraphs for the relations of the various common figures and also to the article *Arithmetic.* If the formula does not express the factor desired, it should be algebraically transformed so that the desired factor stands on the left of the equality sign.

CONVERSION OF FAHRENHEIT AND CENTIGRADE TEMPERATURES

$$C = \tfrac{5}{9}\,(F - 32);\ F = \tfrac{9}{5}C + 32.$$

Problem. What is the equivalent of 68° Fahrenheit in degrees Centigrade?

Solution. $C = \frac{5}{9}\,(68 - 32) = \frac{5}{9} \times 36 = 20$. Therefore 20° Centigrade represents the same temperature as 68° Fahrenheit.

FALLING BODIES AND PROJECTILES

The following formulas are true for movement in a vacuum and approximately true for movement in air.

S = distance fallen in feet.
g = acceleration due to gravity, 32.16 feet per second per second.
t = time in seconds.
v = velocity in feet per second.
h = height to which a projectile will rise when given an initial velocity v.

$$S = \frac{gt^2}{2} = 16.08t^2. \quad (1)$$

$$v = gt = 32.16t. \quad (2)$$

$$h = \frac{v^2}{2g} = .01555v^2. \quad (3)$$

Problem. How long will it take a stone to fall a distance of 100 feet?

Solution. Since the time is the unknown factor, equation (1) must be transformed to read as follows:

$$t = \sqrt{\frac{S}{16.08}} = .249\,\sqrt{S}$$

$$= .249\,\sqrt{100} = 2.49 \text{ seconds.}$$

Problem. A baseball thrown vertically upward returns in 5 seconds. With what velocity did it start? How high did it rise?

Solution. The time required for the ball to rise to its highest position is exactly equal to the time it takes in falling back to the starting point. Consequently, the time of rising or falling equals one-half the total time, or 2.5 seconds.

From (2), $v = 32.16 \times 2.5 = 80.4$ ft. per second; from (3), $h = .01555 \times 80.4 \times 80.4 = 100.5$ feet.

HORSEPOWER OF AN ENGINE

The **indicated horsepower** of a reciprocating engine may be computed by use of the formula

$$\text{H. P.} = \frac{\text{PLAN}}{33{,}000},$$

where,

P = mean effective pressure in pounds per square inch,
A = area of piston in square inches,
L = length of stroke of engine in feet,
N = number of revolutions of the flywheel, (there are N double strokes, forward and back).

The **mean effective pressure** is obtained experimentally by use of a pressure indicator, and the number of revolutions are found by using a counting device. Pressure is produced by some expanding substance such as steam, or other vapor. An important source of pressure for operating an engine is the explosive mixture of air with vapor from gasoline which is used in an internal combustion engine. The mean effective pressure is a fictitious pressure which, if such a pressure were maintained constant throughout a stroke, would perform the same work as is done by the expanding substance during the stroke.

HORSEPOWER OF A STEAM ENGINE

Steam engines, like other engines, are used for generating power. Two types of steam engines are the reciprocating engine and the rotary engine, or turbine. The problem below will illustrate the use of the formula in computing the horsepower of a two-cylinder, double-acting, reciprocating engine.

Problem. What is the indicated horsepower of a two-cylinder, double-acting steam engine if the mean effective pressure for one cylinder is 72.4 lb./sq. in. for the head end ($P_h = 72.4$), and 71 lb./sq. in. for the crank end ($P_c = 71$), the crank is 18 in., the cylinder and piston-rod are respectively 12 in. and 2 in. in diameter, and the engine makes 90 rev./min.?

Solution.

Head end.

P_h = 72.4 lb./sq. in.
L = 3 ft. (stroke = double the crank length in feet).
A = $\pi \cdot 6^2 = 113.1$ sq. in. (area of piston).
N = 90 r.p.m. (strokes or revolutions per minute).

$$\text{H.P.} = \frac{72.4 \times 3 \times 113.1 \times 90}{33{,}000} = 66.9$$

Crank end.

P_c = 71 lb./sq. in.
L = 3 feet.
A = $\pi \cdot 6^2 - \pi \cdot 1^2 = \pi \cdot 35 = 109.956$
= 110 sq. in.
N = 90 r.p.m.

$$\text{H.P.} = \frac{71 \times 3 \times 110 \times 90}{33{,}000} = 63.9.$$

Each cylinder,
H.P. = 66.9 + 63.9 = 130.8.
Indicated horsepower for engine,
H.P. = 130.8 × 2 = 261.6.

HORSEPOWER OF A GAS ENGINE

To compute the horsepower of a gas engine is not quite as simple a problem as is the problem with a steam engine, as there are many more things to be considered. However, if the mean effective pressure, the piston area, the length of stroke, the number of cylinders, and the number of strokes per minute are known, then the general formula for horsepower may be used.

Some years ago the Society of Automotive Engineers (S.A.E.) adopted the following formula for horsepower of a gas engine.

$$\text{H.P.} = \frac{nd^2}{2.5} = 0.4\,nd^2,$$

where n = number of cylinders, and d = diameter of cylinder in inches.

This formula is used by some taxing authorities for computing the rated horsepower of gas engines. The horsepower as obtained by this formula is smaller than the actual indicated horsepower.

Problem. What is the rated horsepower of a four-cylinder automobile engine whose cylinders are 3.5 inches in diameter?

Solution. H. P. = $0.4 \times 4 \times 3.5 \times 3.5 = 19.6$.

CAPACITY OF A PIPE IN GALLONS

$C = 0.0408\,L\,D^2$, in which C = capacity in gallons, L = length in feet, D = diameter in inches.

Problem. How many gallons of water will be contained in a 2″ pipe line 300′ long?

Solution. $C = 0.0408 \times 2 \times 2 \times 300 = 48.96$ gal. (Reduction of feet to inches and other steps in the mensuration are included in the coefficient 0.0408).

RELATION OF WATER PRESSURE TO HEAD

$P = 0.433\,h$; $h = 2.31\,P$ where h = head, or vertical height in feet, of a column of water and P = pressure in pounds per square inch.

Problem. The level of the water in a house tank is 40 feet above a laundry tub faucet. What is the pressure in pounds per square inch at the faucet?

Solution. $P = 40 \times 0.433 = 17.32$ lb. per sq. in.

Problem. How high must a tank be placed above a laundry motor if the motor requires a pressure of 20 lb. per sq. in. to operate it?

Solution. $h = 2.31 \times 20 = 46.2$ ft.

CURVATURE OF THE EARTH AND VISIBILITY

The greatest distance from which an object, such as a ship, may be seen by a person who sights from sea level, depends on the height of the object and is expressed approximately by the formula

$$d = \sqrt{\frac{3h}{2}}, \text{ in which}$$

d = the distance of the object from the observer in miles and
h = the height of the object in feet.

Problem. A lightship carries a light 30 feet above the water. What is the greatest distance at which this light can be seen from a position on the shore at the water level?

Solution.

$$d = \sqrt{\frac{3 \times 30}{2}} = \sqrt{45} = 6.7 + \text{ miles.}$$

Used in another way, this formula will show the distance from an observer on the seashore to the *horizon*, or the point where the sky and the water seem to meet.

Problem. What is the distance to the horizon for a man whose eyes are 5½ feet above the sea level?

Solution.

$$d = \sqrt{\frac{3 \times 5.5}{2}} = \sqrt{8.25} = 2.87 \text{ miles.}$$

WIND PRESSURE

A stream of air in motion will exert a force upon any surface which it strikes. Engineers must be able

to estimate with reliable accuracy the force exerted by wind of various speeds upon fixed surfaces, such as buildings, bridges, radio towers, and other structures, and also upon moving surfaces such as automobiles and airplanes. The general formulas and computations are too complicated for inclusion here, but simple applications will be given.

The force exerted by wind upon a fixed or moving surface depends upon many factors, notably, the speed of the wind, the shape and size of the surface area subjected to wind pressure, and whether or not the surface is perpendicular to the direction of the wind, the density of the air, and the speed of the moving object.

If the moving air strikes perpendicularly against a plane surface so as to lose all of its velocity, a formula* for computing the approximate force exerted is

$$F = 1.28 \frac{\rho}{2} AV^2,$$

where F = force in pounds,
ρ = density of air in slugs per cubic foot,
A = surface area in square feet,
V = speed in miles per hour.

For standard air density this formula becomes

$$F = 1.28 \times \frac{0.002378}{2} \times A \times \left(\frac{88}{60}V\right)^2$$
$$= 0.00327\ AV^2,$$

and if A is taken as unity the value found for F will be in pounds per square foot.

Problem. An air stream flowing horizontally with a velocity of 45 miles per hour, strikes a vertical wall 9 ft. by 12 ft. in size. If atmosphere is normal density, what is the force acting against the wall?

Solution.

Using

$A = 9 \times 12 = 108$ sq. ft.,
$V = 45$ mi./hr.,

in the second formula above, we find,

$F = 0.00327 \times 108 \times 45 \times 45$
$= 715$ lb.,

which is approximately 6.6 pounds per square foot of the area.

From the formula it can be seen that the force on a flat surface area varies as the square of the air speed. If the force acting when the speed of a moving object relative to the speed of the wind is one mile per hour, then that at any other speed of the car can be found by multiplying by the square of the air speed (or speed of the object).

Problem. The force against an automobile windshield has been found to be 0.015 lb. when the car was moving forward at 1 mile per hour. What is the force when the car is traveling at 40 miles per hour?

Solution.

$F = 0.015 \times 40 \times 40$
$= 24$ lb.

The lift, or force, exerted on the wings of an airplane will determine whether the plane maintains horizontal flight or will gain or lose altitude. For horizontal flight (excepting for a few small components of thrust that need not be considered here) the weight of the airplane and the lift of the wings are equal. The airplane will rise if the lift is greater than the weight and fall if the weight is greater than the lift

For horizontal flight

$$W = L = C_L \frac{\rho}{2} SV^2,$$

where L is in pounds,
S is area in square feet,
V is speed in feet per second,
C_L is the lift coefficient.**

*See *Elements of Practical Aerodynamics* by Bradley Jones, John Wiley and Sons, Inc.

**The value of C_L for various angles of attack may be found in Jones, *Elements of Practical Aerodynamics.*

Problem. What weight can an airplane have to fly level with a Clark Y wing 300 sq. ft. in area, at 6° angle of attack, at 120 miles per hour?

Solution.

Substituting

$C_L = 0.79$,
$\rho = 0.00237$,
$S = 300$,
$V = 176$,

in the formula above for L or W we obtain

$$W = 0.79 \times \frac{0.00237}{2} \times 300 \times 176 \times 176$$
$$= 8699 \text{ lb.}$$

STATISTICAL CHARTS OR GRAPHS

In science, in business, and even in ordinary activities of life, one is frequently required to examine an extensive collection of data in an effort to discover significant facts. Important facts that could be overlooked by a competent statistician when reading data in tabular form, are often evident, even to an untrained mind, when the data are exhibited in an appropriate chart or graph. Ever since Rene Descartes (1596–1650) introduced coordinates, and through them the means of representing functions of variables graphically, mathematicians, and other scientists, have used graphs in studying the relations between variables. Graphical representations of related variables have played an important part in the development of the various branches of engineering, and, with the rapid development of the study of statistical methods and applications of statistics which has taken place in the present century, charts have been devised for use with data such as influences business activities. Today everyone should be familiar with one or more of the various charts, diagrams or other means used for exhibiting data graphically, because of the frequent appearance of such charts in daily papers, magazines, and technical journals.

An important use of a graphical representation of data is to enable an observer to make comparisons between different values of something that varies either with time or from object to object. A simple illustration of graphs for this purpose is the pictograph, a common example of which is the one showing the standing armies of several nations as soldiers of various heights. Since the height of each soldier is proportioned to the standing army of his country the sizes of standing armies may be readily compared. Pictographs are classified as one type of graph for exhibiting data. Graphs which are more appropriately classified as statistical charts include such charts as those which exhibit a patient's temperature at frequent intervals of time, or the hourly record of the steam pressure in a boiler, or the daily record of the price of iron, steel, or other commodity used in industry, or the record of the corn, or wheat, or other farm products, as varying between neighboring states.

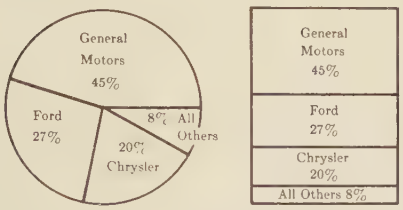
An additional important use of charts is as an aid in making an analysis of data so that predictions of future values may be made on the assumption that the pattern of variation will continue as in the past. In scientific studies many specific applications arise with which the investigator may use charts as aids in analyzing data. A time series chart, or line chart, is a statistical chart, which is often very useful for business executives. With this type of chart something which varies with time, either from hour to hour, day to day, month to month, or at some other interval of time (such as the price of stocks or production of pig iron), is plotted against time and the points are connected by straight or curved lines. Though a time series chart or graph seldom provides for accurate predictions, it is often useful in showing trends. These trends could serve as indices of business conditions and give some indication of what may be expected in the immediate future.

AREA GRAPHS

A circular area may be used to compare the relative sizes of each item of a set, or of any item with the total for the set, if the area of a circle (of any size radius) is divided into as many slices as there are items. The area of each slice must bear the same ratio to the area of the circle as the size of the item which it represents bears to the total for the set. Because of the obvious comparison with a pie such a chart is known as a *pie chart* or *pie graph*.

A report on the production of passenger automobiles gave approximately the figures of the table below. The percentage of the total number of cars which each manufacturer produced is shown in both the pie chart and the rectangular chart.

Manufacturer	Number of Cars
General Motors	1,460,000
Ford	880,000
Chrysler	650,000
All Others	260,000



Pie Graph Rectangular Graph

The size of a slice for the pie graph corresponding to any manufacturer's production may be obtained by using degrees and by taking the same percentage of 360° that the manufacturer's production figure is of the total productions. For example, the angle which corresponds to the output for General Motors is obtained by multiplying 360° by .45 and is 162°. This can be measured by using a protractor.

A **rectangular graph** is another one which may be used for comparing sizes of items of a set. The rectangular graph above shows (for the data which were used with the pie chart) various rectangles with the area of each having the same ratio to the area of the over-all rectangle that the number of cars produced by the indicated manufacturer bears to the total number of cars produced. The reader should note how readily comparisons can be made by using either graph.

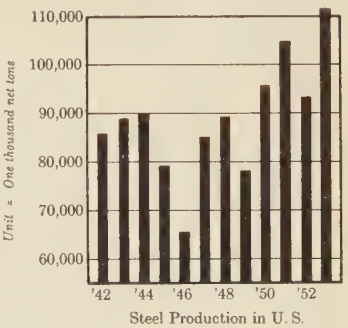
BAR GRAPHS

Bar graphs, with the bars either vertical, as in the graph shown, or horizontal, are used to indicate direct comparisons. The height, or length, of each bar is proportional to the size of the item which it represents. Sizes may correspond to money values, or to the number or weight of the items produced, or to any other significant measure, and may vary with time or from item to item of a set. Bar graphs are frequently used for making comparisons of various farm products; these may represent comparisons of quantities of a product, such as wheat, raised in each of several states in a particular section, or they may show a comparison of various farm products in one state. The graphs are also used in industry for making comparisons of such things as annual, or monthly, output of materials which are used in manufacturing, of the cost of labor, or the hours worked per week, or of numerous other variables which affect the cost of a manufactured item. Evidently, some of the comparisons which have been indicated as appropriate applications of bar graphs, could also be made by using a rectangular graph, and, if the number of items to be compared is small, a rectangular graph may be preferred. In the case of a bar graph the heights (or lengths) of the bars are used as the basis of comparison, whereas, with a rectangular graph, the areas are more often thought of in making comparisons.

The accompanying bar graph features the annual steel production in the United States during the years 1942 to 1953. The approximate amount of steel produced in each of these years is given in the table. The production for any particular year may be found from the graph by projecting from the top of the bar for that year and reading on the scale at the left. The reader should recognize how much more readily he can discover significant features through a glance at the graph than he can by a rigorous examination of the data in the table.

Table giving the approximate annual production of steel in the United States, in units of 1000 net tons.

Year	Units
1942	86,000
1943	88,800
1944	89,600
1945	79,700
1946	66,600
1947	84,900
1948	88,900
1949	78,000
1950	96,800
1951	105,000
1952	93,200
1953	112,000



LINE GRAPHS

Line graphs (also called **"time series graphs"** or **"time series curves"**) represent another useful means for showing graphically the relationship of one variable to another, or of showing the changes in one variable corresponding to changes in the other. In scientific applications the relationship between two variables is often expressible through an equation and the graph then becomes a smooth curve. However, in applications in business a line graph usually features the changes in some variable through successive periods of time, and the resulting line graph is seldom a smooth curve. These latter graphs may be used as a means of comparing changes in one variable as time changes, as with a patient's temperature chart, or they may serve to show a trend in the price of some commodity, such as steel. They may furnish the means of comparing the changes in two variables, as each varies with regard to time, by drawing a line graph of each of two variables on the same graph and with a common time scale. This last case is illustrated with the accompanying chart.

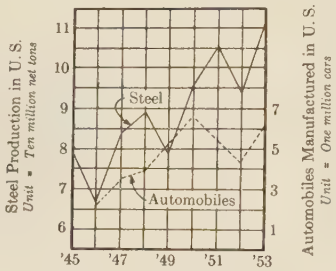
A simple conception of a line graph can be gained by thinking of placing a point at the top of each bar in a bar diagram, connecting these points by a straight line (sometimes a curved line may be used), and then erasing the bars.

A line graph for part of the data on steel production that were used with the bar graph is shown on the accompanying chart, which also includes a line graph for the data in the table for the approximate number of passenger automobiles produced during the years 1946 to 1953. Since automobile production was curtailed, and finally discontinued, during the war, the years 1946 to 1953 were chosen because the graphs would show significant relations between the production of steel and automobiles following the resumption of the manufacture of automobiles after the close of the World War II. Even a hasty examination of the graphs will enable an observer to see the general upward trend in the production of both steel and automobiles, and also that, with two exceptions (1949 and 1953), the production of each either increased or decreased together; facts which are much more readily identified from the graphs than they would be from an examination of the two tables.

Economists, and others who might be interested in discovering significant relationships between the two variable productions, would make a careful analysis in an effort to discover if the upward trend could be expected to continue, and to see why in 1949 steel production decreased while automobile production increased, whereas in 1951 the reverse was true. Factors which might be significant in the case of the discrepancies could be overproduction of one commodity during one year which made it necessary to decrease its production during the next year, or a crippling strike which affected one industry more seriously than it did the other. The important thing is that when the two line graphs have a common trend with a few contrary readings a careful analysis could be made to see what significance, if any, could be read from the common trends and the discrepancies in them.

Table giving the approximate number of passenger automobiles produced in the United States from 1946 to 1953.

Year	Number
1946	2,155,000
1947	3,555,000
1948	3,910,000
1949	5,128,000
1950	6,674,000
1951	5,338,000
1952	4,337,000
1953	6,133,000



Line Graphs, Steel and Automobile Production

PRACTICAL PROBLEMS

In this section are given formulas and directions for dealing with situations in everyday industry which call for special methods of measurement or computation.

HOW TO ESTIMATE WALLPAPER

All wallpaper is made in double rolls or bolts, 16 yards long and 18 inches wide. Under average conditions of matching and waste, a double roll will cover 60 square feet, and the number of double rolls needed may be found by dividing the total number of square feet to be papered by 60; the quotient will be the number of double rolls required. The price quoted for wallpaper is usually the price per single roll, and in buying paper the purchaser should note whether the advertised price is for a single or a double roll.

The following table will facilitate the estimating of the quantity of paper needed. Measure around all four walls with a rule or yardstick. Find the height of the room by measuring from the ceiling or molding to the baseboard or floor. The number of yards of border will be found by dividing the distance around the room in feet by 3. Do not use the table for the ceiling of a long hallway, but apply the rule stated above.

Distance around Room in Feet	Double Rolls of Side-wall Paper Necessary, according to Height of Room				Double Rolls of Ceiling Paper
	8 Ft.	9 Ft.	10 Ft.	12 Ft.	
30	3	3	4	4	1
33	3	4	4	5	2
36	4	4	4	5	2
39	4	4	5	6	2
42	4	5	5	6	2
45	5	5	6	7	3
48	5	6	6	7	3
51	5	6	7	8	3
54	5	6	7	8	3
57	6	7	7	9	4
60	6	7	8	9	4
63	7	7	8	10	4
66	7	8	9	10	5
69	7	8	9	11	5
72	7	8	9	11	6

In practice it is hardly worth while to compute the exact amount of paper that will be wasted in papering a room. A single illustration will show how the accompanying table was computed, average conditions of waste being considered.

Problem. How many rolls of paper will be required to paper the walls of a room 12 feet long by 9 feet wide by 9 feet high?

Solution. Perimeter of room = 9 + 9 + 12 + 12 = 42 feet; number of vertical strips required = 42 ÷ 1½ = 28; 28 strips each 9 feet long will require 28 × 9 = 252 feet, or 84 yards. The number of rolls required will be 84 ÷ 16 = 5¼ rolls. The allowance for openings will probably make the quantity given in the table a safe estimate of the number of rolls required for the walls. Since a double roll will cover 60 to 72 sq. ft., the ceiling, with an area of 9 × 12, or 108, sq. ft. will require more than 1 and less than 2 rolls. Hence 2 double rolls must be purchased, making a total of 7 rolls.

HOW TO ESTIMATE WOOD-LOT PRODUCTS

The products of the wood-lot may be cordwood, poles, piling, crossties, mine timbers, or lumber. They are sold in a number of different units. The amount may be measured in cords or in board feet; or it may be sold by the linear foot or pieces in the form of posts, piling, ties, or other products. In the latter case, the specifications of the purchaser will determine just which pieces fulfill the requirements. Some problems relating to the measurement of lumber are given below.

LUMBER

Specifications for lumber deal with quality and size, in addition to the kind of wood. Lumber is generally classified as select or common. Common lumber as used for house construction is graded as No. 1 Common, No. 2 Common, and No. 3 Common. There are numerous defects to which lumber is liable and these affect the quality. Lumber of good quality should have no defects due to growth; these include twists, large knots, shakes (split between annular rings), and decay. Defects due to manufacture, which include crook (curvature of the edges of lumber), cup (cross section of board becomes curved during seasoning), and roughness of surface, also affect the quality of lumber. The grading of common lumber depends upon the number or extent of the various defects that may be permissible.

By-Products. For every thousand feet of hardwood lumber, between two-thirds and three-fourths of a cord of wood may be cut from the tops. For every 10 ties, about 1 cord of wood may be cut from the tops. For every 10 poles, about 1 cord of wood may be cut from the tops.

LUMBER MEASURE

Rough lumber is usually sawed in thicknesses of 1 in., 1¼ in., 1½ in., 2 in., etc. Dressed stock is usually sold on a basis of the value of the rough material before it was dressed plus the cost of dressing.

Lumber is usually sold by the hundred (C) or thousand (M) feet, board measure.

A **board foot** is a square foot of lumber one inch or less in thickness. Thus, ⅞ in. and ¾ in. lumber is measured and priced the same as 1-inch lumber, but for thinner material, such as ½ in. and ⅜ in. stock, a reduced price is made. The number of feet, board measure, for 1¼ in. stock is 1¼ times that of an inch board.

Matched lumber, such as is used for flooring, sheathing, etc., is usually sold on the basis of the size in the rough. Thus, "flooring 4 in. wide" means that the rough lumber was 4 in. wide. The process of planing and matching this board has nar-

rowed its face to about 3¼ in., which is the width of floor such a board will cover. In estimating the quantity of lumber required for a floor, add ¼ to ⅓ of the area to be covered for narrow flooring (3 in. or less) and ⅙ for wider flooring.

To Find the Number of Board Feet in a Piece of Lumber 1 Inch or Less in Thickness.

Multiply the length in feet by the width in feet.

To Find the Number of Board Feet in a Piece of Lumber More Than 1 Inch in Thickness.

Multiply the length in feet by the width in feet by the thickness in inches.

Problem. How many board feet are there in 2 joists 15 ft. long, 8 in. wide, and 3 in. thick?

Solution.

Amount of lumber = $15 \times \frac{2}{3} \times 3 \times 2 = 60$ board feet.

Problem. What will be the quantity of lumber required to cover a floor 25′ × 32′ with 3″ matched boards? Allow 33⅓% for matching and 5% for waste in cutting.

Solution. Total waste is 38⅓%. Area to be covered = 25 × 32 = 800 sq. ft. Waste = 800 × .38⅓ = 306⅔ sq. ft. Equivalent area in rough lumber (800 + 306⅔) × 1 = 1106⅔ board feet, or approximately 1100 board feet.

Problem. How many feet, board measure, are there in a stick of timber 32 ft. long, 8 in. thick, 12 in. wide at one end, and 9 in. wide at the other end?

Solution. Average width = $\frac{12 + 9}{2}$ = 10½ in.

$32 \times \frac{8}{12} \times 10\frac{1}{2} = 224$ board feet.

LATHING AND PLASTERING

Plastering is usually computed by the square yard, and estimates for plastering, which may include the lathing, are figured to the nearest square yard. The allowance for openings depends on the size of the opening and the character of the work. Some contractors make no deductions for openings, and some make no deductions for openings less than two feet wide; for openings more than two feet wide a deduction varying from 50% to 100% of the area of the openings is made.

The regular size of lath is ¼ in. × 1½ in. × 4 ft. Laths are sold by the thousand (M) and are put up in bundles containing 100 laths. It requires 1400 to 1500 such laths and 10 lb. of 3-penny nails fo 100 sq. yd.

The quantity of cement or hard wall plaster, mixed 2 parts of sand to 1 part of plaster, required to cover 100 sq. yd. of wood lath varies from 10 to 12 100-pound sacks. The white finish (putty coat) will require 1½ barrels of lime and 200 lb. plaster for each 100 square yards of surface.

Problem. Find the amount of material required to lath and plaster a room 10 ft. wide, 14 ft. long, and 9 ft. high, making no allowances for openings.

Solution.

Distance around room = 10 + 14 + 10 + 14 = 48 ft.

Area of walls = 48 × 9 = 432 sq. ft.

Area of ceiling = 10 × 14 = 140 sq. ft.

Total area = 572 sq. ft. = 63⅝, or 64, sq. yd.

The material ordered will be 64% of that required for 100 sq. yd., as given above, or 10 bundles of lath, 7 lb. of 3-penny nails, 8 sacks of hard plaster, 1 bbl. of lime, 125 lbs. of finishing plaster, and 1 cu. yd. of sand.

ESTIMATING CONCRETE

The methods of using concrete and the proper proportion of cement, sand, and stone to be employed in preparing concrete for definite purposes are explained in the article on *Concrete*.

When calculating the amount of materials required for a certain piece of concrete work, the first step is to compute the total cubic space to be filled. Secondly, decide on the proper mixture to be used. (See *Concrete*.) Thirdly, by means of the table, ascertain the exact quantities of materials that will be needed.

This table shows the amount of cement, sand, and stone required to make 1 cu. yd., or 27 cu. ft., of concrete.

MATERIALS REQUIRED TO MAKE ONE CUBIC YARD OF CONCRETE

Mixture	Quantity of Materials		
	Cement (in sacks)	Sand (cu. ft.)	Stone or Gravel (cu. ft.)
1–1½	15.5	23.2	
1–2	12.8	25.6	
1–3	9.6	28.8	
1–1½–3	7.6	11.4	22.8
1–2 –3	7.0	14.0	21.0
1–2 –4	6.0	12.0	24.0
1–2½–4	5.6	14.0	22.4
1–2½–5	5.0	12.5	25.0
1–3 –5	4.6	13.8	23.0

Problem. What quantities of materials will be required to build a one-layer concrete floor, 30 ft. long, 24 ft. wide, and 5 in. thick?

Solution.

Volume to be filled = $30 \times 24 \times \frac{5}{12} = 300$ cu. ft. = $\frac{300}{27}$, or 11⅑, cu. yd.

Reference to the article on *Concrete* shows that such a floor should be composed of a 1 – 2 – 3 mixture. As shown by the table, 1 cu. yd. of this mixture would require 7 bags of cement.

Cement required = 7 × 11⅑ = 78 bags.

Sand required = 14 × 11⅑ = 156 cu. ft.

Gravel required = 21 × 11⅑ = 233 cu. ft., or 26 cu. yd.

It will be noticed that the results are expressed in integers, although if multiplied exactly the values would be 77⅞, 155⅝, and 233⅜. The values given are sufficiently accurate for practical purposes because, for example, an even greater error in the volume might be occasioned by a slight difference in the amount of water used to wet the mixture.

Problem. A man who has 8 bags of cement wishes to make concrete fence posts 8 ft. long and tapering evenly from 5 × 5 inches at the bottom to 3 × 3 inches at the top. How many posts can he make? How much sand and gravel will he need?

Solution.

Average thickness of posts = $\frac{5 + 3}{2}$ = 4 in., or ⅓ ft.

Volume of each post = ⅓ × ⅓ × 8 = ⅘ cu. ft.

From the article on *Concrete*, it is seen that fence posts are best made from a 1 – 2 – 3 mixture. The table shows that 1 bag of cement will make 3.9 cu. ft. of this mixture.

Volume of mixture obtainable from 8 bags of cement = 3.9 × 8 = 31.2 cu. ft.

Number of posts = 31.2 ÷ ⅘ = 35.

Sand required = 2 × 8 = 16 cu. ft.

Gravel required = 3 × 8 = 24 cu. ft.

HOW TO DETERMINE THE WEIGHT OF AN IRON OR STEEL BAR

To problems of this character, either of the following methods may be applied:

(1) An iron or steel bar 1 inch square and 12 inches long weighs 3.4 lb. Hence the weight of any iron or steel bar will be found by multiplying the area of its cross section by 3.4 and multiplying this result by the length of the bar in feet.

(2) An iron or steel bar has a weight of 0.283 lb. per cu. in. Hence, to determine the weight of such a bar, multiply its volume in cubic inches by 0.283.

Problem. What is the weight of a round steel bar ¾″ in diameter and 7 feet, 6 inches long?

Solution (1).

Area of cross section =
0.75 × 0.75 × 0.7854 = 0.442 sq. in.
Weight of given bar 1 foot long =
0.442 × 3.4 = 1.50 lb.
Weight of given bar 7.5 feet long =
1.50 × 7.5 = 11.25 lb., or 11 lb., 4 oz.

Solution (2).

7 ft., 6 in. = 90 in.
Area of cross section =
0.75 × 0.75 × .7854 = .442 sq. in.
Volume = 90 × .442 = 39.78 cu. in.
Weight = 39.78 × 0.283 = 11.25 lb.

Problem. What is the weight of a steel bar whose dimensions are ¼″ × 1¼″ × 8′9″?

Solution. Weight = 0.25 × 1.25 × 3.4 × 8.75 = 9.3 lb. = 9 lb., 5 oz., nearly.

HOW TO DETERMINE THE CAPACITY OF A COAL BIN

Problem. A coal bin 8 feet, 6 inches long and 5 feet, 10 inches wide is filled to an average depth of 5 feet, 9 inches with white ash anthracite coal of nut size. The dealer claims to have delivered 8 tons of coal. Check the accuracy of this statement.

Solution. Change all dimensions to feet and decimals of a foot. Consult conversion table *Inches Reduced to Decimals of a Foot*, if necessary. Consult table *Weights of Various Substances* for the weight of nut size white ash anthracite coal. Proceed as follows:

Area of the bottom =
8.5 × 5.83 = 49.6 sq. ft.
Volume of coal =
49.6 × 5.75 = 285.2 cu. ft.
Weight of coal =
285.2 × 55.5 = 15,829 lb.

This seems to be about 171 pounds short of the supposed weight. To determine how high the bin should have been filled, compute the weight of coal per foot of vertical height.

Weight of coal per vertical foot =
49.6 × 55.5 = 2753 pounds.
Error in height =
171 ÷ 2753 = 0.06 + feet, or about ¾ inch.

This amount clearly might have been an error in measurement, and the weight has been checked as closely as a volume measurement will do it.

Problem. It is desired to store 10 tons of red ash anthracite coal of stove size in a cellar having an available height of 6 feet. How large a bin must be built?

Solution. Weight of a column of red ash anthracite coal 1 foot square and 6 feet high = 1 × 1 × 6 × 52.5 = 315 pounds. The bottom of the bin must have an area of 20,000 ÷ 315 = 63.5 square feet. A bin 8 feet square will hold the required amount of coal. If one dimension is fixed by the location, the other dimension may be found by dividing 63.5 by the fixed dimension.

HOW TO DETERMINE THE CAPACITY OF CIRCULAR TANKS

Problem. Find the capacity per foot of height of a cylindrical tank made of 1½ inch material with an outside circumference of 17 ft., 3½ in.

Solution.

Circumference = 17.292 ft.
External diameter = 17.292 ÷ 3.1416 = 17.292 × 0.318 = 5.50 ft.
Internal diameter = 5.50 − .125 × 2 = 5.25 ft.
Area of base = 0.7854 × 5.25 × 5.25 = 21.648 sq. ft.
Volume for 1 ft. of depth = 21.648 cu. ft.
Capacity for 1 ft. of depth = 21.648 × 7.48 = 161.9 gal.

HOW TO LAY OUT A BASEBALL DIAMOND

The four bases of a ball field mark the four corners of a 90-foot square. The official rule books give explicit directions as to the amount of fair territory and other situations needed, but for impromptu games and outings the following method is sufficient. According to the article on the *Square*, the diagonal of a square is 1.414 *s*, where *s* = one side of the square. Therefore, the distance from "first" to "third" is 1.414 × 90, or 127.26 (127 ft., 3 in.). Secure a cord or rope over 180 feet in length. Knot or otherwise mark the cord at the following distances from one end: 60 feet, 6 inches; 90 feet; 127 feet, 3 inches; 180 feet.

Select for the home plate a location as favorable as possible to the fielders' eyes, and there drive a peg. Attach one end of the cord to the peg and then proceed to lay out in line the pitcher's slab at 60 feet, 6 inches and second base at 127 feet, 3 inches. Attach the 180-foot point at second base, leaving the other end still fastened at "home." Now grasp the line at the 90-foot point, and then, proceeding to the right of "home" until the cord is taut, mark the location of first base. In a similar manner, proceeding across the "diamond" to the left of "home," locate third base. For boys under 16 years of age, the following modifications are recommended: distance between bases, 82 feet; home plate to second base, 116 feet (115.94 exactly); home plate to pitcher's slab, 50 feet.

CHAIN SURVEYING

The old-fashioned surveyor's chain has been practically supplanted by the steel tape. The term chain is still in use, and the men who do the measuring are called chainmen. The term chain surveying as here used applies only to surveys done without the use of instruments to measure angles or to determine magnetic bearings. The accurate survey of a large tract of land, however, cannot be made without the use of surveying instruments and without the aid of a skilled surveyor.

Methods. A preliminary rough sketch of the field should be made, showing the approximate relative dimensions. Keeping in mind the lay of the land, divide the tract into a number of triangles as shown in the sketch below and mark all corners with stakes.

Many of the common errors of measurement occur for the following reasons:

1. The tape is not held in a horizontal position. All distances must be measured on a horizontal line. If the tape is not held level, the measurement will exceed the actual distance.

2. The tape is not held with a proper and constant tension.

3. The plumb bobs are too light.

4. The number of tape lengths are not carefully counted.

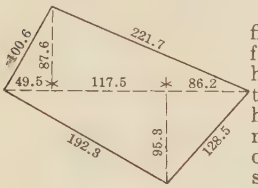
The plumb bobs are used to transfer the measurement from the horizontal tape to the ground. With the foot a small spot on the ground is smoothed in order to receive a clear impression of the bob, which must not be allowed to swing. This spot is then marked with a chalk mark, nail, or pin.

Measure all sides of the tract and all of the diagonals or tie lines. If the figure is thought to be a rectangle, measure both diagonals; if they are equal, the figure is a rectangle. The methods of computing the areas of plane figures are given in the section on *Mensuration of Plane Surfaces*.

It is usually best to divide the figure, as previously suggested, into triangles by tie lines. The computation of the area of a triangle when the three sides are known is a tedious process. It is therefore advisable

to drive a stake on each line to establish the perpendicular height of the triangle and to compute the area according to the simpler formula. If the distances are measured in feet and inches, reduce all measurements to feet and decimals of a foot. See table *Inches Reduced to Decimals of a Foot.*

COMPUTATION OF THE AREA OF A FIELD



A possible four-sided figure is shown here. The four sides and the diagonal have been measured, and the perpendiculars also have been staked and measured. Two methods of computing the areas are shown—one with and one without the perpendiculars.

Using the formula $A = \frac{bh}{2}$, where $b = 49.5 + 117.5 + 86.2 = 253.2$ and $h = 87.6$ or 95.3, we have, as the area of the upper triangle, $253.2 \times 87.6 \div 2 = 11{,}090$ sq. ft. and, as the area of the lower triangle, $253.2 \times 95.3 \div 2 = 12{,}065$ sq. ft. The total area then is $11{,}090 + 12{,}065 = 23{,}155$ sq. ft. To reduce this area to acres divide the total area by 43,560. We thus obtain for the area 0.531 acres, or, as usually stated on maps, $\frac{531}{1000}A$.

Using the formula $A = \sqrt{S(S-a)(S-b)(S-c)}$, where S is half the sum of the three sides, and solving by the use of logarithms, we proceed as follows:

Upper Triangle

		Factor	Logarithm
a	= 100.6.	$S - a$ = 187.15.	2.2722
b	= 221.7.	$S - b$ = 66.05.	1.8199
c	= 253.2.	$S - c$ = 34.55.	1.5385
	2)575.5	S = 287.75.	2.4590
S	= 287.75.		2)8.0896
			4.0448

4.0448 is log A. Therefore A = 11,087 sq. ft.

Lower Triangle

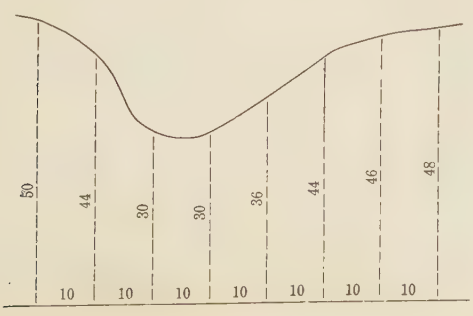
		Factor	Logarithm
a	= 128.5.	$S - a$ = 158.5.	2.2001
b	= 192.3.	$S - b$ = 94.7.	1.9763
c	= 253.2.	$S - c$ = 33.8.	1.5289
	2)574.0	S = 287.0.	2.4579
S	= 287.0.		2)8.1632
			4.0816

4.0816 is log A. Therefore A = 12,067 sq. ft. and the total area = 11,087 + 12,067 = 23.154 sq. ft., which checks the former computation.

SURVEY OF IRREGULAR TRACT

The area of an irregular piece of ground, such as a tract of land bounded on one side by a curved and irregular line marked by a stream of water, may be computed by the mid-ordinate r le as follows:

Divide the plot preferably into a series of strips of equal width, as shown. Measure the width of each strip and the length of each figure. The area of each trapezoidal figure will be the width of each strip multiplied by the average of the parallel dimensions.



The middle lengths are $\frac{50+44}{2} = 47$, $\frac{44+30}{2} = 37$, $\frac{30+30}{2} = 30$, $\frac{30+36}{2} = 33$, $\frac{36+44}{2} = 40$, $\frac{44+46}{2} = 45$, $\frac{46+48}{2} = 47$; and the area = $10\,(47 + 37 + 30 + 33 + 40 + 45 + 47) = 2790$ sq. ft.

Or, using the trapezoidal rule as given in the article on *Trapezoid*, the area is computed as follows: $(25 + 44 + 30 + 30 + 36 + 44 + 46 + 24) \times 10 = 279 \times 10 = 2790$ sq. ft.

LEVELING

Many small local improvements depend for their execution upon a determination of the difference of elevation between two or more points. To do this within certain rough limits demands an improvised leveling instrument and the ability to add and subtract.

A vertical line is a line that points to the center of the earth. A level line is a line parallel to the surface of still water, which is a curved surface. A level line as determined by a leveling instrument is at right angles to a vertical line. It is a straight line tangent to the earth's surface and follows the level line so closely that the small error is ordinarily neglected.

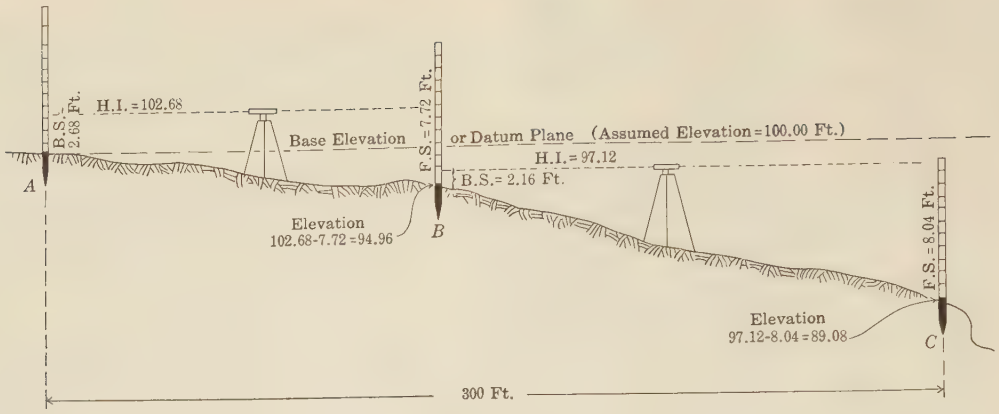
Leveling Instruments. There are many kinds of leveling instruments, varying from the engineer's instrument to a simple water level. A carpenter's spirit level may be fitted with sights and mounted on a driven stake, on a tripod, or supported by some other improvised means; a long rubber tube, free from kinks, fitted with glass tubes and filled with water, makes a good device for short distances; a float, fitted with sights and placed in a pail of water, may serve the purpose. There are also moderately priced leveling instruments on the market. A measuring pole with some kind of movable sighting target must be provided.

Whatever kind of instrument is used, it must answer one test, which may be performed as follows: A nail is driven into a pole. By means of the leveling instrument, a line is sighted across the nail to another pole some distance away. The intersection of the line on the distant pole is marked with a second nail. The instrument is now moved beyond the second pole, and the line is sighted in the reverse direction. If both nails are still on the line, the instrument is correct. If not, a third nail is driven above or below the first, to mark the second line. A line connecting the second nail with a point midway between the first and the third is level, and the instrument must be adjusted to "line up" with the corrected points. A level that will not reverse correctly should not be used.

Process of Leveling. In most cases the elevation of the starting point is unknown, and it is usually assumed at some figure sufficiently large to obviate the necessity of using minus numbers. The process of leveling is illustrated by the accompanying diagram.

H. I. means height of the instrument; F. S. means foresight; B. S. means back sight. We add 2.68 to the starting elevation to find the first H. I. We subtract 7.72 from this H. I. to find the elevation of the second point. We add 2.16 to this second elevation to find the second H. I. We subtract 8.04 from the second H. I. to find the elevation of the th rd point. This operation may be repeated for any number of points. From the differences of elevation the proper system of grades is planned.

In order that the fall may be uniform, it is necessary to measure the distance between the stakes. By dividing the total fall by the total distance, the fall per foot or per hundred feet may be determined.



This procedure may be illustrated as follows: A ditch drops 4′ 10″ in 460′. 4′ 10″ = 4.83′. 4.83′ ÷ 460′ = 0.0105+. The fall is 0.0105′ per foot or 1.05′ per 100′. 1.05′ = 1′ 0-5/8″. See table *Decimal Equivalents*.

WEIGHTS AND MEASURES

Accurate and definite standards of weight, measure, and value are an absolute necessity of modern science, commerce, and industry. Rough standards of weights and measures have been in use since man first began to have commercial relations with his fellows, the only essential requirement being that all persons of a given locality should comprehend the amounts represented.

Originally, an acre meant the amount of land that a man with a yoke of oxen could plow in one day; the total length of the left feet of sixteen men selected at random constituted a legal rod; and a fathom was the distance between the middle finger tips of a man's outstretched hands. The extension of commerce created a need for much more accurate methods of measurement. As a result, each nation gradually established legal standards for use within its own boundaries.

With the great development of science, of modern mechanical methods of production, and of rapid universal transportation and communication, the degree of accuracy required even for ordinary measurements had a corresponding increase. An error of an inch made in measuring a piece of land in New York City might result in *a difference in value* greater than that of an entire prairie farm. Many of the interchangeable parts of modern machines must not vary in size by so much as the thousandth part of an inch. This necessary uniformity is assured by having definite standards and methods of weighing and measuring.

The two principal modern systems of weights and measures are the English system, based on the standard yard and the standard avoirdupois pound, and the metric system, based on the meter and the kilogram. Values expressed in either system may be converted into the other by means of the table of equivalents given below. It should be remembered that no measurement is absolutely accurate; but scientific methods are so exact that, should the standard meter and the yard be destroyed, they could be replaced within one ten-millionth of their present values.

STATISTICAL QUALITY CONTROL

The increase in the requirements for accuracy, as indicated above, caused the modern manufacturer to become more aware of the necessity of controlling the quality of his product, and more interested in methods for doing so. The best method that has been devised for controlling the quality of a manufactured item is one that makes an application of statistical methods. This is known as **"Quality Control by Statistical Methods,"** and is commonly abbreviated as **"Statistical Quality Control,"** and designated by **"S. Q. C."**

DICTIONARY OF WEIGHTS AND MEASURES

Acre. (*A.*) A measure of surface area of land. The U. S. and the English acre are the same; each contains 160 sq. rds., or 4840 sq. yds. A Scotch acre is .27 larger and an Irish acre is .62 larger.

Acre Foot. The volume required to cover an acre 1 foot deep: 43,560 cu. ft., or 325,851 U. S. gallons of water.

Are. (*a*) Meaning "area." A land measure 10 meters (about 33 ft.) square.

Astronomical Unit. The average distance of the earth from the sun: 92.9 million miles.

Avoirdupois Weight. From the French *avoir-de-pois*, "goods of weight." The name of the system of weights generally applied in Great Britain and in the United States to all goods except precious metals, precious stones, and medicines.

Bale. A large compressed bundle or package fastened with cords, wire, or straps. The approximate weight of a bale of cotton is 500 pounds gross.

Barleycorn. The length of a grain of barley; 1/3 inch Survives only in *shoe sizes*, which increase from 4 inches, by barleycorns, in series of 13's. For example: "Youth's size 12" equals 4 + 12/3 = 8 inches long. "Adult size 8" equals 4 + 13/3 + 8/3 = 11 inches.

Barrel. (*bbl.*) The size of this unit varies greatly. A barrel for fruits and dry commodities in the United States must contain 7056 cu. in. A liquid barrel is usually considered as 31½ gal. A barrel of flour weighs 196 pounds net; petroleum is measured by the barrel of 42 gallons.

Board Foot. (*bd. ft.*) The contents of a board 144 square inches on the surface and 1 inch thick. Lumber is usually sold by the thousand board feet.

Bushel. (*bu.*) The U. S. bushel is based on the Winchester bushel of 2150.42 cu. in., while the Imperial bushel of Canada and Great Britain equals 8 Imperial gallons, or 2218.192 cu. in. The amount delivered from a *heaped bushel* is usually considered as 1¼ *struck bushels*. A struck bushel consists of a bushel measure filled to the rim. A heaped bushel consists of a struck bushel on which the commodity is piled in the form of a cone, as high as the nature of the article will naturally permit. Because of the great chance for error, the legal weight of a bushel of most commodities is now generally fixed by statute. See table of *Legal Weights per Bushel*.

Carat. (*c.*) (1) A small unit of weight used for weighing precious stones. Originally a seed of the Abyssinian coral tree or of the carob tree of the Mediterranean region. On

July 1, 1913, the international metric carat of *200 milligrams*, equivalent to 3.086 grains, was made official in the United States. (2) A term used to indicate the fineness of gold. Pure gold is said to be 24 carat fine. Therefore, 18 carat gold contains 18 parts of pure gold together with 6 parts of some other metal or metals.

Catty. A Chinese weight of 1⅓ pounds. A *tea caddy* was originally a box or canister containing a catty of tea.

Cental. 100 pounds avoirdupois, or a short hundredweight.

Centare. (*ca*) 1 square meter. About 1⅕ square yards, or 10.7643 sq. ft.

Centimeter. (*cm*) About ⅖ inch. 1 inch = 2.54 cm.

Chain. (*ch.*) The 66-foot surveyor's chain, legal in the United States, has 100 links, each of 7.92 inches. The engineer's chain has 100 one-foot links.

Cord. (*cd.*) A measure of wood equal to a pile 4 ft. high, 4 ft. wide, and 8 ft. long. A *cord foot* is a pile 4× 4×1 feet. A cord of masonry usually contains 100 cu. ft.

Dekaliter. (*dkl*) A metric unit of capacity equal to 10 liters, or about .9 U. S. pecks.

Drop. A convenient unit for practical use, although it varies greatly with the liquid and with the method of dropping. It corresponds roughly to a minim.

Ell. A measure, chiefly for cloth, now rarely used. It varies from 27 to 48 inches in different countries. The English ell = 1¼ yards, or ⅛₂ bolt.

Firkin. A wooden, hooped container for butter, lard, etc. A standard Danish firkin of butter weighs 50 kilograms. In British liquid measure, a firkin is 9 gal.

Foot. A measure of length which is one third of a yard, or twelve inches. It was derived from the length of the human foot. It is designated by *ft.* or by the symbol ′. One foot is equal to 30.480 cm.

Gallon. (*gal.*) The British Imperial gallon equals the volume of 10 lbs. of water at 62° F., or 277.274 cu. in., and is 20% larger than the standard U. S. gallon of 231 cu. in. In some states a dry gallon and a milk gallon of 282 cu. in. are in use. A proof gallon contains a gallon of proof spirit.

Grain. (*gr.*) A small unit which has the same value in the troy, apothecaries', and avoirdupois systems: .0648 gram.

Gram. (*g*) The metric unit generally used to express ordinary weights of less than 1 kilogram. It is equal to 15.4324 grains. 28.35 g = 1 oz. avoir.

Hand. A measure of 4 inches; used chiefly in measuring the height of horses.

Hank. Used in measuring yarn. A hank of cotton yarn contains 840 yards, of worsted yarn 560 yards, and of linen yarn 3000 yards. A hank of linen yarn consists of 10 *leas* of 300 yards each. The Scottish hank contains 12 leas. Other lengths also are used.

Hectare. (*ha*) A unit of area used similarly to the English acre: 100 meters square or 10,000 square meters (m^2), about 2½ acres (2.471).

Hectoliter. (*hl*) A metric measure of capacity equal to 100 liters, or 26.418 U. S. gal.; about ⅘ bbl. dry, or ⅝ bbl. liquid.

Hundredweight. (*cwt.*) Commonly 1⁄20 long ton, or 112 lb. avoir. A short cwt. = 100 lb.

Inch. A unit of length which is the twelfth part of a fool. It is designated by *in.* or by the symbol ″. One inch is equal to 2.54 cm.

Kilogram. (*kg*) The fundamental standard of weight in the United States; equal to 2.20462 lb. avoir.

Kilometer. (*km*) The metric unit of distance corresponding to the English mile; 1000 meters; ⅝ (.62137) mile.

Knot. The only unit of speed in the English language. *Ten knots* means a speed of 10 nautical miles per hour. A nautical mile is 6080.27 feet in the United States and 6080 feet in Great Britain.

Libra. The "pound" weight of Spain, Portugal, and the Latin American countries. Equal to about 1.016 lb. avoir.

Line. (*l.*) A small unit of length equal to: (1) 1⁄12 inch. (2) Button measure, 1⁄40 inch.

Liter. (*l*) The metric unit of capacity, both of liquid and of dry measure. It is equal to 1.0567 liquid qt., which is the volume of 1 kilogram of water at 4° C. This is 1.000027 times the volume of 1000 cubic centimeters.

Meter. (*m*) The fundamental standard of length in the United States and in almost all civilized countries outside of the British Empire. It is equivalent to 39.37 inches, or about 1 1⁄11 yards.

Metrology. The branch of science which is concerned with weights and measures; also a system of weights and measures.

Mil. (1) A measure equal to .001 inch. The *circular mil*, used to express the area of the cross section of electrical conductors, is equal to the area of a circle 1 mil in diameter. A wire *1 inch* in diameter has a cross section of 1,000,000 circular mils.

(2) An angular measure used by artillerists. It is the angle subtended by a single unit at a distance of a thousand units.

Mile. (*mi.*) From the Latin *mille passuum*, or "1000 paces." As the Roman pace was a double step, the mile became a unit of about 5000 feet. The length of a mile used in different European countries has varied from about ⅔ U. S. mile, in Holland, to 7 U. S. miles, in Norway. The geographical, or nautical, mile is defined as 1 minute of the arc of a great circle of a sphere having a surface equal to that of the earth. One statute mile = 5280 ft.

Milliliter. (*ml*) .001 liter. This unit is slightly (.000027) larger than the cubic centimeter. Consequently, in accurate work the abbreviation *cc*, or cm^3, for cubic centimeter is incorrectly used when substituted for *ml*. This measure is usually referred to as a *mil*.

Miner's Inch. The amount of water which will flow from an opening 1 inch square at a pressure usually fixed by state laws. The unit varies, but it is about 1.5 cubic feet per minute.

Minim. (*min.*) Approximately 1 drop; 1⁄60 fluid dram.

Ounce. (*oz.*) One oz. avoir. = 437.5 grains, or 28.35 grams. One oz. troy or apoth. = 480 grains, or 31.1 grams.

Perch. A unit having various meanings: (1) One rod. (2) One sq. rod. (3) In stonework, about 25 cu. ft., often 16½ × 1½ × 1 ft.

Pig. A British weight: 301 lb. of lead; 2½ lb. of hemp; 60 lb. of salt.

Point. (1) One of the 32 principal divisions of the compass: equal to 11¼°. (2) In type founding, an arbitrary unit, .0138, or practically 1⁄72 inch, used to designate the size of type. Printing done with 6-point type will have 12 lines per inch; with 12-point, 6 lines per inch.

Pood. A Russian weight: 36.1128 lb.

Pound. (*lb.*) One pound avoir. = 453.5924277 grams. The pound troy, 373.24177 grams, was legalized in 1828 as the standard unit to be used by the U. S. mint. In practice, however, weights of precious metals are always expressed in troy ounces. The troy pound was declared illegal in England in 1878.

Puncheon. A large cask holding from 72 to 120 gallons.

Second Foot. A flow of water equal to 7.48 U. S. gallons per second, or 1.98347 acre feet per day.

Shoemaker's Sizes. See *Barleycorn*.

Skein. A variable quantity of reeled yarn or thread. A skein of woolen yarn equals 256 yds. A skein of cotton yarn is equal to 80 turns on a reel 1½ yds. in circumference. It is 120 yards, or 1⁄7 hank.

Square. A surface 10 feet square, or 100 sq. ft. of flooring, ceiling, or roofing.

Ton. (*t.*) A variable unit, of which the *short* or *net ton* of 2000 lbs., the *long ton* of 2240 lbs., and the *metric ton* of 2204.6 lbs. are most common. Others are: *shipping ton*, calculated as 40 cubic feet; *displacement ton*, equal to 35 cubic feet of water displaced by a vessel; *register ton*, 100 cubic feet of a ship's volume; *gross ore ton* of 2688 lbs., to allow for sand in the ore; *timber ton* of 42 cubic feet. An *assay ton* contains 29.166 grams because the number of milligrams of gold or silver obtained from a sample of this size represents the number of troy ounces of the metal contained in a short ton of the ore. The customary abbreviation of ton is *t.*; but in scientific usage the abbreviation *t* represents a metric ton and *tn.* represents a short ton.

Tun. A liquid ton; a large cask for holding wine or other liquids, nominally 8 bbl., or 252 gal., but often much larger.

Verst. A Russian measure of distance: ⅔ mile, or 1.06 kilometers.

Yard. (*yd.*) A legal measure of length in the United States and one of the two fundamental units of length in the British Empire. In the United States, the yard = $\frac{3600}{3937}$, or .9144018, meters and is consequently very slightly longer than the British Imperial yard, which = .9143835 meters. According to legend, the original English yard was established by King Henry I as the extreme distance from the point of his nose to the end of his thumb.

TABLES OF WEIGHTS AND MEASURES

LINEAR MEASURE

Used for measuring distances.

12 inches (″) = 1 foot (*ft.*, ′).
3 feet = 1 yard (*yd.*).
5½ yards, 16½ feet = 1 rod (*rd.*), perch, or pole.
40 rods, 660 feet = 1 furlong (*fur.*).
8 furlongs, 1760 yards, 5280 feet = 1 statute mile (*mi.*).
3 miles = 1 league (*lea.*).
3 barleycorns, 12 lines, 72 points, 1000 mils = 1 inch (*in.*).
2¼ inches = 1 nail.
3 inches = 1 palm.
4 inches = 1 hand.
9 inches = 1 span.
18 inches = 1 cubit.
40 yards = 1 bolt (cloth).
2½ feet = 1 military pace.
5 feet = 1 geometrical pace.

SQUARE MEASURE

Used for computing areas.

144 square inches = 1 square foot (*sq. ft.*).
9 square feet = 1 square yard (*sq. yd.*).
30¼ square yards = 1 square rod (*sq. rd.*) or perch.
160 square rods = 1 acre (*A.*).
640 acres = 1 square mile (*sq. mi.*).

CUBIC MEASURE

Employed for computing volumes.

1728 cubic inches = 1 cubic foot (*cu. ft.*).
27 cubic feet = 1 cubic yard (*cu. yd.*).
144 cubic inches = 1 board foot (*bd. ft.*).
128 cubic feet = 1 cord (*cd.*).
40 cubic feet, merchandise = 1 shipping ton.

SURVEYORS' LINEAR MEASURE

Commonly employed by surveyors in measuring land.

7.92 inches = 1 link (*l.*).
625 links = 1 rod (*rd.*).
4 rods, 66 feet, 100 links = 1 chain (*ch.*).
80 chains = 1 mile (*mi.*).

SURVEYORS' SQUARE MEASURE

Used by surveyors in computing the area of land.

625 square links = 1 square rod (*sq. rd.*).
16 square rods = 1 square chain (*sq. ch.*).
10 square chains = 1 acre (*A.*).
640 acres = 1 square mile (*sq. mi.*).
36 square miles (6 miles square) = 1 township (*tp.*).

NAUTICAL MEASURE

Used for expressing distances on the sea.

6 feet = 1 fathom.
120 fathoms = 1 cable's length.
6080.27 feet, 1.1516 statute miles = 1 nautical, or geographic, mile.
3 nautical miles = 1 league (marine).
1 nautical mile *per hour* = 1 knot (speed).

CIRCULAR MEASURE

Used in astronomy, navigation, engineering, and wherever angles or arcs of circles must be measured.

60 seconds (60″) = 1 minute (1′).
60 minutes = 1 degree (1°).
90 degrees = 1 quadrant.
4 quadrants, 360 degrees = 1 circle or circumference.
1 radian = 57.29577 degrees.
3.14159 (π) radians = ½ circumference.

AVOIRDUPOIS WEIGHT

The system of weights most commonly used in Great Britain and the United States.

27⅓ grains (27.34375) = 1 dram (*dr. avoir.*).
16 drams, 437.5 grains = 1 ounce (*oz. avoir.*).
16 ounces, 7000 grains = 1 pound (*lb. avoir.*).
14 pounds = 1 stone (*st.*) (Eng.).
25 pounds = 1 short quarter (*sh. qr.*).
28 pounds = 1 long quarter (*l. qr.*).
100 pounds, 4 short quarters = 1 short hundredweight (*sh. cwt.*).
112 pounds, 4 long quarters = 1 long hundredweight (*l. cwt.*).
2000 pounds, 20 short hundredweight = 1 short ton (*sh. tn.*).
2240 pounds, 20 long hundredweight = 1 long ton (*l. tn.*).

TROY WEIGHT

Used for expressing the weight of precious metals.

24 grains = 1 pennyweight (*pwt.* or *dwt.*) = 24 grains.
20 pennyweights = 1 ounce (*oz. t.*) = 480 grains.
12 ounces = 1 pound (*lb. t.*) = 5760 grains.

APOTHECARIES' WEIGHT

Used for weighing medicines when filling physicians' prescriptions.

20 grains = 1 scruple ℈ (*sc. apoth.*) = 20 grains.
3 scruples = 1 dram ʒ (*dr. apoth.*) = 60 grains.
8 drams = 1 ounce ȝ (*oz. apoth.*) = 480 grains.
12 ounces = 1 pound ℔ (*lb. apoth.*) = 5760 grains.

APOTHECARIES' FLUID MEASURE

Employed for measuring liquid medicines.

			Symbol
60 minims ♏	=	1 fluid dram (*fl. dr.*).	f ʒ
8 fluid drams	=	1 fluid ounce (*fl. oz.*).	f ȝ
16 fluid ounces	=	1 liquid pint (*pt.*).	O
8 liquid pints	=	1 gallon (*gal.*).	C

In writing prescriptions in the apothecaries' system, Roman, not Arabic, numbers are used. These are placed *after* the symbol. Thus: f ʒ ii means 2 fluid ounces; ℈ ss means one-half scruple; ȝ iss means one ounce and one-half.

LIQUID MEASURE—UNITED STATES

4 fluid ounces = 1 gill (*gi.*).
4 gills = 1 pint (*pt.*) = 28.875 cu. in.
2 pints = 1 quart (*qt.*) = 57.75 cu. in.
4 quarts = 1 gallon (*gal.*) = 231.00 cu. in.
31½ gallons = 1 barrel (*bbl.*).
2 barrels = 1 hogshead (*hhd.*).
2 hogsheads = 1 pipe.
2 pipes = 1 tun.

DRY MEASURE

The system of units commonly employed for measuring the bulk of "dry commodities," such as grain, vegetables, nuts, and fruit. The dry peck and the dry quart are 16.36 per cent larger than the corresponding liquid measures.

2 pints = 1 quart (*qt.*) = 67.2 cu. in.
8 quarts = 1 peck (*pk.*) = 537.6 cu. in.
4 pecks = 1 bushel (*bu.*) = 2150.42 cu. in.
105 quarts = 1 barrel (*bbl.*) = 7056.0 cu. in.

LIQUID AND DRY MEASURE—BRITISH AND CANADIAN

The system of units adopted by Great Britain is the same as that of the United States, but it is based on the Imperial gallon of 277.274 cu. in. and on the Imperial bushel of 2218.192 cu. in.

KITCHEN MEASURE

3 teaspoonfuls, ½ fluid ounce = 1 tablespoonful.
16 tablespoonfuls, 2 gills, ½ liquid pint, 8 fluid ounces = 1 cupful.
2 cupfuls, 16 fluid ounces = 1 pint.
4 cupfuls = 1 quart.

PAPER MEASURE

For small paper the old measure is still in use:

24 sheets = 1 quire (*qr.*).
20 quires } = 1 ream (*rm.*).
480 sheets }
2 reams = 1 bundle.
5 bundles = 1 bale.

For papers packed in cases, bundles, or frames, the following measure is now used:

25 sheets = 1 quire.
20 quires } = 1 standard ream.
500 sheets }

ASTRONOMICAL DISTANCE

92.9 million miles = 1 astronomical unit.
63,500 astronomical units = 1 light year = 5.9 trillion miles
3.26 light years = 1 parsec = 19.2 trillion miles

MISCELLANEOUS

12 units = 1 dozen.
20 units = 1 score.
12 dozen = 1 gross (144).
12 gross = 1 great gross (1728).

CONVERSION FACTORS

To change cubic feet to gallons.

Multiply the number of cubic feet by 7.48. For approximate results multiply by 7½.

To change gallons to cubic feet.

Multiply the number of gallons by 0.1337.

To change cubic inches to gallons.

Divide the number of cubic inches by 231, or multiply by 0.004329.

To change cubic feet to bushels.

Divide the number of cubic feet by 1.244. For approximate results multiply the number of cubic feet by ⅘.

To change cubic inches to bushels.

Divide the number of cubic inches by 2150.42, or multiply the number of cubic inches by 0.000465.

To change bushels to cubic feet.

Multiply the number of bushels by 1.244. For approximate results multiply the number of bushels by ⅘.

METRIC SYSTEM

A system of weights and measures invented by the French during the latter part of the 18th century. The fundamental unit or base of the system is the *meter*, which was intended to be exactly one ten-millionth part of a quadrant of the earth's meridian. Seven years were spent by famous scientists in obtaining the length as exactly as possible; but the resulting value was subsequently found to be slightly incorrect, so that the meter is now defined as the distance between two engraved lines on a bar of platinum-iridium alloy which is preserved in the archives of the International Metric Commission at Paris.

The unit of weight—the *gram*—was intended to be the mass, at 4° C., of a cubical volume of pure water measuring exactly .01 meter, or 1 centimeter, on each side. As this unit is comparatively small, it was decided that the standard actually constructed should have the mass of 1000 grams, or 1 *kilogram*. Here again a *very slight* error was made, so the kilogram is now defined as the mass of a certain piece of platinum, which also is deposited with the International Metric Commission.

The unit of capacity, the *liter*, is defined as the volume of 1 kilogram of water at its greatest density and is practically equal to 1000 cubic centimeters.

All of the units are theoretically based on the unit of length, and the tables are built on the decimal plan. Since our system of notation is a decimal system, metric computations are very easily made although the results are no more accurate than those obtained by any other system.

The following prefixes are used: Latin, *milli* (.001); *centi* (.01); *deci* (.1); Greek, *deka* (10); *hecto* (100); *kilo* (1000); and *myria* (10,000). These ratios are not difficult to remember; for, just as a cent is .01 dollar and a mill .001 dollar, so is a centimeter .01 meter, a centigram .01 gram, and a milliliter .001 liter. It is not generally known that the U. S. five-cent piece, or nickel, weighs, when new, just 5 grams; the dime, 2.5 grams; the quarter, 6.25 grams; and the half dollar, 12.5 grams.

METRIC MEASURE

UNITS COMMONLY USED

Length	10 millimeters (*mm*)	= 1 centimeter (*cm*).
	100 centimeters	= 1 meter (*m*).
	1000 meters	= 1 kilometer (*km*).
Capacity	1000 milliliters (*ml*)	= 1 liter (*l*).
	100 liters	= 1 hectoliter (*hl*).
Weight	1000 milligrams (*mg*)	= 1 gram (*g*).
	1000 grams	= 1 kilogram (*kg*).
	1000 kilograms	= 1 metric ton (*t*).

METRIC TABLES

Length	10 millimeters (*mm*)	= 1 centimeter (*cm*).
	10 centimeters	= 1 decimeter.
	10 decimeters	= 1 meter.
	10 meters	= 1 dekameter.
	10 dekameters	= 1 hectometer.
	10 hectometers	= 1 kilometer.
	10 kilometers	= 1 myriameter.

In microscopic work, and for expressing the length of light waves, the micron (Greek. Very small) is used.

	1 micron (μ)	= .001 millimeter
	1 millimicron (μμ)	= .001 micron
Capacity	1 milliliter (*ml*)	= .001 liter.
	10 milliliters	= 1 centiliter (*cl*).
	10 centiliters	= 1 deciliter (*dl*).
	10 deciliters	= 1 liter (*l*).
	10 liters	= 1 dekaliter (*dkl*).
	10 dekaliters	= 1 hectoliter (*hl*).
	10 hectoliters	= 1 myrialiter.
Weight	1 milligram (*mg*)	= .001 gram.
	10 milligrams	= 1 centigram (*cg*).
	10 centigrams	= 1 decigram (*dg*).
	10 decigrams	= 1 gram (*g*).
	10 grams	= 1 dekagram (*dkg*).
	10 dekagrams	= 1 hectogram (*hg*).
	10 hectograms	= 1 kilogram (*kg*).
	1000 kilograms	= 1 metric ton (*t*).

Area	100 square millimeters (mm^2)	= 1 square centimeter.
	100 square centimeters (cm^2)	= 1 square decimeter.
	100 square decimeters (dm^2)	= 1 square meter.
	100 square meters (m^2) } 1 are (*a*) }	= 1 square dekameter.
	100 ares } 1 hectare }	= 1 square hectometer.
	100 hectares	= 1 square kilometer.
	1 square kilometer (km^2)	= 1,000,000 m^2.

Volumes

1000 cubic millimeters (mm^3)	= 1 cubic centimeter (cm^3).
1000 cubic centimeters	= 1 cubic decimeter (dm^3).
1000 cubic decimeters	= 1 cubic meter (m^3).
1000 cubic meters	= 1 cubic dekameter (dkm^3).
1000 cubic dekameters	= 1 cubic hectometer (hm^3).
1 cubic meter	= 1 stere.

COMPARISON OF METRIC AND CUSTOMARY (U. S.) WEIGHTS AND MEASURES

These tables are based on the U. S. legal standard, which is slightly different from the British standard. Equivalents such as those here given should be used only to the required degree of accuracy. For example, 4 inches is equal to about 10 centimeters. If greater accuracy is desired, 10.2 centimeters or 102 millimeters may be used.

LENGTH

1 centimeter	= 0.394 inch.
1 inch (″)	= 2.540 centimeters.
1 meter	= 3.281 feet.
1 foot (′)	= 0.305 meter.
1 meter	= 1.094 yards.
1 yard	= 0.914 meter.
1 kilometer	= 0.621 statute mile.
1 statute mile	= 1.609 kilometers.
1 kilometer	= 0.540 nautical mile.
1 nautical mile	= 1.853 kilometers.

CAPACITY

1 milliliter	=	0.271 U. S. fluid dram.
1 U. S. fluid dram	=	3.697 milliliters.
1 milliliter	=	0.034 U. S. fluid ounce.
1 U. S. fluid ounce	=	29.573 milliliters.
1 liter	=	1.057 U. S. liquid quarts.
1 U. S. liquid quart	=	0.946 liter.
1 liter	=	0.908 U. S. dry quart.
1 U. S. dry quart	=	1.101 liters.
1 liter	=	0.264 U. S. gallon.
1 U. S. gallon	=	3.785 liters.
1 hectoliter	=	2.838 U. S. bushels.
1 U. S. bushe	=	0.3524 hectoliter.

WEIGHT

1 gram	=	15.432 grains.
1 grain	=	0.065 gram.
1 gram	=	0.643 pennyweight.
1 pennyweight	=	1.555 grams.
1 gram	=	0.772 apothecaries' scruple.
1 apothecaries' scruple	=	1.296 grams.
1 gram	=	0.257 apothecaries' dram.
1 apothecaries' dram	=	3.888 grams.
1 gram	=	0.035 avoirdupois ounce.
1 avoirdupois ounce	=	28.350 grams.
1 gram	=	0.032 troy ounce.
1 troy ounce	=	31.103 grams.
1 kilogram	=	2.205 avoirdupois pounds.
1 avoirdupois pound	=	0.454 kilogram.
1 kilogram	=	2.679 troy pounds.
1 troy pound	=	0.373 kilogram.
1 metric ton	=	0.984 gross or long ton.
1 gross or long ton	=	1.016 metric tons.
1 metric ton	=	1.102 short or net tons.
1 short or net ton	=	0.907 metric ton.

AREA

1 square centimeter	=	0.155 square inch.
1 square inch	=	6.452 square centimeters.
1 square meter	=	10.764 square feet.
1 square foot	=	0.0929 square meter.
1 square meter	=	1.196 square yards.
1 square yard	=	0.8361 square meter.
1 square kilometer	=	0.3861 square mile.
1 square mile	=	2.590 square kilometers.
1 hectare	=	2.471 acres.
1 acre	=	0.4047 hectare.

VOLUME

1 cubic centimeter	=	0.0610 cubic inch.
1 cubic inch	=	16.3872 cubic centimeters.
1 cubic meter	=	35.3145 cubic feet.
1 cubic foot	=	0.02832 cubic meter.
1 cubic meter	=	1.3079 cubic yards.
1 cubic yard	=	0.7646 cubic meter.
1 liter	=	0.03532 cubic foot.
1 cubic foot	=	28.3162 liters.
1 stere	=	0.2759 cord.
1 cord	=	3.6245 steres.

ROMAN NUMERALS

I	1	IX	9	XVII	17	LXX	70	DC	600
II	2	X	10	XVIII	18	LXXX	80	DCC	700
III	3	XI	11	XIX	19	XC	90	DCCC	800
IV	4	XII	12	XX	20	C	100	CM	900
V	5	XIII	13	XXX	30	CC	200	M	1000
VI	6	XIV	14	XL	40	CCC	300	MM	2000
VII	7	XV	15	L	50	CD	400	$\overline{V}$	5000
VIII	8	XVI	16	LX	60	D	500	$\overline{X}$	10,000

The above is the most generally used way of expressingby Roman notation the numbers indicated, although some of them differ from the ancient Roman usage. The Romans, for instance, wrote IIII instead of IV.

It should be noted that repeating a symbol repeats its value. Thus CCC (300) triples the value of C (100). A symbol following one of greater value adds its value to that of the preceding symbol. Thus VI (6) indicates V (5)+I (1). A symbol preceding one of greater value subtracts its value from that of the following symbol. Thus IV (4) indicates V (5)−I (1). A dash placed over a symbol multiplies its value by 1000. Thus $\overline{M}$ indicates 1,000,000.

WEIGHTS AND SPECIFIC GRAVITIES

Substance	Average Specific Gravity	Average Weight per Cubic Foot in Pounds	Average Weight per Cubic Inch in Pounds
Metals, Alloys			
Aluminum	2.7	168	.097
Brass	8.5	530	.31
Copper	8.9	556	.32
Gold	19.3	1205	.70
Gold, coin (U. S.)	17.2	1073	.62
Iron, gray cast	7.1	443	.26
Iron, wrought	7.8	487	.28
Lead	11.3	707	.41
Mercury	13.6	849	.49
Platinum	21.2	1320	.78
Silver	10.5	655	.38
Steel	7.8	487	.28
Zinc	7.1	443	.25
Various Solids			
Butter	.....	59	.....
Cereals in bulk	.....	.....	.....
Oats	.....	26	.....
Barley	.....	39	.....
Corn, Rye	.....	45	.....
Wheat	.....	48	.....
Cork	.25	16	.009
Fats	.90–.97	58	.034
Flour, loose	.....	28	.....
Flour, pressed	.....	47	.....
Glass	2.6	162	.094
Hay and Straw	.....	20	.....
Ice	.91	57	.033
Potatoes (piled)	.....	42	.....
			Weight per Board Foot in Pounds
Timber (Seasoned, moisture 15 to 20%)			
Ash	.63	40	3.3
Birch	.51	32	2.7
Cedar	.35	22	1.8
Chestnut	.66	41	3.4
Cypress	.48	30	2.5
Hemlock	.47	29	2.4
Hickory	.75	48	4.0
Maple	.68	43	3.6
Oak, red, black	.65	41	3.4
Oak, white	.74	46	3.8
Pine, white	.41	26	2.2
Pine, long-leaf	.70	44	3.7
Pine, shortleaf	.61	38	3.2
Spruce, white, black	.43	27	2.3
Walnut, black	.67	42	3.5
Willow	.50	31	3.6
			Weight per Gallon in Pounds
Various Liquids			
Cider Vinegar	1.01	63	8.42
Cream (18% fat)	1.01	63	8.42
Cream (40% fat)	.99	62	8.25
Gasoline	.7	44	5.83
Kerosene	.8	50	6.66
Linseed Oil	.93	58	7.7
Milk	1.03	64.5	8.6
Sirup (65.6% sugar)	1.32	82.5	11.0
Turpentine	.86	54	7.2
Water (4°C., 39.2°F.)	1.00	62.357	8.34
Water (100° C., 212° F.)	.958	59.765	7.99
Water, sea	1.03	64	8.59
Masonry			
Brick, pressed		140	.....
Brick, common		120	.....
Concrete, cement, stone, sand		144	.....
Concrete, cement, cinder, etc.		100	.....
Limestone, mortar rubble		125	.....
Sandstone, mortar rubble		110	.....
Various Building Materials			
Ashes, cinders		43	.....
Cement, Portland, loose		94	.....
Clay, damp, plastic		110	.....
Earth, moist, packed		96	.....
Sand, gravel, dry, packed		100–120	.....
Coal, piled			
Anthracite, white ash, egg		57	.....
Anthracite, white ash, stove		56.5	.....
Anthracite, white ash, nut		55.5	.....
Anthracite, white ash, pea		53.5	.....
Anthracite, red ash, egg		53	.....
Anthracite, red ash, stove		52.5	.....
Anthracite, red ash, nut		52	.....
Anthracite, red ash, pea		51	.....
Bituminous		47–55	.....

INCHES REDUCED TO DECIMALS OF A FOOT

In.	Feet	In.	Feet	In.	Feet
0	0.0000	4	0.3333	8	0.6667
1/8	0.0104	1/8	0.3438	1/8	0.6771
1/4	0.0208	1/4	0.3542	1/4	0.6875
3/8	0.0313	3/8	0.3646	3/8	0.6979
1/2	0.0417	1/2	0.3750	1/2	0.7083
5/8	0.0521	5/8	0.3854	5/8	0.7188
3/4	0.0625	3/4	0.3958	3/4	0.7292
7/8	0.0729	7/8	0.4063	7/8	0.7396
1	0.0833	5	0.4167	9	0.7500
1/8	0.0938	1/8	0.4271	1/8	0.7604
1/4	0.1042	1/4	0.4375	1/4	0.7708
3/8	0.1146	3/8	0.4479	3/8	0.7813
1/2	0.1250	1/2	0.4583	1/2	0.7917
5/8	0.1354	5/8	0.4688	5/8	0.8021
3/4	0.1458	3/4	0.4792	3/4	0.8125
7/8	0.1563	7/8	0.4896	7/8	0.8229
2	0.1667	6	0.5000	10	0.8333
1/8	0.1771	1/8	0.5104	1/8	0.8438
1/4	0.1875	1/4	0.5208	1/4	0.8542
3/8	0.1979	3/8	0.5313	3/8	0.8646
1/2	0.2083	1/2	0.5417	1/2	0.8750
5/8	0.2188	5/8	0.5521	5/8	0.8854
3/4	0.2292	3/4	0.5625	3/4	0.8958
7/8	0.2396	7/8	0.5729	7/8	0.9063
3	0.2500	7	0.5833	11	0.9167
1/8	0.2604	1/8	0.5938	1/8	0.9271
1/4	0.2708	1/4	0.6042	1/4	0.9375
3/8	0.2813	3/8	0.6146	3/8	0.9479
1/2	0.2917	1/2	0.6250	1/2	0.9583
5/8	0.3021	5/8	0.6354	5/8	0.9688
3/4	0.3125	3/4	0.6458	3/4	0.9792
7/8	0.3229	7/8	0.6563	7/8	0.9896

Opposite each inch or fraction of an inch will be found its decimal equivalent in feet. Thus, 7⅜ in. = 0.6146 ft.

TABLE OF DECIMAL EQUIVALENTS

DECIMAL AND MILLIMETER EQUIVALENTS OF FRACTIONAL PARTS OF AN INCH.

Fractions of an Inch	Decimal Equivalents in Inches	Equivalents in Millimeters
1/32	0.03125	0.794
1/16	0.0625	1.588
3/32	0.09375	2.381
1/8	0.125	3.175
5/32	0.15625	3.969
3/16	0.1875	4.763
7/32	0.21875	5.556
1/4	0.25	6.350
9/32	0.28125	7.144
5/16	0.3125	7.938
11/32	0.34375	8.731
3/8	0.375	9.525
13/32	0.40625	10.319
7/16	0.4375	11.113
15/32	0.46875	11.906
1/2	0.5	12.700
17/32	0.53125	13.494
9/16	0.5625	14.288
19/32	0.59375	15.081
5/8	0.625	15.875
21/32	0.65625	16.669
11/16	0.6875	17.463
23/32	0.71875	18.256
3/4	0.75	19.050
25/32	0.78125	19.844
13/16	0.8125	20.638
27/32	0.84375	21.431
7/8	0.875	22.225
29/32	0.90625	23.019
15/16	0.9375	23.813
31/32	0.96875	24.606
32/32	1	25.400

TABLE OF POWERS, ROOTS, AND RECIPROCALS

No.	Square	Cube	Square Root	Cube Root	Reciprocal	No.	Square	Cube	Square Root	Cube Root	Reciprocal
1	1	1	1.0000	1.0000	1.0000	51	2601	132651	7.1414	3.7084	0.0196
2	4	8	1.4142	1.2599	0.5000	52	2704	140608	7.2111	3.7325	0.0192
3	9	27	1.7321	1.4422	0.3333	53	2809	148877	7.2801	3.7563	0.0189
4	16	64	2.0000	1.5874	0.2500	54	2916	157464	7.3485	3.7798	0.0185
5	25	125	2.2361	1.7100	0.2000	55	3025	166375	7.4162	3.8030	0.0182
6	36	216	2.4495	1.8171	0.1667	56	3136	175616	7.4833	3.8259	0.0179
7	49	343	2.6458	1.9129	0.1429	57	3249	185193	7.5498	3.8485	0.0175
8	64	512	2.8284	2.0000	0.1250	58	3364	195112	7.6158	3.8709	0.0172
9	81	729	3.0000	2.0801	0.1111	59	3481	205379	7.6811	3.8930	0.0169
10	100	1000	3.1623	2.1544	0.1000	60	3600	216000	7.7460	3.9149	0.0167
11	121	1331	3.3166	2.2240	0.0909	61	3721	226981	7.8102	3.9365	0.0164
12	144	1728	3.4641	2.2894	0.0833	62	3844	238328	7.8740	3.9579	0.0161
13	169	2197	3.6056	2.3513	0.0769	63	3969	250047	7.9373	3.9791	0.0159
14	196	2744	3.7417	2.4101	0.0714	64	4096	262144	8.0000	4.0000	0.0156
15	225	3375	3.8730	2.4662	0.0667	65	4225	274625	8.0623	4.0207	0.0154
16	256	4096	4.0000	2.5198	0.0625	66	4356	287496	8.1240	4.0412	0.0152
17	289	4913	4.1231	2.5713	0.0588	67	4489	300763	8.1854	4.0615	0.0149
18	324	5832	4.2426	2.6207	0.0556	68	4624	314432	8.2462	4.0817	0.0147
19	361	6859	4.3589	2.0684	0.0526	69	4761	328509	8.3066	4.1016	0.0145
20	400	8000	4.4721	2.7144	0.0500	70	4900	343000	8.3666	4.1213	0.0143
21	441	9621	4.5826	2.7589	0.0476	71	5041	357911	8.4261	4.1408	0.0141
22	484	10648	4.6904	2.8020	0.0454	72	5184	373248	8.4853	4.1602	0.0139
23	529	12167	4.7958	2.8439	0.0435	73	5329	389017	8.5440	4.1793	0.0137
24	576	13824	4.8989	2.8845	0.0417	74	5476	405224	8.6023	4.1983	0.0135
25	625	15625	5.0000	2.9240	0.0400	75	5625	421875	8.6603	4.2172	0.0133
26	676	17576	5.0990	2.9625	0.0385	76	5776	438976	8.7178	4.2358	0.0132
27	729	19683	5.1962	3.0000	0.0370	77	5929	456533	8.7750	4.2543	0.0130
28	784	21952	5.2915	3.0366	0.0357	78	6084	474552	8.8318	4.2727	0.0128
29	841	24389	5.3852	3.0723	0.0345	79	6241	493039	8.8882	4.2908	0.0127
30	900	27000	5.4772	3.1072	0.0333	80	6400	512000	8.9443	4.3089	0.0125
31	961	29791	5.5678	3.1414	0.0323	81	6561	531441	9.0000	4.3267	0.0123
32	1024	32768	5.6569	3.1748	0.0313	82	6724	551368	9.0554	4.3445	0.0122
33	1089	35937	5.7446	3.2075	0.0303	83	6889	571787	9.1104	4.3621	0.0120
34	1156	39304	5.8310	3.2396	0.0294	84	7056	592704	9.1652	4.3795	0.0119
35	1225	42875	5.9161	3.2711	0.0286	85	7225	614125	9.2195	4.3968	0.0118
36	1296	46656	6.0000	3.3019	0.0278	86	7396	636056	9.2736	4.4140	0.0116
37	1369	50653	6.0828	3.3322	0.0270	87	7569	658503	9.3276	4.4310	0.0115
38	1444	54872	6.1644	3.3620	0.0263	88	7744	681472	9.3808	4.4480	0.0114
39	1521	59319	6.2450	3.3912	0.0256	89	7921	704969	9.4340	4.4647	0.0112
40	1600	64000	6.3246	3.4200	0.0250	90	8100	729000	9.4868	4.4814	0.0111
41	1681	68921	6.4031	3.4482	0.0244	91	8281	753571	9.5394	4.4979	0.0110
42	1764	74088	6.4807	3.4760	0.0238	92	8464	778688	9.5917	4.5144	0.0109
43	1849	79507	6.5574	3.5034	0.0233	93	8649	804357	9.6437	4.5307	0.0108
44	1936	85184	6.6333	3.5303	0.0227	94	8836	830584	9.6954	4.5468	0.0106
45	2025	91125	6.7082	3.5569	0.0222	95	9025	857375	9.7468	4.5629	0.0105
46	2116	97336	6.7823	3.5831	0.0217	96	9216	884736	9.7980	4.5789	0.0104
47	2209	103823	6.8557	3.6088	0.0213	97	9409	912673	9.8489	4.5947	0.0103
48	2304	110592	6.9282	3.6342	0.0208	98	9604	941192	9.8995	4.6104	0.0102
49	2401	117649	7.0000	3.6593	0.0204	99	9801	970299	9.9499	4.6261	0.0101
50	2500	125000	7.0711	3.6840	0.0200	100	10000	1000000	10.0000	4.6416	0.0100

ALGEBRA

The word **algebra** is derived from Arabic; *al-jebr* is the first part of a phrase meaning transferring and removal. It was used as the title of a book by one of the 9th-century Arabian mathematicians, to whom the early development of algebra is chiefly due.

As taught today, it constitutes a *postulational system*. That is, starting with certain basic axioms and definitions (i.e., assumptions) that are accepted without proof, pupils develop for themselves basic mathematical concepts by applying logical methods of deduction. These new concepts are called *theorems* and, once proved, may be used to discover and prove still other concepts.

At the elementary grade level, the methods of learning mathematics (arithmetic) are now inductive and intuitive. The youngsters use the simplest forms of the basic concepts and gradually grow familiar with the foundations of the structure of mathematics. They do as much as they can without using paper and pencil. In the upper elementary grades, the pupils begin to generalize and learn how to solve problems. In the secondary grades, the students first learn algebra, which may be considered as an extension and generalization of arithmetic, by applying the logical methods of deduction. That is, they are able to understand why mathematical statements or sentences are true or false.

Algebra can be defined as the branch of mathematics in which letters, signs of operation, or other symbols, replace numbers of arithmetic in the general solution of problems involving computations of arithmetic. It is the science of solving mathematical problems by means of symbols and either equations or inequalities. A knowledge of algebra is essential for the student of geometry, trigonometry, physics, and other branches of mathematics and science.

NOTATIONS AND ASSUMPTIONS

Sets. The basic concept of sets is introduced in the primary grades because of its importance in clarifying other concepts and in bringing together the fields of application of mathematics. Sets are of such especial help in algebra they are studied at the beginning of the course.

A set, first considered by Georg Cantor (1845–1918), is a collection of objects of any sort, such as:

(a) The set of all states in New England.
(b) The set of positive integers less than 10.
(c) The set of all authors of this encyclopedia.
(d) The set of all points that lie on a given line.

A set may be finite or infinite. (a), (b), and (c) are finite because all the elements can be listed, though it may be tedious to do so in (c). (d) is an infinite set since the number of points that constitute a line could never be completely listed.

A set may be indicated by enclosing the list of the elements in braces. For example {Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut} is the set of all states in New England. {1, 2, 3, 4, 5, 6, 7, 8, 9} is the set of positive integers less than 10.

A set may be also indicated by enclosing a descriptive phrase in braces. This is usually done when it is difficult or impossible to list the elements. $\{x \mid x$ is an author of this encyclopedia.$\}$, using x as a symbol for any element of this set. It is read "There exists an x, such that x is an author etc." Note that $\mid$ is read "such that." How do you read $\{x \mid x$ is a point on a given line$\}$? These two sets represent (c) and (d) above.

A capital letter is usually used to represent a set. For example, the set of vowels in the English alphabet can be written V = {a, e, i, o, u} or V = $\{x \mid x$ is a vowel in the English alphabet.$\}$.

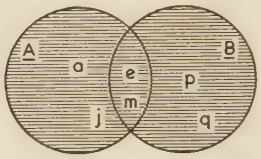
Any element in a set is denoted $a \in V$.

Any group of elements in a set is denoted {a, e} $\subset$ V. That is, {a, e} is a *subset* of the set V.

If there are no elements in a set, it is denoted { } or $\emptyset$.

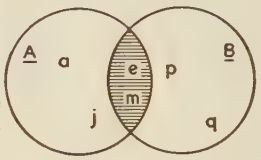
If we are interested in two or more sets, then three other symbols can be introduced: $\cup$, called "union" or "cup;" $\cap$, called "intersection" or "cap;" and $\bar{A}$ or A', called "complement of A." To illustrate these symbols, let us use three finite sets, one containing all the letters that appear in any of these sets (called therefore the *universal set*, U). Thus, given U = {a,b,e,f,j,k,m,p,q}, A = {a,e,j,m}, and B = {e,m,p,q}: (Note also the drawings, called *Venn diagrams*, that can be used to visualize these symbols.)

C = A $\cup$ B = {a,e,j,m} $\cup$ {e,m,p,q} = {a,e,j,m,p,q} That is, list all the elements in A *or* in B.



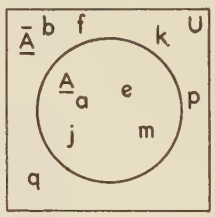
(a)

D = A $\cap$ B = {a,e,j,m} $\cap$ {e,m,p,q} = {e,m} That is, list all the elements in A *and* in B.



(b)

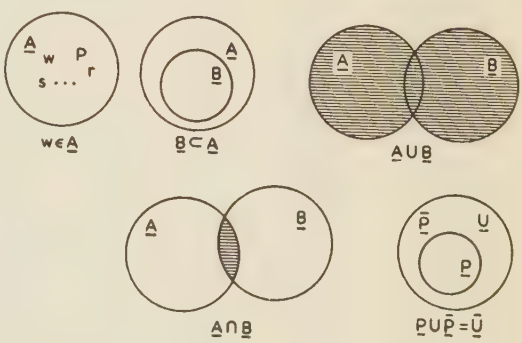
A' = {b,f,k,p,q} That is, list all the elements not in A that do appear in U.



(c)

All of these symbols ϵ, $\subset$, $\cup$, $\cap$, P′ can be used with infinite sets as illustrated by the following Venn diagrams.

(d)



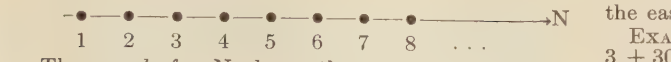
OUR REAL NUMBER SYSTEM AND THE NUMBER LINE

Using set notation, the numbers of our real number system can be classified as follows:

N = {1,2,3,4,. . . }, letting N define the set of natural numbers (or counting numbers or positive integers), and letting . . . mean "and so forth." These are the only numbers used in the early grades when youngsters are learning the fundamental operations of addition (+), subtraction (−), and multiplication (·).

As early as possible the *number line* is intro-

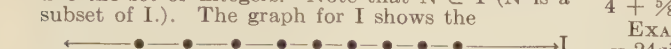
duced and used as much as possible. The figure below shows how it can be done.



The *graph* for N shows the number of units of length from the left end to the desired natural number.

By introducing a zero (0) and negative numbers, the natural number scale can be extended to the left. This was done only a few centuries ago when man found it necessary to use numbers other than natural numbers and fractions.

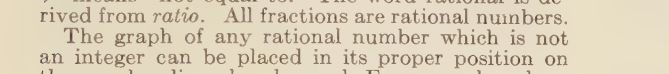
$I = \{. . . , -3, -2, -1, 0, 1, 2, 3, . . .\}$, letting I define the set of integers. Note that $N \subset I$ (N is a subset of I.). The graph for I shows the



number of units of length from the zero (0) position to the desired integer by going to the right (+) or to the left (−).

$Q = \left\{\frac{a}{b}, a \in I, b \in I, b \neq 0\right\}$, using Q to define the set of *rational* numbers and understanding that $\neq$ means "not equal to." The word rational is derived from *ratio*. All fractions are rational numbers.

The graph of any rational number which is not an integer can be placed in its proper position on the number line already used. For example, where are $2\frac{1}{4}$ and $-\frac{2}{3}$ on the number line used for *I*?



Thus we can see that $I \subset Q$.

To complete the real number system, we need to recognize the fact that there are many points on the number line that cannot be defined as ratios. A few of them are $\sqrt{2}$, $\sqrt[3]{7}$, π, c (the velocity of light). Such numbers are often called *irrational* numbers.

$R = \{x \mid x$ is a rational number or an irrational number$\}$, using R to define the set of real numbers that make up our real number system. The elements of the set account for every possible point on the number line. Thus we can see that $N \subset I \subset Q \subset R$.

THE BASIC AXIOMS AND DEFINITIONS

We have been considering the types of numbers that constitute our real number system. Now we must consider the basic assumptions, which are accepted without proof, that apply to that number system. To do so we will use a set $G = \{a,b,c,. . .\}$, in which at least two elements exist; and we will consider only two operations: plus (+) and times (·). You will soon see that we will not need minus (−) and divided by (÷).

Closure axiom. If a and b are numbers included in any of the sets we have listed, $a + b$ and $a \cdot b$ are also numbers from this same set. That is, adding and multiplying numbers in any one set form a closed system under addition and multiplication, and will not generate any *new* kind of number. For example, 2 (a natural number) + 3 (a natural number) = 5 (a natural number); $2\frac{1}{4}$ (a rational number) + $3\frac{1}{2}$ (a rational number) = $5\frac{3}{4}$ (a rational number); 4 (a rational number) times $2\frac{1}{3}$ (a rational number) = $9\frac{1}{3}$ (a rational number).

Commutative axiom. The order in which a sum or product is formed is immaterial. If a and b are real numbers, then $a + b = b + a$ and $a \cdot b = b \cdot a$. Thus $2 + 3 = 3 + 2$ and $2\frac{1}{4} \cdot 3\frac{1}{2} = 3\frac{1}{2} \cdot 2\frac{1}{4}$.

Associative axiom. In performing addition or multiplication of three or more numbers, they may be grouped in any desired way. If a, b, and c are distinct real numbers, then $a + (b + c) = (a + b) + c$ and $a(bc) = (ab)c$. Thus $2 + (3 + 4) = (2 + 3) + 4$, or $2 + 7 = 5 + 4 = 9$.

These last two axioms enable us to scan a group of several terms or several factors and determine the easiest way to find the sum or product.

Example 1. $23 + 34$ can be thought of as $20 + 3 + 30 + 4$. Then by the commutative axiom we have $20 + 30 + 3 + 4$. Then by the associative axiom $(20 + 30) + (3 + 4)$ or $50 + 7 = 57$.

Example 2. $2\frac{3}{8} + 3\frac{1}{2} + 4\frac{5}{8} = ?$ Observe that $\frac{3}{8} + \frac{5}{8} = 1$. Hence, using the commutative axiom put the example in the form $2\frac{3}{8} + 4\frac{5}{8} + 3\frac{1}{2}$. Then by the associative axiom we have $7 + 3\frac{1}{2} = 10\frac{1}{2}$. Noting that $2\frac{3}{8}$ means $2 + \frac{3}{8}$, etc., can you show what could be done if the given example were put in the form $2 + \frac{3}{8} + 3 + \frac{1}{2} + 4 + \frac{5}{8}$?

Example 3. $2a^2 \cdot (3ax) \cdot (4x) = 2 \cdot 3 \cdot 4 \cdot a^2 \cdot a \cdot x \cdot x = 24a^3x^2$.

Distributive axiom. This axiom tells us that a multiplier is distributed over an indicated sum. If a, b, and c are distinct real numbers, then $a(b + c) = ab + ac$. The distributive axiom is also reversible; that is, $ab + ac = a(b + c)$. This makes the process of factoring possible.

Example 1. $3 \cdot 24 = 3(20 + 4) = 60 + 12 = 70 + 2 = 72$

2. $4 \cdot 3\frac{1}{2} = 4(3 + \frac{1}{2}) = 12 + 2 = 14$

3. $4\frac{1}{3} \cdot 3\frac{1}{2} = 4(3 + \frac{1}{2}) + \frac{1}{3}(3 + \frac{1}{2}) = 12 + 2 + 1 + \frac{1}{6} = 15\frac{1}{6}$

4. $27 + 18 = 9 \cdot 3 + 9 \cdot 2 = 9(3 + 2) = 9 \cdot 5 = 45$

Once you understand these basic axioms you can solve any of these examples shown, and similar ones, without using paper and pencil. And remember that this ability is one of the objectives in modern mathematics.

Two neutral elements. The real number system contains two unique, distinct numbers which have similar properties, one in relation to addition, the other with respect to multiplication:

Zero: There exists a unique number 0, such that $a + 0 = a$. This number is called *zero*. Zero is neutral with respect to addition in the sense that adding it to any other number gives that same number for the sum. Thus $7 + 0 = 7$ and $-25 + 0 = -25$.

Unity: There exists a unique number 1, $1 \neq 0$, such that $a \cdot 1 = a$. This number is called *unity* or *one*. Unity is neutral with respect to multiplication in the sense that multiplying any other number by it gives that same number as the product. Thus $8 \cdot 1 = 8$ and $(-14) \cdot 1 = -14$.

Two inverse elements: There are two sets of inverse elements that are needed if we consider only the two operations of multiplication and addition.

1) *Additive inverses:* Corresponding to each number a, there exists a unique number, $-a$, such that $a + (-a) = 0$. $-a$ is called the *negative* of a. That is, the negative of 5 is -5, and the negative of -8 is 8. By using an additive inverse, we can avoid subtraction. For example, $8 - 5 = 8 + (-5) = 3 + [5 + (-5)] = 3 + 0 = 3$.

2) *Multiplicative inverses:* Corresponding to each number a, $a \neq 0$, there exists a unique number $\frac{1}{a}$, such that $a \cdot \frac{1}{a} = 1$. $\frac{1}{a}$ is called the *reciprocal* of a. *Special note: Zero has no reciprocal.* The reciprocal of 5 is $\frac{1}{5}$ and the reciprocal of $\frac{1}{8}$ is 8. By using a multiplicative inverse we can avoid division. For example, $12 \div 4 = 3 \cdot [4 \cdot \frac{1}{4}] = 3 \cdot 1 = 3$.

From these definitions of the inverses, certain other properties can be deduced. For example, simplification of equalities in both addition and multiplication becomes possible.

Example 1. If $a + b = a + c$, then $b = c$. This can be proved by adding $(-a)$ to each side of the first equality.

Example 2. If $ab \neq ac$, $a \neq 0$, then $b = c$.

This can be proved by multiplying ab and ac by $\frac{1}{a}$.

These two properties are used extensively in solving open sentences, i.e., equations and inequalities.

As an example of the types of concepts which can be proved on the basis of the above assumptions, consider the following:

Theorem: For every real number a, $a \cdot 0 = 0$.

Proof:

1. $a \cdot 0 = a[b + (-b)]$	1. Definition of additive inverse
2. $= ab + (-ab)$	2. Distributive axiom
3. $= 0$	3. Same as 1.

It may seem trivial to prove something which is "obvious" and which you have "known" since grade school. But this is the essence of modern mathematical thinking—to justify every conclusion logically and to be aware *exactly* of those things which are undefined or postulated.

AXIOMS OF ORDER

So far, the assumptions have dealt largely with operations and processes and nothing has been said of the relationships of numbers to each other. A set of axioms which deals with *order relations* must be included.

Trichotomy axiom: If a and b are any two real numbers, then one and only one of the following relations holds: $a = b$ or $a > b$ or $b > a$. That is, two numbers are either equal or they are not equal, and if they are not equal, one *must* be greater than the other.

Transitive axiom: If a, b, and c are real numbers, and if

1) $a = b$ and $b = c$, then $a = c$.
2) $a > b$ and $b > c$, then $a > c$; i.e., $8 > 5$ and $5 > 3$, then $8 > 3$.

Additive axiom: 1) If $a = b$ and c is any real number, then $a + c = b + c$. 2) If $a > b$ and c is any real number, then $a + c > b + c$.

Multiplicative axiom: 1) If $a = b$ and $c > 0$, then $ac = bc$. 2) If $a > b$ and $c > 0$, then $ac > bc$.

There are three important theorems based on these axioms of order. Before considering them, the symbol $<$ is needed. It means "is less than." For example, if $a > b$, then $b < a$.

Theorem I. If $a > b$ and $c > d$, then $a + c > b + d$.

Proof:

1. $a + c > b + c$, and $b + c > b + d$	1. Additive axiom
2. $a + c > b + d$	2. Transitive axiom

Theorem II. $a > b$ is the same as $-a < -b$.

Proof:

1. $[(-a) + (-b)] + a > [(-a + (-b)] + b$	1. Additive axiom
2. $(-b) + a + (-a) > (-a) + b + (-b)$	2. Commutative axiom
3. $(-b) + [a + (-a)] > (-a) + [b + (-b)]$	3. Associative axiom
4. $(-b) > (-a)$	4. Def. of additive inverse
5. $-a < -b$	5. Order of inequality

Theorem III. If $a > b$ and $c < 0$, then $ac < bc$.

Proof:

1. Let $c = -d$, where $d < 0$	1. Possible assumption
2. $ad > bd$	2. Multiplicative axiom
3. $-ad < -bd$	3. Theorem II
4. $a(-d) < b(-d)$	4. Commutative axiom where $-ad = (-1)ad = a(-1)d = a(-d)$
5. $ac < bc$	5. Substitution from 1.

Theorems II and III are needed whenever we multiply both sides of an inequality by a negative number, since we change its sense by doing so.

Example 1. From $5 > 3$, we conclude that $-5 < -3$.

2. From $-3 > -7$, we conclude that $3 < 7$.

3. From $4 > 3$ and $-2 < 0$, we conclude that $-8 < -6$.

Other Definitions and Notations Needed in Algebra. One essential difference between algebra and arithmetic is the use of letters, called *literal* numbers, as well as arithmetic numbers. These letters are essentially *placeholders* for numbers and make possible generalized statements.

Any combination of numbers, whether literal numbers or arithmetic numbers, and the symbols for the fundamental operations (i.e., addition, subtraction, multiplication, division) is an *algebraic expression*. For example, $\frac{2x - 3}{y}$, $\frac{x^2 - 7y}{2 - z}$ and $4x^2 - 7xy + 12$ are algebraic expressions. When there are no indicated operations other than addition, subtraction, and multiplication, as was true for the last example, we have a *multinomial*. Those parts of such an expression separated by $+$ or $-$ signs are called *terms*. Thus a multinomial must contain at least two terms. Each term of a multinomial is called a *monomial;* such an expression of two terms can be called a *binomial;* and a three-term expression is often called a *trinomial*. If a multinomial contains only positive integral powers of one variable, it is known as a *polynomial*.

Example 1. Monomials: 3; $-5x$; $-x^3y$; axy^2

2. Binomials: $2a + 5$; $2x - y$

3. Trinomials: $x^2 + 3x + 4$; $2x^2y - 5xy^2y + 7$

4. Multinomials: $2xy - 5$; $3x^2 - 8xy - 7y^3$

5. Polynomials: $2x^2 + 5x - 8$; $8x^3 - 5x^2 + 3x - 5$

Algebraic expressions are the nouns, adjectives or phrases of algebraic statements, called sentences, just as the signs $=$, $>$, $<$, etc, serve as verbs.

Each algebraic term of a multinomial can be a product of literal and/or arithmetic numbers, such as $3xy$; $-5b^2$; $7a^2bx$. The arithmetic number, including its sign, is called the *numerical coefficient* of the term. The coefficient of any *factor* of the term is the product of all the other factors. In the examples above, the numerical coefficients are 3, -5, and 7, respectively. The coefficient of x in the first term is $3y$; in the last term, it is $7a^2b$.

A **formula** is the expression of a general principle or rule by the aid of symbols. Thus, as the area (a) of a rectangle is equal to the product of its length (l) and width (w), the area is expressed by the formula $A = lw$.

A **power** is the product obtained by using a number or an algebraic expression a certain number of times as a factor: $3 \cdot 3 \cdot 3 \cdot 3 = 3^4 = 81$, the fourth power of 3, which may be read "3 to the fourth power." A *square* is the second power, and a *cube* is the third power.

An **exponent** is the small expression written above and to the right of a quantity to show the power to which the quantity is raised. It is omitted when it equals unity. An exponent may be positive, negative, zero, or a fraction: x^2; x^{-2a}; $x^{2a/b}$; $(3x - 4)^{-3/2a}$.

Observe the distinction between *coefficient* and *exponent*. A coefficient is placed before the quantity and *multiplies* the quantity. An exponent, when an integer, indicates that the quantity is to be multiplied by itself: b^2 means b times b.

A **root** of a number is one of the equal factors whose product is the number; 2 is a root of 4, 8,

16, 32, 64, and so on, since $4 = 2^2$; $8 = 2^3$; $16 = 2^4$; $32 = 2^5$; $64 = 2^6$, and so on.

The symbol $\sqrt{5}$, often written $5^{1/2}$, is read "the square root of 5." It represents the positive number which, when squared will equal 5. That is $(\sqrt{5})^2 = 5$. The symbol $\sqrt[3]{5}$, often written $5^{1/3}$, is read "the cube root of 5," and represents the number which, when cubed, will equal 5. That is $(\sqrt[3]{5})^3 = 5$.

A **known quantity** is a quantity whose value is given. It is usually represented by one of the first letters of the alphabet; as a,b,c,d. These letters represent *placeholders* for numbers or numerals that are known.

An **unknown quantity** is a quantity whose value is to be determined. It is usually represented by one of the final letters of the alphabet; as x,y,z. The value or values determined are the elements of the *solution set* for the statement or sentence.

Positive and Negative Quantities have the property of being opposite in direction, character or quality; as, gain or loss, money earned and money owed, right and left, water running into a tank and water running out. Such quantities are often called directed numbers, or + and − numbers, where these signs are not to be interpreted as indicating *addition* or *subtraction* but as indications of *direction*, *character* or *quality*.

Problem: A man gains \$200 and loses \$325. What is his net loss?

Solution. Think of the number line for real numbers. By this gain, the man's financial condition advances \$200 in a positive direction from its original state, represented by zero. It then moves from this point \$325 in the opposite, or negative, direction. Its final position is \$125 on the negative side of zero, or −\$125. Since a gain was considered positive, −\$125 means a net loss of \$125.

The **Signs of Operation** are +, −, ·, and ÷. They have the same meaning in arithmetic and in algebra. Remember that the + and − signs are the main points of separation in a simple algebraic expression.

There are four **Signs of Aggregation.** The *parenthesis*, ( ), is the most commonly used sign of aggregation. In addition to the parenthesis, the following are used: the *bracket*, [ ]; the *brace*, { }; the *vinculum*, ———.

Any expression within a parenthesis, or within similar signs, or over or under a vinculum, is to be treated as a single quantity. Note: *The brace used in set notation must not be confused with the brace used as a sign of aggregation.*

If such a quantity is raised to a certain power, the exponents of each factor within the sign of aggregation are multiplied by the index of that power. Thus $(a^2b)^3 = a^6b^3$ and $[a^9b^6]^{\frac{1}{3}} = a^3b^2$.

A minus sign in front of a sign of aggregation reverses the sign of operation of every term within when the sign of aggregation is removed. This is true because the distributive axiom applies. Thus $-(+b - c) = (-1)(+b - c) = -b + c$. This result assumes the following *Law of Signs*, which we shall accept without proof.

The Law of Signs states that the sign of the product of two quantities is + when the quantities have *like signs;* the sign is − when the quantities have unlike signs: $3a \cdot 2b = 6ab$; $(-3a) \cdot (-2b) = 6ab$; $(-3a) \cdot 2b = -6ab$; $3a \cdot (-2b) = -6ab$.

Here is a simple way to remember the Law of Signs:
A friend of a friend is a friend $(+ \cdot + = +)$
An enemy of an enemy is a friend $(- \cdot - = +)$
An enemy of a friend is an enemy $(- \cdot + = -)$
A friend of an enemy is an enemy $(+ \cdot - = -)$

Symbols used in modern algebra include the following. Note carefully the meaning of each.

$=$ — equals or is equal to
$\neq$ — is not equal to
$>$ — is greater than
$<$ — is less than
$\geqslant$ — is greater than or equal to
$\leqslant$ — is less than or equal to
$\vee$ — or
$\wedge$ — and
$\pm$ — plus or minus
$\approx$ — is approximately equal to; i.e., $\pi \approx 3.142$
X — represents the set of all real numbers on the number line denoted X
$X \cdot Y$ — represents the set of all ordered pairs (x,y) of real numbers in a plane associated with the number lines denoted X and Y.
ϵ — is an element of
$\subset$ — is a subset of
$\cup$ — union or cup
$\cap$ — intersection or cap
P' — is the complement of P
$|a|$ — means "the absolute value of a" and refers to its numerical value regardless of sign. Thus $|5| = 5$ and $|-5| = 5$.
$n!$ — is read "n factorial" and means the product of the natural numbers from 1 to n inclusive. Thus $2! = 1 \cdot 2$; $4! = 1 \cdot 2 \cdot 3 \cdot 4$; etc.

EQUATIONS AND INEQUALITIES (OPEN SENTENCES)

An **equation** is an expression of equality between two quantities which are separated by the sign of equality $=$, as $\{x \mid 3x - 2 = 2x + 3\}$.

An *inequality* is an expression of inequality between two quantities which are separated by a sign of inequality, as $\{x \mid 3x + 2 > 2x + 3\}$.

Both expressions are called **open sentences in one unknown.**

A *simple* open sentence is an equation or an inequality, which when simplified (cleared of fractions or parentheses if necessary), involves in each term only a constant or the first power of only one unknown quantity. Thus $\{x \mid 4x - 8 = 12\}$, $\{x \mid 4x - 8 > 12\}$, $\{(x,y) \mid x + y = 7\}$ and $\{(x,y) \mid x + y < 7\}$ are simple open sentences in one or two unknowns. $\{x \mid 2x^2 - x = 5\}$, $\{x \mid 2x^2 - x > 5\}$, $\{(x,y) \mid x^2 + y^2 = 25\}$ and $\{(x,y) \mid x^2 + y^2 \leqslant 25\}$ are *not* simple open sentences.

If an equation is true for all values of the letters involved, it is an *identity*. Thus $\{x \mid 3(x + 2) = 3x + 6\} = X$ and $\{(a,b) \mid (a + b)^2 = a^2 + 2ab + b^2\} = A \cdot B$.

The *solution set* of an open sentence in an unknown is the subset of the universal set of real numbers, R, that contains only those elements that make the sentence a true statement. Thus $\{x \mid 3x - 6 = 4x - 12\} = \{6\}$, since $3 \cdot 6 - 6 = 12 = 4 \cdot 6 - 12 = 12$.

Problem 1. $\{x \mid 4x - 9 = 2x + 3\} = \{6\}$, since
Proof:

1. $4x + [(-9) + 9] = 2x + 3 + 9$	1. Additive axiom
2. $4x = 2x + 12$	2. Def. of additive inverse
3. $2x + [2x + (-2x)] = [2x + (-2x)] + 12$	3. Same as 1.
4. $2x = 12$	4. Same as 2.
5. $\left[\frac{1}{2} \cdot 2\right]x = \left[\frac{1}{2} \cdot 2\right] \cdot 6$	5. Multiplicative axiom
6. $x = 6$	6. Def. of multiplicative inverse

Problem 2. $\{x \mid 3(x + 2) = 2(x - 3) + 17\} = \{5\}$, since
Proof:

1. $3x + 6 = 2x + [(-6) + 6] + 11$	1. Distributive axiom
2. $3x + 6 = 2x + 11$	2. Def. of additive inverse

3.	$x + [2x + (-2x)] + 6 = [2x + (-2x)] + 11$	3. Additive axiom
4.	$x + 6 = 11$	4. Same as 2.
5.	$x + [6 + (-6] = 5 + [6 + (-6]$	5. Same as 3.
6.	$x = 5$	6. Same as 2.

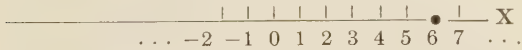
Problem 3. $\{x \mid 5x + 4 > 3x + 8\} = \{x \mid x > 2\}$, since

Proof:

1.	$2x + [3x + (-3x)] + 4 > [3x + (-3x)] + 8$	1. Additive axiom
2.	$2x + 4 > 8$	2. Def. of additive inverse
3.	$2x + [4 + (-4)] > 4 + [4 + (-4)]$	3. Same as 1.
4.	$2x > 4$	4. Same as 2.
5.	$\left[\frac{1}{2} \cdot 2\right] x > \left[\frac{1}{2} \cdot 2\right] \cdot 2$	5. Multiplicaive axiom
6.	$x > 2$	6. Def. of multiplicative inverse

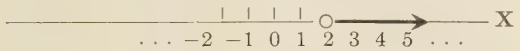
The solution sets of all of these examples, which illustrate open sentences, can and should be graphed. Here are the three graphs.

Problem 1.



Problem 2.

Problem 3.



Note that a closed circle is put at 6 for Problem 1 and at 5 for Problem 2. For Problem 3, an open circle is put at 2 and a solid arrow goes to the right. This merely points out that this third open sentence is true for any value of x greater than 2 and false for any value of x less than or equal to 2. What would $\{x \mid x \geqslant 2\}$ look like in graph form?

Such open sentences can be used to solve "word" problems, sometimes called "story" problems.

Problem. Three students decide to sell Christmas trees. Some of them sell at \$4 each, twice this number sell at \$2.50 each, and as many as both combined sell at \$1 each. If the total sales amounted to \$600, how many were sold at each price?

Solution.

Let x = number of trees sold at \$4 each (i.e., \$4x received)
then $2x$ = number of trees sold at \$2.50 each (i.e., \$5x received)
and $3x$ = number of trees sold at \$1 each (i.e., \$3x received)

Hence $\{x \mid 4x + 5x + 3x = 600\} = \{x \mid 12x = 600\} = \{x \mid x = 50\}$

Thus, 50 trees were sold for \$4 each, 100 trees were sold for \$2.50 each, and 150 trees were sold for \$1 each. *Check:* Since \$200 (received for the \$4 trees) plus \$250 (received for the \$2.50 trees) plus \$150 (received for the \$1 trees) equals \$600, the example is true for this particular value of x. If any other value for x were tried, the statement would be false.

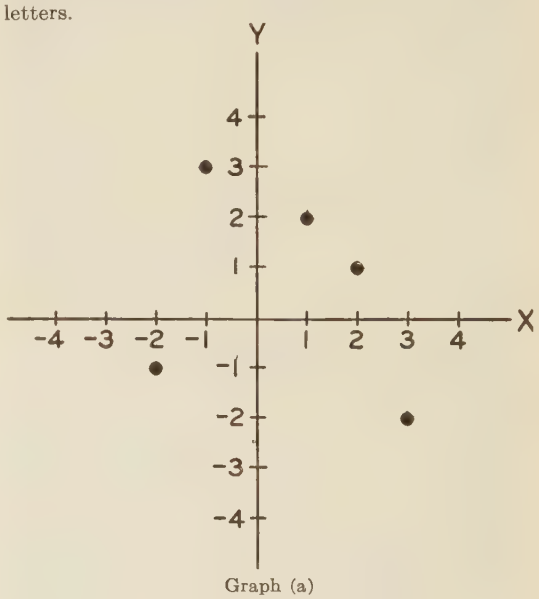
Problem. To publish a pamphlet, it costs \$600 plus an amount per copy. What price per copy would it cost to publish 10,000 copies for less than \$2000?

Solution.

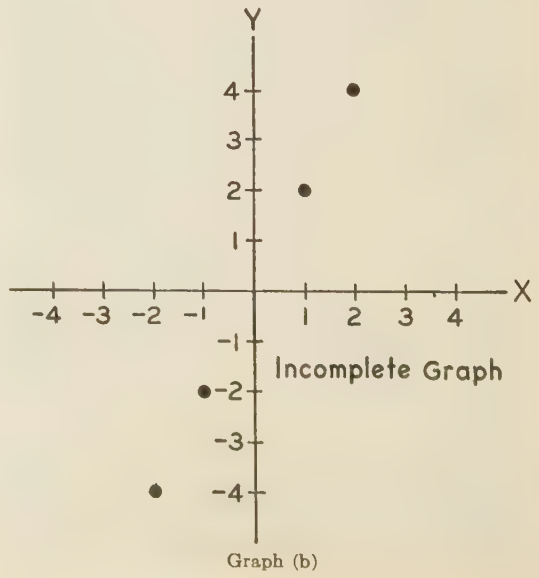
Let x = amount in dollars per copy. Then $\{x \mid 10{,}000x + 600 < 2{,}000\} = x \mid 10{,}000x < 1{,}400\}$ $= \{x \mid x < 0.14\}$. Hence the statement is true if the price per copy is less than 14 cents.

If the linear equation or inequality contains two unknowns it has the form $\{(x,y) \mid ax + by + c \text{ Ⓥ } 0\}$ where Ⓥ can represent $=$, $>$, $<$, $\geqslant$ or $\leqslant$; and a and b cannot equal zero at the same time. Their solution set is a set of *ordered pairs* that can be graphed by using two number scales that intersect at the 0 point for each and each scale is perpendicular to the other. Thus we are considering points in a plane (x,y) where $x \in X$ and $y \in Y$ and $X \cdot Y$ represents the graph Idesired. It is customary to define the number scale representing the set X as the X-axis (the horizontal axis) and the number scale representing the set Y as the Y-axis (the vertical axis). X and Y can represent N or I or R. Study carefully the following examples and their graphs.

Example 1. The graph of $\{(1,2), (2,1), (-1,3), (-2,-1), (3,-2)\}$ is shown in (a). It is an illustration of a finite set of ordered pairs. Note that (1,2) is *not* the same point as (2,1). You would use a similar technique to locate a certain place on your home town map, where the horizontal axis will be marked with numbers and the vertical axis with letters.



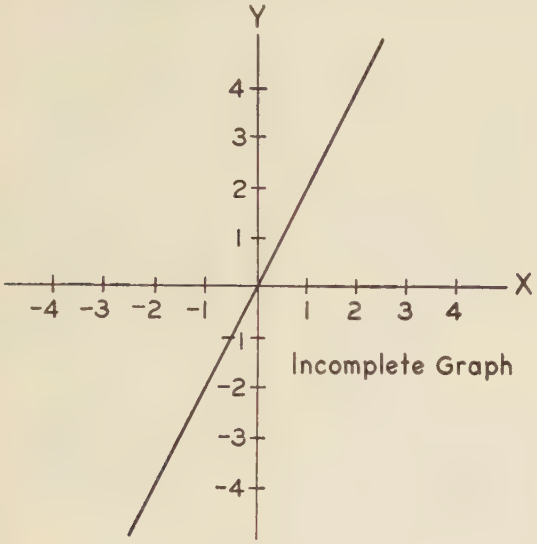
Graph (a)



Graph (b)

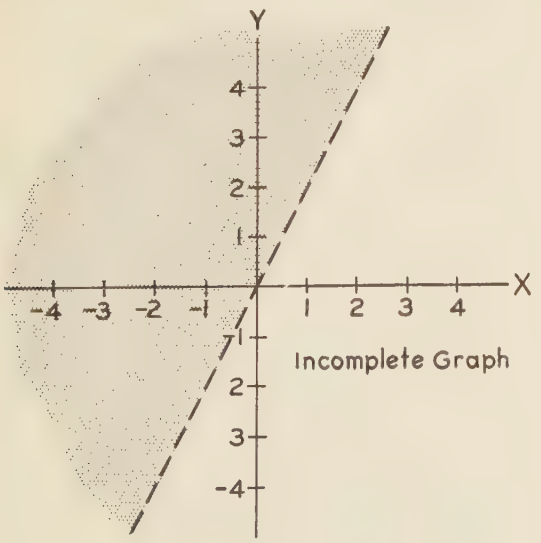
Example 2. The graph of $\{(x,y) \mid y = 2x, x \in I, y \in I\}$ is shown in (b). Note that the graph is a set of points that lie along a straight path like mileposts along a straight road. The solution set is a set of integral ordered pairs. That is: $\{(x,y) \mid y = 2x, x \in I, y \in I\} = \{\ldots, (-2,-4), (-1,-2), (0,0), (1,2), (2,4), \ldots\}$

Example 3. The graph of $\{(x,y) \mid y = 2x\}$ is shown in (c). Here it is assumed that $x \in X$ and $y \in Y$ and both X and Y are the same as R, the set of real numbers. Note that the graph is a continuous straight line, not a set of isolated points as we had in Example 2.



Graph (c)

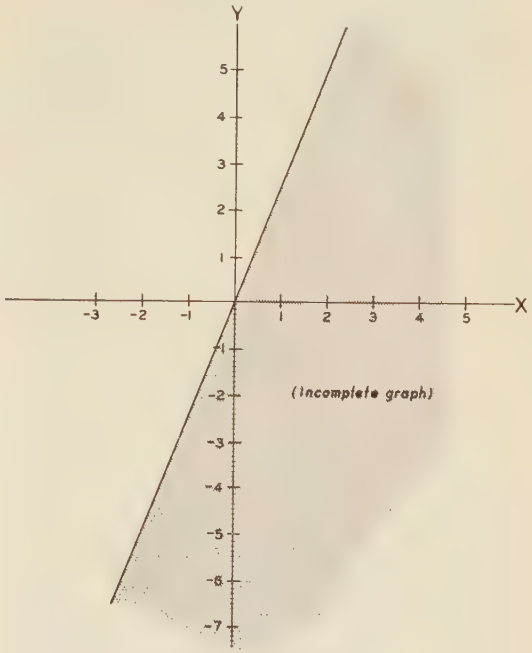
Example 4. The graph of $\{(x,y) \mid y > 2x\}$ is shown in (d). Note that any ordered pair in the shaded area makes the open sentence a true statement. This is not true for points on the line itself, so it is shown as a broken line.



Graph (d)

To draw such a graph it is first necessary to assume the inequality symbol to be $=$. That is, the *boundary line* must be drawn first. Then, by trial, determine which side of the line is to be shaded by using any ordered pair not on the line. Note that the point at $(-1,2)$ must be in the shaded area since $2 > 2(-1)$.

Example 5. The graph of $\{(x,y) \mid y \leqslant 2x\}$ is shown in (e). Note that any ordered pair, defining a point in the shaded area or on the boundary line itself, makes the statement true. Hence the boundary line is a solid line.



Graph (e)

The simplest way to draw the graph of a linear equation in two unknowns, or the boundary line of a linear inequality in two unknowns, is to find and locate any two ordered pairs, and use the statement that "through two points one and only one straight line can be drawn."

If we have two linear equations in two unknowns, such as $\{(x,y) \mid a_1x + b_1y + c_1 = 0\}$ and $\{(x,y) \mid a_2x + b_2y + c_2 = 0\}$, the equations are said to form a *system of linear equations* if we take their intersection. Such a problem would read: $\{(x,y) \mid a_1x + b_1y + c_1 = 0\} \cap \{(x,y) \mid a_2x + b_2y + c_2 = 0\}$. The intersection may have no common ordered pair, or all ordered pairs of one may also be the ordered pairs of the other. In general, there will be only one ordered pair that will satisfy both open sentences of the intersection.

To find the single ordered pair for such a pair of equations, two methods can be used. The first is purely algebraic. By this method we eliminate one of the two unknowns by using the postulational system. The second procedure is to graph the two sets of ordered pairs on a single $X \cdot Y$ plane and note the ordered pair at the point where the two graphs intersect, i.e., their point of intersection. Two algebraic methods of elimination are shown here.

(1) Elimination by Addition or Subtraction.

Multiply each given equation by a number such that the coefficients of the same unknown quantity in both of the new equations will be numerically equal.

If the equal coefficients thus obtained have the same sign, subtract one equation from the other; if they have unlike signs, add.

Problem. Solve the system of equations:

$$\begin{cases} 3a + 2b = 13. & (1) \\ 2a - 7b = -8. & (2) \end{cases}$$

Solution.—

Multiply (1) by 2.	$6a + 4b = 26.$	(3)
Multiply (2) by 3.	$6a - 21b = -24.$	(4)
Add inverse of (4) to (3).	$25b = 50.$	(5)
	$b = 2.$	(6)

Substitute in (1) the value of b as shown in (6), and solve., $3a + 4 = 13$, so $a = 3$.

Check by substituting 2 for b and 3 for a in the other equation. $6 - 14 = -8$.

(2) Elimination by Comparison.

In each equation find the value of one unknown in terms of the other. Form an equation with these values, and solve it.

Problem. Solve the system of equations:

$$\begin{cases} 3x + 2y = 5. & (1) \\ 2x + 5y = 7. & (2) \end{cases}$$

Solution.—

From (1), $3x = 5 - 2y$; $x = \dfrac{5 - 2y}{3}$. (3)

From (2), $2x = 7 - 5y$; $x = \dfrac{7 - 5y}{2}$. (4)

From (3) and (4), $\dfrac{5 - 2y}{3} = \dfrac{7 - 5y}{2}$.

Clear of fractions. $10 - 4y = 21 - 15y$.

$-4y + 15y = 21 - 10$.

$11y = 11$.

$y = 1$.

Substitute 1 for y in (4). $x = \dfrac{7 - 5}{2} = 1$.

Check by substituting the values 1 for x and 1 for y in both equations. $3 \cdot 1 + 2 \cdot 1 = 5$.

$2 \cdot 1 + 5 \cdot 1 = 7$.

ALGEBRAIC OPERATIONS WITH MULTINOMIALS

Addition. When multinomials are added, similar terms are combined. Adding them consists of combining their numerical coefficients according to our basic assumptions. This can be done either horizontally or vertically.

Problem. Add $3x^2 + 2x - 7$; $4x^2 - 7x + 3$; $-2x^2 + 2x + 5$.

Solution.

$3x^2 + 2x - 7 + 4x^2 - 7x + 3 - 2x^2 + 2x + 5$

$= 3x^2 + 4x^2 - 2x^2 + 2x - 7x + 2x - 7 + 3 + 5$ Commutative axiom

$= (3 + 4 - 2)x^2 + (2 - 7 + 2)x + 1$ Distributive axiom

$= 5x^2 - 3x + 1$ Simple arithmetic

or, arrange similar terms in columns:

$$\begin{array}{r} 3x^2 + 2x - 7 \\ 4x^2 - 7x + 3 \\ -2x^2 + 2x + 5 \\ \hline 5x^2 - 3x + 1 \end{array}$$

To check the accuracy of the work, evaluate each algebraic expression by substituting some convenient value for x. If 2 is used for x, we have $(12 + 4 - 7) + (16 - 14 + 3) + (-8 + 4 + 5) = 9 + 5 + 1 = 15$ and $20 - 6 + 1 = 15$.

Subtraction. Subtraction is the inverse of addition and is accomplished by changing the signs of all the terms in the multinomial being subtracted and then following the procedure for addition.

Problem. From $6x^3 - 3x^2 + 2x + 4$, subtract $3x^3 - 2x + 5$.

Solution.

$6x^3 - 3x^2 + 2x + 4 - (3x^3 - 2x + 5)$

$= 6x^3 - 3x^2 + 2x + 4 - 3x^3 + 2x - 5$ Distributive axiom

$= 3x^3 - 3x^2 + 4x - 1$ Commutative axiom and simple arithmetic

Using $x = 2$ to check, we have

$48 - 12 + 4 + 4 - (24 - 4 + 5) =$

$44 - 25 = 19$

and $24 - 12 + 8 - 1 = 19$.

Multiplication. Multiplication of multinomials follows the distributive axiom. Each term of one multinomial is multiplied by each term of the other multinomial and similar terms of the partial products are combined using the commutative and associative axioms.

Problem. Multiply $3x^2 + 2xy + y^2$ by $2x^2y$.

Solution.

$2x^2y\,(3x^2 + 2xy + y^2) = 2x^2y \cdot 3x^2 + 2x^2y \cdot 2xy + 2x^2y \cdot y^2 = 6x^4y + 4x^3y^2 + 2x^2y^3$

Problem. Multiply $5a - 6b$ by $3a - 4b$.

Solution.

$(3a - 4b)(5a - 6b) = 3a(5a - 6b) - 4b(5a - 6b)$

$= 15a^2 - 18ab - 20ab + 24b^2$

$= 15a^2 - 38ab + 24b^2$

Problem. Multiply $5x^2 + 2x - 3$ by $2x^2 - 3x + 1$.

Solution.

$(2x^2 - 3x + 1)(5x^2 + 2x - 3)$

$= 2x^2(5x^2 + 2x - 3) - 3x(5x^2 + 2x - 3) + 1(5x^2 + 2x - 3)$

$= 10x^4 + 4x^3 - 6x^2 - 15x^3 - 6x^2 + 9x + 5x^2 + 2x - 3$

$= 10x^4 - 11x^3 - 7x^2 + 11x - 3$

Or the product can be taken as follows: (Arranging terms in descending powers of one letter insures that the result will have the same order.)

$$\begin{array}{r} 5x^2 + 2x - 3 \\ 2x^2 - 3x + 1 \\ \hline 10x^4 + 4x^3 - 6x^2 \\ - 15x^3 - 6x^2 + 9x \\ 5x^2 + 2x - 3 \\ \hline 10x^4 - 11x^3 - 7x^2 + 11x - 3 \end{array}$$

Check by letting $x = 2$. Show that we have $21 \cdot 3 = 63$.

Division. To carry out division by a monomial divisor, each term of the dividend is multiplied by the multiplicative inverse of the divisor.

Problem. Divide $15x^3y - 35x^2y^2 + 25xy^3$ by $5xy$.

Solution.

$15x^3y\dfrac{1}{5xy} - 35x^2y^2\dfrac{1}{5xy} + 25xy^3\dfrac{1}{5xy}$

$= 3x^2 - 7xy + 5y^2$

If the divisor contains more than a single term, the process resembles that of long division in arithmetic.

$$\begin{array}{r} 2x - 5 \\ x^2 - 5x + 3 \overline{)\,2x^3 - 15x^2 + 31x - 15} \\ \underline{2x^3 - 10x^2 + 6x} \\ - 5x^2 + 25x - 15 \\ \underline{- 5x^2 + 25x - 15} \end{array}$$

Steps in dividing multinomials:

1. Arrange dividend and divisor in either ascending or descending powers of one of the letters involved.
2. Multiply the first term of the dividend by the multiplicative inverse of the first term of the divisor and place the result in the quotient.
3. Multiply the entire divisor by the term just entered in the quotient.
4. Add the additive inverse of this product to the dividend.
5. Use the remainder plus additional terms brought down from the dividend as a new dividend and repeat from step 2.

SPECIAL PRODUCTS

The results obtained from certain products are so important in any use of algebra they should be recognized at sight. Such special products, obtained by using the distributive axiom, are of the following kinds:

I. $x(a + b) = ax + bx$

II. $(x + y)^2 = (x+y)(x+y) = x(x+y) + y(x+y) = x^2 + xy + xy + y^2 = x^2 + 2xy + y^2$

$(x - y)^2 = (x-y)(x-y) = x(x-y) - y(x-y) = x^2 - xy - xy + y^2 = x^2 - 2xy + y^2$

III. $(x + y)(x - y) = x(x-y) + y(x-y)$
$= x^2 - xy + xy - y^2 = x^2 - y^2$

IV. $(x + a)(x + b) = x(x+b) + a(x+b)$
$= x^2 + bx + ax + ab$
$= x^2 + (a+b)x + ab$

V. $(ax + b)(cx + d) = acx^2 + (ad + bc)x + bd$

VI. $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$

It is as important to be able to describe some of these products in words as it is to write down the results immediately. For example:

II. *The square of the sum of two quantities is equal to the square of the first quantity plus twice the product of the two quantities, plus the square of the second quantity.*

III. *The product of the sum and difference of two quantities is equal to the difference of their squares.*

FACTORING

The process of "undoing" multiplication to find the factors which compose a given product is important because of its wide practical application in algebra. If you learn to recognize the special products just considered, you will be able to easily find the factors which compose a given product. Thus **factoring** is the process of finding two or more expressions whose product is equal to a given expression. To be factored completely each factor must be a *prime factor*, which is an expression that has no factor except itself and 1.

I. Common Monomial Factor. $15x^3 - 10x^2 + 25x = 5x(3x^2 - 2x + 5)$

II. Trinomial Square. $4x^2 - 12xy + 9y^2 = (2x - 3y)^2$

The characteristics which identify a trinomial square are:

1. Two terms are positive perfect squares.
2. The remaining term is either positive or negative and is twice the product of the square roots of the other two terms.

III. Difference of Squares. $9x^2 - 16y^2 = (3x + 4y)(3x - 4y)$

A difference of squares is exactly that—two perfect squares connected by a minus sign. The two binomial factors are made up of the sum and the difference of the square roots of the two perfect squares.

IV. Grouping of Terms. Frequently a multinomial of four terms can be grouped in smaller forms which contain a common factor, then factored further as the following example shows:

Example: $6x^3 + 15x^2 + 4x + 10$ may be grouped:

$(6x^3 + 15x^2) + (4x + 10)$.

Factor each group of terms:

$= 3x^2(2x + 5) + 2(2x + 5)$

Remove the common binomial factor:

$= (2x + 5)(3x^2 + 2)$

V. General Quadratic Trinomial. $6x^2 - 7xy - 20y^2$ has two binomial factors which are most easily found by converting into a problem in grouping. The *product* of the first and last terms is divided into two factors whose algebraic sum is the middle term, as follows:

$(6x^2)(-20y^2) = -120x^2y^2 = (-15xy)(8xy)$ and $-15xy + 8xy = -7xy$. These *two* terms are written *in place of the original term* $-7xy$:

$6x^2 - 7xy - 20y^2 = 6x^2 - 15xy + 8xy - 20y^2 = (6x^2 - 15xy) + (8xy - 20y^2)$
$= 3x(2x - 5y) + 4y(2x - 5y)$
$= (2x - 5y)(3x + 4y)$

Problem: Factor $10m^2 - 29m + 21$.

Solution. Since $(10m^2)(21) = 210m^2$
$= (-15m)(-14m)$
and $-15m - 14m = -29m$,
$10m^2 - 29m + 21 = 10m^2 - 15m - 14m + 21$
$= (10m^2 - 15m) - (14m - 21)$
$= 5m(2m - 3) - 7(2m - 3)$
$= (2m - 3)(5m - 7)$

HIGHEST COMMON FACTOR

The **highest common factor** (H. C. F.) of two or more algebraic expressions is the factor of *highest degree and greatest numerical coefficient* that is common to these expressions. It is equal to the product of all the common factors of the expressions. Its value is determined by the following method:

Write each expression as the product of its prime factors. Find the product of the common factors, using each factor the least number of times it occurs in any one expression. This product is the H. C. F. of the expressions.

Problem. Find the H. C. F. of $2x^4 - 12x^3 + 18x^2$ and $4x^5 - 36x^3$.

Solution.—Factoring, we have

$2x^4 - 12x^3 + 18x^2 = 2 \cdot x \cdot x\ (x-3)\ (x-3)$
and $4x^5 - 36x^3 = 2 \cdot 2 \cdot x \cdot x \cdot x\ (x-3)\ (x+3)$.

H. C. F. is $2 \cdot x \cdot x\ (x - 3)$, or $2x^3 - 6x^2$.

LOWEST COMMON MULTIPLE

The **lowest common multiple** (L. C. M.) of two or more algebraic expressions is the expression of *lowest degree and smallest numerical coefficient* that is exactly divisible by each of the given expressions. To find the L. C. M., observe the following method:

Write each expression as the product of its prime factors. Find the product of all the different prime factors, using each factor the greatest number of times it occurs in any one expression.

Problem. Find the L. C. M. of $x^2 + 5x + 6$, $x^2 + 4x + 3$, $x^2 + x$.

Solution.—Factoring, we have

$x^2 + 5x + 6 = (x + 3)(x + 2)$.
$x^2 + 4x + 3 = (x + 3)(x + 1)$.
$x^2 + x = x(x + 1)$.
L. C. M. $= (x + 3)(x + 2)(x + 1)(x)$.

FRACTIONS

An **algebraic fraction** is an indicated ratio of two algebraic expressions in which the dividend is the *numerator* and the divisor is the *denominator*. The type form is written $\frac{a}{b}$, in which a and b may each represent any algebraic expression.

The **terms** of a fraction are the numerator and the denominator.

A fraction with a zero numerator becomes zero. If the denominator only is zero, the fraction does not represent any finite quantity. If both numerator and denominator are zero, the fraction may be regarded as equal to any number.

An **integral expression** is an expression which does not contain a fraction: $2x^2 + 3y$.

A **mixed expression** is an expression, part of which is fractional and part integral:

$$2x + y + \frac{3}{x + 1}.$$

An **improper fraction** in algebra is a fraction in which the numerator contains a power equal to or higher than the highest power of the same letter in the denominator; as,

$$\frac{6x^2 + 6}{2x^2}, \quad \frac{6x^3 + 4x^2 - 8}{x - 2}.$$

The **sign of a fraction** is the sign placed before the dividing line. This sign is distinct from the sign of either the denominator or the numerator. By the laws of signs of multiplication and division, we have

$$+\frac{+a}{+b}=+\frac{-a}{-b}=-\frac{-a}{+b}=-\frac{+a}{-b}\;;\;\frac{x}{-ay}=-\frac{x}{ay};$$

$$\frac{m+n}{m-n}=\frac{-(m+n)}{-(m-n)}=\frac{-m-n}{-m+n}.$$

TRANSFORMATION OF FRACTIONS

Transformation of a fraction is the process of changing its form without changing its value.

Multiplying both terms of a fraction by the same number does not change the value of the fraction.

A fraction is in its **lowest terms** when the numerator and denominator have no common factor.

(1) To Express a Fraction in its Lowest Terms.

Express the numerator and the denominator in terms of their prime factors and remove all factors common to both.

Problem. Express $\frac{9x^2+6x+1}{9x^2-1}$ in its lowest terms.

Solution.—

$$\frac{9x^2+6x+1}{9x^2-1}=\frac{(3x+1)\ (3x+1)}{(3x+1)\ (3x-1)}=\frac{3x+1}{3x-1}.$$

(2) To Express an Improper Fraction as an Integral or a Mixed Number.

Divide the numerator by the denominator; if there is a remainder, write it over the denominator in the form of a fraction, which, with the proper sign, should be annexed to the integral part of the quotient.

Problem. Change $\frac{16x^2+8x-3}{4x+5}$ to a mixed expression.

Solution.—

$$\frac{16x^2+8x-3}{4x+5}=4x-3+\frac{12}{4x+5}.$$

(3) To Change a Mixed Expression to a Fraction.

Multiply the integral expression by the denominator of the fraction, add this product to the numerator, and under the result write the denominator.

Problem. Express $a+y-\frac{a^2+y^2}{a-y}$ as a fraction.

Solution.—

$$\frac{(a+y)\ (a-y)-(a^2+y^2)}{a-y}$$

$$=\frac{a^2-y^2-a^2-y^2}{a-y}=\frac{-2y^2}{a-y}=\frac{2y^2}{y-a}.$$

(4) To Express Fractions with their Lowest Common Denominator.

Find the L. C. M. of the denominators; this is the L. C. D. of the fractions.

Divide the L. C. D. by the denominator of the first fraction, and multiply both terms of the fraction by the resulting quotient. Treat each of the other fractions similarly.

Problem. Express $\frac{1}{3x-6}$, $\frac{5}{2x+4}$, $\frac{3x+1}{x^2-4}$, with their lowest common denominator.

Solution.—Find the L. C. D. as follows:

$3x - 6 = 3\ (x-2)$.
$2x + 4 = 2\ (x+2)$.
$x^2 - 4 = (x-2)\ (x+2)$.
L. C. D. $= 2\cdot3\ (x-2)\ (x+2)$, or $6(x^2-4)$.

$$\frac{1}{3x-6}=\frac{2x+4}{6(x^2-4)}\;;\;\frac{5}{2x+4}=\frac{15x-30}{6(x^2-4)}$$

$$\frac{3x+1}{x^2-4}=\frac{18x+6}{6(x^2-4)}.$$

ADDITION AND SUBTRACTION OF FRACTIONS

Change the given fractions, if necessary, to fractions having the L. C. D. Place the algebraic sum of the numerators of the new fractions over the L. C. D. Express the result in its lowest terms.

Problem. Simplify $\frac{a-b}{a+b}-\frac{a+b}{a-b}+\frac{4a^2}{a^2-b^2}$.

Solution.—Find the L. C. D. as follows:

$(a+b) = (a+b)$.
$(a-b) = (a-b)$.
$a^2-b^2 = (a+b)\ (a-b)$.
L.C.D. $= (a+b)\ (a-b)$ or a^2-b^2.

$$\frac{a-b}{a+b}-\frac{(a+b)}{a-b}+\frac{4a^2}{a^2-b^2}=$$

$$\frac{(a-b)(a-b)-(a+b)(a+b)+4a^2}{(a+b)(a-b)}$$

$$=\frac{(\cancel{a^2}-2ab+\cancel{b^2})-(\cancel{a^2}+2ab+\cancel{b^2})+4a^2}{(a+b)\ (a-b)}=\frac{-4ab+4a^2}{(a+b)\ (a-b)}$$

$$=\frac{4a\ \cancel{(a-b)}}{(a+b)\cancel{(a-b)}}=\frac{4a}{a+b}$$

MULTIPLICATION OF FRACTIONS

Express the numerator and the denominator of each fraction as the product of their prime factors. Remove all factors that are common to both the numerators and the denominators. Multiply the remaining factors of the numerators to obtain the new numerator, and of the denominators to obtain the new denominator.

Problem. Find the product of $\frac{y^2-9}{y^2+y}\cdot\frac{y^2-1}{y-3}$.

Solution. Where possible, factor and use the definition of a multiplicative inverse.

$$\frac{y^2-9}{y^2+y}\cdot\frac{y^2-1}{y-3}$$

$$=\frac{(y+3)\ (y-3)}{y(y+1)}\cdot\frac{(y+1)\ (y-1)}{y-3}$$

$$=\frac{(y+3)}{y}\cdot\frac{\cancel{(y-3)}}{\cancel{y-3}}\cdot\frac{1}{\cancel{y+1}}\cdot\frac{\cancel{(y+1)}}{1}\cdot(y-1)$$

$$=\frac{(y+3)\ (y-1)}{y}=\frac{y^2+2y-3}{y}$$

DIVISION OF FRACTIONS

Change all integral or mixed expressions to fractional form. Multiply both the dividend and the divisor by the multiplicative inverse of the divisor and proceed as in the multiplication of fractions.

Problem. Divide $\frac{x^2-1}{4}$ by $\frac{x-1}{x+2}$.

Solution. $\frac{x^2-1}{4}\div\frac{x-1}{x+2}$

$$=\frac{x^2-1}{4}\cdot\frac{x+2}{x-1}\div\frac{\cancel{x-1}}{\cancel{x+2}}\cdot\frac{\cancel{x+2}}{\cancel{x-1}}$$

$$=\frac{(x+1)\ \cancel{(x-1)}}{4}\cdot\frac{x+2}{\cancel{x-1}}\div 1$$

$$=\frac{(x+1)\ (x+2)}{4}=\frac{x^2+3x+2}{4}$$

FRACTIONAL EQUATIONS

The process of changing an equation containing fractions to an equation without fractions is called *clearing of fractions.*

To clear an equation of fractions, multiply both members of the equation by the L.C.M. of the denominators. That is, use the multiplicative axiom. Express the resulting fractions in their lowest terms, thereby eliminating their denominators. If a fraction is preceded by a minus sign, all the signs in the numerator must be changed when the denominator is removed. Can you state why?

Problem.

$$\left\{x \mid \frac{3+2x}{3} = \frac{3}{2} - \frac{4x^2}{3(3-2x)}\right\} = \left\{\frac{1}{2}\right\}, \text{ since}$$

Proof.

1. $\frac{3+2x}{3} \cdot 6(3-2x) = \frac{3}{2} \cdot 6(3-2x) - \frac{4x^2}{3(3-2x)} \cdot 6(3-2x)$ — 1. Multiplicative axiom
2. $2(9-4x^2) = 9(3-2x) - 8x^2$ — 2. Multiplicative inverse
3. $18 - 8x^2 = 27 - 18x - 8x^2$ — 3. Distributive axiom
4. $18 = 27 - 18x$ — 4. Additive axiom
5. $18x + 18 = 27 + [(-18x) + 18x]$ — 5. Same as 4.
6. $18x + 18 = 27$ — 6. Def. of additive inverse
7. $18x + [18 + (-18)] = 9 + [18 + (-18)]$ — 7. Same as 4
8. $18x = 9$ — 8. Same as 6
9. $\left[\frac{1}{9} \cdot 9\right] 2x = \left[\frac{1}{9} \cdot 9\right]$ — 9. Same as 1
10. $2x = 1$ — 10. Same as 2
11. $\left[\frac{1}{2} \cdot 2\right] x = \frac{1}{2} \cdot 1$ — 11. Same as 1
12. $x = \frac{1}{2}$ — 12. Same as 2.

Check. $\frac{3+2(1/2)}{3} = \frac{3}{2} - \frac{4(1/4)}{3[3-2(1/2)]}$

$$\frac{4}{3} = \frac{4}{3}$$

If x had equalled $\frac{3}{2}$ instead of $\frac{1}{2}$, you would have to state *no solution*, since one of the denominators in the given example would have been zero (0) in the check. The solution set would have been $\{\ \}$.

QUADRATIC EQUATIONS

A *quadratic equation* is an equation that, when simplified, contains the unknown quantity in the second but no higher power: $\{x|ax^2 + bx + c = 0\}$. Such an equation has been reduced to the *standard form.*

A *constant term* in a quadratic equation is a term that does not contain the unknown quantity. In the equation $\{x|2x^2 - 3x - 7 = 0\}$, -7 is the constant term.

A *pure quadratic equation* is a quadratic equation that does not contain the first power of the unknown quantity. Such are, for example,

$$\{x|x^2 = 4\} \text{ and } \{x|x^2 - ab = 0\}.$$

Every pure quadratic has two elements in the solution set, numerically equal but opposite in sign. In the first of the above examples,

$$\{x|x^2 = 4\} = \{2, -2\};$$

in the second example,

$$\{x|x^2 = ab\} = \{\sqrt{ab}, -\sqrt{ab}\}.$$

Problem. $\{x|7x^2 - 36 = 3x^2\} = \{3, -3\}$, since

Proof.

1. $4x^2 + [3x^2 + (-3x^2)] - 36 = [3x^2 + (-3x^2)]$ — 1. Additive axiom
2. $4x^2 - 36 = 0$ — 2. Def. of additive inverse
3. $4x^2 + [(-36) + 36] = 36$ — 3. Same as 1
4. $4x^2 = 36$ — 4. Same as 2
5. $\left[\frac{1}{4} \cdot 4\right] x^2 = 9 \cdot \left[4 \cdot \frac{1}{4}\right]$ — 5. Multiplicative axiom
6. $x^2 = 9$ — 6. Def. of multiplicative inverse
7. $x = \pm 3$

A *complete quadratic equation* is a quadratic equation that contains both the first and the second power of the unknown quantity: $\{x|x^2 + 3x = 10\}$.

Every quadratic equation may be reduced to the standard form, $\{x|ax^2 + bx + c = 0\}$, where a may have any real value other than 0, and b and c may have any real value whatsoever. Methods of solving quadratic equations are as follows:

1) the factoring method
2) the method of completing the square
3) the use of the quadratic formula

FACTORING METHOD

To solve quadratic equations by factoring, put the equation in standard form and then factor the left member.

Thus we have the product of two factors equalling zero. The only way to obtain zero as a result of multiplying two numbers a and b is to have $a = 0$ or $b = 0$ or both a and b equal zero. *This was the first Theorem proved in the ALGEBRA section.* Hence we place each factor equal to zero and solve.

Problem. $\{x|x^2 + 5 = 6x\} = \{5,1\}$, since

$$\begin{aligned}\{x|x^2 + 5 = 6x\} &= \{x|x^2 - 6x + 5 = 0\} \\ &= \{x|(x-5)(x-1) = 0\} \\ &= \{x|x-5 = 0\} \cup \{x|x-1 = 0\} \\ &= \{5\} \cup \{1\} = \{5,1\}\end{aligned}$$

Check. $5^2 + 5 = 6 \cdot 5$, and $1^2 + 5 = 6 \cdot 1$

COMPLETING THE SQUARE

A binomial, such as $x^2 + kx$, can be made into a perfect square in x by adding to it the square of one-half the coefficient of x. Thus $x^2 + kx$ is made into a perfect square by adding $\left(\frac{k}{2}\right)^2$ or $\frac{k^2}{4}$ to it.

That is: $x^2 + kx + \frac{k^2}{4} = \left(x + \frac{k}{2}\right)^2$

For example, $x^2 - 8x$ can be made into a perfect square by adding 16, which is the square of half of -8. $x^2 - 8x + 16 = (x-4)^2$

The following steps are used to solve a quadratic equation by completing the square:

1. Put all terms containing the unknown on one side of the equation and all other terms on the other side. Combine like terms.
2. Multiply all terms by the multiplicative inverse of the coefficient of the quadratic term.
3. Complete the square of the side containing the unknown by adding an appropriate term to both sides. Rewrite the completed square as the square of a binomial. Simplify the other side.
4. Extract the square roots of both sides. Be sure to take both positive and negative square roots of the side which does not contain the unknown.

Problem.

$$\{x|3x^2 + 10x - 8 = 0\} = \left\{\frac{2}{3}, -4\right\}, \text{ since}$$

$$\begin{aligned}\{x|3x^2 + 10x - 8 = 0\} &= \left\{x|x^2 + \frac{10}{3}x + \frac{25}{9} = \frac{8}{3} + \frac{25}{9}\right\} \\ &= \left\{x|\left(x + \frac{5}{3}\right)^2 = \frac{49}{9}\right\} \\ &= \left\{x|x + \frac{5}{3} = \frac{7}{3}\right\} \cup \left\{x|x + \frac{5}{3} = -\frac{7}{3}\right\} \\ &= \left\{x|x = \frac{2}{3}\right\} \cup \{x|x = -4\} = \left\{\frac{2}{3}, -4\right\}\end{aligned}$$

Check.

$3 \cdot (-4)^2 + 10 \cdot (-4) - 8 = 48 - 40 - 8 = 0$

$3 \cdot \left(\frac{2}{3}\right)^2 + 10 \cdot \frac{2}{3} - 8 = 1\frac{1}{3} + 6\frac{2}{3} - 8 = 0$

FORMULA METHOD

By using the method of completing the square, we obtain

$$\{x|ax^2 + bx + c = 0\} = \left\{\frac{-b + \sqrt{b^2 - 4ac}}{2a}, \frac{-b - \sqrt{b^2 - 4ac}}{2a}\right\}$$

Using the formula method, verify the solution set found in the example above where $a = 3$, $b = 10$, and $c = -8$.

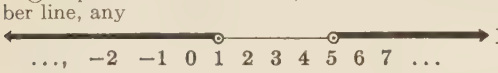
QUADRATIC INEQUALITIES

A *quadratic inequality* is an inequality of the form $\{x|ax^2 + bx + c \ \textcircled{v}\ 0\}$ where $\textcircled{v}$ represents $>$, $<$, $\geqslant$, or $\leqslant$. A quadratic equation is where $\textcircled{v}$ represents $=$.

To solve a quadratic inequality, first assume that $\textcircled{v}$ represents $=$. That is, first determine the solution set as was done for a quadratic equation. Then carry out the steps needed as shown in the following problems.

Problem. $\{x|x^2 - 6x + 5 > 0\}$

Solution. Since $x^2 - 6x + 5 = (x - 5)(x - 1)$, the points 1 and 5 on the number line would be closed circles if $\textcircled{v}$ represented $=$ and open circles if $\textcircled{v}$ represented $>$. Hence, as seen on the number line, any



real number greater than 5 or less than 1 makes the original statement true; and any real number between 1 and 5, as well as 1 and 5 themselves, makes the statement false. Hence:

$$\{x|x^2 - 6x + 5 > 0\} = \{x|(x - 5)(x - 1) > 0\} = \{x|x > 5\} \cup \{x|x < 1\}$$

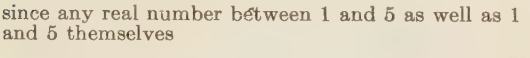
Problem.

$\{x|x^2 - 6x + 5 \leqslant 0\}$

Solution.

$$\{x|x^2 - 6x + 5 \leqslant 0\} = \{x|(x - 5)(x - 1) \leqslant 0\} = \{x|x \geqslant 5\} \cup \{x|x \leqslant 1\}$$

since any real number between 1 and 5 as well as 1 and 5 themselves



makes the statement true, and all other real numbers make the statement false. This solution can be put into a simpler form:

$$\{x|x^2 - 6x + 5 \leqslant 0\} = \{x|1 \leqslant x \leqslant 5\}.$$

Problem. $\{x|3x^2 + 10x - 8 < 0\}$

Solution. $\{x|3x^2 + 10x - 8 < 0\}$

$= \{x|(3x - 2)(x + 4) < 0\}$

$= \{x|3x - 2 < 0\} \cap \{x|x + 4 > 0\}$

$$= \left\{x\middle|x < \frac{2}{3}\right\} \cap \{x|x > -4\} = \left\{x|-4 < x < \frac{2}{3}\right\}$$

since any real number between -4 and $\frac{2}{3}$ makes the statement true

and all other real numbers make the statement false.

Special notes: If $\textcircled{v}$ is $<$ or $\leqslant$, then $\cap$ is used; and if $\textcircled{v}$ is $>$ or $\geqslant$, then $\cup$ is used. Also, be sure to draw the graph.

BINOMIAL THEOREM

Where the exponent of a binomial of the form $(a + b)^n$ is a positive integral quantity, we can obtain by successive multiplications the following identities:

$(a + b)^2 = a^2 + 2ab + b^2$;

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$;

$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$.

Any one of these expansions may be written to show the law of its formation. Thus:

$$(a + b)^4 = a^4 + 4a^3b + \frac{4 \cdot 3}{1 \cdot 2} a^2b^2 + \frac{4 \cdot 3 \cdot 2}{1 \cdot 2 \cdot 3} ab^3 + \frac{4 \cdot 3 \cdot 2 \cdot 1}{1 \cdot 2 \cdot 3 \cdot 4} b^4.$$

If n represents the exponent of $(a + b)$, then it may be observed that

(1) The number of terms in the expansion is $n + 1$.

(2) The first term is a^n, and the exponent of a decreases by 1 in each succeeding term.

The first power of b is found in the second term, and the exponent of b increases by 1 in each succeeding term.

(3) The sum of the exponents of a and b in any term is n.

(4) The coefficients of the terms, taken in order, are 1, n, $\frac{n(n-1)}{1 \cdot 2}$, $\frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3}$, etc.

The formula, therefore, for the expansion of any positive integral power of the binomial expression $a + b$ is as follows:

$$(a + b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{1 \cdot 2} a^{n-2}b^2 + \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} a^{n-3}b^3 + \cdots + b^n.$$

If b is negative, the signs of the even-numbered terms are negative.

If n is a negative number or a fraction, we may also form such a series, but it will contain an infinite number of terms.

Problem. Expand $(a + b)^5$.

Solution.—

$$(a + b)^5 = a^5 + 5a^4b + \frac{4 \cdot 5}{1 \cdot 2} a^3b^2 + \frac{5 \cdot 4 \cdot 3}{1 \cdot 2 \cdot 3} a^2b^3 + \frac{5 \cdot 4 \cdot 3 \cdot 2}{1 \cdot 2 \cdot 3 \cdot 4} ab^4 + \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} b^5.$$

Hence, $(a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$.

PROGRESSIONS

A **series** is a succession of numbers formed according to some fixed law.

The **terms** of a series are its successive numbers.

The terms of the binomial expansions above form a series as do those of the progressions, two of which, arithmetical and geometrical, are treated in this section.

ARITHMETICAL PROGRESSIONS

An **arithmetical progression** (A. P.) is a series, each term of which, after the first, is derived from the preceding term by the addition of a constant number called the **common difference:**

2, 5, 8, 11, 14;

19, 14, 9, 4, −1, −6;

$x, x + y, x + 2y, x + 3y$.

The **common difference** is the number which is added to each term to produce the next one. In the arithmetical progressions given above the common difference is 3 for the first one, −5 for the second, and y for the third. The first is an ascending progression, the second descending.

THE FORMULA FOR THE nTH TERM l OF AN A. P., WHEN THE FIRST TERM a AND THE COMMON DIFFERENCE d ARE GIVEN, IS

(I) $l = a + (n - 1)d$.

Problem. Find the 10th term of the series 3, 7, 11, 15, etc.

Solution.—Use $a = 3$, $d = 4$, $n = 10$ in (I):

$$l = 3 + (10 - 1)\,4;$$
$$l = 39.$$

THE FORMULA FOR THE SUM s OF THE TERMS IN AN A. P. IS

$$\text{(II)}\quad s = \frac{n}{2}(a + l), \text{ or } n\left(\frac{a + l}{2}\right).$$

Problem. What is the sum of the series 2, 4, 6, 8, etc. containing 12 terms?

Solution.—Since the last term is not given we substitute $a = 2$, $n = 12$, $d = 2$ in formula (I) to find l and then use formula (II) to find s.

$$l = 2 + (12 - 1)\,2 = 24.$$

$$s = \frac{n}{2}(a + l).$$

$$s = \frac{12}{2}(2 + 24) = 156.$$

Formulas (I) and (II), used in solving problems relating to arithmetical progressions involve five quantities. If any three of the five quantities are given the other two may be found by use of (I) and (II).

Problem. The first term of an A. P. is 12, the last term is 144, and the sum of the terms is 1014. Find the series.

Solution.—$s = 1014$, $a = 12$, $l = 144$.

Substituting in formulas (I) and (II),

$$144 = 12 + (n - 1)d, \quad (1)$$

$$1014 = \frac{n}{2}(12 + 144). \quad (2)$$

From (2), $78n = 1014$, or $n = 13$.

Substituting in (1), $144 = 12 + 12d$.

Hence, $d = 11$.

The series is 12, 23, 34, 45, 56, 67, 78, 89, 100, 111, 122, 133, 144.

The **arithmetic mean,** or **average,** is the number half way between any two numbers, such as 10 and 20, which together with these numbers makes an A.P. of three terms: 10, 15, 20.

Problem. Find the arithmetic mean between 12 and 17.

Solution. Since $a = 12$, $l = 17$ and $n = 3$, formula (I) gives $17 = 12 + 2d$ or $d = \frac{1}{2}(17 - 12) = 2\frac{1}{2}$. Hence, the arithmetic mean is $14\frac{1}{2}$. The A.P. is 12, $14\frac{1}{2}$, 17.

Any number of *intermediate terms* may be inserted between two given numbers to form an A.P.

Problem. Find the four intermediate terms of an A.P. of six terms whose first and last terms are 10 and 20.

Solution. Since $a = 10$, $l = 20$ and $n = 6$, formula (I) gives $20 = 10 + 5d$ or $d = \frac{1}{5}(20 - 10) = 2$. Therefore, the required terms are 12, 14, 16, 18, and the A.P. is 10, 12, 14, 16, 18, 20.

GEOMETRICAL PROGRESSIONS

A **geometrical progression** (G. P.) is a series, each term of which, after the first, is derived from the preceding term by multiplying it by a constant number, called the *common ratio*: 3, 6, 12, 24, etc.

The **common ratio** is the constant multiplier, and may be integral or fractional, positive or negative.

The **geometrical mean** is the middle term when three terms form a G.P. That is, the middle term is the mean proportional of the other two. For example, 3, 6, 12 are in G.P. since $\frac{3}{6} = \frac{6}{12}$. 6 is the geometrical mean between 3 and 12.

The *intermediate terms of a G.P.* are all the terms of a geometrical progression intermediate between the first term and the last term.

THE FORMULA FOR THE nTH TERM l OF G. P., WHEN THE FIRST TERM a AND THE COMMON RATIO r ARE GIVEN, IS

$$\text{(I)}\quad l = ar^{n-1}.$$

Problem. Find the 6th term of the series 2, 6, 18, etc.

Solution.—Use $a = 2$, $r = 3$, $n = 6$ in formula (I) to find the last term:

$$l = 2 \times 3^5 = 2 \times 243 = 486.$$

THE SUM s OF THE TERMS IN A G. P. IS EXPRESSED BY THE FORMULA,

$$\text{(II)}\quad s = \frac{ar^n - a}{r - 1}.$$

Problem. Find the sum of 8 terms of the series 2, 4, 8, etc.

Solution.—Use $a = 2$, $r = 2$, $n = 8$ in formula (II) and find s.

$$s = \frac{2 \times 2^8 - 2}{2 - 1} = \frac{2 \times 256 - 2}{1} = 510.$$

If r is less than unity, it is convenient to write formula (II) of a G. P. in the following form:

$$\text{(III)}\quad s = \frac{a - ar^n}{1 - r}.$$

Formulas (I), (II), and (III), used in solving problems relating to geometrical progressions, involve five quantities. If any three of the five quantities are given the other two may be found by use of (I) and either (II) or (III).

Problem. Find the five intermediate terms of a G.P. of seven terms whose first and last terms are 9 and 576.

Solution. Since $a = 9$, $l = 576$ and $n = 7$, formula (I) gives $576 = 9r^6$ or $r^6 = 64$. Hence $r = \pm 2$. Therefore, the series is 9, 18, 36, 72, 144, 288, 576, or 9, −18, 36, −72, 144, −288, 576, and the required intermediate terms are ±18, 36, ±72, 144, ±288.

PERMUTATIONS AND COMBINATIONS

If we have a set of different things, each different arrangement, or selection, in a definite order which can be made from the given number of things is called a **permutation** of the set.

If the order of arrangement is disregarded then each different selection which can be made from a set of things, by taking any part or all of them at a time, is called a **combination.**

The difference between permutations and combinations may be illustrated by arranging the first three letters of the alphabet in different orders. Thus, *abc*, *acb*, *bca*, *bac*, *cab*, and *cba* all form different permutations, but each represents the same combination.

Formulas. The number of permutations of n different things taken r at a time,

$${}_nP_r = n(n - 1)(n - 2)\cdots(n - r + 1).$$

The number of permutations of n different things taken all at a time is $n!$. The number of permutations of n different things taken r at a time when repetition is allowed is n^r.

The number of combinations of n different things taken r at a time,

$${}_nC_r = \frac{n(n - 1)(n - 2)\cdots(n - r + 1)}{r!}.$$

Problem. Four people enter a room in which there are seven vacant chairs. In how many different ways can they be seated?

Solution.—In this problem, $n = 7$, $r = 4$, and $n - r + 1 = 7 - 4 + 1 = 4$.

Substituting these values in the formula for permutations given above, we get ${}_7P_4 = 7 \cdot 6 \cdot 5 \cdot 4 = 840$.

Problem. How many committees of nine men each can be selected from twelve men?

Solution.—This is a problem in combinations where $n = 12$, $r = 9$, and $n - r + 1 = 12 - 9 + 1 = 4$.

Substituting these values in the given formula,

$$_{12}C_9 = \frac{12 \cdot 11 \cdot 10 \cdot \cancel{9} \cdot \cancel{8} \cdot \cancel{7} \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4}}{\cancel{1} \cdot \cancel{2} \cdot \cancel{3} \cdot \cancel{4} \cdot \cancel{5} \cdot \cancel{6} \cdot \cancel{7} \cdot \cancel{8} \cdot \cancel{9}} = \frac{\overset{4}{\cancel{12}} \cdot 11 \cdot \overset{5}{\cancel{10}}}{1 \cdot \cancel{2} \cdot \cancel{3}} =$$

220 possible committees.

RADICALS

A **radical,** or **radical expression,** is an indicated root of a quantity, in which the radical sign is used to signify that a certain root is to be found.

The **radicand** is the quantity whose root is required.

$\sqrt{3a}$, $\sqrt[3]{x^5}$, $\sqrt[6]{a^2+2}$, and $\sqrt[4]{a+b}$ are radicals whose radicands are $3a$, x^5, $a^2 + 2$, and $a + b$.

The **order** of a radical is shown by the index of the root.

$\sqrt{x+y}$ and $\sqrt[5]{m-n}$ are radicals of the second and fifth orders, respectively.

A radical is **rational** if the root can be extracted exactly: $\sqrt{4}$; $\sqrt[3]{64}$; $\sqrt{(x+y)^2}$.

A radical is **irrational** if the root cannot be extracted exactly: $\sqrt{2}$; $\sqrt[3]{5}$.

A **surd** is a word sometimes used to denote an irrational radical.

Similar surds are surds which contain the same irrational factors:

$$\sqrt{3};\ 2 - a\sqrt{3};\ 5\sqrt{3}.$$

To Express a Radical in its Simplest Form.

Separate the quantity under the radical sign into factors if possible, one of which is the greatest perfect power of the same degree as the radical.

Extract the required root of the factor, and multiply the coefficient of the radical by the result.

Problem. Simplify $5\sqrt{18a^3b^2}$.

Solution.—

$$5\sqrt{18a^3b^2} = 5\sqrt{9a^2b^2 \cdot 2a} = 15ab\sqrt{2a}.$$

To Express Radicals as Equivalent Radicals of the Same Order

Express the given radicals with fractional exponents. Make such changes in exponents as may be needed so that the exponents will have a common denominator and each one will be equivalent to its original form. Raise each quantity to the power indicated by the numerator of its exponent, and indicate the root which is expressed by the common denominator.

Problem. Express $\sqrt{x^2y^3}$ and $\sqrt[3]{xy^2}$ as radicals of the same order.

Solution.—

$$\sqrt{x^2y^3} = (x^2y^3)^{\frac{1}{2}} = (x^2y^3)^{\frac{3}{6}} = \sqrt[6]{x^6y^9}.$$
$$\sqrt[3]{xy^2} = (xy^2)^{\frac{1}{3}} = (xy^2)^{\frac{2}{6}} = \sqrt[6]{x^2y^4}.$$

ADDITION AND SUBTRACTION OF RADICALS

Only similar radicals can be united into one term by addition or subtraction.

Problem. Simplify $\sqrt{45a^3} + 5\sqrt{20a^3} - \sqrt{80a^3}$.

Solution.—

$$\sqrt{45a^3} = \sqrt{9a^2 \cdot 5a} = 3a\sqrt{5a}.$$
$$5\sqrt{20a^3} = 5\sqrt{4a^2 \cdot 5a} = 10a\sqrt{5a}.$$
$$-\sqrt{80a^3} = -\sqrt{16a^2 \cdot 5a} = -4a\sqrt{5a}.$$
$$3a\sqrt{5a} + 10a\sqrt{5a} - 4a\sqrt{5a} = 9a\sqrt{5a}.$$

MULTIPLICATION OF RADICALS

Surds of the same order are multiplied by multiplying the product of the coefficients by the product of the irrational factors.

$$a\sqrt[n]{y} \cdot b\sqrt[n]{x} = ab\sqrt[n]{xy}.$$

Dissimilar surds are reduced to surds of the same order and then multiplied.

Problem. Multiply $5\sqrt[3]{25y^2}$ by $3\sqrt[3]{50y^2}$.

Solution.—

$$5\sqrt[3]{25y^2} \cdot 3\sqrt[3]{50y^2} = 15\sqrt[3]{5^2 \cdot 5^2 \cdot 2 \cdot y^4} = 75y\sqrt[3]{10y}.$$

Problem. Multiply $3\sqrt{2}$ by $\sqrt[3]{3}$.

Solution.—

$$3\sqrt{2} \cdot \sqrt[3]{3} = 3\sqrt[6]{2^3} \cdot \sqrt[6]{3^2} = 3\sqrt[6]{72}.$$

Problem.

Multiply $5\sqrt{7} - 2\sqrt{5}$ by $4\sqrt{7} + 8\sqrt{5}$.

Solution.—

$$\begin{array}{r} 5\sqrt{7} - 2\sqrt{5} \\ 4\sqrt{7} + 8\sqrt{5} \\ \hline 140 - 8\sqrt{35} \\ + 40\sqrt{35} - 80 \\ \hline 140 + 32\sqrt{35} - 80 \end{array}$$

$$140 + 32\sqrt{35} - 80 = 60 + 32\sqrt{35}.$$

DIVISION OF RADICALS

Monomial surds of the same order may be divided by multiplying the quotient of the coefficients by the quotient of the surd factors. Thus:

$$a\sqrt{b} \div m\sqrt{x} = \frac{a}{m}\sqrt{\frac{b}{x}}.$$

This method is applicable also to monomial surds of different orders, since the latter may always be reduced to the same order and then treated as here shown.

Problem. $12\sqrt{60} \div 15\sqrt{3}$.

Solution.—

$$12\sqrt{60} \div 15\sqrt{3} = \frac{4}{5}\sqrt{20} = \frac{4}{5}\sqrt{4 \cdot 5} = \frac{8}{5}\sqrt{5}.$$

Problem. $(\sqrt{50} + 3\sqrt{12}) \div \sqrt{2}$.

Solution.—

$$(\sqrt{50} + 3\sqrt{12}) \div \sqrt{2} = \sqrt{25} + 3\sqrt{6} = 5 + 3\sqrt{6}.$$

Problem. Divide $\sqrt{6}$ by $\sqrt[3]{2}$.

Solution.—

$$\sqrt{6} \div \sqrt[3]{2} = \sqrt[6]{6^3} \div \sqrt[6]{2^2} = \sqrt[6]{216 \div 4} = \sqrt[6]{54}.$$

RATIONALIZATION OF THE DIVISOR

Rationalization of the divisor is the process of multiplying both dividend and divisor by such a quantity that the divisor will be free of surds.

Problem. Rationalize the divisor of $\frac{3}{\sqrt{2}}$.

Solution.—

$$\frac{3}{\sqrt{2}} = \frac{3 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{3\sqrt{2}}{2} = \frac{3}{2}\sqrt{2}.$$

Explanation: Since the divisor is to be freed of surds, $\sqrt{2}$ must be multiplied by a factor which will

render the radical a perfect square. Any quantity multiplied by itself gives a perfect square; hence, in this case, the multiplier is $\sqrt{2}$. To avoid changing the value of the fraction, the numerator also must be multiplied by $\sqrt{2}$.

When the divisor is a binomial involving a surd or surds of no higher order than the second, the multiplier required is made up of the terms of the divisor connected by the opposite sign.

Problem.

Rationalize the denominator of $\dfrac{x+\sqrt{z}}{x-\sqrt{z}}$.

Solution.—

$$\frac{x+\sqrt{z}}{x-\sqrt{z}}=\frac{x+\sqrt{z}}{x-\sqrt{z}}\times\frac{x+\sqrt{z}}{x+\sqrt{z}}=\frac{x^2+2x\sqrt{z}+z}{x^2-z}.$$

LAWS OF EXPONENTS

An expression, such as a^m, when m is a natural number, is a shorthand way of writing the product $a \cdot a \cdot a \cdot a \cdots$, where there are m factors. In such an expression, the a is called the *base* and the m is called the *exponent* of a. Thus, by definition, an exponent indicates how many times the base, a, is used to produce the number, a^m.

There are four important laws for operating with positive integral exponents.

I. $a^m \cdot a^n = a^{m+n}$. To multiply exponential quantities with the same base, *add* exponents.

II. $a^m \div a^n = a^m \cdot a^{-n} \div a^n \cdot a^{-n}$. Here the multiplicative inverse of a^n has been written a^{-n} instead of $1/a^n$. Hence $a^m \div a^n = a^{m+(-n)} = a^{m-n}$. Thus, to divide exponential quantities with the same base, add the additive inverse of the exponent of the divisor to the exponent of the dividend.

III. $(a^m)^p = a^{mp}$. To find the power of an exponential quantity, *multiply* the power by the exponent.

IV. $\sqrt[p]{a^m} = a^m \cdot \frac{1}{p} = a^{m/p}$. To extract the root of an exponential quantity, multiply the exponent by the multiplicative inverse of the index of the root.

Scientific Notation. Since the decimal number system is based on powers of 10, very large numbers and very small numbers are often written in *scientific notation*. For example, since $1000 = 10^3$, 6000 could be written $6 \cdot 10^3$. In like manner, 427,000 would be written $4.27 \cdot 10^5$. Since 0.01 could be written 10^{-2}, 0.035 could be written $3.5 \cdot 10^{-2}$. In like manner, using the negative exponent symbol, 0.000 005 25 would be written $5.25 \cdot 10^{-6}$. Thus, in scientific notation, a number is written with one digit before the decimal point and multiplied by an appropriate power of 10; i.e., $d \cdot 10^k$ where d lies in the range $1 < d < 10$.

LOGARITHMS

Logarithms are exponents. Because they have the properties of exponents, logarithms make it possible to perform multiplication by adding logarithms (exponents) and to perform division by subtracting logarithms. Logarithms also make it possible to raise a quantity to a power by multiplying a logarithm and to extract a root by dividing a logarithm. That is, each arithmetic operation is simplified and reduced one notch on the scale of difficulty.

Base of a logarithm. The combination of a base and an exponent as a^2 is an operational symbol. This applies to logarithms. For elementary calculations, the base of the system of *common logarithms* is chosen to be 10. The definition of the common logarithm of any number is given by x in the following: If $10^x = N$, when N is a real number, then x is the logarithm of N, written simply $x = \log N$.

Characteristic of a logarithm. The common logarithm of any number is the exponent of the power to which 10 must be raised to produce the number. The logarithms of most numbers will consist of an integral followed by a decimal. This integral part is called the *characteristic*, and the decimal part is called the *mantissa*. The ideal way to find the characteristic is to use the scientific notation. Note the following:

Number	Scientific form	Characteristic
27	$2.7 \cdot 10^1$	1
3.95	$3.95 \cdot 10^0$	0
2,860	$2.86 \cdot 10^3$	3
0.534	$5.34 \cdot 10^{-1}$	−1
8,120,000	$8.12 \cdot 10^6$	6
0.000705	$7.05 \cdot 10^{-4}$	−4

Note that in 0.000705, only the zeros *immediately* after the decimal point are of any significance in determining the characteristic.

Calculations with negative characteristics are much simplified if the characteristics are written as combinations of a positive number with −10. That is, a characteristic of

−1 can be written as 9.—— −10, since $9 - 10 = -1$.
−2 can be written as 8.—— −10, since $8 - 10 = -2$.
−4 can be written as 6.—— −10, since $6 - 10 = -4$.

This notation avoids also placing a minus sign before the mantissa, which, in every case, is positive.

Mantissa of a logarithm. Only numbers like 10, 100, 1000 have integral logarithms to the base 10. The logarithms of all numbers which are not integral powers of ten are approximate decimals. These can be found only from tables which have been computed in advanced mathematics by means of infinite series. Such a four place table is on page 1185. The decimal part of the logarithm of a number, the *mantissa*, depends only on the sequence of digits in the number. Every digit pattern has a unique mantissa. As an example, $\sqrt{10} \approx 3.162$. This can be written: $10^{0.5000} \approx 3.162$. By definition, $\log 3.162 = 0.5000$. To find $\log 316.2$, note that $316.2 = 3.162 \cdot 10^2 = 10^2 \cdot 10^{0.5000} = 10^{2.5000}$. Therefore, $\log 316.2 = 2.5000$.

Because the digit pattern of 316.2 is the same as that of 3.162, the mantissa for both numbers is identical: 5000. The characteristic, however, depends on the position of the decimal point in the digit sequence

$$\begin{aligned} \log 3.162 &= 0.5000 \\ \text{since } 3.162 &= 3.162 \cdot 10^0 \\ \log 0.3162 &= 9.000 - 10 \\ \text{since } 0.3162 &= 3.162 \cdot 10^{-1} \\ \log 316{,}200 &= 5.5000 \\ \text{since } 316{,}200 &= 3.162 \cdot 10^5 \\ \log 0.003162 &= 7.5000 - 10 \\ \text{since } 0.003162 &= 3.162 \cdot 10^{-3} \end{aligned}$$

The mantissa of the logarithm of any three-digit number may be read directly from the table. For example, to find $\log 37.6$, write the characteristic which is 1, then look for 37 under the column headed "N," and the mantissa, .5752, is found to the right of 37 under the column headed by 6. Therefore $\log 37.6 = 1.5752$.

Interpolation. The logarithms of four-digit numbers can be found from the table by interpolating values between those given. The assumption is made that, for small increases between successive numbers, the change in the logarithm is proportional to the change in the number. This assumption introduces only a small inaccuracy into the computation. For example, find $\log 58.42$. From the table, $\log 58.40 = 1.7664$ and $\log 58.50 = 1.7672$. $\log 58.42$ is somewhere between these values. Since 58.42 is 0.2 of the way from 58.40 to 58.50, the log of 58.42 is assumed to be 0.2 of the way from 1.7664 to 1.7672, or, is equal to 1.7666. This is the result since $0.2(1.7672 - 1.7664) = 0.2 \cdot 0.0008 = 0.0002$,

corrected to the fourth place; and 1.7664 + 0.0002 = 1.7666. Thus log 58.42 = 1.7666.

Antilogarithms. For computations with logarithms, numbers are converted into exponents, or logarithms, and then the proper operations are performed. The last step in any problem is to convert the result from a number expressed as a power of 10 to a number in terms of the ordinary digit notation. For example $10^{0.3010}$ is changed to 2. The number corresponding to a given logarithm is called the *antilogarithm* of the logarithm. To find such a number, consult the table and reverse the entire process described above. For example, find the number whose logarithm is 1.9795. The mantissa, 9795, tells, with the help of the table, what the pattern of digits in the number is, and the characteristic, 1, indicates that the number has two digits before the decimal point. (Note the scientific form of a number.) Looking up 9795 in the *body* of the table, you will find it corresponds to the number sequence 954. Since the characteristic is 1, place the decimal point between the 5 and the 4. That is, the antilogarithm of 1.9795 is 95.4.

Usually, the mantissa of a logarithm will not be found directly from the table. In this case, the final digit of the number must be calculated by interpolation. This is best shown by an example. Thus, find the antilogarithm of the logarithm 1.8071. Locate the mantissa 8071 in the table between 8069 and 8075. The corresponding digit patterns are 641 and 642. 8071 is ⅓ of the way from 8069 to 8075. The corresponding digit pattern, then, is ⅓ the way from 6410 to 6420, namely 6423. The characteristic ,1, indicates that the desired value is 64.23.

FORMULAS FOR LOGARITHMS

For use in developing the formulas below we shall let $10^m = M$, and $10^n = N$, so that

$m = \log M$, and $n = \log N$.

To Multiply Numbers.

From I, $M \times N = 10^m \times 10^n = 10^{m+n}$, hence
$\log M \times N = m+n = \log M + \log N$.

This process may be extended to any number of factors. Therefore, to find the product of two or more numbers by use of logarithms, we add the logarithms of all of the factors and find the antilogarithm of the result.

Problem. Multiply 254 by 781.

Solution.—

log 254	= 2.4048.
log 781	= 2.8927.
log of product	= 5.2975.
Product	= 198,400.

Problem. Find the product of 561.75, 4.356, and 0.0328.

Solution.—

log 561.75	= 2.7495.
log 4.356	= 0.6391.
log 0.0328	= 8.5159 − 10.
log of product	= 11.9045 − 10
	= 1.9045.

Product = antilog 1.9045 = 80.26.

To Divide One Quantity by Another.

From II, $M \div N = 10^m \div 10^n = 10^{m+(-n)}$, hence
$\log M \div N = m + (-n) = \log M + \operatorname{colog} N$,
where $\operatorname{colog} N + \log N = 0$.

To find the value of a fraction (or quotient) by use of logarithms, add the cologarithm of the denominator (divisor) to the logarithm of the numerator (dividend) and find the antilogarithm of the result.

Note: In a fraction (or quotient) the numerator and denominator (dividend and divisor), either one or both, may be one factor or two or more factors.

Problem. Divide 46.72 by 0.0998.

Solution. To the logarithm of 46.72 add the cologarithm of 0.0998. The logarithm of 0.0998 is 8.9991 − 10. Since the additive inverse of 8.9991 − 10 is 10 − 8.9991, the cologarithm of 0.0998 is 1.0009. Hence

log 46.72	= 1.6695
colog 0.0998	= 1.0009
log of quotient	= 2.6704
quotient	= 468.2

Problem. Divide 637.4 by the product of 867.2 and 0.0347.

Solution. To the logarithm of 637.4 add the cologarithms of 867.2 and 0.0347. The logarithm of 867.2 is 2.9381, so its cologarithm is 7.0619 − 10 (i.e., 0 − 2.9381 = 10 − 2.9381 − 10 = 7.0619 − 10). The logarithm of 0.0347 is 8.5403 − 10, so its cologarithm is 1.4597. Hence

log 637.4	= 2.8044
colog 867.2	= 7.0619 − 10
colog 0.0347	= 1.4597
log of quotient	= 1.3260
quotient	= 21.18

To Raise a Number to any Power.

From III, $M^p = (10^m)^p = 10^{pm}$, hence
$\log M^p = pm = p \log M$.

To compute the power of a number by use of logarithms, multiply the power by the logarithm of the number and find the antilogarithm of the result.

Note: The quantity M to be raised to a power may be composed of one or more factors, and may represent a quotient or a product.

Problem. Find the value of $\left(\frac{7.23^2 \times 581}{2300}\right)^3$.

Solution.—

$$\log \left(\frac{7.23^2 \times 581}{2300}\right)^3 = 3 \log \frac{7.23^2 \times 581}{2300}$$

$= 3\,[\log (7.23^2 \times 581) + \operatorname{colog} 2300]$
$= 3\,[2 \log 7.23 + \log 581 + \operatorname{colog} 2300]$

log 7.23	= 0.8591.
2 log 7.23 = 2 × 0.8591	= 1.7182.
log 581	= 2.7642.
colog 2300	= 6.6383 − 10
log of fraction	= 1.1207
	3
log of power of fraction	= 3.3621.

Hence, $\left(\frac{7.23^2 \times 581}{2300}\right)^3$ = antilog 3.3621
= 2302.

To Find any Root of a Number.

From IV, $\sqrt[p]{M} = \sqrt[p]{10^m} = 10^{\frac{m}{p}}$, hence

$$\log \sqrt[p]{M} = \frac{m}{p} = \frac{\log M}{p}.$$

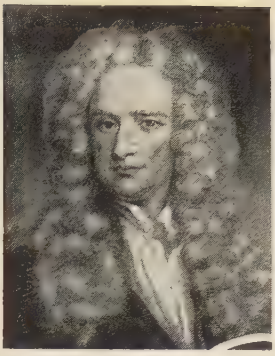
To extract a root of a number by use of logarithms, multiply the logarithm of the number by the multiplicative inverse of the index of the desired root and find the antilogarithm of the result.

Problem. Find the square root of 348.

Solution.—

log 348	= 2.5416.
$\log \sqrt{348}$	= ½ log 348 = ½ (2.5416)
	= 1.2708.
$\sqrt{348}$	= antilog 1.2708
	= 18.66.

Evariste Galois

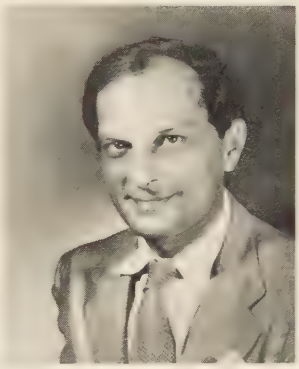


Isaac Newton

NOTED MATHEMATICIANS

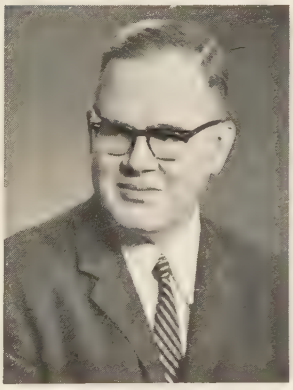
George Boole

David Hilbert



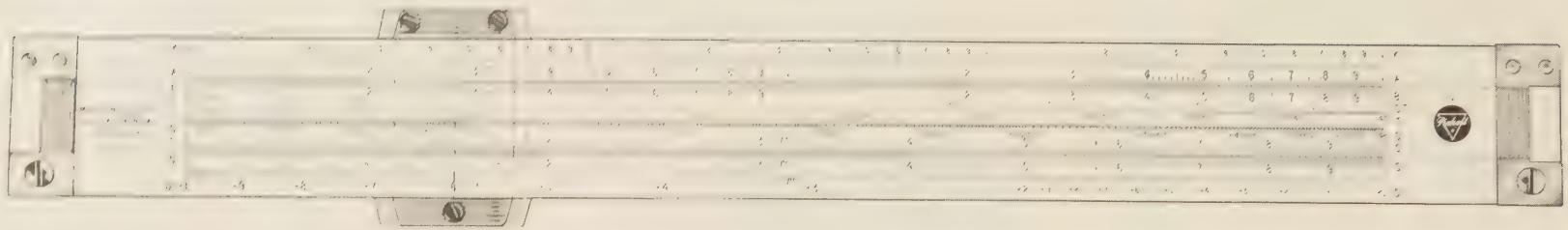
Dr. Stanislaw Ulam

Albert Einstein



Dr. John W. Tukey
Courtesy of Orren Jack Turner

THE SLIDE RULE



The slide rule is a device which makes use of logarithmic calculations. It consists of the association of two or more *scales* in such a way as to permit addition or subtraction of a length of rule which represents the logarithm of a number. With a slide rule, such as the one shown in the illustration, you can multiply, divide, extract roots, perform combinations of these operations and find three place logarithms of numbers. All of this is possible because the scales are made up of lines which represent the positions of the mantissas of the logarithms of the numbers represented on its face.

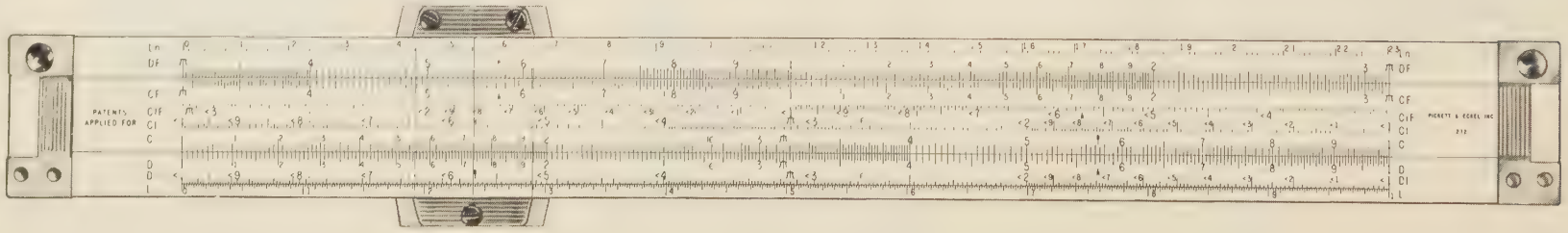


TABLE OF COMMON LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996

GEOMETRY

Geometry had its beginning in practical problems associated with land surveying and the construction of pyramids, temples, and other structures. The ancient Egyptians, who had a high civilization in the fertile valley of the Nile, were subjected to annual floods which changed the locations of many boundaries. There was frequent necessity for relocating boundaries, and triangles and other geometrical figures were used in locating points and lines along the changing banks of the Nile. Thus was developed a simple practice of land surveying.

Their temples and pyramids give additional evidence of the skill of the Egyptians in employing geometrical facts. The Babylonians also knew something of land measures, and their monuments show many geometrical designs. The Greeks collected these geometrical facts, and made much progress in developing them. In doing so, they discovered new ones, and arranged them into a logically consistent system.

Euclid, a Greek who taught geometry in Egypt about 300 B. C., organized all of the geometrical knowledge of his time, and presented it in his *Elements*. The plan of Euclid is founded on a relatively small number of assumptions and definitions, derived through sense perception and intuition. He was able to use ideas of logical demonstration first introduced by Thales and Pythagoras.

Geometry as taught today is basically the same as it was presented by Euclid. It has been put into a modern form suggested and perfected by the German mathematician David Hilbert (1862–1943) in his *Foundations of Geometry* (1899). Hilbert found it necessary to correct some of the logical reasoning and other weaknesses of Euclid.

ASSUMPTIONS AND DEFINITIONS

Geometry is an abstract postulational system just as is Algebra. Three basic concepts are needed:

Undefined Terms, Assumptions, Definitions. Undefined Terms: 1) point; 2) line, or arc of a circle; 3) plane; 4) surface of a sphere; 5) space; 6) on; 7) between; 8) geometric figure; 9) True; 10) False.

Assumptions:

1) Two distinct points determine one and only one straight line on a plane.

2) Two distinct straight lines on a plane have at most one point in common. Two distinct arcs of a great circle on a sphere intersect at points diametrically opposite.

3) Every line may be numbered since a line is a

set of points. This permits addition and subtraction of parts of a line.

4) Any point on a line that is on a plane separates the line into two half-lines. That is, the point divides the set of points on the line into three subsets: those on one side of the point, those on the other side of the point and the point itself.

5) Any line on a plane separates the plane into two half-planes.

6) Any plane in space separates space into two half-spaces.

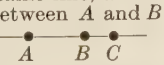
7) A triangle on a plane is uniquely determined when two sides and the included angle are given (s.a.s.). A triangle on a sphere is not uniquely determined.

8) A triangle on a plane is uniquely determined when two angles and the included side are given (a.s.a.).

9) Through a point not on a given straight line there exists one and only one line parallel to this given line. Such a point and such a line form a plane.

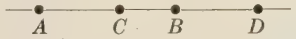
The final assumptions deal with the notions of order and betweenness.

10) If B is a point on a line between points A and C, then A, B, and C are all on the same line, and B is between A and C, and C is not between A and B and A is not between B and C.



11) If A, B, and C are three distinct points on the same line, then one of them is between the other two.

12) For any two distinct points A and B, a point C can be placed between them, and a point D can be placed so that B is between A and D.



13) A line which intersects one side of a triangle, but does not pass through any of its vertices must intersect another side of the triangle.

14) A line l on a plane is between two points A and B on the plane if the line through A and B intersects the given line at a point between A and B. That is, A and B are on opposite sides of l.

15) A plane P in space is between two points A and B in space if the line through A and B intersects the given plane at a point between A and B. That is, A and B are on opposite sides of P.

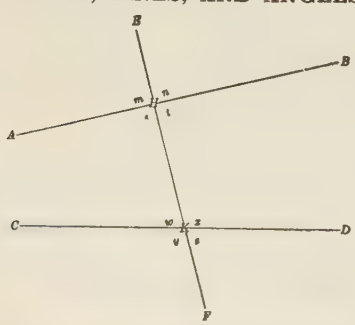
Definitions:

A *proposition* is a statement which is either true or false but not both.

A *theorem* or a *corollary* is a statement to be proved true.

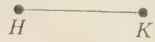
A *demonstration* is a course of logical reasoning used in proving a theorem or solving a problem.

POINTS, LINES, AND ANGLES



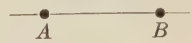
In examples under the following definitions, the letters refer to corresponding letters in the above figure.

A *line segment*, or simply a *segment*, means two specific points on a line, together with the set of points between them.



$(\overline{HK})$

A *straight line* is a set of points that does not change its direction throughout its entire length. Such a set of points is the intersection of two planes in space.



$(\overleftrightarrow{AB})$

Points and straight lines on a plane correspond to the points and arcs of great circles on a sphere.

A *construction* on a plane is the representation of a required geometric figure by means of points and lines, either straight or curved. A construction on a sphere is the representation of a required geometric figure by means of points and arcs of circles.

A *ray* is the union of a half-line and the point determining it. $K \cup \overrightarrow{KD}$ or $K \cup \overrightarrow{KF}$.

An *angle* is the geometric figure formed by two rays that have the same end-points. The abbreviation or symbol for the word angle is $\angle$. Note the angle formed by $\overrightarrow{KD}$ and $\overrightarrow{KF}$. It is written $\angle FKD$.

A *dihedral angle* is the geometric figure formed in space by two half-planes that have a common edge.

The *vertex* of an angle is the intersection of the two rays or half-planes that form the angle. The rays or half-planes are called the *sides* of the angle.

The *interior of* $\angle FKD$ is the intersection of the set of points on the F side of $\overrightarrow{KD}$ and the set of points on the D side of $\overrightarrow{KF}$. The *exterior of* $\angle FKD$ is the complement of the interior $\angle FKD$. These two definitions do not hold for an angle on a sphere, but they do hold for the half-planes of a dihedral angle.

Among the units used for measuring angles are: the revolution, the right angle, the degree, and the radian. A *degree* is equal to $\frac{1}{360}$ of one complete revolution of a ray about its point; this is otherwise expressed as 360 degrees = 360° = 1 revolution. A *right angle* is equal to one fourth of a complete revolution, or to 90°. The $\angle AHE$ is a right angle. A *radian* is an angle at the center of a circle that subtends an arc whose length is equal to the radius; in terms of degrees 1 radian $= \frac{180}{\pi}$ degrees $\approx$ 57° 17′ 45″. An angle is indicated by three capital letters, reading from one side to the other with the vertex letter in the middle. Where there is no doubt as to which angle is meant, the vertex letter alone may be used. Thus, $\angle FKD = \angle z$. The symbol $\angle K$ cannot be used here to name any single angle, as there are four angles around the point K.

A *straight angle* is an angle whose rays form a straight line. The $\angle AHB$ is a straight angle. A straight angle is equal to two right angles, or to half of a complete revolution, or to 180°.

An *acute angle* is an angle that is less than a right angle. The $\angle CKE$ is an acute angle.

An *obtuse angle* is an angle that is greater than a right angle but less than a straight angle. The $\angle CKF$ is an obtuse angle.

Complementary angles are two angles whose sum is a right angle.

Supplementary angles are two angles whose sum is a straight angle. Thus, $\angle FKD$ and $\angle DKE$ are supplementary angles.

Adjacent angles have a common ray. Thus, $\angle CKE$ and $\angle EKD$ are adjacent angles. They are also supplementary angles.

Vertical angles are the non-adjacent angles formed by two intersecting straight lines. Thus, $\angle CKE$ and $\angle DKF$ are vertical angles.

A *transversal* is a line that intersects two or more lines. The line $\overleftrightarrow{EF}$ is a transversal.

The following terms are used to designate angle pairs, as illustrated in the figure:

Corresponding angles, $\angle n$ and $\angle x$;
Alternate-interior angles, $\angle w$ and $\angle t$;
Alternate-exterior angles, $\angle m$ and $\angle z$.

A *perpendicular* is a straight line that forms a

right angle with another straight line. The point of intersection is the *foot* of the perpendicular. A perpendicular is the shortest distance from a given external point to a given line. Thus, $\overline{KH}$ is the shortest distance from the K to the line $\overleftrightarrow{AB}$. To indicate that lines are perpendicular we use the symbol $\perp$. Thus, $\overleftrightarrow{AB} \perp \overleftrightarrow{EF}$.

A *bisector* of an angle is the ray that divides the angle into two congruent parts.

A *triangle* is a geometric figure that is the union of three line segments: $\overline{AB} \cup \overline{BC} \cup \overline{CA}$. The points of intersection are called the *vertices* of the triangle, and the segments are called the *sides* of the triangle. Such a triangle can be written $\triangle ABC$. The sum of the interior angles is equal to two right angles, or 180°. (This last statement is false if the triangle is drawn on a sphere.)

A *polygon* is a geometric figure that is the union of at least three line segments that lie on the same plane. A *triangle* is a polygon of three sides, a *quadrilateral* has four sides, a *pentagon* has five sides, a *hexagon* has six sides, etc.

Congruence, or *congruent*, means that two or more quantities have the same size. It is used to define the length of a line segment and the measure of an angle. Two or more polygons are congruent to each other if the lengths of the corresponding sides are congruent, and if the measures of the corresponding angles are congruent. The symbol used is $\cong$: $AB \cong CD$ or $\angle ABC \cong \angle DEF$ have the same measure.

Equal means that two or more quantities are really the same quantity. For example, $A = B$ means that A and B are the same point; $\overline{AB} = \overline{CD}$ means that $\overline{AB}$ and $\overline{CD}$ are the same segment; $\triangle ABC = \triangle DEF$ means that $\triangle ABC$ and $\triangle DEF$ are the same triangles; etc.

A *regular polygon* is a polygon which has all its sides congruent and all its angles congruent.

A *circle* is a set of points that form a closed curved line on a plane and are equally distant from a point called the *center*. The perimeter, or length, of a circle is called the *circumference*.

A *sphere* is a set of points that form a closed curved surface in space and are equally distant from a point within called the *center*. Any plane through its center cuts the surface to form a *great circle*. Any other plane cuts the surface to form a *circle*.

A *radius* of a circle or sphere is a straight line segment from the center to the circumference or surface. All radii of the same circle or sphere are equal.

Any portion of the circumference of a circle is called an *arc*: $\overleftrightarrow{AB}$.

A *sector* of a circle is the area formed by two radii and their intercepted arc.

A *chord* of a circle is a line segment between any two points on the circumference of a circle: $\overline{AB}$.

A *segment* of a circle is the area formed by an arc of the circle and its chord.

A *secant* of a circle is a straight line that cuts the circle in two of its points: $\overleftrightarrow{AB}$.

A *tangent* to a circle is a straight line, lying on the plane of the circle, which touches the circumference at only one point. A tangent to a circle is perpendicular to the radius drawn to the point of contact: $\overrightarrow{OA} \perp \overleftrightarrow{AB}$.

LOGIC

The theorems and problems of geometry, together with their proofs, employ statements. The study of the procedures for making correct statements is called *logic*. A statement can be a simple statement, or more complicated by combining two or more simple ones. When two or more statements are combined, one or more of the following relationships exist.

1) If p and q are statements, then the statement $p \wedge q$ (read "p and q") is called the *conjunction* of p and q.

Example: A triangle has three sides (p) *and* ($\wedge$) a pentagon has five sides (q). This is a true statement.

2) If p and q are statements, then the statement $p \vee q$ (read "p or q") is called the *disjunction* of p and q.

Example: A triangle has three sides (p) *or* ($\vee$) a pentagon has six sides (q). This is also a true statement even though one part of the statement is false.

3) If p and q are statements, then the statement $p \rightarrow q$ (read "p implies q") is called the *implication* of p and q.

Example: If two lines intersect (p), then they are not parallel (q). This is a true implication. If q was a statement reading "they are parallel," the implication could be written $p \rightarrow (\sim q)$. $\sim$ means "not," and is read "curl."

4) If p and q are statements, then the statement $p \leftrightarrow q$ (read "p is equivalent to q") is called the *equivalence* of p and q. That is, if p and q are equivalent, then either both are true or both are false. This also means that $(p \leftrightarrow q) \leftrightarrow [(p \rightarrow q) \wedge (q \rightarrow p)]$. This is known as a *tautology* in the field of logic.

Example: Two lines are parallel (p) if, and only if, they do not intersect (q). This is a true equivalence since both $p \rightarrow q$ and $q \rightarrow p$ are true statements.

We can describe these relationships by the following *Truth Table:* (If p is T and q is T, then $p \wedge q$ is T, etc.)

p	q	$p \wedge q$	$p \vee q$	$p \rightarrow q$	$p \leftrightarrow q$
T	T	T	T	T	T
T	F	F	T	F	F
F	T	F	T	T	F
F	F	F	F	T	T

Other basic facts can be of great help in verifying that a theorem is true. Consider, for example, the *contrapositive* of an implication. If the implication is "If two lines intersect, then they are not parallel." $(p \rightarrow q)$, then its contrapositive is "If two lines are parallel, then they do not intersect." $[(\sim q) \rightarrow (\sim p)]$. We can use a truth table to show that $(p \rightarrow q) \leftrightarrow [(\sim q) \rightarrow (\sim p)]$ is a tautology.

(1) p	(2) q	(3) $(p \rightarrow q)$	(4) $(\sim q)$	(5) $(\sim p)$	(6) $[(\sim q) \rightarrow (\sim p)]$	(7) $(p \rightarrow q) \leftrightarrow [(\sim q) \rightarrow (\sim p)]$
T	T	T	F	F	T	T
T	F	F	T	F	F	T
F	T	T	F	T	T	T
F	F	T	T	T	T	T

Since column (7) contains Ts only, the tautology is verified.

There are many theorems that are logically equivalent. That is, a verification of the truth of either one is sufficient to verify the truth of the other. Many theorems can be written in four forms: (1) given *theorem*, (2) its *contrapositive*, (3) its *opposite*, and (4) its *converse*. We have shown that (1) and (2) are logically equivalent. In like manner (3) and (4) are also logically equivalent. Note the following four related theorems:

1) If two lines are cut by a transversal so that the alternate-interior angles are equal (p), then the lines are parallel (q). $(p \rightarrow q)$

2) If two lines that are *not* parallel are cut by a transversal $(\sim q)$, then the alternate interior angles are *not* equal $(\sim p)$. $[(\sim q) \rightarrow (\sim p)]$

3) If two lines are cut by a transversal so that the alternate-interior angles are *not* equal $(\sim p)$, then the lines are *not* parallel $(\sim q)$. $[(\sim p) \rightarrow (\sim q)]$

4) If two parallel lines are cut by a transversal

(q), then the alternate-interior angles are equal (p). $(q \rightarrow p)$

Thus for (1) and (2) we have the tautology: $(p \rightarrow q) \leftrightarrow [(\sim q) \rightarrow (\sim p)]$. And for (3) and (4) we have the tautology: $(q \rightarrow p) \leftrightarrow [(\sim p) \rightarrow (\sim q)]$.

Such related theorems can sometimes be put into a single statement. This implies a "necessary and sufficient" condition. For example, (1) and (4) could be written "Alternate-interior angles formed by a transversal that cuts two lines are equal if and only if the lines are parallel," since it can be verified that $[(p \rightarrow q) \wedge (q \rightarrow p)] \leftrightarrow (p \leftrightarrow q)$ is a tautology. And (2) and (3) could be written "Alternate-interior angles formed by a transversal that cuts two lines are *not* equal if and only if the lines are *not* parallel," since it can be verified that $\{[(\sim p) \rightarrow (\sim q)] \wedge [(\sim q) \rightarrow (\sim p)]\} \leftrightarrow [(\sim p) \leftrightarrow (\sim q)]$ is also a tautology.

METHODS OF PROOF

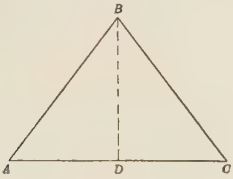
There are two general methods of proving theorems to be true—the direct method and the indirect method. Either method may use algebraic or geometric facts. Only the direct method is used to prove problems. It is essential that a figure be drawn to represent the "if" statement, or the statement that implies the "if" part, of the complete statement. That is, construct the geometric figure and letter the vertices, extended lines, etc.

Direct Proof. A direct proof starts with some known fact and combines known truths with it, step by step, until the desired conclusion is reached. This is the deductive method of proof and uses the *rule of inference:* If a statement of the form $p \rightarrow q$ is true, *and* if p is true, then q is true. In symbol form it is the tautology $[(p \rightarrow q) \wedge p] \rightarrow q$ since

(1)	(2)	(3)	(4)	(5)
p	q	$(p \rightarrow q)$	$[(p \rightarrow q) \wedge p]$	$[(p \rightarrow q) \wedge p] \rightarrow q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

Illustration:

If two sides of a triangle are congruent, then the angles opposite these sides are congruent.



Given (p) Triangle ABC with $\overline{AB} \cong \overline{BC}$.

Prove (q) $\angle A \cong \angle C$.

Proof: Draw $\overrightarrow{BD}$ so as to bisect $\angle ABC$.

A bisector can be drawn. Then in triangles ABD and DBC,

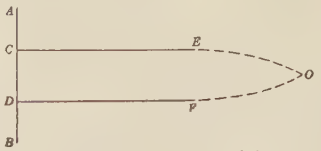
$\overline{AB} \cong \overline{BC}$	given
$\overline{BD} = \overline{BD}$	equal
$\angle ABD \cong \angle DBC$	construction

$\triangle ABD \cong \triangle DBC$, since two sides and the included angle of one triangle are congruent or equal respectively to two sides and the included angle of the other. Therefore:

$\angle A \cong \angle C$, since corresponding parts of congruent figures are congruent.

Indirect Methods of Proof. Three types of indirect reasoning can be used to prove a theorem true: 1) Three possibilities of relation may occur with two magnitudes. The first may be less than, equal to, or greater than, the second. If two of these relations are false, then of necessity the third is true. This is the *method of exclusion*, or *elimination.* 2) By proving the contrapositive. 3) By assuming the falsity of the statement and showing that this assumption leads logically to an absurdity. The following is an illustration of the last method.

Two lines in the same plane perpendicular to the same straight line are parallel.



Given (p) Two straight lines $\overleftrightarrow{CE}$ and $\overleftrightarrow{DF}$, both perpendicular to $\overleftrightarrow{AB}$.

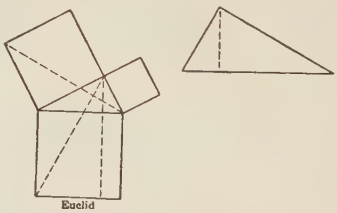
Prove (q) Lines $\overleftrightarrow{CE}$ and $\overleftrightarrow{DF}$ are parallel.

Proof: If these lines are not parallel, then, being produced, they will meet on one side or the other of $\overleftrightarrow{AB}$. Let them be produced and meet on O. Then there will be two perpendiculars, $\overrightarrow{OC}$ and $\overrightarrow{OD}$, let fall from the same point on the same straight line, which is impossible. Therefore $\overleftrightarrow{CE}$ and $\overleftrightarrow{DF}$ are parallel.

The Pythagorean Theorem. In many respects this theorem is the most famous, and perhaps the most useful, single truth of plane geometry. It is practically certain that the truth here stated was known to the Egyptians and Hindus long before the time of Pythagoras, who is credited with having formulated the first geometrical proof of the theorem.

In any right-angled triangle the square on the hypotenuse is equivalent to the sum of the squares on the other two sides.

Many ways of proving this theorem have been devised. Of the following figures, that attributed to Euclid was formerly the most frequently used, but the unmarked triangle is in more common use in modern textbooks.



The proof according to Euclid is based on the fact that triangles having the same base and the same altitude are equal and that, since these triangles are halves of rectangles having the same base and the same altitude, the rectangles also are equal. With these considerations, we are able to prove that, in the figure given, the left-hand rectangle of the large square is equal to the square above it. Similarly, we can prove that the area of the right-hand rectangle in the large square is equal to the area of the small square. Hence, the area of the large square is equal to the sum of the areas of the smaller squares.

The unmarked figure makes use of the theorem: *If in a right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse, each leg of the triangle is the mean proportional between the hypotenuse and its adjacent segment.*

Thus, if, in the given figure, a = the shorter leg, b = the longer leg, and c = the hypotenuse of the triangle and if x = the shorter, and y = the longer, segment of the hypotenuse,

then $c : a = a : x$	(1)
and $c : b = b : y$	(2)
and $c = x + y$.	(3)
Hence from (1), $cx = a^2$.	(4)
From (2), $cy = b^2$.	(5)
Adding (4) and (5), $c(x + y) = a^2 + b^2$.	(6)
Substituting (3) in (6), $c^2 = a^2 + b^2$.	(7)

The proof according to Bhaskara is based on the fact that a large square may be divided into four equal right triangles and a square whose side is equal to the difference between the legs of one of the right triangles.

If c = the side of the large square, a = the shorter leg of the triangles, and b = the longer leg, then c^2 = the area of the large square; $\frac{ab}{2}$ = the area of one of the right triangles; $(b-a)^2$ = the area of the small square.

Therefore, $c^2 = 4\left(\frac{ab}{2}\right) + (b-a)^2$,

from which $c^2 = a^2 + b^2$.

Problem. From the top of a building wall 60 feet high, a rope is stretched to the bottom of a fence 50 feet distant from the base of the wall. What is the length of the rope between the points of attachment?

Solution.—The rope forms the hypotenuse of a right triangle; the height of the wall and the distance from the base of the wall are the legs.

Let L = the length of the rope.
Then $L^2 = 60^2 + 50^2 = 3600 + 2500 = 6100$.
Therefore $L = \sqrt{6100}$, or 78.1, feet.

SIMILAR FIGURES

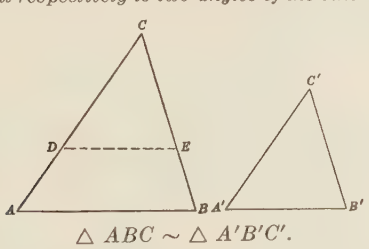
Similar figures are figures which are alike in shape or form, differing only in size. A map is similar in outline to the area which it represents. Photography is based on the idea of similarity. The plans of the carpenter, the architect, or the engineer are reproductions on a small scale of the outlines of the structure each intends to build. The relative size of any part of such a drawing may be determined by a comparison of measurements, since all parts are drawn to the same scale. This condition of similarity exists only when every possible pair of dimensions in one figure has a ratio equal to the ratio of corresponding dimensions in the other figure. Thus, all circles are similar; likewise all squares, all spheres, and all cubes. Rectangles are similar when they have the same ratio of width and length.

SIMILAR TRIANGLES

Since all plane figures that are composed of line segments may be divided into triangles, the laws of similarity may best be mastered by a study of the following summary of the geometrical theorems on similar triangles.

The fact that two figures are similar, and therefore that this equality of ratios of corresponding sides exists between them, is denoted in geometry by the symbol $\sim$. Thus, the notation $\triangle ABC \sim \triangle A'B'C'$ is read, "The triangle ABC is similar to the triangle A prime, B prime, C prime."

1. *Two triangles are similar if two angles of one are congruent respectively to two angles of the other;* that is



$\triangle ABC \sim \triangle A'B'C'$.

in the above figures, if $\angle A \cong \angle A'$ and $\angle B \cong \angle B'$, the triangles are similar.

2. *Two triangles are similar if the ratio of two sides of one is equal to the ratio of two sides of the other and the angles included between these sides are congruent;* that is, if $\frac{AC}{CB} = \frac{A'C'}{C'B'}$ and $\angle C \cong \angle C'$, the triangles are similar.

3. *Two triangles are similar if the ratios of their corresponding sides are equal;* that is, if $\frac{AC}{A'C'} = \frac{CB}{C'B'} = \frac{AB}{A'B'}$, the triangles are similar.

Other theorems relating to similar plane figures or to similar solids are:

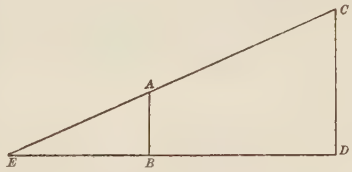
4. *The perimeters of two similar polygons have the same ratio as any corresponding parts of the polygons in the same dimension.*

5. *The areas of two similar polygons are to each other as the squares of any corresponding lines of the polygons.*

6. *The volumes of two similar solids are to each other as the cubes of any corresponding lines of the solids.*

DISTANCE MEASURING DEVICES

How far is it from a given point to a certain tree or other object? For calculating the answers to such questions as this, many interesting devices have been perfected, varying from the elaborate range finders of the coast defense artillery to the string and calibrated wooden stick of the boy scout. The method of operation of these instruments is based on the theory of similar triangles as follows:



The $\triangle EAB$ is similar to the $\triangle ECD$ because $\angle E$ is identical in both triangles and the $\angle ABE$ and $\angle CDE$, by construction, are both right angles, thus answering the condition of theorum I. Therefore the following equality results: $\frac{AB}{CD} = \frac{EB}{ED}$. This fractional equation may be solved in four ways so as to find any one of the four lines in terms of the other three. Thus:

(1) $AB = \frac{CD \times EB}{ED}$, (2) $CD = \frac{AB \times ED}{EB}$,

(3) $EB = \frac{AB \times ED}{CD}$, (4) $ED = \frac{CD \times EB}{AB}$.

HEIGHT BY SHADOWS

The sun's rays are considered to be parallel. Therefore the line connecting the top of any object with the corresponding point of its shadow is parallel to every other line similarly formed. Since parallel lines make equal angles with a horizontal plane, the shadows cast by vertical objects may be considered as corresponding parts of similar triangles and the ratios of their corresponding sides as equal.

Problem. A yardstick standing vertically casts a shadow 30 in. long. What is the height of a tree which at the same time casts a shadow 35 ft. long?

Solution (1). By the formula (2) above for similar triangles, $CD = \frac{AB \times ED}{EB}$, letting ED and EB represent the lengths of shadows. Substituting,

$$CD = \frac{3 \times 35}{2.5} = \frac{105}{2.5} = 42 \text{ ft.}$$

Solution (2).

$$\frac{\text{height of yardstick}}{\text{shadow of yardstick}} = \frac{\text{height of tree}}{\text{shadow of tree}}.$$

$$\frac{3 \text{ ft.}}{2.5 \text{ ft.}} = \frac{\text{height of tree}}{35 \text{ ft.}}.$$

Height of tree $\times$ 2.5 = 105 ft.
Height of tree = 42 ft.

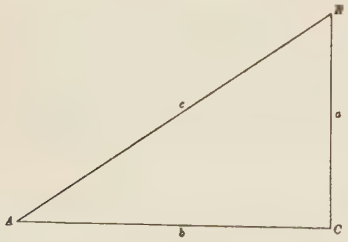
Problems such as the preceding, in which several of the lines may be measured, are easily solved by making use of the geometrical relationships between the sides of similar right triangles. However, it frequently happens that the length of only one side of a right triangle is known or can be measured. In such cases, if the size of one of the acute angles can also be measured, the dimensions of all of the sides and angles may then be calculated by means of trigonometry.

TRIGONOMETRY

Trigonometry is the branch of mathematics that deals specifically with relations between the sides and angles of triangles and with quantities closely related to them. It is based chiefly on theorems concerning similar triangles and on the Pythagorean theorem. The science has wide application in astronomy, physics, engineering, and other fields where magnitudes may be calculated more readily by means of the construction of triangles some elements of which can be easily measured.

The need for this type of calculation arises especially in the determination of distances that do not readily admit of the actual physical processes of measuring, such as the distance between the tops of two buildings or the distance of a ship from a point on the shore. The following paragraphs explain the elementary ratios used in trigonometry and exemplify their application in the solution of a few simple problems.

Trigonometrical Ratios. The last preceding figure shows the similar right-angled triangles EAB and ECD. Since these triangles are similar, their corresponding sides are in proportion and the ratio of AB to EA, for example, is equal to the ratio of CD to EC. In any triangle similar to these, the ratio of the sides corresponding to AB and AE remains the same and will not be affected by the *size* of the triangle. This ratio is therefore a constant for every angle of the same size. If the $\angle E$ changes, however, while the $\angle$ corresponding to B remains right, the ratio also will change. This fact enables us to use the ratio of the sides in such a triangle as a means of determining the magnitude of an angle. To facilitate such a process, distinctive names have been assigned to the six ratios between the different sides of a right-angled triangle. These ratios, by means of which most trigonometrical results are obtained, are called *trigonometric ratios*, or *trigonometric functions of the angle.*



With reference to the right-angled triangle ABC, in which C is the right angle and c is consequently the hypotenuse, the names and definitions of three of the fundamental trigonometric ratios may be given as follows:

Sine of $\angle A = \frac{a}{c} = \frac{\text{opposite side}}{\text{hypotenuse}}$.

Cosine of $\angle A = \frac{b}{c} = \frac{\text{adjacent side}}{\text{hypotenuse}}$.

Tangent of $\angle A = \frac{a}{b} = \frac{\text{opposite side}}{\text{adjacent side}}$.

These three ratios are those most commonly employed. They are usually abbreviated **sin** A, **cos** A, and **tan** A, respectively. The multiplicative inverses of these ratios are also trigonometric ratios and are identified by names. The definition of each of these and the identity of each with its reciprocal function, are given below.

Cosecant of

$$\angle A = \csc A = \frac{c}{a} = \frac{\text{hypotenuse}}{\text{opposite side}} = \frac{1}{\sin A}.$$

Secant of

$$\angle A = \sec A = \frac{c}{b} = \frac{\text{hypotenuse}}{\text{adjacent side}} = \frac{1}{\cos A}.$$

Cotangent of

$$\angle A = \cot A = \frac{b}{a} = \frac{\text{adjacent side}}{\text{opposite side}} = \frac{1}{\tan A}.$$

By definition,

$\sin A = \frac{a}{c}$, therefore $a = c \sin A$, and $c = \frac{a}{\sin A}$;

$\cos A = \frac{b}{c}$, therefore $b = c \cos A$, and $c = \frac{b}{\cos A}$;

$\tan A = \frac{a}{b}$, therefore $a = b \tan A$, and $b = \frac{a}{\tan A}$.

Just as $\sin A = \frac{\text{side opposite } A}{\text{hypotenuse}} = \frac{a}{c}$, so the sine of $\angle B$, or $\sin B$, $= \frac{\text{side opposite } B}{\text{hypotenuse}} = \frac{b}{c}$. As stated above, the ratio $\frac{b}{c}$ also equals $\cos A$. Therefore $\sin A = \cos B$.

Since $\angle C$ is a right angle and the sum of all of the angles in a triangle equals two right angles, $\angle A + \angle B$ must equal 90°. It follows, therefore, that the sine of any angle is equal to the cosine of its complementary angle (complement's sine). Similarly, the tangent and secant of any angle are equal to the cotangent and cosecant, respectively, of the complementary angle.

These relationships explain why, in using the following table of the numerical values of trigonometrical functions, the values for any angle from 45° to 90° may be obtained by reading from the foot of the table to the top, using the column of degrees at the right. More complete tables should be obtained by anyone who has to solve many problems which involve trigonometric functions.

The letters designating sides and angles in the following problems correspond to those used in the figure shown in first column, this page, in which $\overline{BC}$, or a, is the altitude, or height; $\overline{AB}$ or c, is the hypotenuse; and $\overline{AC}$, or b, is the base. The student is advised to make his own sketch for every problem.

Problem. The line of sight from the eyes of an observer standing on level ground 250 feet from the base of a flagpole to the top of the pole forms an angle of 20° with the horizontal. What is the height of the pole if the observer's eyes are 5 feet above the ground?

Solution.—Height above observer's eyes $= a = b \tan A = 250 \tan 20°$
$= 250 \times .3640 = 91$ ft.
True height = 91 ft. + 5 ft. = 96 ft.

Problem. From an airplane directly above a town, the angle of depression of another town 9 miles distant from the first is 6°. How high was the plane at the moment of observation?

Solution. The angle of depression of the town as seen from the airplane is the same as the angle of elevation of the airplane as seen from the town. Therefore, lines joining the two towns and the plane form a right-angled triangle in which $b = 9$ miles and $\angle A = 6°$. The height, $a = b \tan A = 9 \tan 6°$ $= 9 \times .1051 = .9459$ miles, or 4994 feet.

Other Relations of the Trigonometric Functions. In addition to the use of these trigonometric functions in solving problems involving angles

TRIGONOMETRIC FUNCTIONS

Angle	sin	cos	tan	cot	
0°	0.0000	1.0000	0.0000	∞	**90°**
1°	.0175	.9998	.0175	57.2900	89°
2°	.0349	.9994	.0349	28.6363	88°
3°	.0523	.9986	.0524	19.0811	87°
4°	.0698	.9976	.0699	14.3007	86°
5°	.0872	.9962	.0875	11.4301	**85°**
6°	.1045	.9945	.1051	9.5144	84°
7°	.1219	.9925	.1228	8.1443	83°
8°	.1392	.9903	.1405	7.1154	82°
9°	.1564	.9877	.1584	6.3138	81°
10°	.1736	.9848	.1763	5.6713	**80°**
11°	.1908	.9816	.1944	5.1446	79°
12°	.2079	.9781	.2126	4.7046	78°
13°	.2250	.9744	.2309	4.3315	77°
14°	.2419	.9703	.2493	4.0108	76°
15°	.2588	.9659	.2679	3.7321	**75°**
16°	.2756	.9613	.2867	3.4874	74°
17°	.2924	.9563	.3057	3.2709	73°
18°	.3090	.9511	.3249	3.0777	72°
19°	.3256	.9455	.3443	2.9042	71°
20°	.3420	.9397	.3640	2.7475	**70°**
21°	.3584	.9336	.3839	2.6051	69°
22°	.3746	.9272	.4040	2.4751	68°
23°	.3907	.9205	.4245	2.3559	67°
24°	.4067	.9135	.4452	2.2460	66°
25°	.4226	.9063	.4663	2.1445	**65°**
26°	.4384	.8988	.4877	2.0503	64°
27°	.4540	.8910	.5095	1.9626	63°
28°	.4695	.8829	.5317	1.8807	62°
29°	.4848	.8746	.5543	1.8040	61°
30°	.5000	.8660	.5774	1.7321	**60°**
31°	.5150	.8572	.6009	1.6643	59°
32°	.5299	.8480	.6249	1.6003	58°
33°	.5446	.8387	.6494	1.5399	57°
34°	.5592	.8290	.6745	1.4826	56°
35°	.5736	.8192	.7002	1.4281	**55°**
36°	.5878	.8090	.7265	1.3764	54°
37°	.6018	.7986	.7536	1.3270	53°
38°	.6157	.7880	.7813	1.2799	52°
39°	.6293	.7771	.8098	1.2349	51°
40°	.6428	.7660	.8391	1.1918	**50°**
41°	.6561	.7547	.8693	1.1504	49°
42°	.6691	.7431	.9004	1.1106	48°
43°	.6820	.7314	.9325	1.0724	47°
44°	.6947	.7193	.9657	1.0355	46°
45°	.7071	.7071	1.0000	1.0000	**45°**
	cos	sin	cot	tan	Angle

and sides of triangles, there are other relations of these functions needed in higher mathematics. Three of them are based on the fact that $a^2 + b^2 = c^2$.

1. $\frac{a^2}{c^2} + \frac{b^2}{c^2} = 1$ $\quad (\sin A)^2 + (\cos A)^2 = 1$, or simply $\sin^2 A + \cos^2 A = 1$.

2. $\frac{a^2}{b^2} + 1 = \frac{c^2}{b^2}$ $\quad \tan^2 A + 1 = \sec^2 A$

3. $1 + \frac{b^2}{a^2} = \frac{c^2}{a^2}$ $\quad 1 + \cot^2 A = \csc^2 A$

Another group of relations is based on the following simple mnemonic:

$$\tan A$$

$$\sin A \qquad \sec A$$

$$\cos A \qquad \csc A$$

$$\cot A$$

Any function is equal to (1) *the product of the two adjacent functions,* (2) *the quotient of either adjacent function divided by the one beyond it, and* (3) *the reciprocal of the opposite function.* For example:

$\tan A = (1) \sin A \cdot \sec A = (2) \frac{\sin A}{\cos A} = \frac{\sec A}{\csc A} = (3) \frac{1}{\cot A}$ and $\cos A = (1) \sin A \cdot \cot A = (2) \frac{\sin A}{\tan A} = \frac{\cot A}{\csc A} = (3) \frac{1}{\sec A}$.

CALCULUS

Sir Isaac Newton and Gottfried Wilhelm Leibnitz have been recognized as independently discovering calculus. The introduction of calculus, and the developments which followed, made it possible for mathematicians, astronomers, and other scientists, to solve numerous previously unsolved problems. Through the interpretation of a derivative as a rate of change, and through the summation principle of definite integrals, calculus opens the door to voluminous applications and to unlimited travels in regions of advanced mathematics. The nature of calculus and the type of problems with which it deals are illustrated in the following brief discussion.

In this section the term *calculus* is used for *differential* and *integral calculus*, or as that undergraduate course in mathematics, usually at the college level, which follows the study of algebra, trigonometry, and analytic geometry.

Increment Quotient; Average Rate of Change. Let us assume that y is a single-valued, continuous function of a variable x, and express this functional relationship through the equation

$$(1) \qquad y = f(x),$$

in which x is considered as the independent variable and y as the dependent variable, or function.

We now regard the values of x and y in (1) as initial values, which will remain unchanged during the process of finding a derivative, and will denote any change in the variables by adding increments to their initial values. Thus a change in the independent variable will be indicated by adding an increment Δx to x. Δx is read "delta x." This is not Δ times x, but is a symbol to denote a variable to be added to its initial value in order to obtain a new value of the independent variable. In the process of obtaining a derivative Δx will be made to approach zero. Substituting $x + \Delta x$ in place of x in (1) gives a new value of the dependent variable, which we will indicate by adding the increment Δy to its initial value. The new value of the dependent variable may be expressed as

$$(2) \qquad y + \Delta y = f(x + \Delta x).$$

Subtracting (1) from (2) we find the increment of y

$$(3) \qquad \Delta y = f(x + \Delta x) - f(x).$$

Dividing both sides of (3) by Δx, which can be done before Δx is made to approach zero, we obtain the increment quotient

$$(4) \qquad \frac{\Delta y}{\Delta x} = \frac{f(x + \Delta x) - f(x)}{\Delta x}.$$

Since Δy denotes the change in the function caused by adding an increment to the independent variable, the increment quotient in (4) represents the *average rate of change of the function with respect to the independent variable in the interval* Δx.

Derivative; Instantaneous Rate of Change. If the increment quotient in (4) approaches a limit as Δx approaches zero, the limit is called the **derivative of y with respect to x.** This derivative is most frequently denoted by the symbol $\frac{dy}{dx}$, or its equivalent dy/dx. Other symbols that are often used are y', $\frac{d}{dx}f(x)$, and $f'(x)$. Using the first symbol the derivative may be expressed as

$$(5)\quad \frac{dy}{dx} = \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}.$$

Obtaining a derivative by following the steps from (1) through (5) is known as differentiating by the **increment process.** By use of this process formulas may be found for the derivative of each elementary function which may arise in applications.

From the interpretation of the increment quotient as the average rate of change of the function with respect to the independent variable within the interval Δx, as given above, it is readily seen that the derivative in (5) represents the instantaneous **rate of change of y with respect to x at the beginning of the interval.**

Example 1. Let us follow the steps from (1) through (5) and obtain the derivative of the function

$$(6)\qquad y = 4x^3 - 3x + 7,$$

by the increment process.

$$\begin{aligned} y + \Delta y &= 4(x + \Delta x)^3 - 3(x + \Delta x) + 7, \\ \Delta y &= \{4[x^3 + 3x^2(\Delta x) + 3x(\Delta x)^2 + (\Delta x)^3] \\ &\quad -3x - 3\Delta x + 7\} - (4x^3 - 3x + 7) \\ &= [12x^2 + 12x(\Delta x) + 4(\Delta x)^2 - 3]\,\Delta x, \\ \frac{\Delta y}{\Delta x} &= 12x^2 + 12x(\Delta x) + 4(\Delta x)^2 - 3, \\ \frac{dy}{dx} &= \lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \\ &\quad \lim_{\Delta x \to 0} [12x^2 + 12x(\Delta x) + 4(\Delta x)^2 - 3], \end{aligned}$$

and, finally,

$$(7)\quad \frac{dy}{dx} = 12x^2 - 3.$$

The derivative of the function of equation (6), for any particular value of x, may be found by substituting this value in the right member of (7). Thus, for $x = 2$, $dy/dx = 45$.

Formulas. In the brief list of formulas given below without derivation, it is assumed that x is the independent variable, that u and v are differentiable functions of x, that a, a_0, a_1, . . . , a_n, and n are constants, and that all of these are real.

$$(8)\quad \frac{d}{dx}\,a = 0.$$

$$(9)\quad \frac{d}{dx}\,ax = a.$$

$$(10)\quad \frac{d}{dx}\,ax^n = anx^{n-1}.$$

$$(11)\quad \frac{d}{dx}(a_0x^n + a_1x^{n-1} + \cdots + a_{n-1}x + a_n) = a_0nx^{n-1} + a_1(n-1)x^{n-2} + \cdots + a_{n-1}.$$

$$(12)\quad \frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}.$$

$$(13)\quad \frac{d}{dx}\frac{u}{v} = \frac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}.$$

$$(14)\quad \frac{d}{dx}\,au^n = anu^{n-1}\frac{du}{dx}.$$

Example 2. By use of (11), we find

$$\frac{d}{dx}(3x^4 - x^3 + 5x^2 + 7x + 2) = 12x^3 - 3x^2 + 10x + 7.$$

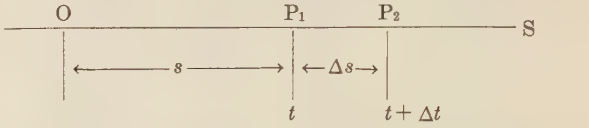
Example 3. Use (14), with $a = 5$, $u = 3x^2 - 11$, $n = 4$, and $\dfrac{du}{dx} = 6x$,

to find

$$\frac{d}{dx}\,5(3x^2 - 11)^4 = 5 \cdot 4\,(3x^2 - 11)^3\,(6x) = 120x\,(3x^2 - 11)^3.$$

Speed; Acceleration. The speed and acceleration of a moving particle illustrate the use of a derivative as a rate of change.

Let us consider a particle moving at a variable rate on the line OS, shown in the figure, and suppose



that at times t and $t + \Delta t$ the particle passes through the points P_1 and P_2, respectively. Designating by s the displacement OP_1, and by Δs its increment P_1P_2, we interpret the increment quotient $\dfrac{\Delta s}{\Delta t}$ as the average speed of the moving particle during the interval of time Δt. The limit of this increment quotient as Δt approaches zero is the speed of the particle at the instant t, or at the point P_1. Denoting the speed of the particle at time t by v, we may write

$$(15)\qquad v = \frac{ds}{dt} = \lim_{\Delta t \to 0} \frac{\Delta s}{\Delta t}.$$

The particle was assumed to be moving at a variable rate, so that its speed at P_2 may be expressed as its speed v at P_1 increased by the increment Δv. The limit of the increment quotient $\dfrac{\Delta v}{\Delta t}$ as Δt approaches zero is the rate of change of the speed with respect to time at the beginning of the interval, and is called the acceleration of the particle at time t. If we designate the acceleration by a, we have

$$(16)\qquad a = \frac{dv}{dt} = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t}.$$

As there will be no opportunity to introduce higher derivatives formally, it is well to observe that a, as the derivative of v, may be considered as the *second derivative* of s. Thus, from (16) and (15), we may give

$$a = \frac{d}{dt}v = \frac{d}{dt}\frac{ds}{dt} = \frac{d^2s}{dt^2}.$$

Example 4. The approximate distance a body will fall from rest is given by the formula (See page 1156.)

$$(17)\qquad s = \tfrac{1}{2}gt^2,$$

where s is the distance in feet the body will be from its starting point after t seconds, and g is the acceleration due to gravity.

Identifying $\frac{1}{2}g$, t, and 2 in (17) with a, x, and n, respectively, in formula (10), we obtain

$$(18)\qquad \frac{ds}{dt} = v = gt,$$

which expresses the speed of the falling body at time t.

Differentiating $v = gt$ of (18) with respect to t we find the acceleration $a = dv/dt = g$.

Interpretation of a Derivative; Applications. Interpretation of a derivative as the rate of change of a function with respect to its variable has just been illustrated in Example 4 where the time rate of change of displacement was interpreted as speed, and of speed as acceleration. In Examples 5 and 6 we shall make two applications in each of which the area of a circle will be expressed in terms of a variable radius.

Example 5. Let us find the rate of change of the area of a circle with respect to its radius, and determine this rate when the radius is 2 ft.

Considering the radius r as varying the area A is expressed as a function of r through the equation $A = \pi r^2$. Differentiating both sides of this equation with respect to r, after identifying π, r, and 2, with a, x, and n, respectively, in (10), we have

$$\frac{dA}{dr} = 2\pi r, \tag{19}$$

as the rate of change of the area of the circle with respect to its radius. For the circle of radius 2 ft., we substitute $r = 2$ in (19) and find that for this value of r the area of the circle is changing at the rate of 4π sq. ft. per foot change in the radius.

Example 6. If the radius of a circle is increasing at a rate of four feet per second, so that $dr/dt = 4$ ft./sec., let us find the time rate of change of the area when the radius is 3 ft.

With π, r, 2, and dr/dt replacing a, u, n, and du/dx, respectively, in (14), we differentiate both sides of the equation $A = \pi r^2$ with respect to t to obtain

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} \tag{20}$$

as the time rate of change of the area. If we substitute $r = 3$ and $dr/dt = 4$ in (20) we find $dA/dt = 2 \cdot \pi \cdot 3 \cdot 4 = 24\pi$ sq. ft./sec.

Differentials. Because the symbol of integration is generally used with a differential we shall give its definition here.

We start by taking the differential dx of the independent variable x as equal to its increment, so that $dx = \Delta x$, and diefine the differential of a function of x as its dervative multiplied by the differential of x. Thus, for the single-valued, continuous function $y = f(x)$, defined in (1), we have $dy = f'(x)\,dx$.

In order to obtain a formula for the differential of a function, multiply the corresponding formula for the derivative by the differential of the independent variable. For example, the formula for the differential of ax^n is found by multiplying the right side of (10) by dx. Hence, $d(ax^n) = anx^{n-1}\,dx$.

Example 7. $d(3x^4 - 5x^3 + 9x - 3) = (12x^3 - 15x^2 + 9)\,dx$.

Integration. We now define integration as the process inverse to differentiation. Integration, like differentiation, can be used with many important applications.

If one is asked to find an expression for y for which

$$dy/dx = 12x^5, \text{ or } dy = 12x^5\,dx, \tag{21}$$

he can readily see that $y = 2x^6$, $y = 2x^6 + 8$, $y = 2x^6 - 90$, and $y = 2x^6 + C$, where C denotes any constant, will all satisfy either expression in (21), the last one denoting a general expression of the function which satisfies the given condition. Using the customary notation, and the general constant C, we write

$$y = \int 12x^5\,dx = 2x^6 + C. \tag{22}$$

In (22) the symbol $\int$ is called the **sign of integration,** and may be thought of as asking "What is the function whose differential is $12x^5dx$?".

If we let $F(x)$ denote a function whose derivative is $f(x)$, the process of integration may be indicated by

$$\int f(x)\,dx = F(x) + C. \tag{23}$$

In (23) $f(x)$ is usually called the **integrand,** $F(x)$ a **particular integral,** $F(x) + C$ the **general** or **indefinite integral** of $f(x)\,dx$, C the **constant of integration,** and the equation may be read, "The integral of $f(x)\,dx$ is $F(x) + C$." Supplementary information is needed in order to determine the value of the constant C.

Constant of Integration. The determination of the value of the constant of integration is often very important, but, when it is possible to use a definite integral, it is unnecessary to find that value. The use of supplementary information for evaluating C will be illustrated in Examples 8 and 9.

Example 8. Let us start with the equation $ds/dt = v = gt$, from (18) and find, by integration, how far the falling body will be from a fixed point in its path in terms of t. Thus,

$$s = \int v\,dt = \int gt\,dt = \tfrac{1}{2}gt^2 + C. \tag{24}$$

The value of C will depend upon the point selected as origin, or as the point from which to measure the distance to the falling body. If we measure s from the starting point, we see that $s = 0$ when $t = 0$ fixes $C = 0$. With this value of C the expression for s in (24) becomes $s = \frac{1}{2}gt^2$, in agreement with (17).

Example 9. The equation of a curve whose slope (dy/dx) at every point on the curve is equal to $6x^2 + 2x - 11$, may be found by evaluating the integral in

$$y = \int (6x^2 + 2x - 11)dx, \text{ and is}$$

$$y = 2x^3 + x^2 - 11x + C. \tag{25}$$

To obtain the equation of a particular one of the infinitely many curves which have the given slope, supplementary information is needed in order to establish the appropriate value of C. If we wish the equation of the curve which contains the point (3,2) we put $y = 2$ and $x = 3$ in (25) and find $C = -28$. Hence the required equation is $y = 2x^3 + x^2 - 11x - 28$.

Study Recommended. Because of space limitations, it has been possible to give only the briefest introduction to calculus. The examples cited are meant to be only illustrative and nothing could be presented with the rigor which is so essential with all work in mathematics. The accuracy of every statement, definition, and formula that has been given can be established, and rigorous proofs are given in standard textbooks on calculus. It is hoped that the interest of the ambitious reader has been aroused and that he will wish to learn more of calculus, and to become proficient in making applications. Formal study in class is very desirable, and is recommended. However, an industrious reader, who is well grounded in algebra, trigonometry, and analytic geometry, can study at home. Each of the three widely-used textbooks that are listed in the bibliography on page 1196 should be found suitable for this purpose.

TEST QUESTIONS

HISTORY OF MATHEMATICS

What forces of civilization encouraged the development of mathematics? 1133

What is Euclid's *Elements* 1133

How did the Greek attitude toward mathematics differ from that of the Egyptians? . 1133

In what way are we indebted to the Arabs for the mathematical symbolism employed today? 1133

How does Non-Euclidean geometry differ from Euclidean geometry? 1134
How did Hilbert's work influence other mathematicians? 1134
Discuss the way in which applications of mathematics today differ from applications of 50 years ago 1134
How has the philosophy of mathematics education changed in recent years? 1134

ARITHMETIC AND MENSURATION

Explain what is meant by a one-to-one correspondence between two sets 1135
How can it be decided without counting which of two sets contains the greater number of elements? 1135
What is the roster method for describing a set? 1135
Explain the use of the equals sign (=) in the statement $5 + 4 = 9$ 1135
What is meant by the statement $A \subset B$? . . 1135
How are the numbers 0, 1, 2, and 3 defined in terms of sets? 1136
Explain how a child could use the concept, *Union of sets*, to add 5 and 3 1136
If multiplication is defined as repeated addition, how does the definition of 3×4 differ from that of 4×3? 1136
Define subtraction and division in terms of addition and subtraction 1136
Give an example of an application of the commutative principle; the associative principle; the distributive principle 1137
Why is 0 called the identity element for addition? 1 the identity element for multiplication? 1137
Work the subtraction problem $942 - 387$ both by the decomposition (subtractive) method and by the Austrian (additive) method . . 1138
Explain how one point on the rational number line can have many fraction names 1139
What does it mean to say that two fractions are equivalent? 1140
What does it mean to say that two fractions are reciprocals of each other? 1141
Explain why special rules do not necessarily have to be memorized for working with decimals 1142
If r is any rational number, what number is meant by r%? 1142
How many significant digits are presented by a measurement reported as .0045 inches? . 1143
Use basic concepts to prove that $8 + (-5) = 3$. Explain how the associative principle is used 1144
Why is 0 greater than -3? 1144
Is every rational number a real number? Is every irrational number a real number? . . 1144
What is the relationship between rational numbers and repeating decimals? 1145
Give a decimal for an irrational number using only the digits 2 and 3 1145
Explain the difference between our base ten numeration system and a base 5 numeration system 1145
Define prime number; composite number . . 1146
Which is larger, the gcd of 12 and 18 or the lcm of 12 and 18? 1147
What is a sample space for an experiment? . 1148
Distinguish between simple interest and compound interest 1149
Define the following figures, and illustrate by drawings: rhombus, rhomboid, trapezoid, trapezium, prism, parallelepiped, pyramid, cone, frustum of a cone, and cylinder . 1152-55
What is the formula from which to find the approximate height (h) in feet to which a particle will rise when given an initial upward velocity (v) in feet per second? 1156
What is the formula for computing the horsepower of a reciprocating engine? 1157
Name three statistical charts or graphs and give a brief explanation of the use of each 1158–60

Mental Tests

Square: 45; 105; 995 1136
Find the products: 846×50; 448×25; 101×86; 999×412.
(*Ans.* 42,300; 11,200; 8686; 411,588.) . . . 1136
Give the sums: $9 + (-5)$; $(-3) + (-4)$; $(-7) + 4$.
(*Ans.* 4; -7; -3) 1143
Give the differences: $8 - (-3)$; $0 - (-5)$; $(-2) - (-6)$.
(*Ans.* 11; 5; 4.) 1143
Give the products: $(-3) \times 5$; $(-6) \times (-3)$.
(*Ans.* -15; 18) 1143
Write 314,000,000 in scientific notation.
(*Ans.* 3.14×10^8) 1143
Arrange the integers 7, 0, -12, -3 in order of size from smallest to greatest.
(*Ans.* -12; -3; 0; 7) 1143
Give the quotients: $20 \div (-5)$, $(-16) \div 8$; $(-12) \div (-4)$.
(*Ans.* -4; -2; 3) 1143
Give the repeating decimal representations for 5/37 and for 7/19.
(*Ans.* .135135 . . . . .368421052631578947 . . .) 1145
Write the number 111 in base 5, base 6, and base 8 notation.
(*Ans.* 421_5; 303_6; 157_8) 1145
Subtract 315_8 from 1000_8.
(*Ans.* 463_8) 1145
Multiply $342_8 \times 56_8$.
(*Ans.* 24234_8) 1146
What is the smallest number that can be written in two different ways as the sum of two cubes?
(*Ans.* $1729 = 10^3 + 9^3 = 12^3 + 1^3$) . . . 1146
Express 100 as the sum of two triangular numbers.
(*Ans.* $100 = 45 + 55$) 1146
Factor into the products of primes 221, 221.
(*Ans.* $221, 221 = 7 \times 11 \times 13^2 \times 17$) . . . 1147
Express 1133 as the sum of three square numbers.
(*Ans.* $1133 = 32^2 + 10^2 + 3^2 = 27^2 + 20^2 + 2^2$) 1147
Give the gcd and lcm of the two numbers $14,700 = 2^2 \times 3 \times 5^2 \times 7^2$ and $7560 = 2^3 \times 3^3 \times 5 \times 7$.
(*Ans.* gcd is $2^2 \times 3 \times 5 \times 7$ and lcm $2^3 \times 3^3 \times 5^2 \times 7^2$) 1147
What is the probability that, if two dice are thrown, the total will be 9 or more?
(*Ans.* 9/36 or 1/4) 1148
What is the probability that, if two dice are thrown, either both dice will come up even or a total of eight will be thrown?
(*Ans.* 11/36) 1148
If two dice are thrown and the number on one die is larger than 4, what is the probability that a total of 7 has been thrown? of 8? of 9?
(*Ans.* 4/20; 4/20; 4/20) 1148

Area and Volume

Find the area of a table top, circular in form, with a diameter of 7 ft.
(*Ans.* 38½ sq. ft., with $\pi = 22/7$; 38.4846 sq. ft., with $\pi = 3.1416$.) 1153

If the price of coal is $15.75 per ton, and one ton occupies 36 cu. ft., how much will the coal cost that will fill a bin 12 ft. long, 8 ft. wide, and 6 ft. deep?
(*Ans.* $252.) 1154, 1162

Find the solid contents of a right circular cone 12 inches high that has a base 12 in. in diameter.
(*Ans.* 452.4 cu. in.) 1155

What is the capacity in gallons of a right circular cylindrical cistern 5 ft. in diameter and 8 ft. from top to bottom?
(*Ans.* 1175 gallons, approximately.) . . . 1155

ALGEBRA

Give the origin of the word algebra and explain briefly the relation of the science of algebra to arithmetic 1170

Illustrate by examples the difference between positive and negative quantities 1170

Define a set, a subset, and the element of a set. Give an illustration of a finite set, an infinite set, and the union of two sets . . 1170

On a number line, locate such points as 2, $-3\frac{1}{2}$, $-\frac{7}{12}$, $4\frac{1}{8}$ 1170-71

Solve the problems $27 - 18$ and $7x - 4x$ by using the definition of an additive inverse . 1171

Show that $\{x|2x + 5 = 9\} = \{2\}$ and that $\{x|3x - 4 > 2\} = \{x|x > 2\}$. Draw the line graphs of each 1173

Jim and Mary received equal allowances. After Jim had spent 40¢ and Mary had spent 60¢, they had $1.50 left between them. What were their allowances?
(*Ans.* $1.25) 1174

What are simultaneous equations? Mention two methods by which simultaneous equations may be solved 1175

Show that $\{(x,y)|3x - y = 6\} \cap \{(x,y)|2x + 3y = 4\} = \{(2,0)\}$ 1175

Find the H.C.F. and the L.C.M. of $4x^2 - 9$ and $2x^2 + x - 6$.
(*Ans.* $2x - 3$; $4x^3 + 8x^2 - 9x - 18$.) . . 1177

Show that $\dfrac{x+4}{x-3} + \dfrac{x-4}{x+3} = \dfrac{2(x^2+12)}{x^2-9}$ . . 1178

Define quadratic equation, pure quadratic equation, complete quadratic equation. Indicate two methods of solving a quadratic equation 1179

Show that $\{x|4x^2 - 25 = 0\} = \{2\frac{1}{2}, -2\frac{1}{2}\}$ and $\{x|2x^2 - x = 6\} = \{-1\frac{1}{2}, 2\}$ . . . 1179

Show that $\{x|x^2 - 5x - 6 \leqslant 0\} = \{-1 \leqslant x \leqslant 6\}$.
Verify using number line 1180

Define series, terms of a series, arithmetical progression, common difference, geometrical progression, common ratio, geometrical mean 1180–1181

Find the sum of the odd integers from 1 to 99.
(*Ans.* 2500.) 1181

If money invested at a certain rate of interest doubles in each period of nine years, what will $950 invested now amount to in 54 years?
(*Ans.* $60,800.) 1181

Define permutations, combinations 1181

A library shelf contains an encyclopedia of eight volumes. In how many ways may these volumes be wrongly arranged?
(*Ans.* 40,319) 1181

Define radical, radicand, surd, similar surds. When is a radical said to be rational? irrational? 1182

Express each of the following radicals in its simplest form: $\sqrt{18x^2y^3}$; $\sqrt{27a^5b^2c^3}$.
(*Ans.* $3xy\sqrt{2y}$; $3a^2c\sqrt{b^2}$.) 1181

Simplify $\sqrt{2a^3b} \cdot \sqrt{3ab^3}$ and $(3\sqrt{2x^3})^2$.
(*Ans.* $\sqrt{6a^2b^2}$ and $18x^3$) 1182

Simplify $\dfrac{3\sqrt{5a}}{\sqrt{2a^3}}$ and $\dfrac{\sqrt{12y^3}}{\sqrt{3y^5}}$.
$\left(Ans.\ \dfrac{3\sqrt{10}}{2a} \text{ and } \dfrac{2}{y}\right)$ 1182

Simplify $\dfrac{\sqrt{5}-\sqrt{3}}{\sqrt{7}}$ and $\dfrac{\sqrt{3}}{\sqrt{7}+\sqrt{5}}$.
$\left(Ans.\ \dfrac{\sqrt{35}-\sqrt{21}}{7} \text{ and } \dfrac{\sqrt{21}-\sqrt{15}}{2}\right)$ . . 1182

Compute $\sqrt{19.7 \cdot 2.32}$ by logarithms.
(*Ans.* 6.77) 1183

Determine log 51.83 by interpolation.
(*Ans.* 1.7146) 1183

Define logarithm, mantissa, characteristic, cologarithm, antilogarithm 1183–1184

By means of logarithms, find the value of $\sqrt[3]{782^2}$.
(*Ans.* 84.88.) 1184

By reference to the logarithm table, find the logarithm of 7183 and the antilogarithm of $8.7639 - 10$.
(*Ans.* 3.8563; 0.05806.) 1185

GEOMETRY AND TRIGONOMETRY

Define the following terms: ray, angle, congruent, radian, complementary angles, circle, sphere, arc, sector, secant, tangent . . 1186–1187

Define acute angles, corresponding angles, alternate-interior angles 1186

How many radians are there in a right angle? in an angle of 135°? in an angle of 450°? . 1186

Complete the following truth table:

p	q	$p \rightarrow q$	$q \rightarrow p$	$\sim p$	$\sim q$	$(\sim p) \rightarrow (\sim q)$
T	T					
T	F					
F	T					
F	F					

1187

Two lines are drawn tangent to a circle from a point outside the circle. If the two points of tangency are A and B, and the outside point is P, prove that $\overline{PA} \cong \overline{PB}$ 1187

Using a truth table construction, show that $\sim[(\sim p) \vee q] \longleftrightarrow p \wedge (\sim q)$ 1187

What is the Pythagorean theorem and why is it so called? Mention two different proofs that have been given for this theorem. 1188–1189

A 4-foot pole standing vertically casts a shadow 60 inches long. What is the height of a tree which at the same time casts a shadow 45 feet long? (*Ans.* 36 feet) . . . 1189

Define trigonometry. What are trigonometrical ratios? State a purpose for which they are used. Define the sine, the cosine, and the tangent of an angle 1190

An observer knew that the horizontal distance from himself to a flagpole was 300 feet. From his position the angle of elevation to the top of the pole was 15°, and the angle of depression to the bottom of the pole was 5°. How high was the pole? What was the elevation of the observer above the base of the pole? (*Ans.* 106.62 feet; 26.25 feet) . . . 1190

Verify the following trigonometric identities:

1. $\tan^2 x = (\sec x + 1)(\sec x - 1)$
2. $\sec x = \tan x \cdot \csc x = \tan x / \sin x = \csc x / \cot x$
3. $\cot^2 x = \cos^2 x + \cos^2 x \cdot \cot^2 x$
4. $\sec^2 x + \csc^2 x = \sec^2 x \cdot \csc^2 x$
5. $\cos^2 x + 2\sin^2 x = 1 + \sin^2 x$ 1191

Solve the trigonometric equations $2\sin x + 3 = 4$ and $3\tan x - 1 = 2$ for positive angles less than 90°.
(*Ans.* x = 30° and x = 45°) 1191

CALCULUS

Given the function $y = 5x^2 - 23x + 49$, find dy/dx by the increment process.
(*Ans.* $10x - 23$.) 1191

Use formula (13) and find the derivative of $(3x - 8)/(x - 2)$.
(*Ans.* $2/(x - 2)^2$.) 1192

Use formula (14) and find the derivative of $3(1 - 2x)^9$.
(*Ans.* $-54(1 - 2x)^8$.) 1192

Use formula (14) and find the derivative of $4(3x^2 - 8)^{3/2}$.
(*Ans.* $36x(3x^2 - 8)^{1/2}$.) 1192

A particle is moving on a straight line so that its distance from a fixed point on its path is given by $s = t^3 - 3t^2 + 21t + 5$, where s is measured in feet and t in seconds. Find the speed when the acceleration is 6 ft./sec^2.
(*Ans.* 21 ft./sec.) 1192

Evaluate the following integrals:

(*a*) $\int (12x^2 - 6x + 5)\,dx$; (*b*) $10 \int x^{3/2}\,dx$.

(*Ans.* (*a*) $4x^3 - 3x^2 + 5x + C$;
(*b*) $4x^{5/2} + C$.) 1193

Of the curves for which the slope, dy/dx, is everywhere equal to $3x^2 + 2x - 4$, find the equation of the one which contains the point (1,2). (*Ans.* $y = x^3 + x^2 - 4x + 4$.) . 1193

If a body is moving in a straight line at 88ft./sec. when a force is applied against its direction of motion and it is brought to rest with a deceleration of 8 ft./sec^2. ($a = -8$), find how far it will move before stopping. (**Hint:** Integrate twice to obtain v, the speed, and s, the displacement, and then substitute the value of t for which $v = 0$ in the expression for s.)
(*Ans.* 484 ft.) 1193

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VII

Economics and Useful Arts

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ECONOMICS AND USEFUL ARTS
RESEARCH AND DEVELOPMENT

ECONOMICS AND USEFUL ARTS

INTRODUCTORY

ECONOMICS is the study of the means by which people obtain their livelihood and satisfy their wants. Many thinkers maintain that the economic system under which a people lives largely determines the form of all its institutions, including its morality, family life, religion, and art. Whether or not this view is entirely correct, there can be no doubt that, along with political government, economic conditions constitute a factor of supreme importance in the life of man.

The economic system touches the life of every man, woman, and child, primarily through their jobs or other sources of income or support and through the prices which must be paid in securing what they want. When jobs fail or prices fluctuate unduly, the average person senses that something is wrong. On giving it proper attention, he begins to perceive that he is part of a vast system of world-wide sweep. If he is to be an intelligent citizen and understand the forces which have such a large part in determining his well-being, it is essential that he study the economic system under which he lives.

The Economic System. In the normal course of events, every one of us, unless he is altogether dependent on others, contributes something to the common store of goods and services. In return, he receives, through the agency of money, the right to a certain share of that common store.

The present economic system of production, distribution, and consumption has been built and rebuilt by many generations, the results differing according to each generation's degree of intelligence, skill, and invention, its command over nature, and its social relationships. The system rests on such institutions as property and contract, the division of labor, competition, and combination. Behind all the factors of an economic system are the laws of human nature. These laws, working through the instincts to acquire, to possess, and to provide for family and dependents, operate to convert the vast resources and powers of the earth into human service.

Under the impact of two world wars, the economic system has been subjected to tremendous strains and shocks of abnormal periods. We have seen inflation and deflation at their greatest extremes, high prices, scarcity of raw materials, rationing and governmental price fixing, excess profits tax, and other programs and policies necessitated by world conflict. The divergent interests of workers and employers, labor and capital, have frequently set class against class, while the intensive research in products and methods has given us great improvements in machines and time-saving devices, all of which have displaced great numbers of workers from one form of employment into other forms, causing a change in the personal life of the individual affecting his housing, type of employment, wage, and social position.

The economic system of a democratic country must assume that the right of private property is an inalienable right. With this right of ownership and possession for use, man becomes a dignified human being and possesses initiative and an incentive to achieve a better education, and a better position so that he may provide more adequately for himself and his family

Today, millions of people live under one or the other of two world economic systems designated as Capitalism and Communism. In the "free world," where people are self-governed, Capitalism prevails. The economic life of the country is carried on by private enterprise instead of government directives. The individual citizen can choose his own occupation, invest his savings as he wishes, and otherwise manage his personal and business affairs. Competition is essentially free, and the hope of profit provides an incentive for industry and thrift. In Russia, which operates under a system of modified Marxist Communism, production has been placed on a basis of use rather than profit, and the strong central government allocates production, regulates prices, and assigns positions. Under this "controlled economy" the individual surrenders his independence and initiative and has his entire future education, work, and leisure time planned for him. While Russia has recently made some concessions to the individual citizen by increasing the supply and availability of consumer goods, an extreme form of Communism exists in mainland China, where the citizen is literally a slave of the state.

In the United States of America, which has the world's highest standard of living, it is recognized that the government, as a servant of all the people, must provide for laws and regulations so that all persons, regardless of race, creed, or color, may have the opportunity of training and work so that they in return may provide for themselves and their families. The purpose of a government in our economic system is simply to outline the rights and responsibilities of each group, so that no one transgresses upon the rights of others.

The Division of Labor. This is the key to the understanding of the whole economic order. If every man or every family produced only for himself or itself, there would be no exchange, no markets, no money, no means of transportation; in fact, no economic system. Some such situation actually existed in the more primitive ages of the world where each household was almost self-sufficient. With the advance of civilization, however, came the division of labor. Men have discovered that it is far more profitable to co-operate with one another, each finding and keeping to his own special task.

Ours is an age of specialization. To provide the breakfast of even the humblest family in a modern country, all parts of the earth are drawn upon. To serve our needs we have thus built up the vast network of modern trade and commerce now in existence.

Linking the World. The greatest benefits of the division of labor are reaped when cities and districts and countries exchange with one another those products which they can produce most advantageously. Such advantages in the production of certain commodities may arise in a particular place by reason of its climate, soil, natural resources, and the capacities of its inhabitants. The United States, with its wide range of soil and climate, is more self-sufficient than most countries. But it needs the rubber and tin of the East Indies, the silk of Japan, the nickel of Canada, and a thousand other products which commerce brings to our shores.

In a similar way, different parts of the same country specialize and create domestic trade. Indiana specializes in corn; South Dakota, in wheat; California, in oranges. Each produces the crops which it can raise to the greater advantage. Likewise, the city depends on the country, but so also does the

country depend on the city. This all-round dependence of part on part is made possible by great systems of transportation and communication.

By aid of the means of communication, we have today markets that are nation-wide and even world-wide for the main articles of commerce—wheat, cotton, wool, rubber, and so forth. By aid of the system of transportation, the resources of the world are exploited and brought wherever there is a demand for them. Nowhere have these agencies been more highly developed than in the United States, and nowhere have they been such important factors in the building up of a national life. In the pages that follow, special attention is paid to the history of *Communication* and *Transportation.*

Capital and Labor. We often speak of capital as a form of wealth. It has another aspect, which appears when we contrast capital with labor. Here lies one of the greatest problems of modern society. Since the Industrial Revolution, the mechanism of production has grown so elaborate and so costly that the worker can no longer own the instruments with which he works. He must work for an employer and often the employer is a large corporation. So a conflict of interests arises.

As producers, capital and labor are of necessity partners, for capital is useless without labor and labor is powerless without capital. But, as claimants to the product of this partnership, the owners of capital and the givers of labor have unreconciled interests. This conflict of interests is not strictly a warfare, as it is sometimes called, since capital and labor *must* combine to produce. Some degree of struggle and conflict is at the same time inevitable at every stage of social evolution. But this struggle has grave social and economic consequences, which have led governments to step in with regulations of far-reaching importance both to employers and to employees. This vital issue is treated in the section on *Labor Relations.*

From Producer to Consumer. When production takes place on a large scale, the consumer is no longer in direct and personal relation to the producer. Hence arises the need for agencies to bring the two together. Modern business makes necessary a system of commission houses, jobbers, wholesalers, and retailers. They all have their parts to perform in the division of labor, and, as such, they serve useful economic functions. The practical aspect of this subject is taken up in the discussion of *Advertising* and *Salesmanship.*

Money as the Medium of Exchange. All this interchange requires a scale of value and a money system. Barter, or the direct exchange of goods for goods, is a cumbersome and difficult process. A standard of value, universally recognized and accepted, is therefore essential, and most modern countries have found it in gold, though China uses silver instead. The American dollar means an amount of gold of certified weight and fineness. So do the pound sterling, the mark, the franc, and other national units, although at times their conversion into gold has been suspended.

On the basis of gold, a wonderful system of credit is built. Banks and other financial institutions issue notes and certificates that are generally "as good as gold" because of the guarantee behind them. These notes do away with the inconvenience involved in carrying around the precious metal. All economic wealth has come to be reckoned and measured in these units of value. In fact, wealth has come to mean, not the owning of so much land and so many cattle and so many houses, as in the old days, but the owning of so much "capital," so many of the standard units of value.

For example, no individual owns today a particular stretch of railroad or a particular locomotive that runs along it, but he may own so many shares, representing so many units of value, in the railroad company. It is this development of the ownership of capital which has made possible the growth of the institutions described in this department under *Insurance, Investments,* and *Money and Banking.* In the section on *Business Crises,* another very significant aspect of the subject is treated.

The Stages of Production. In a study of Useful Arts, we begin with the land, for on it or out of it (including, as economists do, the oceans and inland waters as part of the "land") are produced all the raw materials which the labor and organization of men turn into the means of satisfying their numerous wants. Thus we have first in order the extractive industries, which are described under the titles *Agriculture, Animal Industry, Fisheries,* and *Mining and Mineral Production.*

Most raw materials—wheat, cotton, wool, silk, iron, copper, lumber, and a host of others—go through many and elaborate processes before they are ready for their final use. They must be conveyed by land and water, they must pass through many hands, they must be treated by complicated machinery. Production calls for the work of the inventor and of the engineer no less than that of the farmer and of the miner. Hence the division on *Inventions* and on *Engineering and Building.*

Then comes the last stage, that of manufacturing. In the plant of the manufacturer, the work of the farmer, the miner, the inventor, and the engineer is brought together. Out of the factory the results of their labor pass at last as finished goods, and the whole roundabout process of production is complete. The more important aspects of this last step are treated under *Manufacturing* and *How Things are Made.*

The Age of Industry. One man today can do the work which hundreds or even thousands were needed to perform in the pre-industrial age. Power has been harnessed and applied in countless ways. Steam and electricity and oil and gasoline serve the desires of man. The blast furnace, the power loom, the self-binding reaper, the linotype machine—to mention at random a few of our innumerable inventions—make possible an efficiency of production which surpasses the wildest dreams of the past. The standard of living of ever-greater populations has risen vastly. The ordinary man has at his command commodities that in earlier times were the rare luxuries of kings. Thus has industry, aided by invention, revolutionized the world. The Industrial Revolution is well named because, of all the great changes society has known, none has been at once so rapid and so extensive as this development. A period of much less than a hundred years saw the transformation of the everyday life of our Western civilization, saw a remarkable change in the habits and thoughts and modes of work of many millions, saw a new power over nature created, and saw the very face of the country completely alter d.

To understand these things is to understand our own age and civilization. Through a study of economics and the arts of production, we may attain this understanding and learn in a new way the meaning of the world and the society in which we live. To serve this purpose, through a compact and accurate presentation of the whole system, the material in this department has been prepared.

Mass Production. A logical modern extension of the Industrial Revolution has been the introduction of large-scale manufacturing operations. Through technological developments and the efficiency studies of Frederick W. Taylor and others, a conveyor-belt sequence has been perfected for the production and assembling of parts, thus making possible great saving of time and labor in the manufacture of products differing widely in kind and complexity. These range from simple gadgets for household use to automobiles and even prefabricated buildings. A corollary for mass production is of course mass consumption, which creates demand and absorbs the increased output. This large-scale buying is stimulated by reduced cost, by effective advertising, and by installment selling.

COMMERCE

COMMERCE consists of all those processes of trade involved in the general distribution of commodities from the producer to the consumer. However, the term generally implies an exchange of large volumes of merchandise between different places or communities rather than the trade carried on between individuals. Traffic passing from one nation to another is *foreign*, or *international*, commerce; that moving between localities included within national boundaries is *internal*, or *domestic*, commerce. In the United States, commercial shipments of merchandise from one state to another are said to enter into *interstate* commerce.

Origins. The desire of man to satisfy his wants as easily as possible supplies the primary reason for commercial transactions. However, there can be comparatively little exchange between countries or districts inhabited by people who produce the same type of commodities; for then, neither locality has anything required by the other. Commerce, therefore, depends upon existing differences in temperature and climate, in natural resources, in industrial development, or in racial and cultural characteristics.

Transportation and Commerce. Wherever such differences exist, the inhabitants of one district will generally have a surplus of certain commodities which they are anxious to exchange for the surplus from other places. But, before the exchange can be accomplished, the goods must be transported to the locality where they are needed. For this reason commerce and transportation are mutually dependent to such an extent that the condition of one is almost invariably indicated by a corresponding degree of development in the other.

Because of this intimate relationship, the history of commerce may be divided into three fairly distinct periods: First, that in which transportation was accomplished by man or by beasts of burden on land, and by coasting vessels on the water. Second, that in which mariners, by the aid of the compass, were able to guide their sailing vessels upon the open seas. Third, that in which transportation by land and by sea depended chiefly upon the power of steam. The first period, of possibly 5000 years' duration, extended from the beginning of commerce well into the 15th century, in spite of the fact that the compass was known in parts of Europe as early as 1200; the second period, of about 400 years' duration, may be said to have terminated in 1838, when the first line of commercial steamships began operation. The third period is that of the past century.

ANCIENT COMMERCE

The city of Babylon, possibly as early as 3000 B. C., was a market place to which precious metals, grain, wool, and other materials were brought from all directions. Later, records show that, by 1600 B. C., well developed trade routes existed, over which the Arabs conducted caravans transporting silks, spices, wine, gold, and other commodities from the Red Sea district, from Phœnicia, and even from Asia, to Egypt, where they were exchanged chiefly for grain and linen. Excavations in Egypt have revealed certain vases which seem to have been brought from the island of Crete as early as the year 2000 B. C.

The Phœnicians. The first people devoted chiefly to commerce were the Phœnicians, who inhabited a strip of land about 100 miles long and 10 miles wide on the eastern coast of the Mediterranean. Forced upon the sea as fishermen, these people gradually developed commercial fleets which in time extended their voyages to the Strait of Gibraltar and even north to England. The ships brought back ivory, tin, copper, and precious metals, while caravans sent inland brought spices and frankincense from India. Manufacturing industries were developed, especially in glassware, cloth, and metal products; great cities such as Sidon and Tyre came into existence; colonies—of which Carthage, on the north coast of Africa, was later to become the great rival of Rome—were founded at many advantageous points; and, for perhaps 1000 years, the Phœnicians controlled the commerce of the world.

The Greeks. Eventually, the commercial supremacy of the Phœnicians passed to the Greeks, who excelled both as sailors and as business men. Their homeland, which in area was smaller than the state of Maine, nevertheless offered great incentives to commerce. It was sufficiently fertile to afford a surplus of some products, such as wine, figs, and olive oil, but it did not produce enough grain to feed the population. Mountains on the north protected it fairly well from attack by land; it was centrally located in relation to other countries of the Mediterranean; and its extensive coast line afforded many good harbors.

The conditions of living in a small, well populated country having an insufficient supply of grain were conducive to emigration; ships furnished an easy means of travel. Consequently, for a period of about 500 years, the Greeks followed a consistent policy of founding and of developing settlements in fertile sections of foreign lands, notably on the Black Sea, in Asia Minor, and in southern Italy and Sicily. Malaga, in Spain, and what is now Marseille, in France, were sites of thriving Greek colonies. From these colonies, grain and raw materials were supplied to the mother country, which developed many manufacturing industries, especially the production of bronze, clay, marble, and woolen products.

The Greeks were quick to adopt new devices for facilitating commerce. From contact with the Phœnician traders, they acquired an alphabet, which they greatly improved. From the Lydians of Asia Minor, they learned to mark pieces of silver with an official seal and to use these coins as money.

In spite of the success of the Persians, who broke the Greek power in the East, the Western colonies developed more rapidly than before, while Greece itself, under the leadership of Athens, reached the pinnacle of its power.

Empire of Alexander. The enormous eastern empire held by the Macedonian, Alexander the Great, took away from Athens the control of commerce and led to the development of great commercial cities farther east. Of these, the largest was Alexandria, located near the western corner of the Nile delta. This city surpassed in volume of trade all centers of commerce which had previously existed. The huge lighthouse erected on the island of Pharos to guide mariners safely into the harbor of Alexandria was considered to be one of the seven wonders of the ancient world.

The Romans. The expansion of Roman power outside of Italy is said to have begun in 241 B. C., when Sicily was taken from the Carthaginians. Ninety-five years later, the great commercial cities of Carthage and Corinth were destroyed by Roman soldiers, and Greece and Macedonia were reduced to the position of Roman provinces.

Although Rome ruled the Western world, she never became a commercial city. Captives of war were extensively sold as slaves, and great quantities of foodstuffs, manufactured products, and luxuries were sent to the capital by sea, and over the fine roads that were constructed by Roman engineers, even in the farthest provinces. These products, however, to a large extent, did not represent commercial transactions but were the tributes and taxes imposed upon conquered peoples. What Rome gave in return was almost five centuries of comparative peace and security, during which time commerce developed wherever conditions permitted.

MEDIEVAL COMMERCE

During the "dark ages" that followed the fall of Rome, commerce was almost entirely in the hands of the Mohammedans, with centers at Baghdad, Damascus, Cairo, Alexandria, and the Moorish cities in Spain.

Western and northern Europe became divided under the feudal system into thousands of tiny units, each attempting to be complete within itself, and entirely independent of all external sources of supply. Roads were totally neglected; strangers were regarded with suspicion; robbery was a common practice; and commerce, under such conditions, was quite naturally almost nonexistent.

Growth of Towns. Soon after 1000 A. D. the need for places where an interchange of commodities might be carried on was filled by the widespread development of towns. In these growing communities, manufacturing and trading not only became possible, but were necessary in order to provide something to exchange for the food and raw materials brought in at first from the surrounding country, and, later, from other parts of the world.

Under these conditions some men were enabled to devote all of their time to trading and dealing in commodities. The fear of the townspeople that these traders would take undue advantage of their opportunities, coupled with the prevalent suspicions of all strangers, next led to the establishment of *public markets*, where commercial transactions might be carried on under official supervision. As the markets increased in size and prosperity, traders customarily united for mutual benefit, forming *merchants' guilds*. Somewhat later, the craftsmen also combined, according to their special trades, to form *craftsmen's guilds*. These guilds were at first private organizations, but eventually they were recognized by the town authorities and attained to great power in the local government.

Fairs. An extension of the idea of the town markets led, in all parts of Europe, to the establishment of *fairs* under the protection of various powerful lords. At the fairs, which were usually held annually, special efforts were made to insure honest dealing and the safety of those in attendance. For this reason the large fairs, such as those held in various parts of Champagne, France, were visited by dealers from other French towns and also from Flanders, Italy, Germany, and England. Bankers also were frequently present in order to lend their money. Fairs represented the most important form of commercial activity of the times.

Risks of Medieval Commerce. The extensive commerce of the latter part of the medieval period was carried on at very great risk, because of constant rivalry and open warfare between great commercial cities. There was no central government sufficiently powerful to enforce its laws and to guarantee security. Shipments on land and by inland waterways were subject both to innumerable and excessive tolls and to constant danger from highway robbers. Similarly, coasting vessels always had to be ready for battle with pirates or with ships from rival cities.

Venice and the Hanse. In the north of Europe, during the 13th and the 14th century, the great commercial cities of Lubeck, Hamburg, Cologne, Danzig, and many others united, for mutual protection, into an organization known as the Hanse, or Hanseatic league. This league became extremely powerful and had complete control of commerce with the countries on the Baltic and, to a large extent, with those on the North Sea.

On the Mediterranean the struggle for supremacy was largely between Venice and her chief rivals, Genoa and Pisa. Leadership was secured to Venice by the crafty manner in which the doge, Enrico Dondolo, directed the energies of the Fourth Crusade, first to the capture of Zara, a rival Christian city, and next, in 1203, to the subjugation of Constantinople. Venice then completely dominated the trade with the East, and developed commerce to a degree never before attained. Venetian methods of banking and bookkeeping represented standards that were copied throughout the commercial world.

Between Venice and northern Europe, commerce was carried on in two ways: Traders from central and southern Germany were permitted to bring their metals, furs, coarse textiles, twine, and leather over the Alps by way of the Brenner or the Saint Gotthard pass, to Venice. By sea, the Venetian galleys, with their precious cargoes of spices, dyes, alum, fine textiles, weapons, and paper, traveled to Flanders. Bruges, which was succeeded in the 15th century by Antwerp, was the common center at which the wares of Venice were traded for the fish, furs, coarse textiles, wax, grain, and salt meat brought by the ships of the Hanseatic league, and for the wool, tallow, leather, tin, and lead of England. English exports at this time were almost entirely under the control of the "Merchants of the Staple," a society composed chiefly of foreigners.

MODERN COMMERCE

During the 14th and the 15th century, England, France, and Spain were becoming nations in which many loosely connected feudal divisions were gradually merged under comparatively strong central governments. Then, for the first time, the individual cities of Italy and the weak organization of the Hanse came into conflict with commercial rivals who had less experience but were more powerful and determined than themselves.

Portugal, under the direction of wise rulers, had already attained the leadership in navigation; not because the Portuguese were better sailors than the Venetians, the Genoese, or the mariners of the Hanseatic league, but because they received encouragement and assistance from their government.

New Trade Routes. In the East, the ancient land routes by which the commerce of India and of China had reached Venice were gradually cut off by the spread of Turkish power. As a result, each of the important European nations was actively searching for the "Eastern passage" by which their ships could reach the fabulously rich countries of the Orient.

In 1492, Columbus, a Genoese in command of Spanish vessels, sailed west until he reached the New World, which blocked the direct route to Asia. Cabot, an Italian master of an English ship, reached North America in 1497. Finally, by sailing around Africa, Vasco da Gama, a Portuguese, established trade by sea with India in 1498, and returned home the next year with goods that sold for sixty times the cost of the voyage. In 1522 the expedition which had set out from Spain three years before under command of Magellan completed the first voyage around the world.

The Portuguese obtained the rewards due the winner of the race to the East, for to them Pope Alexander VI assigned all of Africa and of Asia, with the exception of the Philippines. The Americas, except Brazil, were allot ed to Spain.

The Struggle for Supremacy. The open seas now became the highway on which the ships of Portugal, Spain, France, and England speeded in order to obtain as much as possible from the newly found sources of wealth. Portuguese ships brought back great quantities of Eastern products which, because of the increased supply, eventually sold at prices low enough to change such important commodities as tea, coffee, and sugar from luxuries to necessities. Lisbon for a time succeeded Antwerp as the most important city of commerce.

Spain. During the century which followed the discovery of America, Spain became the richest and most important country on the earth. From her colonies she received enormous quantities of gold

WORLD'S PROGRESS IN COMMERCE AND PRODUCTION

Year	Population	Total Commerce	Commerce per Capita	Ships, Sail	Ships, Steam	Railways
		Dollars	Dollars	Tons	Tons	Miles
1840	950,000,000	2,789,000,000	2.93	9,012,000	368,000	5,400
1850	1,075,000,000	4,049,000,000	3.76	11,470,000	864,000	24,000
1860	1,205,000,000	7,246,000,000	6.01	14,890,000	1,710,000	67,400
1870	1,310,000,000	10,663,000,000	8.14	12,900,000	3,040,000	139,900
1880	1,439,000,000	14,761,000,000	10.26	14,400,000	5,880,000	224,900
1890	1,488,000,000	17,519,000,000	11.80	9,166,000	8,295,000	390,000
1900	1,543,000,000	20,105,000,000	13.02	6,674,000	13,857,000	500,000
1910	1,616,000,000	33,634,000,000	20.81	4,624,000	22,046,000	637,000
1920	1,730,000,000	61,277,000,000	35.42	4,066,000	32,092,000[3]	710,600
1930	2,000,000,000	69,526,000,000[1]	34.28[1]	.....	69,734,310[4]	706,090
1940	2,170,000,000	27,706,000,000[2]	12.92[2]	.....	69,439,659[5]	756,781[6]
1950	2,400,000,000	58,400,000,000	24.31	.....	75,718,000	783,679

Year	Telegraphs	Cables [8]	Cotton	Coal	Pig Iron	Gold Production
	Miles	Miles	Pounds	Short tons	Long tons	Dollars
1840	.....	.....	1,310,000,000	44,800,000	2,700,000	134,800,000
1850	5,000	25	1,435,000,000	81,400,000	4,700,000	363,900,000
1860	100,000	1,500	2,551,000,000	142,300,000	7,200,000	1,334,000,000
1870	281,000	15,000	2,775,000,000	213,400,000	11,900,000	1,263,000,000
1880	440,000	49,000	3,601,000,000	340,000,000	18,000,000	1,150,800,000
1890	768,000	132,000	5,600,000,000	466,000,000	27,200,000	1,060,100,000
1900	1,180,000	200,000	6,247,000,000	800,000,000	40,400,000	2,100,000,000
1910	1,307,000	291,000	9,013,000,000	1,141,600,000	65,800,000	3,780,700,000
1920	1,592,000	.....	9,405,000,000	1,305,000,000	68,300,000	4,253,800,000
1930	7,119,665	360,613	12,960,000,000	1,196,003,000	80,289,000	3,846,848,000
1940	6,730,500[7]	344,079[2]	14,770,820,000	1,615,972,000[2]	104,000,000	8,562,100,000
1950	5,089,000	344,079[2]	13,750,000,000	1,441,257,000	112,800,000	8,610,000,000

[1]1929. [2]1938. [3]Includes motor ships. [4]Gross Tons, includes motor and sail ships. [5]Includes barges, motor and sail ships, 1939. [6]1937. [7]1939. [8]Nautical miles. [9]For decade ending year named.

and silver, and also many valuable cargoes of hides, drugs, dyes, cocoa, vanilla, and sugar. Manufacturing industries at home were developed on a large scale for the production of silk and woolen textiles, wines, soap, salt, and many other commodities. In addition to manufactured articles, Spain exported figs, raisins, olives, olive oil, iron ore, and large amounts of mercury for use in obtaining gold and silver at the mines of Mexico and Peru.

All of these great advantages were nullified and finally destroyed by a prolonged period of bad government, marked especially by exorbitant taxes of every kind, and by a policy of exploitation rather than assistance in connection with the colonies. So serious were the results that the population declined rapidly, and some great commercial cities retained only one-fourth of their former inhabitants.

Portugal. The commercial greatness of Portugal was open to attack by her rivals, because it lacked the firm foundation of domestic production. The Portuguese were excellent traders, but their country was small and was not developed industrially. Manufactured articles for export were not made at home but had to be purchased from other European countries. Consequently, England and the Netherlands were eventually able to cut off Portugal's supply of export goods, and to fill the Eastern demand themselves. In addition to this fundamental lack of commercial stability, Portugal fell under the harmful rule of Spain during the 60 years between 1581 and 1640. By the time the Spanish yoke was cast off, England had broken Portuguese control in India, and the Netherlands had taken the islands of Ceylon, Sumatra, Java, and the valuable Moluccas, or Spice islands.

The Netherlands. Dutch traders were quick to take advantage of the opportunities offered by the decline of Spain and Portugal. Their ships traveled to India and to the Eastern islands, and were equally active in European trade. Most of the wool exported by Spain was carried to northern countries by Dutch vessels, which also entered the Baltic and returned with cargoes from Russia.

At home, large business companies grew up, the manufacture of silk and of leather was developed, the fishing industry increased until more than 2000 fishing boats were regularly employed, and business of all forms was greatly stimulated. The Netherlands became the financial center, and Amsterdam the most important commercial city, of Europe.

Unfortunately for the country, a strong central government was lacking, corruption became common among high officials, and taxes were greatly increased. The volume of commerce ceased to grow after 1730. In 1798 the Dutch East India Company, which had ruled all of the Eastern possessions and for 180 years had paid average annual dividends of over 18 per cent, came to an end. Its debts of more than 50 million dollars were assumed by the government.

France. Among the five European nations that achieved commercial power during the modern period of 1500 to 1800, France was one of the two which a historian in the 16th century would probably have selected as most likely to reach and to keep first place. Portugal and the Netherlands were obviously handicapped by their lack of area and domestic resources. But France and Spain were the largest and richest countries of western Europe, and both had extensive coast lines. In exploration, France surpassed both the English and the Dutch, while in area of foreign colonies, she was second only to Spain.

France did develop a prosperous trade with the Levant and with Italy and Spain, but this could not become of first importance because faulty political organization raised almost insuperable obstacles to the free flow of commerce.

The greatest checks to commerce within the country were due to the existence of feudal divisions which prevented national unity, to the continuance of the guilds long after these organizations had been displaced in more progressive nations, and to the establishment of an absolute monarchy wherein the correction of existing evils was impossible unless the ruler was unusually strong and wise. High customs duties were collected whenever goods entered the country and also when they crossed from one internal division to another. The quarrels and the strict regulations of the numerous guilds

CANADIAN SHIPPING, 1959

Vessels Entered and Cargo, 15 Leading Ports

Ports	Foreign Service		Coastal Service		Total		Cargo, in tons		
	No.	Tonnage	No.	Tonnage	No.	Tonnage	Loaded	Unloaded	Total
Montreal, Que.	2,923	9,259,887	3,856	4,804,596	6,779	14,064,483	7,605,087	10,366,477	17,971,564
Sept. Iles, Que.	447	3,446,725	1,364	2,559,303	1,811	6,006,028	14,627,969	401,752	15,029,721
Vancouver, B. C.	3,165	7,750,111	19,700	12,653,202	22,865	20,403,313	7,916,689	3,913,739	11,830,428
Port Arthur, Ont.	421	1,889,184	792	2,962,489	1,213	4,851,673	8,659,708	332,009	8,991,717
Hamilton, Ont.	892	3,281,360	683	1,316,334	1,575	4,597,694	444,834	7,041,204	7,486,038
Halifax, N. S.	1,510	5,758,633	864	1,019,531	2,374	6,778,164	4,087,887	3,309,269	7,397,156
Toronto, Ont.	1,241	2,520,741	1,151	1,573,850	2,392	4,094,591	808,518	3,960,590	4,769,108
Sault Ste. Marie, Ont.	504	2,003,719	464	1,054,933	968	3,058,652	525,097	4,051,719	4,576,816
Quebec, Que.	810	3,610,249	1,865	2,591,943	2,675	6,202,192	1,043,505	3,225,770	4,269,275
Ft. William, Ont.	211	622,872	677	1,970,339	888	2,593,211	3,098,761	601,471	3,700,232
Port Colborne, Ont.	252	582,030	508	1,303,869	760	1,885,899	1,523,471	1,811,947	3,335,418
Sydney, N. S.	144	226,797	731	1,287,444	875	1,514,241	1,812,607	1,412,084	3,224,691
Sarnia, Ont.	332	754,673	857	1,462,631	1,189	2,217,304	1,800,049	1,231,325	3,031,374
Port Alfred, Que.	348	1,249,944	786	603,899	1,134	1,853,843	629,491	2,314,286	2,943,777
New Westminster, B. C.	552	1,582,052	3,964	1,530,580	4,516	3,112,632	1,981,282	810,301	2,791,583

Source: *Canada Year Book, 1961.*

largely prevented any improvements in methods of manufacture, and, finally, selfish monarchs entered upon a series of wars which gained nothing at home and lost most of the colonies abroad.

England. In spite of serious wars and intense commercial competition with larger countries, England, by 1750, had become the dominating factor in world commerce. Of the various reasons for her success, two may be considered as fundamental: First, she was a part of Europe and yet was separated from the continent by a wide channel which effectively prevented invasion by land; this condition made the possession of a powerful navy a primary necessity for national safety. Second, England acquired a coherent central government much sooner than did her rivals, and this government was far more flexible and democratic than theirs.

As a basis for exchange with other countries, England had from very early times the products of her sheep industry and of her mines. Manufacturing industries were gradually developed, which changed these raw materials into cloth and metal products. Ships were required to carry the excess production to other countries, and ships were needed also for protection and to supply trained sailors to the navy in time of war. The government, therefore, adopted the policy of encouraging shipping and commerce. Whenever possible, special privileges were secured by the state for English merchants, and success in battle usually meant the addition of foreign colonies in which an extension of trade could be expected.

English Trading Companies. During the 17th century, English commerce was to a large extent controlled by trading companies such as the East India Company, the Guinea Company, the Virginia Company, and the Hudson's Bay Company. A trader who was not a member of one of the companies could deal only with France, Spain, or Portugal. The strict control and regulations of the companies provoked so much antagonism that they finally lost their power and disbanded. The Hudson's Bay Company, however, still exists as an ordinar business corporation.

Having extensive colonies which supplied raw materials and required manufactured articles in return, together with a powerful merchant marine for the distribution of her products, England experienced at home a high degree of industrial development. Textiles and products of iron and steel were the chief commodities manufactured and exported. Homeward bound ships brought wool, cotton, naval stores, grain, sugar, tea, coffee, spices, tobacco, and rum; also silk, linen, and other foreign

CANADIAN COMMERCE

Imports and Exports to Selected Countries, 1920–1960
(add 000's)

Year	Imports (in dollars)					Exports (in dollars)				
	From U. K.	From Commonwealth	From U. S.	From Others	Total	From U. K.	From Commonwealth	From U. S.	From Others	Total
1920	231,488	*	350,387	755,045	1,336,920	341,168	*	555,337	371,509	1,268,014
1930	227,816	*	653,676	126,987	1,008,479	316,342	*	373,424	173,917	863,683
1935	173,889	*	312,417	64,009	550,315	377,644	*	261,685	85,648	724,977
1940	267,383	*	744,231	70,336	1,081,950	655,957	*	442,984	80,013	1,178,954
1945	271,668	*	1,202,418	111,689	1,585,775	1,486,848	*	1,196,977	534,506	3,218,331
1950	400,811	240,988	2,089,531	393,901	3,125,231	467,896	184,362	2,020,703	431,055	3,104,016
1951	415,194	305,522	2,752,087	532,136	4,004,939	630,124	239,982	2,296,235	730,741	3,897,082
1952	351,541	183,911	2,887,628	493,338	3,916,418	744,461	260,788	2,302,673	974,339	4,282,261
1953	445,441	169,666	3,115,301	517,400	4,247,808	663,785	231,412	2,413,318	788,596	4,097,111
1954	382,229	180,759	2,871,279	533,134	3,967,401	651,033	193,768	2,308,670	706,746	3,860,217
1955	393,117	208,940	3,331,143	634,554	4,567,754	767,642	235,867	2,547,636	707,183	4,258,328
1956	476,371	220,437	4,031,394	818,749	5,546,951	811,113	242,011	2,803,085	904,233	4,760,442
1957	507,319	237,937	3,887,391	840,704	5,473,351	720,898	231,637	2,846,646	989,699	4,788,880
1958	518,505	208,702	3,460,147	863,138	5,050,492	771,576	281,435	2,808,067	930,358	4,791,436
1959	588,573	239,240	3,709,065	972,043	5,508,921	785,802	273,305	3,083,151	879,414	5,021,672
1960	588,930	279,069	3,693,189	931,160	5,492,348	915,290	326,958	2,932,171	1,089,633	5,264,052

Source: *Canada Year Book, 1961.*

textiles. It must not be thought that all of this commerce depended on the colonies, for, at the end of the 18th century, more than half of England's trade was carried on with Europe. The trade with America ranked second in value. That with Africa was very much smaller, but was considered important because it furnished a supply of slaves for sale in America and the West Indies.

Canadian Commerce. The early commerce of Canada was controlled largely by monopolistic companies chartered by France. After the English conquest, control passed to British traders who confined their commerce almost entirely to the homeland. Early trade with the United States was by smuggling until Great Britain removed restrictions on normal traffic.

In 1960, Canada's foreign trade amounted to $10,756,400,000 with an increasingly larger share of its exports going to the United States, 56%, compared to 17% to Great Britain. The United States supplies Canada with 67% of its imports whereas Great Britain supplies 11%. Major exports to Great Britain include wheat, 15% of the total in value, aluminum, copper, nickel, newsprint, and lumber. Exports to the United States include newsprint, 22% of the total, lumber, wood pulp, uranium ores, iron ore, and petroleum. Imports are largely manufactured goods such as auto parts, machinery, and vehicles. The accompanying tables indicate the character of Canadian trade.

Traditionally, Canada has ranked fourth in world trade following the United States, Great Britain, and West Germany. It has enjoyed the trade advantages associated with membership in the British Commonwealth. The effect of Great Britain's entry into the European Common Market upon the pattern of Canadian trade cannot yet be judged.

IMPORTS OF CANADA, 1960
(add 000's)

Classes of Merchandise	From United Kingdom	From United States	From All Countries
Agricultural and vegetable prods.	Dollars 38,750	Dollars 365,495	Dollars 681,265
Animals and Animal products .	18,743	82,468	143,693
Fibers and Textiles	87,726	220,269	433,549
Wood and Paper	9,219	228,589	266,123
Iron and Prods. .	271,276	1,610,213	2,046,307
Nonferrous Metals	69,699	296,054	471,120
Nonmetallic Minerals	29,248	268,149	672,170
Chemicals and Allied products	24,909	282,723	338,652
All other commodities .	39,360	339,232	439,468
Total	588,930	3,693,189	5,492,348

EXPORTS OF CANADA, 1960
(add 000's)

Classes of Merchandise	To United Kingdom	To United States	To All Countries
Agricultural and vegetable prods.	Dollars 268,516	Dollars 174,425	Dollars 831,479
Animals and Animal products .	35,088	204,790	319,945
Fibers and Textiles	8,643	10,022	39,219
Wood and Paper	179,514	1,257,786	1,591,919
Iron and Prods. .	72,792	325,425	605,225
Nonferrous Metals	297,329	564,910	1,222,476
Nonmetallic Minerals	16,577	248,270	339,569
Chemicals and Allied products	34,088	92,220	237,687
All other commodities .	2,744	54,321	76,534
Total	915,290	2,932,171	5,264,052

Source: *Canada Year Book, 1961.*

UNITED STATES

The preceding sections relate the story of commercial progress on the earth, from the days of ancient Babylon to the beginning of the 19th century. At the conclusion of this 4800-year period of development, world commerce had reached a yearly value of about one and one-half billion dollars. Of the total, the United States of America was credited with about one-tenth.

World commerce, due to advanced methods of transportation and communication, increased tremendously from 1800 to the present time, while from 1800 to the beginning of World War I the rise of American foreign commerce was almost proportional to that of the rest of the world. Assembly line methods in production of ships and planes enabled America to lead the world in World War II in its merchant marine tonnage, rail transportation, and air transport.

In the following paragraphs, the development of foreign commerce in the United States is given especial attention. The corresponding growth in other nations is indicated by the commercial relations of these countries with America, and by the comparative importance of each in world trade.

The commerce of the English colonies in North America was such as would be expected between fertile, newly discovered lands, and the older, more advanced countries. Food and raw materials, consisting chiefly of flour, grain, tobacco, lumber, fish, potash, and indigo, were exported in exchange for textiles and other manufactured articles, and for colonial products such as sugar, molasses, coffee, and tea.

It is surprising to note that after the Revolution the United States continued to trade chiefly with England, although that country closed the ports of the West Indies to American ships. The European wars between England on one side, and France, Spain, and the Netherlands on the other, afforded the new nation its first great commercial opportunity. Having ships and sailors equal to any in the world, the American merchant marine developed rapidly, and carried a large share of the world's commerce while Europe was busily engaged in warfare.

This commercial growth received serious checks when France and England both placed arbitrary restrictions on neutral shipping. A general embargo, ordered by the American government in 1807 as a means of retaliation, proved even more disastrous. Commerce declined until the conclusion of the War of 1812, and then, after a few years of sharp fluctuations, experienced a long period of slow growth.

Expansion and Development. This period was, for the United States, one of active territorial expansion and economic development. The West grew rapidly, and in various parts of the country improved highways, new canals, or steamboats on the large rivers supplied better means of transportation. At the same time, more and better manufactured commodities were produced by industries which had originated or developed during the seven years between the passing of the Embargo act and the end of the War of 1812. Domestic manufacturers fought hard to retain the home market which had been created by the temporary shortage of foreign goods. They succeeded to a notable extent because their increased *production* was accompanied

by an even greater increase in *demand*, together with great improvements in the natural means of *distribution*. Although the *per capita* consumption of foreign goods decreased, the total amount of foreign trade continued to increase, and was carried chiefly by American ships. During this period the American merchant marine approached very closely in size that of Great Britain, and was second to none in skill and efficiency.

The change in the economic condition of the country is well shown by the changes in the list of exports. In 1800, grain amounted to one-third, and cotton to less than one-fourteenth, of all exported merchandise; in 1860, cotton accounted for four-sevenths of the total, and grain for only one-thirteenth. Manufactured goods, which stood low on the earlier list, were second only to cotton in 1860.

Triangular Exchange. The South gave all of its energies to the production of cotton. The North developed extensive manufacturing industries, but it also produced sufficient grain and meat to supply the entire nation and still had a surplus for export. From New Orleans, enormous quantities of cotton were shipped to Europe. Europe returned to New York textiles, articles manufactured from iron and steel, and luxuries. Finally, the cycle was completed and the South received compensation for its cotton in the form of food and manufactured products sent from the North.

Effects of Civil War. Intersectional warfare checked for a time the development of American commerce; it decided that the country should be one political unit; and it abolished slavery. It also had the effect of definitely marking the economic paths to be followed by the opposing sections. The world demand for cotton, and the consequent high prices paid for this staple, forced the South to resume the production of white fiber as rapidly as possible. In the North, a shortage of labor accentuated the advantages that were to be obtained by the extensive use of machinery in the factories and on the farms.

1850 to 1900. During the second quarter of the 19th century the annual production of coal increased from one-half million to six million tons, and the economic value of railroads was clearly demonstrated. Between 1850 and 1860, thousands of miles of track were laid, especially in the middle west. Our domestic exports, which amounted to 316 million dollars in 1860, averaged less than 225 million dollars a year until 1870; but by 1880 they became 824 million, and in 1892 they exceeded one billion dollars for the first time.

The last half of the 19th century was marked throughout the civilized world by the expansion of industrial and commercial activities. That the United States was able to hold a position of decided commercial importance is shown by the tables, *Economic Growth of the United States* and *World's Progress in Commerce and Production*.

Merchant Marine. This position was retained in spite of a great decline in American shipping. Many conditions contributed to this marked decrease in tonnage. The country was expanding and developing so rapidly that there were unusual opportunities for profits in domestic rather than in foreign trade. Higher tariff rates gave protection to home industries but did not help the merchant marine. Lower priced, foreign built ships were not purchased because, according to the law, they could not obtain American registry. And, finally, we were not prepared to build iron ships at a cost that could compete with those built in England.

In 1860, 70 per cent of our exports and 63 per cent of the imports were carried by American vessels. These ratios fell to about 10 per cent in 1910 but rose to more than 35.8 per cent by 1935. The foreign commerce of the United States amounted to $21.26 *per capita* in 1860. Fifty years later, although population was three times as great, the figures had increased to $34.78. In 1920, following World War I, the amount became $120.81, but fell to $77.59 by 1929. It was $48.92 in 1940.

Exports and Imports of the U.S. Historically, U.S. exports were characterized by large quantities of relatively few products largely agricultural in nature. In 1860, 80% of the exports were in this category, reflecting the impact of colonialism upon the country. In 1962, exports from the United States amounted to $21.3 billion consisting largely of manufactured products. Principal exports include industrial machinery, 14% of the total, grains, aircraft, auto and truck parts and accessories, electrical machinery, cotton, industrial chemicals, and iron and steel products.

While major imports emphasize raw material and food requirements, the U.S. also purchases manufactured goods abroad. Whereas manufactured items accounted for over one-half the imports in 1860, by 1962 they accounted for less than one-third. Major imports include petroleum and its products, approximately 10% of the total, machinery and vehicles, coffee, newsprint, cane sugar, copper, rubber, and meat products. Many of these items come from the underdeveloped countries of the world.

UNITED STATES EXPORTS AND IMPORTS, 1962 (add 000,000's)

Exports			Imports		
Rank		$ Value	Rank		$ Value
1.	Industrial Machinery	3,050	1.	Petroleum & Products	1,768
2.	Grains	2,048	2.	Wood & Paper Products	1,764
3.	Metal Manufactures	1,622	3.	Machinery	1,690
4.	Aircraft, parts & acces.	1,440	4.	Coffee, Tea, & Cocoa	1,205
5.	Auto & truck, parts & acces.	1,362	5.	Nonferrous Metals	1,147
6.	Electrical Machinery & Apparatus	1,260	6.	Sugar	564
7.	Industrial Chemicals	1,160	7.	Meat Products	482
8.	Cotton	537	8.	Chemicals	417
9.	Petroleum & Products	443	9.	Fish & Products	397
10.	Iron & Steel Mill Products	438	10.	Rubber	353
	Total	21,359		Total	16,249

Source: *Department of Commerce, Bureau of the Census*

Customers of the U.S. The foreign trade of the United States amounted to $4.2 billion in 1913. Principal participants included Great Britain, an 18% share, Canada 13%, Germany 12.5%, France 7%, and several other nations significant largely in terms of a single commodity—Cuba and sugar, Brazil and coffee.

By 1960, not only had total U.S. foreign trade changed to $36 billion, but the importance of various nations had changed. Canada emerged as the major source of trade, with 19% of the total. Other large participants include Japan 7.1%, United Kingdom 6.9%, West Germany 5.6%, and France 2.8%.

Internal Commerce of the U. S. Although the United States ranks high in world commerce, the internal or domestic trade is of far greater importance. Within American boundaries, sections of widely diversified economic and geographical character specialize in the production of commodities to which the locality is best adapted. Excess production may be transported to any part of the country, or may be shipped out without any hindrance of toll or tariff except the cost of transportation. The great size of this free market has been a vital factor in American economic development.

World Commerce. By the end of World War II, the U.S. had replaced Great Britain as the leader in the total volume of foreign commerce. Post-war German and Japanese rehabilitation, the Marshall Plan, and U.S. commitments to the underdeveloped areas of Latin America, Africa, and Asia, assured expanded commerce. Increased economic and political conflict with the Soviet Bloc

and repercussions growing out of Europe's efforts to unify have created the bases for enlarged U.S. participation in foreign commerce.

In 1948, through the auspices of its Marshall Plan, the United States provided the basis for mutual economic aid and co-operation among 18 European nations in the Organization for Economic Cooperation and Development. The North Atlantic Treaty Organization (NATO) provided a military alliance in which 13 of these nations participated. These programs provided the basis for the European Economic Community, or Common Market, which has evolved as the major unifying force in Europe. The effect of EEC is to reduce internal barriers to trade and expand social communication. With the development of EEC and the persistence of the Soviet trading bloc, changing patterns of world commerce may be anticipated.

Characteristics of Modern Commerce. Commerce is a natural process. It permits of a division of labor, helps to adjust the productive inequalities of different lands and peoples, and makes possible the development of manufacturing and the consequent growth of large cities. Foreign trade has a tendency to raise the standard of living.

Today, commerce supplies the necessities of existence to a large proportion of the population in all civilized countries. Consequently, the wares most characteristic of modern commerce are food, raw materials, manufactured articles, and fuel. The qualities characterizing modern commerce are safety, regularity, economy, and sensitiveness. These are due largely to the improvements that have been made in transportation, communication, and finance.

FOREIGN TRADE (COMMERCE) OF LEADING COUNTRIES*

Showing their trade with the United States

Country	Exports		Exports to the United States		Imports		Imports from the United States	
	Total	Per Cap.			Total	Per Cap.		
	Dollars	Dol.	Dollars	%	Dollars	Dol.	Dollars	%
Argentina	943,800	48.47	117,500	12.4	1,127,600	57.91	230,400	20.4
Australia	1,917,900	203.42	135,900	7.1	1,719,600	182.39	219,300	12.8
Austria	849,000	121.56	44,400	5.0	973,700	139.42	125,400	12.8
Belgian Congo	547,600	43.69	78,300	14.3	413,200	32.96	83,300	20.1
Bolivia	100,200	30.97	55,500	55.4	84,000	25.96	38,500	45.8
Brazil	1,482,600	24.77	734,600	49.5	1,233,900	20.61	355,100	28.8
Burma	242,700	12.22	1,800	0.7	197,400	9.94	5,700	2.9
Canada	5,264,052	307.63	2,932,171	59.6	5,492,348	360.59	3,693,189	73.1
Ceylon	347,000	38.86	29,400	8.5	342,200	38.32	8,400	2.5
Chile	544,200	78.40	243,500	44.7	353,600	50.94	161,500	45.7
Colombia	553,900	42.80	394,000	71.1	652,400	50.42	405,000	62.1
Costa Rica	63,600	64.37	30,700	48.3	91,200	92.30	49,700	54.5
Cuba	666,200	114.29	401,300	60.2	649,000	111.33	487,700	75.1
Czechoslovakia	407,200	30.79	6,000	1.5	327,600	24.77	800	0.8
Denmark	1,111,000	248.76	66,700	6.0	1,311,300	293.61	131,000	10.0
Dominican Republic	124,600	47.77	58,500	46.9	108,300	41.52	70,900	65.5
Ecuador	94,400	24.99	56,200	59.5	80,200	21.23	41,700	52.0
Egypt	408,600	17.45	13,500	3.3	534,200	22.81	71,700	13.4
El Salvador	112,700	49.69	50,200	44.5	104,700	46.16	55,200	52.7
Finland	773,900	180.48	51,500	6.7	885,100	206.41	63,800	7.2
France	4,541,300	104.15	226,100	5.0	5,553,000	127.36	680,400	12.3
Germany, West	7,360,800	142.66	497,600	6.8	6,660,600	129.09	952,000	14.3
Ghana (Gold Coast)	242,500	56.99	44,800	18.5	248,700	58.44	9,400	3.6
Greece	189,900	23.64	22,600	11.9	463,700	57.73	78,100	16.8
Guatemala	106,300	31.74	73,200	68.9	122,400	36.54	82,400	67.3
Haiti	42,000	12.53	14,200	33.8	43,300	12.92	26,800	61.9
Honduras	72,500	42.37	46,500	64.1	58,600	34.24	39,600	67.6
Hungary	166,500	16.80	1,200	0.7	149,600	15.10	2,000	1.3
India	1,251,000	3.23	184,000	14.7	1,708,700	4.41	197,900	11.6
Indonesia	882,000	10.50	141,300	16.0	853,100	10.15	141,200	16.6
Iran	555,800	25.50	41,500	7.5	278,300	12.76	46,600	16.7
Iraq	477,800	98.67	20,900	4.4	320,700	66.23	44,400	13.8
Ireland (Eire)	300,800	103.79	9,000	3.0	506,500	174.77	38,200	7.5
Israel	104,000	57.36	18,800	18.1	364,000	200.77	115,500	31.7
Italy	2,156,800	44.72	210,300	9.8	3,169,100	65.71	520,800	16.4
Japan	2,495,400	27.72	551,500	22.1	3,229,600	35.88	1,067,300	33.0
Malaya-Singapore	1,360,900	217.67	205,600	15.1	1,356,800	217.01	61,400	4.5
Mexico	659,600	21.59	480,700	72.9	1,071,600	35.09	838,500	78.2
Netherlands	2,862,200	262.87	178,600	6.2	3,712,500	340.97	520,700	14.0
New Zealand	770,400	353.71	54,100	7.0	659,200	302.66	50,600	7.7
Nicaragua	65,100	50.78	25,400	39.0	68,800	53.66	43,200	62.8
Norway	771,900	222.96	65,300	8.5	1,209,200	349.27	116,100	9.6
Pakistan	340,200	4.06	31,400	9.2	354,200	4.23	25,900	7.3
Paraguay	36,700	22.92	6,500	17.7	24,600	15.36	3,300	13.4
Peru	311,400	32.26	114,900	36.9	361,100	37 41	179,200	49.6
Philippines	436,900	19.62	236,300	54.1	506,400	22.74	300,500	59.3
Poland	404,900	14.62	27,400	6.8	387,100	13.98	3,700	.9
Portugal	298,800	33.81	27,200	9.1	441,000	49.90	45,600	10.3
Rep. of South Africa	1,156,700	83.12	96,000	8.3	1,385,400	99.56	277,700	20.0
Rumania	114,700	6.52	400	0.3	73,400	4.17	500	0.7
Saudi Arabia	790,800	158.16	76,600	9.7	219,100	43.82	74,400	33.9
Spain	441,400	15.11	61,000	13.8	766,700	26.25	200,800	26.2
Sweden	1,941,400	265.36	100,300	5.2	2,207,700	301.76	226,700	10.3
Switzerland	1,443,500	286.46	177,500	12.3	1,768,000	350.86	235,000	13.3
Syria	145,000	36.52	6,000	4.1	205,000	51.63	21,800	10.6
Thailand	335,100	16.19	83,300	24.9	365,800	17.68	56,800	15.5
Turkey	305,000	12.29	59,900	19.6	407,300	16.42	85,800	21.1
United Kingdom	9,291,700	181.45	727,600	7.8	10,889,800	212.65	1,146,700	10.5
Uruguay	211,100	80.72	24,600	11.7	205,800	78.69	32,800	15.9
U.S.S.R.	806,400	4.02	24,500	3.0	767,400	3.83	3,800	0.5
Venezuela	2,123,600	356.96	830,200	39.1	1,026,400	172.53	606,900	59.1
Yugoslavia	321,400	18.05	27,400	8.5	472,500	26.54	129,200	27.3

Source: *Direction of International Trade.* *Wholly or partly estimated data.

Balance of International Payments. This term refers to the net result of a nation's transactions with the outside world in a given period. It is derived from statistics showing to what extent domestically-produced goods and services have been exchanged with foreign countries, and how the differences in credits have been financed. The chief factors producing the balance are 1) exchanges of merchandise, services, and income on investments, 2) unilateral transactions like individual gifts and government grants, 3) transfers of long-term capital, and 4) movements of gold and short-term capital.

ECONOMIC DEPENDENCE OF THE UNITED STATES†

The United States is more favorably situated in regard to raw materials than any other country. Nevertheless, her high scale of living and enormous consuming power create many needs that cannot be satisfied by materials obtainable within her own territories. The following table presents a summary of the most essential commodities for which she is dependent chiefly on foreign sources of supply. Those in *italics* are of especial importance for national defense in the event of war. An asterisk (*) appears after those of which there is practically no supply native to the United States.

Material	Chief Uses	Quantity Imported 000 omitted	Chief Sources
*Antimony**	printing, glass enamels, cables	18,814 lbs.	Mexico, Bolivia
Bananas*	food	54,660 bnchs.	Honduras, Costa Rica
Bristles	brushes	4,827 lbs.	China
Camphor	celluloid, photographic films	147 lbs.	China
Castor Beans*	lubrication, perfumery	289,936 lbs.	Brazil, Haiti
Chalk	crayons, paints, polishes, linoleum	3,068 lbs.	United Kingdom
Chicle*	chewing gum	6,426 lbs.	Mexico
Chinawood Oil* (Tung)	paint, varnishes	64,968 lbs.	China, Argentina
Chromite	hard steels, paint	475,064 tons	Turkey, Philippines, Union South Africa, S. Rhodesia
*Cobalt**	steel alloys, colored enamels	7,603 lbs.	Belgium, Belg. Congo
Cocoa*	candy, beverages	631,573 lbs.	Brazil, Gold Coast
Coffee*	beverage	2,923,000 lbs.	Brazil, Colombia
*Cork**	bottle stoppers, life preservers, insulation	228,656 lbs.	Portugal, Spain, Algeria
Flaxseed	paint oil	8,274 lbs.	Canada
Graphite	lubrication, polish, paints, lead pencils	63,611 lbs.	Mexico, Ceylon, Madagascar
Gutta Percha*	insulation	440 lbs.	British Malaya
Hat Braids	hats	373,151 lbs.	China, Japan, Switz., Mex.
Hides and Skins	shoe leather, travel goods	169,509 lbs.	Canada, Brazil, India, New Zea.
*Iodine**	disinfectant	490 lbs.	Chile
*Jute**	twine, burlap, bags, linoleum, carpet	587,706 lbs.	Pakistan, India
Kauri Gum*	varnishes	244 lbs.	Indonesia
Manganese	structural steel	1,347,000 lbs.	India, Un. S. Af., Gold Coast, Brazil
Mercury	explosives, medicinal agent	7,839 lbs.	Italy, Spain
Mica	electrical equipment, lubrication	24,934 lbs.	India, Brazil
*Nickel**	steel, electroplating	194,287 lbs.	Canada, Norway
Nitrate of Soda	fertilizers, explosives	676 tons	Chile
Nutgalls*	dyeing, inks, color printing	1,674 lbs.	China, Korea
*Nux Vomica**	medicinal agent	1,038 lbs.	India, Fr. Indochina, Fr. China
*Opium**	medicinal agent	32 lbs.	Turkey, Iran, Yugoslovia
Palm Oil	soap, tin plate	82,340 lbs.	Indonesia, Belg. Congo
Pigments (mineral earth)	paints	34,239 tons	Belgium, Canada, Spain
Platinum	electrical equipment, jewelry, chemical industries	5050 oz.	Canada, Columbia
Potash Materials	fertilizer	36,582 tons	Canada, Belgium, Germany
Pulp	paper	1,763 tons	Canada, Sweden
Quebracho Extract*	leather tanning	114,633 lbs.	Paraguay, Argentina
*Quinine** (*Cinchona* Bark*)	medicinal agent	453 lbs.	Guatemala, Indonesia, Philippines, Belg. Congo
Rabbit Fur and Coney	felt hats	23,566 lbs.	Australia, N. Zealand, Belgium
Rattan*	furniture	3,647 lbs.	Indonesia, Philippines, China, Br. Malaya
*Rubber** (crude)	tires, electrical equipment, footwear, raincoats	1,480,000 lbs.	Br. Malaya, Siam, Ceylon, Indonesia, Liberia, Belg. Congo
*Shellac**	varnishes, insulation, phonograph records, paint	12,778 lbs.	India, Siam
*Silk, Raw**	textiles	2,766 lbs.	Japan, China, Italy
Sisal Hemp	binder twine	126 tons	Mexico, Cuba, Haiti
Sugar	food, confections	7,457,000 lbs.	Cuba, Philippines Dom. Rep.
Pagua Nuts*	buttons	3,310 lbs.	Ecuador, Panama
Tea*	beverage	94,962 lbs.	India, Ceylon, China, Japan
Tin	canning, dyeing, textile mfr.	38,348 tons	Bolivia, Siam, Indonesia, Belg. Congo
Tungsten	high-speed steels, electric lights	6,688 lbs.	China, Korea, Siam, Bolivia, Spain
Vanadium	hard steels	985 lbs.	Peru
Wool, Carpet	rugs	117,572 lbs.	Argentina, China, Pakistan, India, New Zea., Australia, Syria, Lebanon, Iraq
Wool, Other	clothing	159,611 lbs.	Argentina, Uruguay, Brazil, New Zea., Australia

†Prepared in the Department of Commerce, by International Economic Analysis Division, Office of International Trade, from basic data of the Bureau of the Census.

COMMERCIAL RAW MATERIALS

By far the most important commercial raw materials are those commodities which are utilized for food, for clothing, for the production of machinery and of power, and for structural purposes. These are obtained from all parts of the earth as contributions from the three kingdoms of nature—the vegetable, the animal, and the mineral.

The following classification is based primarily on this natural division, and secondarily on the purpose for which each commodity is generally employed. In the various groupings are included the most important commercial raw materials, together with representative examples of a vast number which are of minor importance.

VEGETABLE PRODUCTS

Cereals: Wheat,—including emmer and spelt,—rice, corn, oats, rye, barley, the sorghums, millet, and buckwheat (not a true cereal but used as such).

Other Starchy Foods: Potatoes, yams, sweet potatoes, arrowroot, cassava (tapioca). See *Starch*.

Pulses: Peas, beans, lentils, soy beans.

Sugars: Cane sugar, beet sugar, maple sugar, palm sugar (jaggery), and glucose.

Vegetables: Artichoke, asparagus, beans (string), beet, cabbage, carrot, cauliflower, celery, cucumber, eggplant, endive, garlic, kohl-rabi, leek, lettuce, mushrooms, okra, onion, parsnip, peas (green), pumpkin, radish, rhubarb, spinach, rutabaga, squash, tomato, turnip, and various others.

Fruits: Orchard fruits,—apple, apricot, cherry, peach, pear, plum, prune, and quince; various grapes,—table, raisin, wine, and currant; berry fruits,—blackberry, blueberry, cranberry, currant, gooseberry, huckleberry, loganberry, mulberry, raspberry, and strawberry; melon fruits,—cassaba melon, muskmelon, watermelon; citrous fruits,—citron, grapefruit, kumquat, lemon, lime, and orange; subtropical fruits,—carob (Saint-John's-bread), date, fig, olive, persimmon, and pomegranate; tropical fruits,—avocado, banana, guava, mango, papaw, soursop, and tuna, or prickly pear.

Nuts: Almond (sweet and bitter),—Jordan almonds are a choice hard-shelled variety of sweet almond from Malaga, Spain; chestnut, native to the eastern United States, also imported from southern Europe; cashew nut, from India and Brazil,—poisonous until roasted; coconut, commonly grown in tropical countries; filbert, grown in southern Europe,—see *Hazelnut*; hickory nut, native to the eastern United States; litchi nut, a dried fruit from China; peanut, not a true nut but the fruit of a legume; pecan, both wild and cultivated in the southern United States; pine nuts, oily seeds of pines native to southern Europe and southwestern Asia; piñons, nuts from pines native to the southwestern United States and Mexico; pistachio, grown in Mediterranean countries; and the English walnut, extensively cultivated.

Beverages. The plant materials chiefly used for making beverages are coffee, the cleaned seeds of the coffee tree; cocoa, prepared from the seeds of cacao; maté, the dried leaves of a South American holly; and tea, the variously cured leaves of the Asiatic tea shrub. With these are sometimes grouped fermented beverages, such as beer, wine, sake (Japan), and pulque (Mexico), and also distilled liquors, such as whisky, brandy, rum, gin, mescal (Mexico), arrack (Orient), and vodka (Russia), which, strictly speaking, are manufactured products.

Timber. The most important kinds of commercial timber cut in the United States are shown in the table entitled *Production of Lumber in the United States*. Of imported woods, the most valuable include mahogany, teak, lignum-vitæ, Spanish cedar, Circassian walnut, rosewood, or Jacaranda (from Brazil), satinwood (from the East Indies and West Indies), ebony, greenhart (from South America), lancewood (from Jamaica), and rule boxwood (from West Indies and South America).

Fibers. Textile and cordage fibers include cotton, flax, hemp, jute, ramie, manila hemp, sisal hemp, bowstring hemp, sunn hemp, coir, pineapple fiber, and raffia. Among brush fibers are broom corn, piassaba (from the West Indies and from Brazil), saw palmetto (from Florida), and palmyra (from Ceylon). Other fibers or fiber-like products are kapok, or silk cotton; luffa, a vegetable sponge; Spanish moss, from the southern United States, used for upholstery; rattan, from the East Indies, used in making furniture, baskets, and whips. Fibers used for paper making are exceedingly numerous (See *Paper*.). Panama hat straw, or toquilla, is prepared from the young leaves of a South American screw pine.

Alkaloidal Stimulants and Narcotics. These include tobacco, the most extensively used narcotic; cola leaves, chewed by the Indians of South America; pituri leaves, used by the natives of Australia; the kola nut, containing caffeine, chewed by the natives of Africa; betel leaf and betel nut, widely used by Malayan peoples; hashish, from Indian hemp, used by the peoples of southern Asia; and opium, the dried juice of the poppy, used widely in the Orient.

Medicinal Plants. Many plants contain medicinal principles which experience has proved to be of such value that they are employed more or less widely by all civilized nations. Among plants used for their leaves are belladonna, one source of atropin; coca, the source of cocaine; digitalis, or purple foxglove, grown in Europe and in America; and senna, from Egypt and India. Some of the best-known medicinal roots are aconite, hydrastis (golden seal), gentian, ginseng, licorice, may apple, rhubarb, and sarsaparilla.

Among the most highly prized medicinal barks are cascara sagrada, native to California and Oregon, and cinchona, or Peruvian bark, the source of quinine, now obtained chiefly from cultivated trees in Jalva. Nux vomica (the source of strychnine), chaumoogra, and the castor oil plant are valued for the medicinal properties of their seeds. Plants yielding medicinal juices include aloes and also the poppy, the source of opium. Among medicinal resins are asafetida, balsam of Peru, and guaiac.

Gums and Resins: Rubber, gutta-percha, balata, chicle (See *Sapodilla*.), gum arabic, gum Senegal, gum tragacanth, turpentine, rosin, and copal (See *Varnish*.).

Tanning Materials. These include various barks, woods, roots, fruits, and nuts which contain tannin. Among these are oak bark, hemlock bark, chestnut bark and wood, sumac leaves, canaigre root, myrobalans (unripe fruit), divi-divi (seed pods), quebracho wood, gambier (twigs and leaves), mangrove bark, and oak galls.

Dyestuffs: Logwood, fustic, Brazilwood, Lima wood, Osage orange, indigo, archil, and cudbear.

Vegetable Oils. *Drying oils*, used extensively in paints and varnish, include linseed oil, perilla oil, Chinese wood oil (tung oil), candlenut oil, hempseed oil, walnut oil, soy bean oil, poppy-seed oil, and sunflower oil. *Semidrying oils*, used for various purposes, include corn oil, cottonseed oil, sesame oil (benne oil), rape oil (colza oil), olive oil, apricot kernel oil, peach kernel oil, almond oil, castor oil, and peanut oil.

Vegetable Fats. These substances, which are solid at ordinary temperatures, include cocoa butter (See *Chocolate*.), coconut oil, palm oil, palm kernel oil, and Japan wax.

Essential Oils. Many of these form the basis of natural perfumes; as, for example, attar of roses, geranium oil, lemon-grass oil, lavender oil, neroli, ylang-ylang oil, and patchouli oil. Peppermint oil and spearmint oil are widely used for many purposes.

Spices and Condiments: Allspice (or pimento), cinnamon, cloves, mace, mustard, pepper, tonka bean, and vanilla.

ANIMAL PRODUCTS

Food. Beef, pork, mutton, poultry, and game form the chief items in the meat supply of most civilized countries. In some parts of the world, meat from the whale, horse, camel, and reindeer is also used. Eggs, almost universally an important article of food, are a commercial source of albumin and are used also in tanning. Milk is the source of butter, cheese, casein, milk sugar, and various fermented beverages, such as koumiss and leben. Butter, cheese, condensed milk, preserved meats, canned meats, and meat extracts, though often classified as manufactured products, may also be listed here.

Fish, oysters, clams, lobsters, crabs, and shrimps, marketed fresh, dried, canned, or otherwise preserved, are used in great quantities for food. See *Fisheries*.

Animal Oils. Oils used for food include butter, lard, tallow, and oleo oil (See *Oleomargarine*.). Medicinal cod-liver oil is expressed from the livers of freshly caught cod. Large amounts of other fish oils are obtained, especially menhaden oil. (See *Fisheries*.) Sperm oil, valued as a lubricant, is obtained from the sperm whale. Wool wax, widely used in making salves and ointments, is the natural grease from sheep's wool.

Animal Fibers. Wool, produced chiefly by the sheep, is obtained also from the alpaca in Peru and from the Kashmir goat of central Asia. Silk, produced by the silkworm, ranks next in value to wool among animal fibers. Long hair from the tails of cows and from the manes and tails of horses is used in making bows for musical instruments, for weaving into haircloth, and for stuffing mattresses. Short hair from various animals is used as stuffing material and in making plaster. Swine bristles from Russia and China are largely used in making brushes. The hair of the Australian rabbit is one of the most important materials entering into the manufacture of felt hats.

Hides and Skins. See *Leather*.

Furs. The most expensive furs are probably those of the sea otter, the Russian sable, and the silver fox. Among other valuable furs are those of the seal, ermine, marten, weasel, mink, skunk, mole, chinchilla, beaver, muskrat, karakul sheep (yielding the Persian lambskin), various species of fox, wolf, and bear, and the larger cats, such as the lion, the tiger, and the leopard.

Horns, Hoofs, Bones, and Tusks. Ivory is obtained chiefly from the tusks of the elephant but also from the tusks of the hippopotamus, the horn of the narwhal, the tusks of the walrus, and the tusks of the extinct mammoth whose remains are still found in Siberia. Horns and hoofs are utilized for the production of buttons, combs, ornaments, and of cyanide compounds. Bones are used for making buttons and ornaments, for the production of fertilizer, and for the preparation of bone black and bone charcoal.

Bird Products. Besides eggs, the most important bird products include feathers, plumes (See *Ostrich*.), edible birds' nests, eider down (See *Eider*.), and guano (See *Fertilizer*.).

Insect Products. In addition to silk, the most valuable of all, insect products include honey, beeswax, lac, and cochineal.

MINERAL PRODUCTS

The immense number of commercial products obtained from the mineral kingdom may be classified as (1) ores, metals, and other minerals; (2) fuels; (3) building materials; and (4) gems and precious stones. These are described in detail in the sections entitled *Mining and Mineral Production*; *Useful and Precious Metals*; *Rocks, Minerals, Gems, and Precious Stones*; and *Everyday Chemicals*.

COMMUNICATION

By communication is meant the transference of thoughts and of information from person to person. Underlying, as it does, all human cooperation, it has an importance which can scarcely be exaggerated. The initial step, and unquestionably the most important in making possible an unimpeded exchange of ideas, was the invention of spoken and, later, of written language.

A great length of time elapsed during which communication between distant points could be effected only by means of messages, oral or written, which were carried by messengers. The great development of electrical signaling devices and the vast improvements which have taken place during the past century in the means of transportation have reduced to comparative insignificance the time element in communication. With the help of the printing press, they bring to the whole population of every civilized country a knowledge of all events of importance in the whole world within a few hours of the time of their occurrence.

Early Postal Systems. The complicated postal organization of today had its origin in the system of private messengers employed by ancient rulers. Each messenger was given a fixed station where he should always hold himself in readiness to receive a message and to carry it to the next post. The emperor Diocletian was apparently the first to establish such a post open to the use of private persons. In the 12th century a commercial post was organized by the Hanse Towns of northern Germany, and in the 13th century a postal system was developed by the University of Paris for the benefit of its students. The national postal system in France was established by Louis XI in 1464.

Postal System in England. In England, private postal systems were used in the 14th century, but it was not until 1533 that Sir Brian Tuke was appointed the first "Master of the Post" by Henry VIII. Improvements in the service were gradually made, but, in 1812, the cost of sending a single sheet varied from 8 cents to 35 cents according to the distance. A money order system was begun in 1792 for the convenience of soldiers and sailors.

Due to reforms initiated by Sir Rowland Hill, a rate of one penny was established throughout the United Kingdom in 1840. The first adhesive postage stamp was issued in May of that year. This one-penny stamp was black and carried the profile of Queen Victoria. It had to be cut from the printed sheet. Perforated stamps were not officially issued until 1854. If the postage was not prepaid by means of a stamp, a double rate was charged upon delivery of the letter. The use of postage stamps made possible the mail box, which was first introduced in 1855.

Universal Postal Union. In 1874 an International Postal Union was organized at Berne, Switzerland. This was followed in 1878 by a larger organization known as the Universal Postal Union, which includes practically all nations on the globe. All these countries are declared to be "a single postal territory for the reciprocal exchange of correspondence." Postal accounts between countries are adjusted every three years by checking the amount of correspondence for a month. In all countries the one-cent stamp, or its equivalent, is green, the two-cent stamp, pink, and the five-cent stamp, blue.

Postal System in America. The general court of Massachusetts in 1639 ordered that the house of Richard Fairbank was to be the official distributing point for overseas mail. In 1691, Thomas Neale was by royal patent granted authority for the establishment and control of an American post, and, in 1693, Andrew Hamilton was appointed the first colonial postmaster-general. In 1707, control of the post was purchased from Neale by the English

government, which held it until the Revolution.

Under the new order, Benjamin Franklin was appointed the first postmaster by the Continental Congress in 1775. The first Federal postage stamps were issued in 1847, although in 1845 the postmasters of various large cities were permitted to issue five- and ten-cent stamps at their own expense. Stamped envelopes were first used in 1853.

It was not, however, until 1856 that prepayment was required and stamps came into general use. In 1851 the rate was reduced to three cents up to a distance of 3000 miles, and in 1863, under Lincoln, this rate was established for all distances and free delivery was begun in some of the larger cities. A money order system was established in 1864; postal cards came into use in 1873; a two-cent rate went into effect for the first time in October 1883; a special delivery service, for which an extra charge was made, began in October 1885; and rural free delivery was inaugurated in 1896.

Parcel Post. By the provisions of the general parcel post act which took effect January 1, 1913, and by its subsequent revision, the transportation of parcels within certain limits of size and weighing up to 70 pounds is undertaken by the post office department. By facilitating the cheap transit of merchandise, this service has opened up throughout the entire country a market for goods sent by mail. For rate making purposes, the United States and certain other territories are divided into units of area which are the basis of eight postal zones. The zones represent an area having a mean radial distance of 50, 150, 300, 600, 1000, 1400, 1800, all beyond 1800, miles from the center of any given unit of area which is the mailing point.

The value of the parcel post service is enhanced by the privilege of insuring the contents of the parcel against loss by the payment of a small additional fee. Parcels may also be sent C. O. D., special delivery, or as first class mail.

Air Mail Service. In 1918 the regular use of airplanes was initiated by the United States Government for the carrying of air mail. By 1929, each of the 48 states had air mail service and several foreign countries were included in regular air mail service with the United States.

Since the first air mail service, accomplished by the U.S. Army for the government in 1918 with one round trip a day between Washington, D.C. and New York, delivery and receipt of mail by air has grown immensely. Increased air mail rates, authorized by Congress to help the Post Office Department reduce operating losses, went into effect January 7, 1963. Air mail from any point in the U.S. to coast or border exchange offices, thence by ordinary means of service, was increased from seven cents to eight cents an ounce or fraction. Air mail addressed for A.P.O. or Fleet Post Office delivery outside continental U.S., in care of the Postmaster, is eight cents an ounce with an 8-ounce limit. The air rate to U.S. overseas possessions or to Canada and Mexico is also eight cents. The rate to Latin American nations is fifteen cents, to European nations fifteen cents, and to Africa, Asia, and Oceania, twenty-five cents for each half ounce. An air letter sheet to any overseas nation costs eleven cents.

Dead Letter Office. Every year about 20,000,000 pieces of mail matter are received by the Post Office so carelessly or incorrectly addressed that they can not be delivered. These are sent to the Dead Letter Office at Washington, D. C. where, by means of maps and directories, skilled clerks are able to guess correctly the destinations of about one-half the items. The others are opened and those with addresses inside are returned to the sender. The fee for this service is 4c. Only about 16% can be returned; all others are destroyed. Approximately 3,500,000 of the total number are Christmas cards.

Currency, checks, and money orders amounting to more than $1 million are received annually. Merchandise which cannot be delivered or returned to the sender is sold at auction, letters are burned, and thousands of magazines, picture cards, and holiday cards are sent to hospitals. Insured parcels are held for six months; ordinary parcels for 60 days. Parcel sales are held periodically at each Dead Letter branch post office from two to six times a year. The fees from return postage from unclaimed packages along with the money which was inclosed in some of the letters amounts to about $250,000, which is only $20,000 less than the entire operating expense. The Dead Letter office originated in 1825.

Postal Service in Canada. The postal system of Canada is similar to that of the United States in its main features, and includes the services comprised under the headings of registration, insurance, money orders, postal savings, parcel post, and C. O. D. delivery systems. Rural free delivery was inaugurated in 1908, and an air mail service in 1927. The latter is of especial value in Canada in establishing communication between isolated settlements and the more populous portions of the country. Thus in 1929 an air mail route was established southward from Aklavik, which lies 300 miles within the Arctic Circle.

Telegraphic Communication. Postal communication depends for its speed on the available means of transportation. Although modern air mail service has effected great improvements in speed, it was preceded by Morse's telegraph, which began commercial operations in 1844.

The advantages of a land telegraph system quickly became apparent and in 1861 the first transcontinental system opened between San Francisco and New York. Telegraphic communication between water-separated places was first attempted in 1842 in New York harbor; by 1851, a line crossed the English Channel. After unsuccessful efforts, the first transatlantic cable was completed in 1866. Since then, 21 cables (about 1½″ thick) have been laid in the North Atlantic. A lesser number cross parts of the Pacific Ocean. Control of over one-half the cables is in British hands.

Telephony. Vocal communication over long distances became possible when Bell invented the telephone in 1876. Improvements on the original device were made by many of the greatest inventors of the world. The advantages of the telephone have been so obvious that in the United States there is an average of one telephone for every 2.6 persons. Sweden has one telephone for every 3.5 persons. In the per capita use of telephones the following nations rank in order after the United States and Sweden: Canada, Switzerland, New Zealand, Denmark, Australia, Norway, United Kingdom, Finland, The Netherlands, and Belgium.

COMMUNICATIONS OF PRINCIPAL COUNTRIES, 1961
(add 000's)

Country	Telephones	Radio Sets	Television
United States	77,425	170,000	56,300
United Kingdom	8,544	15,316	11,657
West Germany	6,509	17,228	5,888
Canada	5,719	8,050	4,100
Japan	6,345	10,033	9,215
France	4,649	12,966	2,555
U.S.S.R.	4,276*	44,000	6,000
Italy	4,025	8,488	2,762
Sweden	2,761	2,845	1,327
Australia	2,266	2,256	1,500
Denmark	1,132	1,687	708
Netherlands	1,740	3,064	1,040
Spain	1,930	2,717	400

* Estimated.
Source: *Statistical Abstract, 1963.*

Teletypewriter. A service was inaugurated in 1931 by which two-way communication by typewriter became possible over telephone or telegraph wires. By this system, two people, equipped with teletypewriters, on being connected through a central exchange, can converse in type, the words of both parties being recorded for future reference. This instrument, operating at about 60 words per

GROWTH OF UNITED STATES POSTAL SERVICE, 1880-1960

Item	1880	1900	1920	1940	1960
Post offices, no.	42,989	76,688	52,638	44,095	35,238
City carriers, no.	2,628	15,322	36,142	58,551	109,749
Cost carrier service	$2,363,693	$14,512,190	$74,932,540	$161,184,553	$907,820,000
Rural delivery mileage	.....	28,685	1,151,832	1,401,960	1,768,476
Rural delivery cost	.....	$420,433	$75,562,424	$91,447,713	$252,767,000
Money orders	$103,816,680	$255,670,027	$1,365,659,884	$2,094,543,479	$5,030,614,549
Postage stamps issued, no.	875,681,970	3,998,544,564	13,212,700,033	16,381,427,297	23,773,520,000
Postal cards issued, no.	272,550,500	587,815,250	986,156,087	2,400,188,380	1,773,090,000
Air mail service, cost	.....	.....	$1,264,495	$18,855,306	$88,768,958*
Paid to postmasters	$7,708,407	$19,112,097	$40,108,080	$49,238,362	$167,767,000
Gross revenue	$33,315,479	$102,354,579	$437,150,212	$766,948,627	$3,276,818,000
Gross expenditures	$36,542,804	$107,740,267	$454,322,609	$807,629,180	$3,873,953,000
Total Number Pieces of Mail Handled	.....	7,129,990,000	.....	27,749,467,000	63,674,609,000

* Air mail service costs in 1960 include: Domestic, $46,048,958; Foreign, $42,720,000.
Source: *Annual Report of the Postmaster General.*

minute, is employed extensively also for one-way communication, where it is desirable to send the same message to numerous places throughout the country Market quotations, financial news, and weather reports for airports are broadcast by wire in this manner.

Radio Communication. With the beginning of the 20th century, radiotelegraphy became a practical means of transmitting messages, so that ships at sea were enabled to keep in continuous communication with each other and with many stations ashore. Navigation became at once more safe and more accurate, because a captain can always obtain the exact time and, during a fog, can usually obtain his bearings from a land station equipped with direction-finding apparatus known as the radio compass. All seagoing passenger ships must now be equipped with "radio" apparatus.

Long distance conversation by means of the radiotelephone became possible in 1915. Owing to developments made in the research laboratory of the American Telephone and Telegraph Company, the wire systems may be used in connection with the radiotelephone. By this method it is now possible to establish communication with a properly equipped ocean liner at sea from any commercial telephone in North America. On January 7, 1927, a regular transatlantic radiotelephone service was inaugurated between New York and London. This was followed by extensions which make possible direct vocal communication between any telephone in North America with any telephone in Europe. See *Cable, Submarine; Radio; Telegraph; Telephone; Phototelegraphy.*

Newspapers. The preceding articles have outlined the development of two-way communication. But of no less significance for the world's history is the growth of one-way communication from its primitive forms to the high-speed printing presses and radio broadcasts of the present day.

The prototype of the modern newspaper is to be seen in the *Acta Diurna* ("Daily Events") issued during the Roman Empire and posted in a public place. Copies were made by hand and dispatched to subscribers at a distance.

The invention of printing made possible the first genuine newspaper to be regularly published. It was the *Avisa Relation oder Zeitung*, printed first in 1609 in Germany. In 1622 appeared the first newspaper in England, *The Weekly Newes from Italy, Germany, etc.*, published in London. The earliest news sheet to appear in the Western Hemisphere was the *Relación*, issued in 1594 at Lima, Peru, but it was not until 1620 that a regular newspaper was published there. The first regular newspaper in British America was *The Boston News-Letter*, first printed in 1704.

Before the days of the telegraph, enterprising newsmen employed carrier pigeons, fast ships, pony expresses, and even semaphore signaling systems for gathering news. With the rise of telegraph and telephone systems, this task was greatly simplified and was put on an organized basis. See *Newspaper Press Associations.* With the development of phototelegraphy, it has become possible to transmit news in picture form with practically the same speed as verbal messages. Improvements in printing presses make it possible now to issue editions containing latest news within a few minutes.

Broadcasting. Within the decade 1920–30, a second means of rapid dissemination of information grew into effective rivalry with newspapers. This was the system of radio broadcasting.

Experimental dissemination of speech and music from a central sending station to owners of receiving sets began some years prior to 1920. Lee De Forest was one of the leaders in this development. Station KDKA, operated by the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pa., broadcast the presidential election returns in 1920. The popularity of this broadcast led the way for a phenomenal increase in the number of receiving sets owned and for a corresponding increase in broadcasting stations. By 1940, there was an average of one radio receiving set for each 2.4 persons in the United States, and programs for every taste and purpose had become a regular feature of American life.

By utilizing telephone wires, chains of stations may be connected so as to send out identical programs. In this manner, nation-wide and world-wide "hook-ups" afford opportunities for statesmen, entertainers, or advertisers to reach the ears of millions of listeners. By 1940, there were 675 broadcasting stations in the United States. Canada and Russia ranked next in number, the total for the world being a little fewer than 2,000.

Radio broadcasting has remained an important means of communication even with the introduction of television. By 1961, there were 3,539 AM stations operating in the United States, a 70% increase since 1950. An additional 815 FM stations were also in operation. Television stations increased in number by 440% to a total of 531. Most cities are serviced by one of the four major networks: American Broadcasting Company with 357 radio and 234 television stations; Columbia Broadcasting System with 203 radio and 205 television stations; National Broadcasting Company with 204 radio and 212 television stations; and the Mutual Broadcasting System with 450 radio stations. The broadcasting industry, due to its promotion and program planning, has been an incentive for the manufacture of radio sets, television and other equipment, and for the employment of thousands of artists, musicians, technicians, salespersons, and writers.

Television. Television has grown rapidly as a potent force in the enlightenment, education, and entertainment of the American people. The first commercial station, WRGB, Schenectady, New York, began operations on November 6, 1939, but television receivers were not generally available until after World War II. By 1960, a total of 46.2 million homes were being reached by 500 commercial and 50 educational stations.

TRANSPORTATION

TRANSPORTATION is conducted chiefly by the use of vehicles operated upon the water, upon the land, and, more recently, through the air. Water transportation was early conducted by means of sailing vessels. Land transportation, except upon pack animals, required the construction of roads and railways, as well as the invention and improvement of appropriate vehicles.

Sailing Vessels. Long before the Christian era, the Egyptians, the Phœnicians, and the Greeks made use of sails to propel the small vessels of their time. To a large extent the Greeks, and especially the Romans, propelled by oars the ocean craft with which they navigated the Mediterranean. In the larger boats, called galleys, the oars were arranged in two or three rows or banks. The largest type of vessel widely used in ancient times for commercial or war purposes was the trireme, equipped with three banks of oars. The life of the oarsmen in these galleys was a hard one, and slaves were commonly employed. This practice gave rise to the term "galley slave."

The sailing vessels employed by the Venetians, Italians, Spanish, Portuguese, Danes, Norsemen, and the early English navigatos were small craft, which seldom ventured far from rsight of land. But beginning with the 14th century, the increasing use of the mariner's compass made it possible for sailing vessels to make voyages of great length.

According to present standards, the ships then employed seem small. Few people now living would willingly undertake a transatlantic voyage in a ship of the size of the *Mayflower*, in which the Pilgrims, early in the 17th century, came to their new home in America. But, in small sailing vessels of these or similar types, men in those days were making voyages halfway round the world, and, in a few instances, daring sailors circumnavigated the globe.

Steamships. The great revolution in transportation came when mechanical power was substituted for wind power on the ocean and for muscle power on the land. In performing the service of transportation, mechanical power was first applied to vessels. As early as 1787, John Fitch, a Pennsylvania farmer, propelled a boat on the Delaware by steam power. The *Charlotte Daudas* in 1802 towed two vessels of 140 tons 3½ miles an hour against a strong wind in the Forth and Clyde canal. Robert Fulton five years later ran the *Clermont* from New York to Albany by steam power and demonstrated the practical success of steam navigation.

A few years more were to pass before a vessel crossed the ocean entirely by steam power. The first transatlantic voyage of a steamer was the one made by the *Royal William*, which sailed from Quebec to the Isle of Wight in 1833. This was a wooden vessel, but in 1845 an iron steamer, the *Great Britain*, built by I. K. Brunel, a celebrated British engineer, was put in operation upon the transatlantic service.

The latter vessel is notable also because it was the first large merchant ship driven with a screw propeller. While its basic principle had long been known, the modern practical screw propeller was invented almost simultaneously in 1836 by Francis B. Smith, an English farmer, and by John Ericsson, a Swedish engineer.

Highways. The extensive use of vehicles upon the land could not precede the building of roads. The earliest road building on a large scale was carried on by the Romans. By maintaining order and by building permanent highways in the lands about the Mediterranean and in far-away Britain, the Romans made possible the development of Western civilization.

The first of the modern nations to undertake road building on an extensive scale was France. Beginning in 1597 under Sully, this progressive country proceeded to construct 15,000 miles of surfaced road. Colbert, who became prime minister in 1661, introduced the corvée system of forced labor upon the roads. The method was bad, but it gave France good roads in advance of other nations.

Two Scottish engineers, Thomas Telford and John L. McAdam, who did their work between 1800 and 1830, have fixed their names permanently to types of roads now largely built. Both men emphasized the necessity of providing adequate drainage for roads. Telford roads have a foundation of large broken stones surfaced by more finely broken or crushed rock; macadam roads are built without the foundation of larger stones. Hard surfaced roads are now constructed of the following materials: Sand clay, gravel, water bound macadam, surface treated macadam, bituminous macadam, cement concrete, brick and other block paving materials. The development of the motor car has given great impetus to road construction.

Canals. Canals are nearly as old as human history. The Assyrians built them. The Egyptians connected the Nile with the Red Sea by a canal. The Chinese are said to have constructed canals more than 2000 years ago. They built their Grand Canal, a system about 1000 miles long, in the 13th century. In the 15th century the famous artist, Leonardo da Vinci, invented the canal lock which was introduced into the canals of Milan. France began her existing system of canals early in the 17th century. England built her canals in the 18th century. In the first half of the 19th century numerous canals were built in North America.

Along with the construction of canals went the canalization of rivers until various countries, such as France and England, were equipped with a co-ordinated system of canalized rivers connected by canals. During the early development of the United States and Canada, however, it was impossible, because of physical obstacles, to create a fully co-ordinated system of inland waterways.

Railways, Steam and Electric. Before the system of inland navigation was completely worked out in the United States and Canada, the superiority of the railroad had been demonstrated. In 1829, the steam locomotive was perfected by the English engineer, George Stephenson, whose famous "Rocket" was successfully developed. By 1830, the Baltimore and Ohio, the Mohawk and Hudson, predecessor of the present New York Central, and a few other railroad systems began to operate in a small way. The completion of the Union Pacific in 1869 opened the first transcontinental span of railroad in America.

By 1890 the electric railway became commercially important for its passenger travel and cargo transport. Today, because of its cleanliness in operation and speed, it is utilized in mountainous areas throughout the world where hydroelectric power is available and on such heavily travelled passenger lines as in Washington and New York.

OCEAN TRANSPORTATION

Ocean Vessels in Colonial Times. The *Mayflower*, in which the Pilgrims came to America, was a typical sailing vessel of its time. It was a three-masted, square-rigged ship, only 100 feet long, and between 20 and 25 feet wide. It was registered as of 180 tons burden or, as it would be measured today, of about 160 tons gross register. Aboard this ship were 102 Pilgrims and the crew. The *Speedwell*, which started across the ocean with the *Mayflower* but which had to turn back, was only one-third the capacity of the *Mayflower*.

At the beginning of the 19th century, many ships were owned and operated by the merchant princes of America; as, for example, Elias Haskett Derby of Salem, Mass., and Stephen Girard of Philadelphia. The ships were square-rigged sailing vessels—ships and barks with three masts and brigs with two masts—of 100 or 200 tons register, a few being as large as 300 tons. The American merchants, lumbermen, planters, and fishermen of that period usually operated their own vessels instead of employing the services of common carriers. Derby, with his fleet of small sailing vessels, built up an extensive trade with the East Indies. Stephen Girard used forty sailing ships to carry on his trade with the West Indies and other parts of the world. The small vessels which these men used were well adapted to the service requirements of their time and brought fame and wealth to their owners.

Common Carriers on the Ocean. In American commerce, the common carrier on the ocean dates from 1816, when the Black-Ball Line was established from New York to England. Even in Great Britain the common carrier was hardly known until the beginning of the 19th century. For hundreds of years men had owned ships for hire or for charter to those who desired to use them, but transportation services on the ocean were not organized and conducted by common carriers until a little more than a century ago. The early common-carrier lines employed sailing vessels, but, from about 1840 in England and from about 1870 in America, steamship lines began to replace sailing vessels.

American Clipper Ships. In the 1840's the Cunard and other British companies began to use steamships and iron vessels. Thereupon the shipbuilders and seamen of America sought to increase the size and speed of the wooden sailing vessel so as to enable it to compete successfully with its new rival. Out of this competition grew the famous American clipper ships of the late 1840's and early 1850's. These were square-rigged sailing vessels, some of them between 2000 and 3000 tons gross register—fifteen times the size of the *Mayflower*. They derived their name from their long, overhanging prow and their sharp lines forward.

For a time the swift-sailing clippers held their own in competition with the steamship. But, as the marine engine became more efficient and iron and steel vessels of increasing dimensions were constructed, sailing tonnage rapidly declined. The last serious effort to enable the sailing vessel to maintain its place on the high seas was made at the close of the 19th century. About that time huge six- and seven-masted, steel-hulled sailing vessels of over 5000 tons register were built. Some of these vessels could carry 7000 tons of cargo.

Ocean Steamships. The steamship has had an interesting history. The marine engine, first successfully employed in the 1830's to propel vessels entirely across the Atlantic, was installed in wooden vessels with paddle wheels. English builders began to use the screw propeller for transoceanic service in the 1840's. It was more than a decade later before American builders substituted the screw for the less efficient paddle wheels. Indeed, even some of the British lines, such as the Cunard, kept to the use of paddle wheels until after 1860. The celebrated *Great Eastern*, completed in 1859, was equipped both with screw and with paddle wheels. This ship marked the transition from the older to the newer type of steam vessel. The *Great Eastern* was too large to be successfully driven by the engines of its day.

The Marine Engine. Most steamships are today equipped with the inverted direct-acting marine engine. This type was used first in 1854, and most of the early engines were single expansion, although from the beginning some double expansion engines were constructed. The triple expansion marine engine made its appearance in 1881. However, it was not until 1894, when the *St. Louis* and the *St. Paul* of the American Line were built by the Cramps of Philadelphia, that the quadruple expansion marine engine was constructed.

MERCHANT SHIPBUILDING, 1960*
(in 1,000 gross tons)

Nation	Under Construction	Launched
Australia	59,400	.....
Belgium	154,000	17,800
Canada	67,500	.....
Denmark	259,000	78,000
Finland	65,200	23,200
France	656,000	191,000
Germany	898,000	261,500
Italy	651,000	59,500
Japan	896,000	365,600
Netherlands	617,000	116,200
Norway	357,700	56,100
Poland	256,100	53,700
Spain	279,000	52,500
Sweden	809,000	232,300
United Kingdom	1,694,000	376,000
United States	524,000	123,000
Yugoslavia	222,600	38,900
Total	8,667,000	2,130,000
Steam	3,767,000	808,000
Motor	4,900,000	1,322,000

* Source: *United Nations Monthly Bulletin of Statistics*, July–December 1961.

During this same year, 1894, an entirely new type of engine, the turbine, was also applied to the propulsion of vessels. The first large ocean vessel to be equipped with turbines was the *Carmania* of the Cunard Line, built in 1905. The leviathans of recent construction usually have either turbines or both turbines and reciprocating engines.

The Diesel Engine. Both of these types of marine engines are, however, being displaced by an entirely different kind of engine, which is far more efficient and requires much less fuel. This is the internal combustion engine, named after its inventor, Rudolf Diesel. This engine has no boilers or furnaces but burns oil as fuel in the cylinders. The principal limitation upon the immediate use of the Diesel engine is its relatively large cost, but, in 1927, the tonnage of new ships being equipped with this type of engine exceeded for the first time that of steamship construction. See *Internal Combustion Engine.*

The Diesel driven engines were extensively constructed and used in World War II and proved so efficient that in 1948 practically every major railroad line in America had Diesel engines on order.

Ocean Leviathans. The large vessels of today have little resemblance to the ocean vessels of a century ago. The remarkable increase in the size of vessels is indicated by the developments of the first thirty years of the 20th century. The *Mauretania* (I), which began operation in 1908, was considered a marvel because she registered nearly 30,700 tons gross. She held the transatlantic speed record until 1929. In 1910 the *Olympic* was launched. This ship's length was slightly over 850 feet; its gross registered tonnage was 46,439.

Then, in 1912 and shortly thereafter, came the *Imperator* (renamed the *Berengaria*), the *Vaterland* (renamed the *Leviathan*), and the *Bismarck* (renamed the *Majestic*), all approximately 900 feet long. The *Bremen* (1st), also about 900 feet long, was launched in 1929. It crossed the Atlantic in nearly 9 hours less time than the *Mauretania*. The first liner to exceed this length substantially was the *Normandie*, (renamed *Lafayette*), which was launched in 1932, and later burned in New York harbor. The greatest speed attained by any Atlantic (screw) steamship was 35.59 knots per hour in 1952 by the American-built liner *United States* on her passage from New York to Bishop's Rock in 3 days, 10 hours, and 40 minutes, a total of 3144 sea miles.

Oil Tankers. An outstanding development of marine traffic is the oil tanker. The evolution of super-tankers reflects increased world demand for petroleum products and a drastic reduction in trans-

NOTABLE OCEAN LINERS*

Name	Registry	Length (Ft.-In.)	Tonnage
Queen Elizabeth	Great Britain	1031	83,673
Queen Mary	Great Britain	1019-6	81,237
France	France	1035	66,000
United States	United States	990	53,329
Liberte	France	936-10	51,839
Rotterdam	Netherlands	748	38,650
Nieuw Amsterdam	Netherlands	758-6	36,640
Mauretania II	Great Britain	771-10	35,655
Caronia	Great Britain	715	34,183
America	United States	723	33,961
Bremen (2nd)	Germany	696-10	32,336
Hanseatic	Germany	666-6	30,029
Arcadia	Great Britain	721-4	29,734
Iberia	Great Britain	718-8	29,614
Constitution	United States	682-6	29,496
Independence	United States	682-6	29,496
Cristoforo Colombo	Italy	700	29,191
Edinburgh Castle	Great Britain	747-5	28,705
Pretoria Castle	Great Britain	747-5	28,705
Orcades	Great Britain	708-8	28,164
Himalaya	Great Britain	708-8	27,955
Oronsay	Great Britain	708-8	27,632
Capetown Castle†	Great Britain	734	27,002
Dominion Monarch†	Great Britain	682-1	26,463
Athlone Castle†	Great Britain	725	25,567
Washington	United States	668-4	23,626

Source: *Lloyd's Register of Shipping, 1959.*
*The following famous Atlantic liners were either lost or so seriously damaged in World War II as to be unfit for further use: *Normandie, Rex, Bremen (1st), Conte de Sovia, Empress of Britain, and Columbus.* †Motorships.

port costs. When the 38,000-ton *W. Alton Jones* joined the Cities Service fleet in June 1954, it was the largest tanker afloat. By 1960, the *Universe Apollo*, a 106,416-ton super-tanker built in Japanese shipyards by a U.S. company, exceeded in tonnage any other vessel. In early 1962, a Japanese company had under construction two 130,000-ton vessels. It is estimated that these tankers, which will be used to transport oil from the Middle East to Japan, will reduce the cost of transport by 30 per cent over the 45,000-ton tanker.

The majority of the world's tanker fleets are controlled by individuals such as Aristotle Onassis and Stavros Niarchos, the Greek shipowners who are also brothers-in-law, and Daniel Ludwig, owner of National Bulk Carriers, Inc., an American firm. Major oil companies operate about 30 per cent of the fleet and national governments 10 per cent.

In January 1957, the 46,500-ton tanker, *World Beauty*, a 737-foot vessel with a 102-foot beam and a capacity of 16,500,000 gallons, was launched at Quincy, Mass., for the Greek shipping interests of Stavros S. Niarchos. In the backwash of the Suez Canal crisis, still larger tankers were announced.

The American Marine. The British colonists in America were a maritime people. They had to build ships in order to market their products in the West Indies and in Europe. With low-priced material for shipbuilding from the abundant forests, American shipping prospered until the Civil War.

During the Civil War there was a shrinkage of nearly a million tons in American shipping on the high seas. Four-fifths of this shrinkage was due to war losses and to the transfer of American vessels to foreign flags to escape the hazards of war. Moreover, this blow to the American marine came at the time when the steamship was taking the place of the sailing vessel, and when iron was supplanting wood in the shipyards of the world.

The American merchant marine of 1860 was composed largely of wooden sailing vessels; by 1870, the marine engine provided the steamship with a basis for superiority over the sailing vessel. The American marine began a decline that was to continue to the present due to the relatively high cost of shipbuilding and operation in the U.S. Generally, this reflects high labor costs and expensive material costs. Federal subsidization of construction and operating expenses amounting to 40 to 50 per cent of the total cost is required.

In 1962, the United States operated 15 per cent of the world's 17,861 merchant vessels. This country operated 24 per cent of the combination passenger-cargo vessels, 18 per cent of the freighters, 12.5 per cent of the tankers, and five per cent of the bulk carriers. Of the 178,334,000 tons of cargo received and shipped by the United States in 1962, only 18.9 per cent was carried on U.S. vessels. In 1940, U.S. vessels carried 30.5 per cent of the much smaller total tonnage.

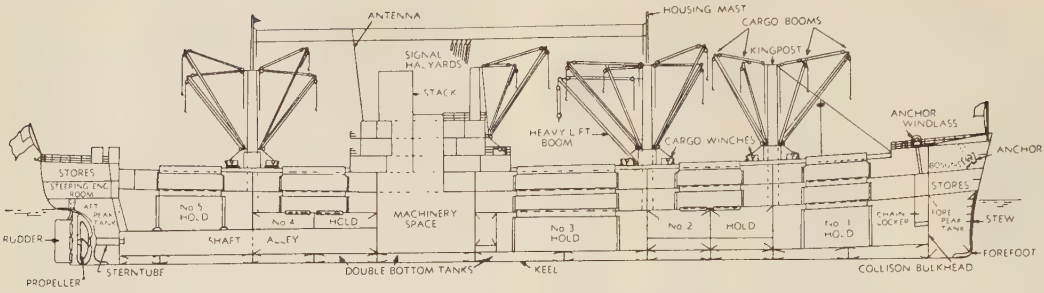
Despite this large tonnage of American shipping, little more than one-third of the foreign commerce of the United States is carried on its American vessels.

WORLD'S MERCHANT MARINE

Number and Tonnage of Vessels of 1000 Tons and Upward

Flagg	Merchant Fleet as of January 1, 1963 (In 1000 tons)		
	Number	Gross Tons	Dwt. Tons
United States	2,733	22,883	31,106
Argentina	169	1,153	1,534
Australia	105	460	615
Belgium	78	668	913
Brazil	226	1,054	1,463
Bulgaria	24	113	168
Canada	59	230	238
Chile	51	250	350
China (Rep.)	165	591	790
China (Nat'l)	84	500	725
Colombia	25	95	138
Costa Rica	5	16	25
Cuba	31	115	160
Czechoslovakia	9	64	93
Denmark	365	2,212	3,153
Ecuador	7	23	33
Ethiopia	2	3	5
Finland	237	822	1,238
France	634	4,894	6,409
Germany (West)	883	4,655	6,666
Germany (East)	48	333	430
Greece	779	6,615	9,751
Honduras	20	89	119
Hungary	9	11	11
Iceland	20	57	72
India	170	1,028	1,466
Indonesia	91	289	330
Iran	3	21	29
Iraq	2	12	17
Ireland	21	130	180
Israel	60	387	500
Italy	632	4,939	6,742
Japan	1,224	8,086	11,948
Korea (South)	31	106	160
Lebanon	190	950	1,445
Liberia	806	10,589	17,230
Mexico	34	190	268
Monaco	3	19	29
Morocco	11	44	65
Netherlands	555	4,657	6,178
New Zealand	60	206	240
Nicaragua	6	16	23
Nigeria	5	29	49
Norway	1,396	12,550	18,686
Panama	485	3,787	5,759
Peru	22	85	132
Philippines	63	350	466
Poland	155	795	1,141
Portugal	90	525	612
Rumania	15	82	112
Saudi Arabia	12	33	48
South Africa	31	170	235
Spain	344	1,599	2,126
Sweden	558	3,976	5,697
Switzerland	28	177	260
Thailand	6	17	25
Tunisia	7	16	24
Turkey	132	665	881
United Arab Rep.	43	208	261
United Kingdom	2,290	20,018	26,246
Uruguay	17	93	140
U.S.S.R.	1,002	4,551	5,922
Venezuela	34	288	451
Yugoslavia	161	874	1,288
Total	17,861	132,064	185,843

Source: *Maritime Administration, U.S. Dept. of Commerce.*



TYPICAL CARGO VESSEL, UNITED STATES MERCHANT MARINE

During the year 1935 the water-borne foreign commerce of the United States was valued at $3,786,000,000, of which 35.8 per cent was carried in American vessels and 64.2 per cent in foreign. If the commerce is measured by tonnage, however, the proportion of the total commerce carried in ships of American registry rises to approximately 40 per cent, indicating that a larger amount of goods bulky in relation to their value, such as grain and petroleum, are carried in American ships. These figures show clearly that, in the overseas commerce of the United States, American vessels in 1935 were playing a minor rôle. This rôle, which had diminished steadily since 1830, expanded remarkably during and immediately after World War I, then fell, but climbed precipitately during World War II.

TRANSPORTATION ON LAKES, RIVERS, AND CANALS

River Navigation. Long before men had the capital or the knowledge required for the construction of highways, and centuries before railroads were thought of, rivers and lakes were used wherever possible for inland transportation. Not only in ancient Egypt, Babylonia, and China, but in modern European countries, such as Austria, Germany, France, Holland, England, and others having navigable streams, the rivers were the only avenues over which traffic could move from interior points to seaboard markets.

For a long time rivers were used without improvement. Later their channels were improved by the removal of obstacles and, to some extent, by the construction of dams, locks, and canals past the rapids in the streams. The importance of rivers as avenues of inland transportation in Europe during the middle ages is indicated by the practices established by the feudal barons. These medieval rulers often maintained their power by constructing castles and barriers along the rivers. Possessing these strategic strongholds, they secured their revenues by exacting tolls from all those who used the streams for commercial purposes.

Canal History. As a result of improving their rivers and of constructing canals during the 17th and the 18th century, Holland, France, and England in turn acquired the economic leadership of other European countries. By building canals to connect their natural waterways, each of these countries was able to develop industrially, to accumulate capital, and successively to play an important rôle in international affairs.

Canal construction in the Netherlands required no special engineering skill, and it was to be expected that the people of that country would extend their numerous natural waterways by artificial channels. In countries like France and England, however, superior engineering skill was required. To France first credit must be given, for in that country as early as 1605, during the reign of Henry IV, construction was begun on the Briare canal to connect the Seine and the Loire rivers. It took until 1642 to finish the work. In 1675 the Orleans canal connected the same rivers by another route, and in 1681 the celebrated Languedoc canal was completed, connecting the Bay of Biscay with the Mediterranean. The summit level of this canal was 600 feet above the sea.

The greatest names in English canal history are Francis, duke of Bridgewater, and his engineer, James Brindley. The Bridgewater canal, connecting Manchester and Liverpool, was begun in 1759. During the succeeding 75 years one inland canal after another was constructed in England and Scotland until the principal streams of the island were connected by a network of waterways. Until after the middle of the 19th century, the waterways of Great Britain, France, and of several other European countries were far more important as freight carriers than were the railways.

Canals in the United States. River and canal transportation in the United States dates from colonial days. The first great leader in the development of inland waterways was George Washington. Washington was a surveyor, and the knowledge he gained in the French and Indian war, which took him as far west as the Ohio river, gave him a lifelong interest in waterways. In 1774, before the Revolution, he brought about the establishment of a company, chartered by Virginia and Maryland, for the improvement of the Potomac river. The ultimate purpose of this company was to connect the Chesapeake bay and the Ohio river by a canal, if possible, or at least by a portage road westward from Cumberland on the Potomac river.

The Revolutionary War interrupted the plans of the colonies for joining the Potomac and Ohio. However, upon the termination of the Revolution, Washington again returned to the prosecution of the project, only to be interrupted once more by being called to the presidency of the new republic. Much later, and in a different manner than Washington had planned, the Chesapeake bay and the Ohio river were connected by the construction of the Baltimore and Ohio railroad which reached Wheeling on the Ohio river in 1851. Forty years earlier, a highway, called the National Pike, had joined the two waterways.

The first man to plan a comprehensive system of inland navigation and of inland waterways and highways in the United States was Albert Gallatin, who for twelve years served as secretary of the treasury under Jefferson and Madison. In the year 1808 Gallatin made a report to Congress outlining

SOME IMPORTANT CANALS

Name	Location	Length (miles)	Width (feet)*	Minimum Depth (feet)†	Number of Locks	Opened	Approximate Cost
Adolf Hitler	Oder-Klodnitz, Germany	26	121.4	11.5	6	1938	
Albert	Antwerp-Liège, Belgium	76	52.5	11.5	6	1939	$ 80,000,000
Amsterdam Ship	Ijsselmeer—North Sea, Netherlands.	16.7	164	32.1	5	1876	12,700,000
Cape Cod	Buzzards Bay—Barnstable Bay	7.68	250	27	none	1914	13,500,000
Chesapeake-Delaware	Delaware and Maryland	13.63	24	19	none	1829	‡9,000,000
Chicago Drainage and Ship	Chicago—Lockport, Ill.	38.6	174	22	1	1900	55,250,000
Corinth	Gulf of Corinth—Ægina Gulf	4	69	26	none	1893	13,750,000
Cronstadt	Leningrad—Bay of Cronstadt	18.75	275	22	none	1884	10,000,000
Hohenzollern	Berlin—Stettin, Germany	136	32	9.8	19	1914	12,500,000
Houston Ship	Galveston Bay—Houston, Texas	50	150	30	none	1925	20,000,000
Illinois-Mississippi	LaSalle, Ill.—Mississippi River	75	35	7	33	1906	7,600,000
Josef Stalin	Baltic-White Sea, Russia	141			19	1935	
Kaiser Wilhelm (Kiel)	Baltic—North Sea, Germany	61	147.6	36	2	1895	95,000,000
Lake Washington	Seattle—Puget Sound	8	80	34	1	1916	3,500,000
Languedoc	Garonne R.—Mediterranean, France	148	19.7	6.5	119	1681	3,500,000
Manchester	Manchester—Mersey River, England	35.5	80	28	4	1894	90,000,000
Moscow-Volga	Russia	80	143	18	11	1937	§180,000,000
New Orleans	Mississippi River—Lake Pontchartrain	5.5	300	30	1	1923	20,000,000
New York Barge	Lake Erie—Hudson River	540.8	44.44	12	57	1918	168,000,000
Ohio River	Pittsburgh, Pa.—Cairo, Ill.	968	110	9	53	1929	125,000,000
Panama	Through Isthmus of Panama	50.5	110**	41	6	1914	400,000,000
Port Arthur	Taylor's Bayou—Sabine Pass, Texas	7	150	26	none	1899	1,500,000
Rhine-Main-Danube	Germany	110	98.4	12	91	1939	150,000,000
Rhone	Rhone River—Marseille, France	51	82	10.5	3	1926	20,000,000
Sabine Neches	Sabine River—Port Arthur Canal	23	150	30	1	1926	18,100,000
Sault Ste. Marie, U. S.	Lake Superior—Lake Huron	1.6	100	25	1	1896	17,500,000
Sault Ste. Marie, Can.	Lake Superior—Lake Huron	1.41	60	19.5	1	1895	5,000,000
Suez	Mediterranean to Red Sea	104.5	196	46	none	1869	136,000,000
Great Lakes Canal	**s, including St. Lawrence Seaway**						
Lachine	Lachine—Montreal, St. Lawrence R.	8.7	45	14	5	1826	14,043,000
Soulanges	St. Lawrence River	14.6	45	15	5	1899	7,897,000
South Cornwall	St. Lawrence River at Cornwall Is.	2	500	29.5	none	1958	17,000,000
Trent	Georgian Bay—Lake Ontario	275.4	33	6	42	1826	19,951,000
Welland Ship	Lake Ontario—Lake Erie	27.6	80	30	8	1930	131,860,000
Wiley-Dondero	St. Lawrence R., south of Long Sault Island	9	442	27.5	2	1958	11,000,000
Williamsburg	St. Lawrence River	12.5	45	14	6	1847	13,550,000

*Width of locks or bottom of channel. †A depth greater than 20 feet indicates a ship canal. ‡Converted, 1926, from lock to sea-level canal. §1,800,000,000 rubles. **300 feet minimum through the Divide.

in detail a plan for a system of inland waterways and of highways extending throughout the then settled portion of the United States. But again an armed conflict, the War of 1812, interrupted transportation development.

History of "Internal Improvements." During the War of 1812–15 the United States had great difficulties in conducting land campaigns. The practical failures of most of the land campaigns of that war made it clear to every one that both military and economic considerations demanded the development of transportation facilities. The railroad had not been invented, and the public naturally turned to improving the rivers, constructing canals, and building highways. The movement for "internal improvements" was led by the ardent young statesman, Henry Clay, and was supported by John Quincy Adams. For a time, leaders of the South, such as John C. Calhoun, advocated Federal support for canals and roads.

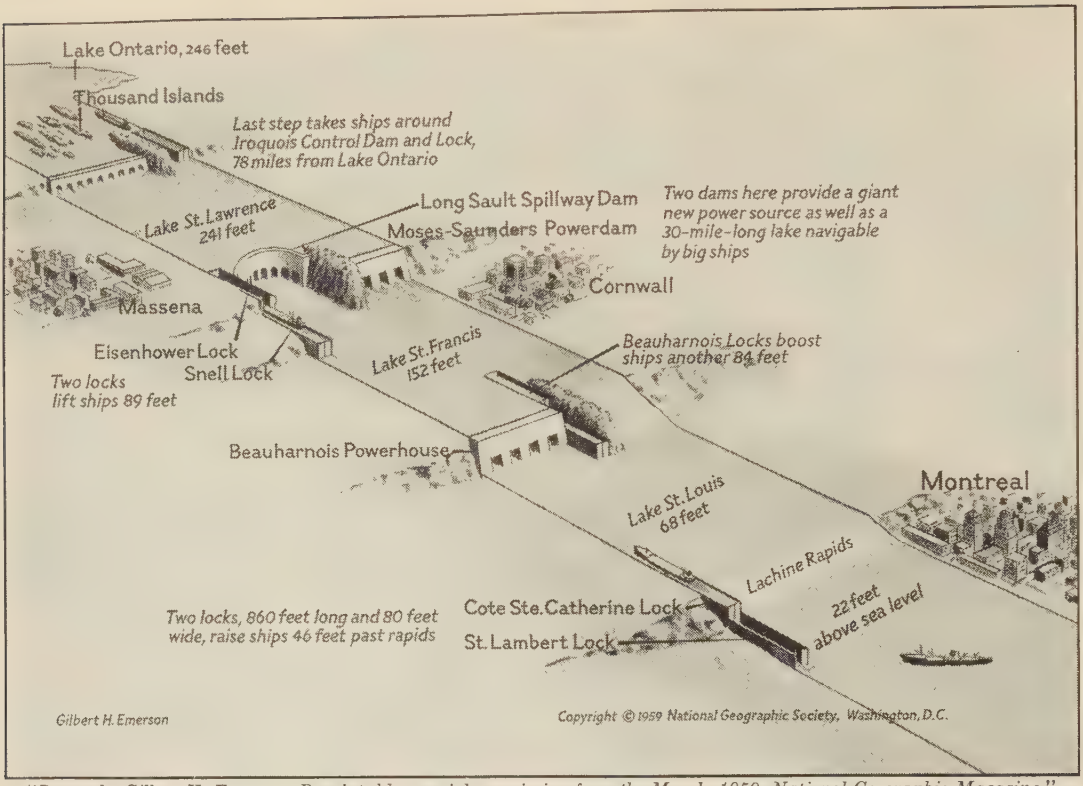
But, from 1820 on, the conflict over slavery and state rights caused the leaders of the South to oppose internal improvements by direct action of the Federal government. During the administration of John Quincy Adams, 1825–29, the Federal government gave active support to canal and road building. But after Andrew Jackson became president he supported the strict constructionists, and took the position that the Federal government could not constitutionally carry on works of internal improvement within the states. His popularity and powerful personality put an end to the policy of Federal aid for canals and roads.

During the year that Andrew Jackson was inaugurated president, the construction of railroads was begun in the United States. Within a decade it became evident that the railroads were to be efficient carriers of freight as well as of passengers, and that the inland waterways must at least share their traffic with the railroads. Indeed, as time went on, the waterways lost most of this traffic to the rival railroads. Nevertheless, the states which had begun works of internal improvements during the two decades following the War of 1812 continued to carry on such works until the Civil War and in some cases beyond that period. See table *Some Important Canals*.

River and Harbor Works. The Civil War settled the controversy as to the power of the Federal government. After 1865 no question was raised as to the power of the United States to expend funds upon the improvement of harbors, upon the channels of the Hudson, the Mississippi, the Ohio, and other rivers, and upon the connecting channels and the ports of the Great Lakes. From 1870 on, the Federal government regularly appropriated funds for rivers and harbors.

River Traffic. Railroads are now so generally used for freight traffic and passenger travel that it is hard to realize the great rôle played by the Mississippi, Missouri, Ohio, Kentucky, Tennessee, and other rivers, in the development of the country from 1840 to 1870. The steamboat, which began to run on the Hudson in 1807, made its appearance on the Ohio in 1811, and its use increased with the settlement of the Mississippi Valley states. St. Louis, on the Mississippi, near the mouth of the Missouri, became the principal trading city of the Mississippi valley, and New Orleans became the chief export city of the United States. The traffic of the great Middle West and of much of the South moved with the river currents to the Gulf, borne by the busy steamboats.

The Erie Canal. The canal which most influenced economic development in the United States was DeWitt Clinton's "Big Ditch"—the Erie


Lake Ontario, 246 feet
Thousand Islands
Last step takes ships around Iroquois Control Dam and Lock, 78 miles from Lake Ontario
Lake St. Lawrence 241 feet
Long Sault Spillway Dam
Moses-Saunders Powerdam
Two dams here provide a giant new power source as well as a 30-mile-long lake navigable by big ships
Cornwall
Massena
Eisenhower Lock
Snell Lock
Two locks lift ships 89 feet
Lake St. Francis 152 feet
Beauharnois Locks boost ships another 84 feet
Beauharnois Powerhouse
Montreal
Lake St. Louis 68 feet
Lachine Rapids
22 feet above sea level
Two locks, 860 feet long and 80 feet wide, raise ships 46 feet past rapids
Cote Ste. Catherine Lock
St. Lambert Lock
Gilbert H. Emerson
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Canal—constructed by the State of New York from 1817 to 1825. By connecting the Hudson River and New York City with the Great Lakes via the Mohawk Corridor, it permitted the expansion of trade between the mid-west and eastern coast. New York City emerged as the great metropolis of the nation and its leading port; in the mid-west, the success of the Erie Canal stimulated the construction of numerous canals, notably in Ohio and Indiana. By the 1870's, competition from the railroads and rate wars caused canal traffic to decline.

New York State Barge Canal System. Presently, the Erie Canal is part of this System. The entire System, including the Champlain, Oswego, and Cayuga-Seneca canals in addition to the Erie, extends over 801.3 miles. The canals are at least 12 feet deep with a minimum bottom width of 75 feet when dredged through earth and of 94 feet where cut through rock. The 56 concrete locks built by the state are 300 feet long and 45 feet wide. The Federal lock at Troy is 44.4 feet wide. The largest barge that can be accommodated would be 300 feet long and 43 feet wide with a 4000-ton capacity.

The lock at Little Falls has a 40½-foot lift, one of the highest in the world. The five locks at Waterford raise a vessel 169 feet, twice as great as that to the summit of the Panama Canal.

Cape Cod Canal. In 1914, this canal was opened across the Isthmus of Cape Cod to shorten the distance between New England and Middle Atlantic ports. Built at a cost of $13.5 million by a private firm, it was sold to the government in 1928 for $11.5 million, and is now operated as a part of the coastal canal system.

Canals in Canada. Canada had an exceptional opportunity for the development of river and lake transportation by canalizing the St. Lawrence River and by connecting Lake Erie with Lake Ontario. The possibility of connecting Georgian Bay with the Ottawa River, and thus with the St. Lawrence River at Montreal, was also early apparent.

The St. Lawrence River has four rapids, which render upstream navigation impossible except by the construction of canals and locks along the river past the rapids. The Lachine Rapids are just above Montreal, and a canal past those rapids was begun in 1824. At later dates, canals past the other rapids of the river were constructed. These were equipped with locks 270 feet by 45 feet, and 14 feet deep.

The first Welland Canal, enabling boats to pass from Lake Erie to Lake Ontario, was opened in 1829. This waterway has been enlarged from time to time, and work completed in 1930 gave the waterway the dimensions of an ocean ship canal. In addition to one guard lock, there are seven lift locks, each of which is 800 feet in length by 80 feet in width, with a depth of 30 feet of water above the sills, each lock having a lift of 46½ feet. The canal connects Port Colborne, on Lake Erie, with Port Weller, on Lake Ontario. The total cost exceeded $122 million.

The St. Lawrence Seaway. The feasibility of a Seaway was studied in 1895 but not until May 13, 1954 was legislation signed authorizing the U.S. to join Canada in its construction. Congress acted after Canada announced plans to construct the Seaway within its boundaries. Passage of the bill was urged for reasons of national security.

The dredging of the St. Lawrence River and construction of locks and canals permits 27-foot draft ocean-going vessels (80 per cent of the world's shipping) to proceed beyond Montreal to Detroit and on to Duluth, Minnesota.

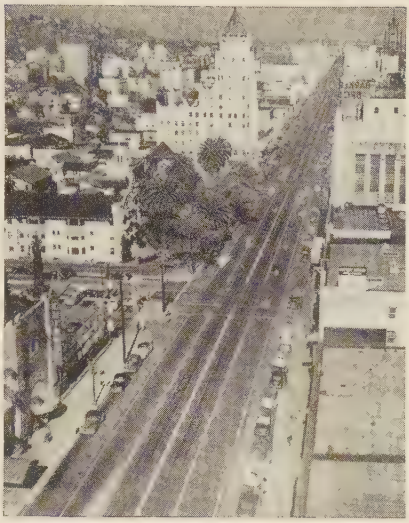
In 182 miles from Lake Ontario to Montreal, the river drops 224 feet. Canada undertook construction of facilities in the 68-mile section from Montreal to the International Rapids. The U.S. built the Wiley-Dondero Canal and three locks in the 46-mile International Rapids section between Cornwall, Ontario, and Ogdensburg, New York.

Another project, the joint development between

FAMOUS STREETS

Below Looking south on Biscayne Boulevard from N. E. 5th Street in Miami, Florida. Modern Hotel Biscayne and Hotel Everglades at the center. Stately palm trees run nearly the entire length of this famous Florida thoroughfare.

Above Canal Street in New Orleans, America's widest business street, measures 171 feet. It includes two 21-foot sidewalks and 58-foot neutral ground in the center on which there are four street car tracks. Canal Street was named from a projected waterway, which was intended to join the Mississippi River and Lake Pontchartrain.

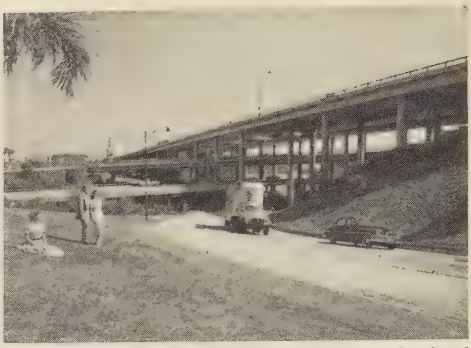


Above The well-known Hollywood Boulevard in Los Angeles, California. Grauman's Chinese Theatre at the left where the footprints of numerous Hollywood picture stars are seen in the cement sidewalk. At the far end of the Boulevard are the large radio and television studios.

Left The crossroads of the world, Times Square, New York. Famous Broadway on the right and, at the left, Seventh Avenue. Hotel Astor marquee on the left, and in the center are the recruiting stations for the Armed Forces.

Below The upper end of the Michigan Avenue Bridge is known as Chicago's Magnificent Mile. At the left is the Wrigley Building. On the right the Tribune and behind it the Sheraton Hotel. The Palmolive Building is in the distance on the right and beyond that the famous swank Gold Coast apartments.

Built for the Ideal Cement Co. of Ada, Okla., this belt conveyor system carries 1000 tons of limestone an hour 5½ miles from a quarry to a cement plant.



"The Stack," at Los Angeles, is the famed 4-level crossing of the motor freeways which expedite traffic to all points in Southern California.

Photo from "All Year Club of Southern California"

MODERN TRANSPORTATION

With vertical take-off, fair horizontal speed, and ability to land in otherwise inaccessible areas, the helicopter has innumerable uses, both military and peace-time.

Bell Aerosystems Co.

The Royal Yacht BRITANNIA leaving Dwight D. Eisenhower Lock after dedication of St. Lawrence Seaway, June 27, 1959.

707 Jet Flagship, American Airlines. Great speed and a smooth ride account for the widespread popularity of jet passenger aircraft.

This modern streamlined passenger train on the Rock Island Lines is drawn by a 4000-horsepower Diesel locomotive weighing more than 300 tons.

Rock Island Lines

New York and Ontario in the International Rapids section of hydro-power facilities capable of producing 13 billion k.w.h. annually, began operations on July 1, 1958. The cost of the power project exceeded $600 million.

Coastwise Canals. In 1824, the Chesapeake and Delaware Canal Company constructed a canal connecting the Chesapeake and Delaware bays. This canal was acquired by the United States government in 1919. The Engineer Corps of the Army took in hand the work of improving the canal by the elimination of curves and the removal of locks, converting it into a sea-level canal. These improvements, completed in 1926, were calculated to reduce a ship's transit time from ten hours to four hours or less.

Attention is being given to the project of enlarging the Delaware and Raritan Canal across New Jersey into a waterway that may be used for ocean vessels and for warships. Eventually, vessels of commerce and of war may be able to proceed from Boston by the Cape Cod Canal, Long Island Sound, the Delaware and Raritan Canal, and the Chesapeake and Delaware Canal to Hampton Roads and Norfolk. Barge canals connect Norfolk with Albemarle sound and the North Carolina seaboard.

The Panama Canal. Encouraged by their success at Suez, the French sought to build a canal across the Isthmus of Panama. Under a concession from the Colombian government, work was begun in 1881. Unexpected physical obstacles and the prevalence of malaria and yellow fever caused the enterprise to be abandoned in the late 1880's. About this time an American company was considering the construction of a canal across Nicaragua, but this project, too, was abandoned and it became evident that if a canal was to be built it would have to be done by the United States government. As between the two locations, the United States in 1902 decided in favor of the Panama route after the French agreed to sell their interest for $10 million. In this same year Congress authorized the President to negotiate with the Colombian government for a concession to build the Canal. However, the two governments were far apart in their valuations of this permission. Colombia wanted $50 million and the United States considered the concession to be worth $10 million. During the delay thus caused, the Republic of Panama declared its independence from Colombia. The United States promptly recognized the new government and made a treaty with it whereby permission was granted for building the Canal and for permanent occupancy of a strip ten miles wide along the canal route. The U.S. Secretary of War, assisted by a commission, began the construction in 1904.

This time, under the leadership of Col. Wm. C. Gorgas, measures were taken to prevent the diseases that had plagued workers on the French project. Sanitary precautions that eliminated disease-carrying mosquitoes made the Canal Zone completely safe from a health standpoint. U.S. Army engineer Col. George W. Goethals was equally successful in overcoming the many physical obstacles that had baffled the French. Both men were raised to the rank of Major General in recognition of their services.

The length of the Panama Canal is about 44 nautical miles or 50 statute miles. The minimum depth is 41 feet, and the minimum bottom width through the Divide is 300 feet. Navigation for most of the distance is in lake channels. A vessel passing from the Caribbean Sea to the Bay of Panama proceeds through a sea-level channel across the swamp district to Gatun, where by means of three locks the vessel rises to the level of the lake. Thence, the channel is through the lake to the Continental Divide, where, through a cut nine miles in length, the vessel passes to within a few miles of the ocean. At Pedro Miguel the vessel is lowered 30 feet to Miraflores Lake. Two locks at Miraflores lower the vessel to mean sea level.

Transit from sea to sea occupies 7 to 8 hours, with passage through the locks 3 to 3½ hours. In 1959 there were 11,110 transits of which 9718 were commercial vessels of more than 300 tons, carrying a record of 51,158,449 tons of cargo. Tolls on commercial ships totaled $45,528,732; on government vessels, $975,057. The canal is operated and regulated financially by the Panama Canal Company, a governmental agency.

The total cost of the Panama Canal has been over $400,000,000. Under a new treaty signed with Panama in 1955, the United States raised the annuity paid Panama for the use of the Canal Zone from $430,000 to $1,930,000 annually and, among other concessions, agreed to return land no longer needed for canal operation.

The Suez Canal. The Suez Canal, connecting the Mediterranean with the Red Sea, was the first inter-ocean canal constructed. Begun in 1859 and opened in 1869, it was constructed by the Suez Canal Company under the leadership of Ferdinand de Lesseps.

This sea-level canal, 105 miles in length, is the world's busiest international waterway. Originally 26 feet in depth and with a bottom width of 72 feet, successive enlargements have given it a depth of 46 feet (capable of handling 35-foot draft vessels) with a minimum bottom width of 196 feet. The original cost was $80 million; total capital investment, approximately $136 million.

Canal use developed slowly since sailing vessels, the only ones employed in the Europe and Orient traffic in the mid-1800's, could not use the route. Traffic increased considerably with the introduction of steam vessels and stockholders realized dividends of 25 to 30 per cent. Approximately 176,000 shares of Canal stock, including that held by Egypt, were purchased by Disraeli for the British government in November 1875. The British government became the largest stockholder, although never controlling the majority of the 400,000-share stock.

Tonnage on the Canal increased from 20 million tons annually prior to World War I, to over 120 million tons in 1955. Nearly three-fourths of the northbound traffic is petroleum. The distance from the Persian Gulf to London via the Canal is 7000 miles; via South Africa, 12,900 miles. A 30,000-ton tanker saves over $100,000 by using the Canal.

The Canal company's 99-year concession was to revert to Egypt in 1968, but in July 1956 the Egyptian government seized and nationalized the Canal. Warfare followed in which Egypt was attacked by Israel, Britain, and France. From October 1956 until mid-April 1957, the Canal was closed while war-damage was being repaired. Since then Egypt has operated the Canal.

RAILROAD TRANSPORTATION

When in 1829 Stephenson succeeded in running "The Rocket" at the rate of 44 miles an hour in the contest at Rain Hill near Liverpool, England, he inaugurated a new epoch in the world's history. The effect of Stephenson's achievement was greater even than that of Watt, for the influence of the locomotive upon the industrial and social life of the world has been more fundamental than that of the stationary engine. The locomotive has made possible the rapid settlement and development of the continents of North and South America and of Australia, and is rapidly opening up Africa.

History of American Railroads. The railroad has had its most rapid and its largest development in the United States. The chartering of railroad companies in the United States began in 1826, and construction, on a small scale at first, soon followed.

The first locomotives were run in 1830. Several roads, the antecedents of the present Baltimore and Ohio, New York Central, and Pennsylvania systems, started at about the same time. The Baltimore and Ohio was chartered in 1827, and the first rail of this historic road was laid July 4, 1828, by Charles Carroll who was then the only surviving signer of the Declaration of Independence.

The Mohawk and Hudson, from which the great New York Central system has developed, was chartered in 1826. Construction was begun in 1830, and the first 17 miles of the line were opened in 1831. These early roads developed slowly, but Buffalo was reached in 1842. The Baltimore and Ohio reached Wheeling in 1851. The most active center of railroad construction in the 1830's was Philadelphia, which was connected with the Susquehanna River by rail in 1834 and thus with Pittsburgh by rail and canal lines. The Camden and Amboy connected the Delaware River with New York bay in 1837, and Baltimore was reached by rail in the same year.

Between 1830 and 1835 three lines were built out from Boston, one north to Lowell, one south to Providence, and the other west to Worcester. By 1841 this third line had been extended to Albany, and before the close of the following year one could travel from Boston to Buffalo by an all-rail route.

Periods of Railroad Construction. The historic growth of American railroads and the decline in mileage since World War I may be observed in the table *Railroad Mileage in the United States, 1845–1960*. Slow initial growth was followed by a 240 per cent increase in mileage in the decade 1850–1860. In no subsequent period did the railroads experience such a rapid rate of increase. In this decade prior to the Civil War, growth occurred principally in two regions, the South and the trans-Appalachian west. Vigorous railroad construction by the southern states provided them with the economic strength to wage four years of Civil War. The extension of northern railroads west beyond the Appalachian Mountains to the Mississippi River and to some extent beyond enabled the North to defeat the South.

From the close of the Civil War to 1880, rapid construction of railroads and the westward extension of the lines were plagued by intermittent panics. The severe panic of 1873, whose effects lasted for five years, resulted in large measure from the over-extension of railroads into the west in advance of traffic requirements. This distinctive railroad panic and its effects were ended by 1880.

From 1880 to 1890, more than 70,000 miles were added to the railroad network of the United States, the largest total in any 10-year period. Expansion occurred in all parts of the country but notably in the new states of the central west.

By 1890, the principal railway systems required to meet the commercial needs of the nation had

RAILROAD MILEAGE OF THE UNITED STATES BY STATES

State	Miles of Line 1930	Miles of Line 1940	Miles of Line 1960
Alabama	5,249	4,996	4,647
Alaska	....	536	572
Arizona	2,494	2,228	2,166
Arkansas	4,826	4,482	3,950
California	8,240	7,947	7,758
Colorado	4,972	4,552	3,786
Connecticut	969	887	825
Delaware	325	295	293
District of Columbia	36	35	30
Florida	5,666	5,218	4,670
Georgia	6,671	6,334	5,864
Hawaii†	....	192	25
Idaho	2,965	2,746	2,685
Illinois	12,500	11,949	11,211
Indiana	7,106	6,889	6,601
Iowa	9,698	8,950	8,569
Kansas	9,339	8,564	8,239
Kentucky	4,054	3,691	3,543
Louisiana	4,654	4,357	3,938
Maine	2,193	1,882	1,786
Maryland	1,443	1,367	1,146
Massachusetts	2,022	1,793	1,654
Michigan	8,072	7,303	6,665
Minnesota	8,779	8,421	8,205
Mississippi	4,209	3,919	3,659
Missouri	7,897	7,042	6,595
Montana	5,228	5,149	4,969
Nebraska	6,174	6,044	5,721
Nevada	2,109	1,941	1,647
New Hampshire	1,165	1,002	869
New Jersey	2,299	2,108	1,915
New Mexico	2,973	2,812	2,473
New York	8,312	7,739	6,541
North Carolina	5,161	4,668	4,310
North Dakota	5,275	5,266	5,255
Ohio	8,804	8,501	8,334
Oklahoma	6,678	6,302	5,802
Oregon	3,456	3,385	3,149
Pennsylvania	11,141	10,328	9,126
Rhode Island	191	194	184
South Carolina	3,780	3,466	3,282
South Dakota	4,238	4,006	3,920
Tennessee	3,940	3,573	3,402
Texas	17,069	16,356	14,769
Utah	2,196	2,082	1,734
Vermont	1,056	919	811
Virginia	4,516	4,261	4,133
Washington	5,442	5,243	4,979
West Virginia	4,046	3,831	3,680
Wisconsin	7,288	6,639	6,191
Wyoming	2,036	2,008	1,881

Source: *Railroad Information Yearbook, 1961.*
* Figures do not include approximately 670 miles of plantation railway lines.

RAILROAD MILEAGE IN THE UNITED STATES, 1845-1960

Year	Miles of Line in Operation	Change in Mileage (5-year period)	Year	Miles of Line in Operation	Change in Mileage (5-year period)	Year	Miles of Line in Operation	Change in Mileage (5-year period)
1845	4,633	.....	1885	128,320	35,058	1925	249,398	−3,477
1850	9,021	4,388	1890	163,597	35,277	1930	249,052	− 346
1855	18,374	9,353	1895	180,657	17,060	1935	241,822	−7,230
1860	30,626	12,252	1900	193,346	12,689	1940	233,670	−8,152
1865	35,085	4,459	1905	218,101	24,755	1945	226,696	−6,974
1870	52,922	17,837	1910	240,293	22,192	1950	223,779	−2,917
1875	74,096	21,174	1915	253,789	13,496	1955	220,670	−3,109
1880	93,262	19,166	1920	252,845	− 944	1960	217,100	−3,570

PASSENGER TRAFFIC, 1930–1963
Millions of Passenger Miles and Percentage of Total

Year	Railroads	%	Busses	%	Air Carriers	%
1930	26,876	68.5	7,100	18.1	73	0.2
1940	23,816	64.5	9,800	26.5	1,052	2.8
1950	31,790	45.3	26,436	37.7	10,072	14.3
1960	21,284	27.2	19,896	25.5	33,958	43.5
1961	20,308	26.3	19,703	25.6	34,642	44.9
1963*	18,600	21.6	21,700	25.3	42,900	49.9

* Estimates.
Source: *Railroad Information Yearbook, 1964.*

been built. From that time on, most additions were built to supplement or extend existing systems. Peak mileage was reached in 1916 when the net extended to 254,037 miles. Since then, nearly 37,000 miles of line have been abandoned due, primarily, to the growth of other forms of transportation and, more recently, in efforts to economize by reducing redundant services.

Distribution of Railroad Mileage. Approximately 39 per cent of the railroad mileage of the world is in the United States. The combined countries of Europe have approximately 30 per cent and the remainder of the world 30 per cent of the total.

The mileage by state is given in an accompanying table. Texas, with 14,769 miles of railway, surpasses the mileage of France or Germany. New Jersey ranks first among the states in the number of miles of railroad per hundred square miles of area whereas Nevada has the lowest ratio.

Standard Gauge. The standard gauge of railroads is 56.5 inches from the inside of one rail to the inside of the opposite rail, measurement being made about ⅝ of an inch from the top of the rail head.

History of Canadian Railroads. In many respects the development of Canadian railways corresponds with that of the United States. As was the case in the States, the Canadian colonies devoted their attention first to canal building and the establishment of inland waterways. During the first half of the 19th century, these were the chief improvements made in transportation.

The first railway in Canada was placed in operation in 1836. This was a line 16 miles in length, connecting Montreal and St. John's on the Champlain route to New York. Up to 1850 only 50 additional miles of railway had been constructed. But the great activity in American railroad building during the 1840's convinced the Canadians that they too must have railroads to supplement their canals.

In 1849 the Canadian government adopted a vigorous policy regarding railway construction by undertaking to guarantee 6 per cent interest on a sum not to exceed one-half the cost of railways 70 miles in length or longer. As a result, the St. Lawrence and Atlantic railway, connecting Montreal and Portland, Maine, was completed in 1853, and, during the same year, the Northern railway from Toronto to Collingwood was placed in operation. In 1854 the Great Western railway, connecting Niagara and Detroit, was opened. The Grand Trunk railroad, chartered in 1852, operated the St. Lawrence and Atlantic under a lease, and, in 1856, completed the main line from Toronto to Montreal, thereby connecting the chief commercial districts of Canada with the Atlantic seaboard.

By 1860 more than 2000 miles of Canadian railways were in operation. These were constructed largely by heavy outlays of British capital. But the financial crisis of 1857, together with the pecuniary embarrassments of most of the lines, prevented extensive railway construction for the ensuing 10 years. Except for the completion of local lines, there was but little additional railway building until after the confederation of the various provinces of the Dominion was effected in 1867.

Fulfilling a condition of Confederation in the East, the Dominion government undertook the completion of the Intercolonial railway between the province of Quebec and the ice-free Atlantic ports of Nova Scotia and New Brunswick. In 1876, at a cost exceeding $20,000,000, this line was completed. A corresponding condition of western federation, demanded by British Columbia, was fulfilled by the construction of the Canadian Pacific railway. At a cost to the country of $62,000,000 in cash and 25,000,000 acres of land, this notable enterprise in railway transportation was begun in 1881 and completed in 1885. It is worthy of note that in the United States at this time only three transcontinental railway connections with the Pacific coast had been established. These were the Central Pacific, from Ogden to San Francisco, finished in 1869; the Southern Pacific, from the Texas seaboard to San Francisco, completed in 1877, and the Atchison, Topeka, and Santa Fé, from the Missouri river to Los Angeles, opened in 1885.

The railways of Canada have been built largely under various forms of government aid, consisting of land grants, cash subsidies, loans, and guarantee of bonds or interest. The total so granted, up to 1940, exceeded 47,000,000 acres.

Government Railways in Canada. A feature wherein railway development in Canada sharply differs from that in the United States is found in the large mileage owned or controlled by the Dominion government. The Prince Edward Island railway, completed in 1875, and the Intercolonial railway, completed in 1876, were the earliest government owned lines. In 1903 the Dominion government began the construction of the eastern division of the National Continental railway from Moncton, N. B., to Winnipeg. This line was to be leased to the Grand Trunk railway. Upon the failure of the latter to operate the new road after it had been completed at a cost of $165,000,000 up to 1919, the Dominion government undertook its operation.

At the beginning of 1918 the Canadian government railways had a total mileage of 5150, comprising the Intercolonial, 2305 miles; St. John and Quebec railway, 128 miles; Prince Edward Island railway, 314 miles, and National Continental railway, 2403 miles. During 1918 branch lines in New Brunswick aggregating 143 miles were taken over for operation. In the same year the Dominion government acquired the capital stock and control of the Canadian Northern Railway Company. The Canadian Northern system at this time had a total mileage of 9566 miles. With the later acquisition of various subsidiaries, including the Hudson Bay railway, the Canadian Northern system, as controlled by the government, comprised fully 10,000 miles of line. In 1920, the Grand Trunk Pacific railway, having a mileage of about 2700 miles, was taken over and operated by the government. The Grand Trunk railway, also, with about 3600 miles, was placed under government management in 1921.

In this manner the government acquired about 21,500 miles of railway; the total was increased to over 24,000 in 1935. This is over one-half the total mileage in the Dominion, which in 1954 amounted to 42,824, of which 90% is controlled by the government-owned Canadian National and the privately owned Canadian Pacific.

Technical Triumphs of American Railroads. The triumph of American railroads has been as significant in the development of equipment as in track construction. The success of U.S. railroading depended upon the ability to move heavy loads over long distances and over such grades as were

required to surmount the Appalachian and Rocky mountains.

In a country of three million square miles, resources are scattered and occasionally remote. The great distances and the diversity of economies and resources suggest the complex nature of the transport problem which the railroads solved. With major markets in the northeastern quarter of the country and on the west coast fringe, extensive transportation systems became a necessity. The wheat and corn of the mid-west and Great Plains must travel 1000 to 1500 miles to the markets and ports of the east. Vast quantities of coal move from the Appalachian fields by rail to the industrial centers of the interior; non-ferrous metals cross the nation from the mines of the west to eastern markets; and the forests of the west, south, and north-central states transport their products by rail to the rest of the nation.

The Steam Locomotive. To provide transportation for the products of forest, mine, and field, the steam locomotive has been enormously increased in size and tractive power. From the tiny locomotive of the 1830's and 40's, weighing from 5 to 20 tons, has been developed the huge triplex articulated locomotive of the present day with 24 driving wheels and a total weight of 853,000 pounds. This is an extraordinarily large locomotive and is intended for work on heavy mountain grades. But the standard freight locomotive, with eight driving wheels, now has a total weight of about 500,000 pounds. The average tractive power of locomotives in the United States more than doubled in the first 40 years of the 20th century, being over 50,000 pounds in 1940. The number in use was 44,333. The maximum of 65,358 was attained in 1924.

Since World War II, however, there has been a sudden and dramatic change from steam locomotives to Diesel engines. By 1957 the railroads owned only 2,404 steam locomotives as against 27,211 Diesel units. But the amount of service each performs tells the true tale of the steamer's passing. Diesels now perform almost 93 per cent of all freight service, almost 93 per cent of all passenger service, and nearly 96 per cent of all switching service. More than 20 railroads are now completely dieselized. In place of the steamer has come a locomotive of greater economy and dependability.

The Car. Such heavy trainloads would not be possible except for the size and the strength of the freight cars now in use. At the close of the Civil War, the standard freight car had a capacity of about 20 tons. By the end of the 19th century the standard had been raised to 40 tons. The average capacity climbed from 42.5 in 1921 to 54.5 tons in 1957. The only limit to the size of the car is the strength of the tracks and bridges.

The Electric Locomotive. The earliest electric locomotive was used to haul cars in mines in 1882, but the most important early use of this form of traction was in subways and tunnels, where it has obvious advantages in the fact that electric locomotives do not emit smoke and noxious gases. The first tunnel in which electric locomotives were used was that of the City and South London Railway under the Thames River, opened for traffic in 1890.

Other situations in which electric locomotives have proved of value sufficient to justify the high initial cost of electrification are: in terminals and suburban divisions of railroads; on steep mountain grades; and on routes carrying heavy traffic and requiring fast service.

Diesel-Electric Locomotive. Although electrically driven, this type of locomotive does not require that tracks be electrified so as to transmit current from a central station. On the contrary, it generates its own current by means of a dynamo driven by a Diesel engine. The current drives motors geared to the wheels. The Diesel uses much less fuel than the steam locomotive. It also requires less maintenance and inflicts less wear and tear on tracks. It allows easier starting for heavy loads, and can maintain higher speeds for longer periods. The first Diesel-Electric locomotive for commercial use was built in 1925. This was the Jersey Central Railroad's No. 1000, which is still in service.

Streamlined Passenger Trains. The purpose of molding the outline of locomotive and cars as a unit is to cut down air resistance. The increase in beauty is important but secondary to traction efficiency. The first completely streamlined train in America was the "Zephyr" put into service by the Chicago, Burlington, and Quincy railroad on November 11, 1934, to run between Lincoln, Nebraska, and Kansas City, Missouri. In 1956, some lines began operating new lightweight trains with short, low-slung coaches that could take curves faster than standard equipment. Even with these improvements, passenger traffic on U.S. railroads has continued a sharp decline since the World War II period. Many commuter lines face serious financial trouble. To compensate, a wave of railroad mergers began in 1960 and continues to the present.

Trailer Trains. A development that has brought about co-operation instead of competition between railroads and motor trucks is the "piggy-back" service provided by many railroads. Truck trailers carried on flat cars with great speed and over long distances can be delivered locally with no delay for

INTERCITY FREIGHT TRAFFIC, 1930–1963*

(Millions of Freight in Ton-Miles)

Year	Railroad	%	Trucks	%	Inland Waterways**	%	Pipeline	%
1930	389,648	74.3	20,345	3.9	86,453	16.5	27,900	5.3
1940	379,201	61.3	62,043	10.0	118,057	19.1	59,277	9.6
1950	596,940	56.2	172,860	16.3	163,344	15.4	129,175	12.1
1955	631,385	49.4	222,254	17.5	116,508	17.0	203,244	15.9
1960	579,130	43.7	297,662	22.4	220,253	16.6	228,626	17.2
1961	569,997	42.9	313,141	23.6	209,706	15.8	233,172	17.6
1962	599,977	43.1	331,319	23.8	223,089	16.0	237,723	17.0
1963	629,457	43.1	347,865	23.8	240,000	16.4	243,286	16.6

* No figures available for airlines since the percentage of total is less than 1/10 of 1%.

** Inland waterways consist of Great Lakes and Rivers & Canals. In the 33-year period, the share of traffic carried on the Great Lakes dropped from 14.8% to 6.8% whereas the share of traffic carried by Rivers & Canals increased from 1.7% to 9.6%.

Source: *Railroad Information Yearbook, 1964.*

redistributing their cargoes. Shipments made in this way are co-ordinated by a national organization of railroads operating all over the United States.

TRANSPORTATION UPON ELECTRIC RAILWAYS

Tramways. The first electric railways were built to take the place of horse car lines or tramways in the cities. The tramways had been preceded by bus lines, which began to run in New York City in 1830 and in Philadelphia the following year. It was not until 1832 that the first horse car was built in the United States. The first street railway in Boston dates from 1853, and, in Philadelphia, from 1858. Chicago's first line was started in 1859. These horse car lines provided a service of four or five miles an hour, and were fairly adequate for the transportation needs of the times.

Cable and Elevated Roads. By 1870, more rapid transit than could be provided by horse car lines had become necessary, and in one important city, San Francisco, steep hills made horse cars impracticable. The cable lines were the first to provide rapid transit. San Francisco opened a cable line in 1873, Chicago in 1878, Philadelphia in 1884.

In New York City, rapid transit was provided by the construction of elevated railways. The franchise for the first of these elevated railways was granted in 1867. Construction followed in due course, and by 1879 New York City had a fairly complete system of elevated roads. It was intended at first to use cable traction upon these elevated lines, but, before operation began, it was decided to use dummy locomotives. Twenty-five years later these steam locomotives were displaced by electric locomotives. Chicago began the construction of elevated roads in 1888; Boston, in 1903; and Philadelphia, in 1907.

Subways. The earliest underground railway for passengers was opened in London in 1863. It was operated with steam locomotives at first, but electric traction began to be used in 1890. The term "tube" is ordinarily applied in England to these railways. Budapest and Glasgow followed with the inauguration of electric train subways in 1896. A subway was opened in Boston in 1898. A subway service in Paris was initiated in 1900. The first line of the New York subway system was opened in 1904. Construction in this city presented peculiar difficulties. The subways had usually to be blasted through rock and, in certain sections, buildings of enormous weight had to be safeguarded while tunnels were driven beneath them. More recently, Philadelphia, Rochester, Toronto, Berlin, Tokyo, and Moscow have constructed transit facilities of this type. Chicago has a freight subway with a network of tunnels beneath the street level.

Technical Development. The electric railway was made possible by the dynamo, which was developed for practical use shortly after the middle of the nineteenth century. However, it was not until 1888 that an electric trolley line was actually demonstrated to be commercially practicable. After its introduction during that year, the electric railway made rapid progress in all cities. By the end of the century it had almost completely displaced horse car lines. It has since been largely displaced by the motor bus.

Early in the 20th century, long distance electric railway and electric interurban traffic developed rapidly and served as a decentralizing force. The increasing use of the automobile and motor bus, and the economic impact of the depression of the 1930's upon the over-extended lines resulted in their decline. Electric street car service thrived during World War II and the immediate post-war period, but with increased private ownership of automobiles and the expansion of the highway system, this service was doomed.

Mass Transportation. An urgent need, and hence a subject of constant study and experiment, is the providing of facilities for rapid and relatively low cost transportation of large numbers of people in metropolitan areas. Increasingly, the central districts of large cities are suffering from congestion which brings the movement of people almost to a standstill at certain hours. In the "downtown" areas, fixed limits for the accommodation of traffic are imposed by insufficient parking space and by narrow streets that were laid out for horse-drawn vehicles. The problem is made more difficult by the inclination of people to use their own automobiles in preference to public transportation.

Various measures have been adopted experimentally, or are under consideration, to improve traffic conditions. Expansion of train commuter service, as in Chicago, is a partial answer. Los Angeles has sought relief in freeways, but is looking for other remedies. Transportation studies have have been made in Boston, New Orleans, San Francisco, and other large cities. One possibility considered promising but still in the experimental stage, is a monorail system.

RURAL ROADS IN THE UNITED STATES—1961

Source: *Dept. of Commerce, Bureau of Public Roads.*

State	State Control	Local Control	Federal Control	Total Mileage
Alabama	16,760	47,584	.....	64,344
Alaska	4,222	291	100	4,613
Arizona	4,692	16,214	13,111	34,017
Arkansas	10,387	60,220	2,176	72,783
California	14,830	78,000	24,035	116,865
Colorado	7,842	64,935	631	73,408
Connecticut	2,726	8,427	.....	11,153
Delaware	4,030	.....	.....	4,030
Florida	14,044	39,656	.....	53,700
Georgia	14,626	68,793	28	83,447
Hawaii	1,060	1,325	67	2,452
Idaho	4,648	27,543	7,739	39,930
Illinois	12,844	89,477	.....	102,321
Indiana	9,966	77,135	.....	87,101
Iowa	9,025	90,636	.....	99,661
Kansas	9,909	114,073	8	123,990
Kentucky	19,761	44,566	264	64,591
Louisiana	14,081	26,547	.....	40,628
Maine	10,834	7,893	131	18,858
Maryland	4,570	14,094	19	18,683
Massachusetts	2,108	14,466	.....	16,574
Michigan	8,017	85,967	.....	93,984
Minnesota	11,295	97,387	1,457	110,139
Mississippi	9,759	48,877	203	58,839
Missouri	28,796	69,984	547	99,327
Montana	11,119	54,707	7,720	73,546
Nebraska	9,068	87,344	281	96,693
Nevada	6,136	37,422	.....	43,558
New Hampshire	3,825	8,708	101	12,634
New Jersey	1,891	18,078	.....	19,969
New Mexico	11,301	44,109	5,045	60,455
New York	13,516	76,035	10	89,561
North Carolina	68,602	.....	1,362	69,964
North Dakota	6,088	92,845	539	99,472
Ohio	16,007	67,890	.....	83,897
Oklahoma	11,262	82,600	602	94,464
Oregon	8,322	33,917	26,710	68,979
Pennsylvania	45,112	49,175	308	91,595
Rhode Island	724	591	.....	1,315
South Carolina	25,945	25,454	.....	51,399
South Dakota	7,204	80,525	1,220	88,949
Tennessee	8,087	57,938	878	66,903
Texas	54,354	139,961	.....	194,315
Utah	5,003	17,722	7,845	30,570
Vermont	2,076	10,760	23	12,859
Virginia	49,058	670	1,081	50,809
Washington	6,219	38,763	7,853	52,835
West Virginia	30,952	.....	625	31,577
Wisconsin	10,408	75,978	53	86,439
Wyoming	5,145	50,864	3,021	59,030
Total	665,256	2,346,146	115,823	3,127,225

TRANSPORTATION ON THE PUBLIC ROADS

Highway History. In colonial days and until within a few decades, road building in the United States was carried on mainly by local governments. The work of construction was done by townships and towns in the middle and eastern states, and by counties and subdivisions of counties in the southern states. These local highways were mostly dirt roads and were not suitable for the handling of freight and passenger traffic between distant points. The first long distance or through-transportation highways were the turnpike roads, built by corporations chartered by the several states. The first important turnpike was the one from Philadelphia to Lancaster, Pa., begun in 1792 and completed two years later. Early in the 19th century, turnpike roads in large numbers were built in Pennsylvania, New York, and other states.

For a time the government of the United States gave aid to highway construction. Works of internal improvement then included highways as well as canals. But the policy of national aid to public highways came to an end in the 1830's, when it was held that Federal works of internal improvement were unconstitutional. By 1850 most of the states had come upon financial difficulties in attempting to build or aid canals, railroads, and highways. As a result, the old colonial policy again prevailed.

Until near the end of the 19th century, the railroads performed long distance transportation in the United States with great efficiency and with a fair degree of adequacy. But by that time a large part of the United States had become closely settled and industry had reached an advanced stage of development. In this changed situation improved highways were recognized as necessary.

Good Roads Movement. About 1890 a "good roads" movement started in Massachusetts, New Jersey, New York, and other states. Following 1910, this movement was powerfully re-enforced through the need for roads more suitable for motor vehicles, which by that time were coming into general use. Rural roads began to be hard-surfaced on an extensive scale. Normally the United States spends over a billion dollars annually on highway construction.

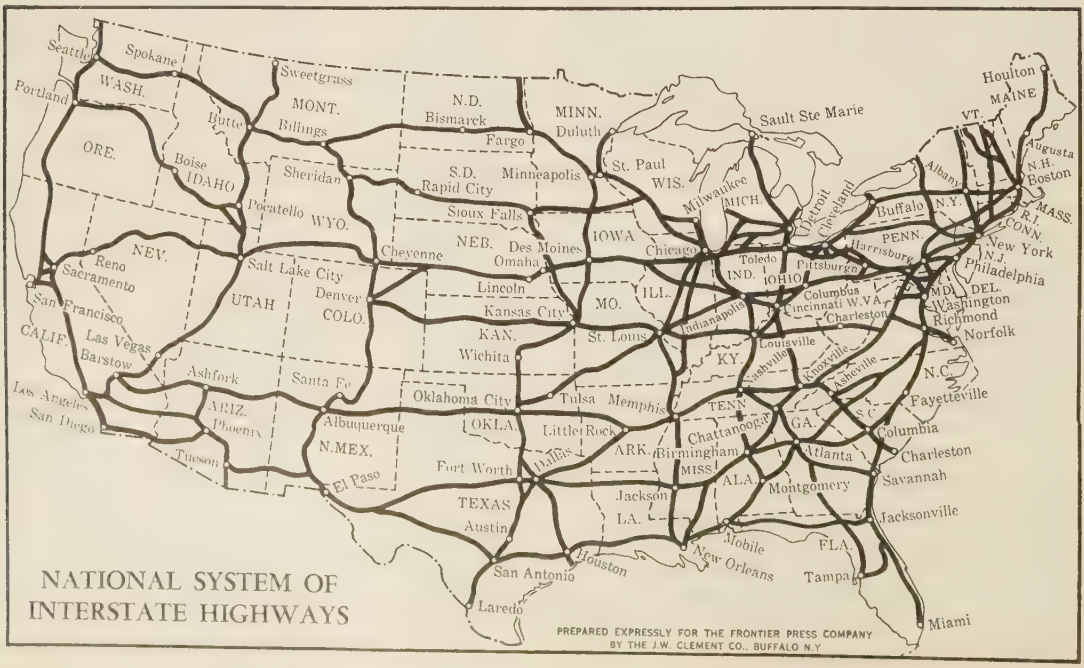
Motor Trucks and Busses. In the decade 1920-30, motor trucks and busses, operating over paved highways, developed into formidable rivals of the railroads. Low initial investment and flexibility of operation gave them important advantages. At the same time, a beginning was made toward coordinating the two types of transport through the medium of financial control of both. Among the improvements thus made possible were door-to-door transportation service and use of motor carriers on "feeder lines" for gathering rail traffic. A recent development is the so-called "piggyback" freight trains which carry truck trailers on special flatcars.

The Federal government stepped into the picture in 1935 with a law placing regulation of interstate bus and truck lines under the Interstate Commerce Commission. Schedules of rates must be filed with the commission and are reviewable by it. Permission to operate interstate motor lines is dependent on possession of "certificates of convenience and necessity" issued by the commission.

National Aid to Highways. Expanding automobile and truck transportation necessitated improved highways. Federal aid first materialized in 1916, and by 1921 increased aid for interstate and intercounty highways was established. During the depression of the 1930's, large-scale Federal expenditures for highway construction were a reality.

In June 1956, Congress passed the Federal Aid Highway Act authorizing the expenditure of over $33 billion during the next 13 years primarily for the construction of 41,000 miles of superhighways connecting 42 state capitals and 90 per cent of all cities with a population exceeding 50,000. The Federal outlay is to be $28.057 billion, or 90 per cent of the total cost, and the states' $5.425 billion. By April 1958, however, Congress authorized additional funds of $1.8 billion to speed up highway spending to combat recession. Thus, provision was made for Federal spending to the unprecedented extent of nearly $5.5 billion in 1958.

Taxes, amounting to more than $14.8 billion in the next 16 years, were increased to offset construction costs. Gasoline and diesel fuel taxes increased from 2c to 3c per gallon; the tire tax from 5c to 8c per pound; and a new 3c per pound tax was placed on retread rubber. Taxes on trucks, buses, and trailers were increased from 8 to 10 per cent of the manufacturers' prices. Heavy buses and trucks weighing in excess of 13 tons (26,000 pounds) are subject to a tax of $1.50 per 1,000 pounds.



AERONAUTICS AND TRANSPORTATION BY AIR

Early History of Aircraft. The earliest *attempts* at flight were made with craft heavier than air. This fact was probably due to the every-day example of the flight of birds.

The Greek inventor Archytas is said to have constructed, about 400 B. C., a wooden pigeon which maintained itself for a short time in the air. About 1500 A. D., Leonardo da Vinci constructed models of helicopters, with propellers rotating in a horizontal plane, which hovered in the air. He is, therefore, properly credited with the invention of the helicopter and also of the propeller with rotating blades. He first conceived also of the parachute and he drew plans for ornithopters, that is, for aircraft to be propelled by flapping wings. These were to be operated by the arms and legs of the aeronaut. Many later inventors continued to experiment on these lines despite the fact that Giovanni Borelli (1606-79) pointed out that man's pectoral muscles have less than one-tenth the power possessed by the wing-operating muscles of birds when the weight of the body is taken into consideration.

Attempts at gliding are said to have been made in Rome in the time of Nero. About 1660, a French acrobat named Allard undertook a gliding flight in Paris before Louis XIV. These and many subsequent attempts ended in injury or death to the would-be aeronauts.

Aeronautics. Mechanical flight is pre-eminently a development of the 20th century. Its success demanded the improved gasoline engine, a light, strong metal, such as duralumin, and a knowledge of air dynamics. These discoveries led to the evolution of the airship from the balloon and to the building of successful heavier-than-air machines, or airplanes. See *Airplane* and *Airship*.

The flight of an airplane is analogous to that of a kite. The string by which the kite is drawn forward corresponds to the forward drive of the propeller, and the upward pressure of the air on the kite corresponds to the lift exerted on the wings of the airplane. This lift is due partly to the pressure exerted on the under side of the wings, and partly to the suction caused by a partial vacuum on the upper side of the wings. Neither surface of the wing is flat. The cross section of the wing follows certain stream-line designs which are a balance between three requirements—maximum lifting power, strength, and minimum resistance in passing through the air. The last mentioned requirement demands also that the body of the airplane should conform to stream-line design.

To exert effective lifting power the wings must be driven forward at a certain minimum speed and must be inclined upward at an angle of from 2° to 20°. Below this limit, or above it, the air resistance, or "drag," causes the plane to "stall;" that is, to fall below the minimum speed necessary for horizontal flight or control. The minimum speed required to keep the average plane in the air is about 35 miles an hour. Average flying speed approximates 250 miles per hour. The record speed exceeds 575 miles per hour and is constantly being revised upward.

The mechanisms for stabilizing the airplane's course include a vertical tail fin and a horizontal tail plane. Control of its course is effected through an "elevator," jointed to the tail plane, a rudder, jointed to the fin, and ailerons, or adjustable wing flaps. Landing on rough ground is facilitated by the use of pneumatic tired wheels on axles fitted and designed for maximum shock absorbing capacity.

While the control of an automobile involves only two main factors—speed and steering in a horizontal plane—the control of an airplane involves at least two additional factors. One is steering in a vertical plane; that is, going upward, downward, or on the level. The other is maintaining an even keel; that is, avoiding undue tipping, or "banking." Most planes have a so-called stick control. Moving the "stick" forward or backward causes a fall or rise in height; moving it sideways causes tipping to the right or left. Steering right or left is accomplished by a foot bar.

For the aviator's guidance, the plane is equipped with numerous instruments: special compasses; the altimeter for recording elevation; the terrain clearance indicator, showing distance from the earth's surface. Radio direction finders, tuned to beams sent out from airports, give him his course. Radar devices, largely developed during World War II, give warning of obstacles in a plane's line of flight and accurate altitude readings in overcast or darkness. At airports equipped with radar approach systems, planes can land in fog. Directions are radioed from the ground to the pilot as the plane's course is noted on radar screens.

Jet and Rocket Propulsion. The demand for higher speeds by the military led to the development of jet aircraft and rocket missiles. The propulsion of jets and rockets is based upon the same principle—they are pushed by the reaction of their own exhaust gases. The principle of Conservation of Momentum (*q.v.*) leads to the conclusion that the forward momentum of the engine will be equal to the rearward momentum of its exhaust gases. Ejection of these gases at very high speeds is desirable.

Jets and rockets differ principally in the way oxygen is provided for combustion. In the jet, air passes into the engine through a frontal opening, is fed into the combustion chamber, and reacts with the fuel. Exhaust gases are expelled rearward. The rocket usually carries its own oxygen (liquid) and hence may operate beyond the atmosphere. Fuel and oxygen meet in its combustion chamber, with the expulsion of exhaust gases the driving force.

In jets and rockets, the development of satisfactory fuels which burn rapidly at high temperatures has been a problem. Long-range missiles have used liquid fuels called bipropellants. The fuel and oxidizing agent are carried separately, necessitating complex firing machinery and elaborate launching mechanisms. Prepackaged liquid monopropellants, easier to handle and requiring simpler mechanisms, are being tested. In "specific thrust" they have an advantage over bipropellants in addition to their ease of handling. Solid fuels, based upon a mixture of a liquid polymer fuel and an oxidizer, are being introduced. These fire quickly but with less thrust and reliability than the liquids. More exotic solid high-energy fuels based upon boron are being developed currently in the laboratories.

Jet aircraft have attained speeds up to 2200 m.p.h. but are limited to the atmosphere. Rockets have lifted satellites into orbit and have carried man into space. The X-15 rocket-plane, a piloted craft that can be lifted like a ballistic missile, is carried aloft to 35,000 feet by a B-52 and released. In a flight in August 1963 Chief Research pilot Joseph A. Walker achieved an altitude of 354,200 feet or 67 miles.

TRANSPORTATION BY AIR

The airship, being lighter than air, rises by its own buoyancy. It was the first type of aircraft to attain success. An account of its invention and early development will be found in the article on *Airship*, page 1324. It was also the first type to be used commercially in aerial transportation.

The first regularly organized aerial transport company was the "Delag," abbreviated from *Deutsche Luftschiffart Actien Gesellschaft* ("German Airship Transport Corporation"). This company, organized in 1910 by Count Zeppelin, operated with a total of six dirigibles and carried 34,228 passengers in the three years preceding the outbreak of World War I. The first trip was made June 22, 1910, by the *Deutschland* from Friedrichshaven to Düsseldorf, a distance of about 300 miles.

Important Dates in Aircraft and Missile History. The history of flight has evolved from man's primitive efforts to develop winged craft, or to soar aloft by means of balloons, through various types of airplanes and airships (notably the costly and inflexible dirigibles of the early 1900's), to jet planes and rocket propelled missiles.

Aug. 27,1783—Hydrogen first used in a balloon by Prof. J. A. C. Charles, of Paris.

Jan. 7, 1785—The first crossing of the English channel in a balloon, by J. J. Blanchard, a Frenchman.

Jan. 9, 1793—The first ascent of a balloon in America, at Philadelphia, by J. J. Blanchard, in the presence of George Washington.

1848—The first power-driven airplane which actually flew, a 9-pound model, steam-driven, constructed by John Stringfellow, an Englishman. It flew 120 feet.

Dec. 17, 1903—First successful piloted flight in a power-driven airplane, at Kitty Hawk, N.C., by Wilbur Wright, 120 feet in 12 seconds. Nine days previously Samuel P. Langley's "aerodrome" had crashed in a take-off, but was later proved capable of flight by Glenn Curtiss and flown successfully at Hammondsport, N.Y. Sept. 17, 1914.

1904—The first airship built in the United States, the *California Arrow*, by Captain T. S. Baldwin.

Aug. 22, 1906—First successful flight in Europe and first in the world without launching aids, by Alberto Santos-Dumont at Bagatelle, France.

July 25, 1909—First airplane flight across the English Channel, by Louis Bleriot, 20 miles in 37 minutes.

June 22, 1910—The first flight of an airship on a regularly operated transportation service, by Count Zeppelin at Friedrichshaven, Germany.

May 15, 1918—First regular air mail route in America inaugurated, between New York and Washington.

June 14, 1919—First non-stop transatlantic airplane flight, by Alcock and Brown, Newfoundland to Ireland, 1936 miles in 15 hours, 57 minutes.

1924—First aerial circumnavigation of the globe, by United States Army planes in 175 days.

1930—Development of "blind flying."

1931—Aerial circumnavigation of the earth in 8 days, 15 hours, 51 minutes, by Post and Gatty, as compared with the first circumnavigation in 1519 by Magellan, which required 37 months.

1934—First west to east crossing of the Pacific, by Sir Charles Kingsford-Smith and Capt. P. G. Taylor, 7365 miles in 51 hours flying time.

Nov. 1935—First transpacific air mail service—San Francisco to Manila.

June 17, 1939—Transatlantic passenger service inaugurated between U.S. and Europe.

1940–45—World War II mass production of aircraft; emergence of the helicopter as a useful craft; development of jet aircraft and V-2 rockets by German scientists.

1950–53—Korean War saw the military use of advanced jet aircraft.

1953–57—Development of turbo-prop, turbo-jet, and pure-jet commercial aircraft; experimental VTOL (vertical take-off and landing craft) introduced; advanced development of military rockets and missiles.

October 4, 1957—U.S.S.R. launched first man-made "moon" or satellite into space. "Sputnik I" was an aluminum alloy sphere 22″ in diameter weighing 184 pounds. It reached a maximum altitude of about 500 miles.

November 3, 1957—Second Sputnik launched weighing 1,120 pounds.

January 31, 1958—U.S. satellite "Explorer I" launched. Discovered existence of the Van Allen radiation belt in the earth's atmosphere.

1958—First U.S. commercial jet aircraft capable of speeds up to 615 m.p.h. and reducing flying times by nearly one half.

Jan. 2, 1959—U.S.S.R. launched "Lunik I" in a solar orbit.

Sept. 12, 1959—U.S.S.R. launched "Lunik II" which hit the moon.

Oct. 4, 1959—U.S.S.R. launched "Lunik III" which circled the moon photographing the opposite side of the moon.

April 12, 1961—Major Yuri A. Gagarin, U.S.S.R., in the "Vostok I" completed one orbit of the earth in a manned craft.

May 5, 1961—Commander Alan B. Shepard, U.S., traveled 115 miles into space in the spacecraft "Freedom 7."

Aug. 6, 1961—"Vostok II" successfully orbited 17 times.

Feb. 20, 1962—Lt. Col. John H. Glenn, Jr., U.S., successfully completed three orbits in 4 hrs. 56 minutes in the spacecraft "Friendship 7."

May 24, 1962—Astronaut Scott Carpenter in spacecraft "Aurora 7" duplicates Glenn's three-orbit flight and adds scientific data.

July 19, 1962—United States anti-missile missile Nike Zeus makes the first known intercept of an intercontinental ballistic missile.

July 23, 1962—Satellite TELSTAR, joint product of private industry and the U.S. government, inaugurates transoceanic television.

August 11–15, 1962—U.S.S.R.'s Vostok III and IV remain in closely parallel paths while orbiting 64 and 48 times respectively.

Dec. 1962—U.S. Mariner II, Venus probe.

July 31, 1964—U.S. spacecraft "Ranger 7" crashes on moon after traveling approximately 243,000 miles in 68 hrs. 35 min., sending back more than 4000 still TV close-up photos giving much data heretofore uncharted.

Oct. 12, 1964—U.S.S.R. 3-man team, in a single craft, orbited the earth 16 times in 24 hrs. 17 min. First multiman space flight.

Commercial Air Transportation. At the end of the second decade of commercial air transport in the U.S. in 1940, there were 2331 airports in operation and 16,903 aircraft which carried 3,185,278 passengers and over 14 million pounds of freight and express traffic. At the end of 1960, there were 6835 airports in the U.S. Approximately 1900 aircraft carried 50,584,135 passengers.

The airlines carried nearly 644 million ton-miles of freight. Significant changes involved increasing use of jets and helicopters (234 of the craft operating in 1960 were turbo-jets and 188 turbo-props). The use of jet aircraft is costly not only in terms of the craft but in airport expansion and modernization as well. The nation's busiest airport in 1961 was Chicago-Midway; by 1962, this airport was abandoned by commercial flights in favor of O'Hara Field due to its inability to expand runways to meet jet requirements. With increasing costs and a narrowing of the profit margin, several mergers have occurred among major domestic lines.

Mass production of aircraft began in the United States in 1942 under the pressure of war. In that year also was begun the production of large transport planes, each capable of the transoceanic transport of many tons of freight on each trip.

Federal Control. Federal promotion and regulation of civil aviation are carried out by two bodies—the Civil Aeronautics Administration and the Civil Aeronautics Board. The Civil Aeronautics Board is an independent agency concerned primarily with the issuance of certificates of public necessity, economic regulation, the formulation of safety regulations, and the investigation of accidents in civil aircraft. The Civil Aeronautics Administration is an operating agency of the Department of Commerce. Its principal activities are the building and operation of air navigation aids, the enforcement of safety regulations, and the promotion of a national airport system.

LABOR RELATIONS

SINCE the days of feudalism, the world's work has been done under what is known as the system of free contract which means that the employee delivers his work to his employer for a stipulated price. Forced labor, as under slavery, and labor exacted as a duty because of social status, which prevailed under feudalism, theoretically at least have no part in labor relations today among democratic nations.

Before the rise of large-scale industry, as on many farms today, the relation between employer and employee was close and personal. But as the small property owner yielded to the large corporation as the typical employer, the relation of employee to employer became rather that of production worker to manager with personal acquaintance replaced by rules and policies. In a corporation, the management itself consists of employees of the corporation. Its interests, however, lie chiefly with the owners of the corporation rather than with the production workers. This fact provides the setting for the problems of labor relations in industry.

Management and Workers. The interests of management and workers conflict in so far as each group seeks to obtain a larger share of the revenue of the enterprise. Their interests overlap, however, in that neither could operate the enterprise without the aid of the other and both stand to profit by enlarged revenue. Under normal conditions, ownership and management have the initial advantage that they do not need workers as much as the workers need them. That is to say, the workers are usually much more dependent upon the weekly or monthly pay check than the owners of capital are upon profit or dividends from business. The owners are likewise able, as a group, to employ their superior money resources as a purveyor of power through political activity, use of the courts, and publicity. To offset this advantage, workers eventually built up strong organizations—labor unions—to mobilize countervailing economic and political power.

Role of the Government. For these reasons the labor problem in an industrialized nation enters vitally into government itself. On the one hand, two groups, one the wealthier and the other the more numerous, compete for control. But the government, which represents all other interests as well as these, has a primary concern in seeing that peace is preserved, production of goods is promoted, and the causes of strife are eliminated. It has also an interest in seeing that the health and well-being of the citizenry are not impaired by substandard conditions of work.

In so-called totalitarian states, labor unions are either suppressed or become in effect branches of the governmental organization. In either event, their freedom of action in striking and consequently in negotiations with employers is lost. Wages and working conditions are apt to be set by the government.

INDUSTRIAL CONFLICT

In the early 19th century, the legal relation of employer and employee was still that of master and servant, a relic of the feudal system. Concerted action by employees to obtain better wages or working conditions was punishable by the courts as conspiracy, for which prison sentences might be imposed. In 1842, however, the Supreme Judicial Court of Massachusetts, then perhaps the most influential court in the country, ruled that employees might lawfully organize for mutual aid.

This right was slow in obtaining recognition. Its practical exercise, however, and the use of it to better the conditions of labor provide the key to most of the economic conflict between capital and labor both before and since.

The ultimate weapons of industrial conflict are the strike on the part of employees and the lockout on the part of employers. These simple forms of economic pressure, however, are usually supplemented by other actions intended to break the resistance of the opposing parties. Strikes, cessation of work by a group of employees until certain issues are settled, are usually accompanied by picketing and may be supplemented by boycotts. In the past, especially in the late 1930's, the stay-in or sit-down strike technique was used. Lockouts are much rarer than strikes. Most employer action in industrial disputes, therefore, takes the form of combating strikes.

Early History of Unions. The first recorded strike in America took place in the colonial period, when in 1741 New York bakers quit work as a protest against a municipal ordinance regulating the price of bread. The earliest known strike for higher wages took place in 1786, when the Philadelphia printers ceased work as a means of enforcing their demand for a minimum weekly wage of six dollars. A sympathetic strike took place in 1799, when the shoemakers, belonging to the organization known as the Federal Society of Journeymen Cordwainers, were compelled to lay down their tools in order to aid the bootmakers, who were seeking an increase in wages. This action may be regarded also as the first *organized* strike in America. Sympathetic strikes, however, did not play an important part in industrial disputes until the last two decades of the 19th century.

A successful attempt to establish a 10-hour working day was made by the unions of Philadelphia in 1835. Fifty-one years later, in 1886, occurred the first nation-wide strike for an eight-hour day.

Many trade unions were formed in the period between 1792 and 1810, especially in the cities of New York, Baltimore, Philadelphia, and Pittsburgh. The first central organization of trades in one city was formed at Philadelphia in 1827. It was called the Mechanics Union of Trade Associations.

In 1833, there were 29 organized trades in New York City. Many of these affiliated to form the New York Trades Union. Similar organizations followed quickly in other cities, so that when a convention was called in New York in August 1834, delegates were present representing the trades unions of Boston, Brooklyn, Philadelphia, Poughkeepsie, New York, and Newark. At this convention was inaugurated the National Trades Union. A trades union, comprising as members *unions* in various trades, must be distinguished from a trade union, which comprises as members *individual workers* in *one* trade only.

The printers were apparently the first craft to unite their local units into a national association, so that the Typographical Union, organized in 1850, is the oldest *national* trade union in America. The Stonecutters effected a national organization in 1853; the Hat Finishers, in 1854; the Molders, and the Machinists and Blacksmiths, in 1857.

In addition to unions of the workers in a particular trade, two organizations on a national scale arose prior to 1870, each of which admitted workers of any trade. The first was known as the National Labor Union, founded in 1866. The second, established in 1869, was called the Noble Order of the Knights of Labor. It began as a secret society, but the policy of secrecy was abandoned in 1878. Dissensions within these organizations led, in 1881, to the formation at Pittsburgh of the Federation of Organized Trades and Labor Unions of the United States and Canada. This federation merged with a separate trade union conference on December 8, 1886, forming the present American Federation of Labor. In 1889, the new federation recognized the continuity of its existence by dating its records from 1881.

Strikes. A strike is a concerted cessation of work on the part of the employees to compel an employer to meet their wishes as to wages or other conditions. It is a two-edged weapon, however; sometimes it cuts three ways. While its purpose is to cause loss to the employer, it also cuts off earnings of employees and may entail serious consequences for the public.

To enable employees to stand the loss of wages, labor organizations usually accumulate strike funds from which payments may be made to needy strikers in the form of strike benefits.

When the effect of strikes on the public goes beyond mere inconvenience and threatens disorganization of customary ways of living, as when electric power is cut off, the government is likely to intervene. Some states make strikes against public utility companies unlawful. The Federal government has the power by law to delay strikes which the president finds to imperil the public health or safety.

Sit-down Strike. This is a term applied when strikers, instead of leaving their jobs, remain at their places and refuse to work. Such action amounts practically to taking over the shop. When first used, in 1937, the sit-down strike brought workers some conspicuous successes, but in 1938 it was held by the U.S. Supreme Court to be illegal, and participants were deprived of the protection of Federal labor laws which they would otherwise have enjoyed.

Sympathetic Strike. This is a strike called by a union against an employer with whom the union has no quarrel, the purpose being to aid a sister union involved in a dispute with another employer.

Picketing. The picket line is the commonest means of adding to the effectiveness of a strike. It usually takes the form of a file of strikers carrying signs near a plant entrance, the signs conveying in simplified form the strikers' version of the dispute. The signs, for example, may read, "Unfair to organized labor." Sometimes sound trucks are pressed into service to give the public a more detailed account of the strikers' case.

The effectiveness of a picket line may be much greater than the number involved would lead one to expect. This is because crossing a picket line is regarded by large numbers of people as a species of treason to the employee class or the labor movement. The picket line helps to make a strike complete.

When feelings run high, picketing may become much more than an advertisement of the strikers' case. The pickets may attempt forcibly to prevent nonstrikers or customers from entering the employer's premises. This is sometimes known as obstructive or violent picketing as opposed to peaceful picketing.

Peaceful picketing has been declared by the United States supreme court to be a right protected by the Constitution as a form of free speech. On the other hand, courts ordinarily take the view that violent picketing is unlawful and may be forbidden by injunction. Even peaceful picketing when engaged in for unlawful purposes falls under the ban of many laws which define such purposes.

Boycotts. In addition to picketing, unions frequently seek to exert pressure on employers with whom they are in controversy through destroying their markets by means of boycotts. That is to say, members and others are asked not to patronize the employer concerned.

Secondary Boycott. A boycott is secondary when it is aimed only indirectly at the employer with whom the union has a quarrel. It seeks to reach him by forcing his customers, suppliers, or employees to cease doing business with him until he consents to what the union wants. An example would be picketing a radio store to prevent it from handling radios made by a company against which the union was striking. Such tactics are forbidden by Federal law and by some state laws.

Union Label. The use of a special label for goods made in factories where labor is unionized is another form of aiding a consumer's boycott. In another sense it is a form of advertising so as to permit preferential buying, comparable to the injunction to "buy home goods."

Strikebreaking. The usual strategy of the employer in combating a strike, the picket line, and boycott is to attempt to operate his business with nonstrikers or new employees and weaken the morale of the strikers. Injunctions against picketing and boycotts may be sought. Attacks on morale of strikers may take the form of enlisting the aid of a citizen's committee to organize a "back to work" movement, obtaining police aid in escorting nonstrikers through picket lines, and sending "missionaries" to strikers' families to undermine confidence in the union's leaders and in the ultimate success of the strike. Professional strikebreakers ("finks") may be employed to create the impression that the plant is fully manned. Or an impression may be created that the plant will close down permanently.

LABOR INJUNCTIONS

It is impossible to understand industrial conflict without appreciating that, while the objective of employees is better pay and working conditions, these can be achieved as a rule only when the employees are able to act together effectively. Only by organizations can strikes, picketing, or boycotts be made into effective instruments.

For this reason, in the earlier stages of the industrial age, employers' efforts to combat employee demands were aimed at preventing employees from organizing. One method used was to insist that new employees sign what came to be called "yellow-dog contracts." These were undertakings not to join a labor organization on pain of discharge. Even without such contracts, many employers considered membership in such organizations ground for discharge.

When conflicts came into the open through strikes and picketing, the weapon of court injunctions was relied on. An injunction is a court order usually issued to prevent the violation of someone's right. If it is disobeyed, the violators may be punished at the court's discretion through fines or imprisonment.

The first labor injunction by a Federal court was issued in 1885 (*U. S. v. Kane*) to prevent an act threatening a bankrupt property which was directly under the guardianship of the court. This precedent was extended to protect private property rights in the case of Casey v. Cincinnati Typographical Union, decided in 1891. Thereafter injunctions were used freely to prevent picketing and other strike action, frequently without the union being notified or given a chance to reply.

Antitrust Laws. In 1890 Congress passed the Sherman Antitrust act designed to break up combinations of capital. Combinations in restraint of interstate commerce were made subject to injunctions and to suit for triple damages by persons injured by the combinations. This law was utilized to prevent picketing and boycotts where interstate commerce was affected.

The supreme court of the United States, in 1906 and 1908 respectively, decided that a boycott conducted by a labor union against goods of a manufacturer with which the union has a dispute and a boycott against retailers buying from such a manufacturer fall under the prohibitions contained in the Sherman act. (See *Buck Stove and Range Case* and *Danbury Hatters' Case.*) The Clayton act, amending the Sherman act in 1913, provided that the antitrust laws should not apply to labor unions acting lawfully in pursuit of their legitimate purposes. The courts held, however, that action which interfered with interstate commerce was not part of the legitimate activity of unions, thus leaving the earlier decisions of the supreme court in effect.

Norris-LaGuardia Anti-Injunction Act. This act, passed in 1932, attempted, among other things, to do what the Clayton act failed to do. It forbids Federal courts to issue injunctions in labor disputes except under narrowly defined circumstances. The result was that labor organizations were pretty largely freed of injunctions issued by Federal courts. A seeming exception was the 1947 injunction to prevent a coal strike, but this applied to a government-operated industry.

Injunctions Under Taft-Hartley Act. The Labor-Management Relations act, 1947, popularly known as the Taft-Hartley act, punched at least two holes in the Norris-LaGuardia act. First, it allows injunctions in labor disputes at the instance of the national labor relations board, an agency established for regulating labor relations. This agency is *required* to seek orders to stop secondary boycotts and certain other kinds of "unlawful" acts by unions. It is *permitted* to seek such orders to stop "unfair labor practices." (See *Taft-Hartley Act* below.)

The other major modification in the Anti-Injunction act is a provision of the Taft-Hartley act under which the attorney general of the United States may obtain injunctions to delay up to 80 days any strikes found by the president to affect the public health or safety.

RIGHT TO ORGANIZE

As stated above, a key objective of employees in industrial conflict is the right to organize for mutual aid and protection. The chief obstacles to the exercise of this right have been these: (1) the discharge of employees known to be members of unions or active in forming unions; (2) refusal by employers to recognize and deal with unions organized by employees to act as their agents; and (3) undermining the unions of employees by organizing so-called company unions which the employer could control.

After decades of costly controversies in which these tactics were combated by unions through the use of their economic weapons of strikes, picketing, and boycotts, Congress adopted legislation to curb those employer practices which undercut the right of employees to organize. The six principal steps in this legislation are as follows:

In 1926, the Railway Labor act asserted the duty of railroads to deal with freely chosen representatives of their employees for the establishment of wages, hours, and other conditions of employment. In 1929, the United States supreme court held that employers violate this law by forming company unions and dealing with them as though they were the freely chosen representatives of employees (*Railway Clerks v. Texas & New Orleans Ry.*).

In 1932, the Norris-LaGuardia act, already referred to, forbade "yellow-dog contracts." It thereby put an end to the practice of requiring employees to consent in advance to their discharge if they joined a union.

In 1933, the National Industrial Recovery act authorized industry codes in which it was obligatory to incorporate terms which (1) prohibited employers from discriminating against employees for union activity and (2) required employers to recognize as bargaining agent of employees any union selected by the majority of the employees. The act was declared unconstitutional in 1935.

In 1934, the Railway Labor act was amended to provide for designation of employees' bargaining agents by a government agency, the national mediation board. That representative—union or person—must be designated for which the majority of the employees in any craft or class have voted to represent them in dealing with the railroad employing them.

Wagner Act. In 1935, Congress adopted the National Labor Relations act, popularly known as the Wagner act. This law served as a basic guarantee of the right to organize and bargain collectively. There were two principal reasons for its effectiveness.

First, it brought under Federal regulation nearly all forms of business except small local enterprises.

Second, the act provided an enforcing agency, the national labor relations board, which prosecuted violations at government expense and without cost to the complainant.

In 1947, this basic labor law was made still more sweeping by a new act. At the same time its emphasis was changed. While the purpose of the Wagner act was to remove certain causes of labor strife by restraining conduct of employers, the Labor Management Relations act, 1947, was designed to guard rights of the public, of employers, and of individual employees. In doing so, it abridges in some respects the collective rights of employees which had been guaranteed by the Wagner act.

TAFT-HARTLEY ACT

The Taft-Hartley act, officially known as the Labor Management Relations act, 1947, contains as Title I the National Labor Relations act (the Wagner act of 1935) as amended in 1947. The other titles, or divisions, of the act relate to restrictions on payment of benefits to employees or unions, outlawry of certain kinds of union conduct, suability in the Federal courts for breach of agreements, and handling of disputes imperiling the national health or safety. The act also establishes the United States mediation and conciliation service and defines its rôle in the settlement of labor disputes.

The most publicized part of the law is Title I. This is the part which forbids as "unfair labor practices" certain types of conduct on the part of employers and of unions. It describes the methods by which the conduct may be stopped through action by the national labor relations board and the courts. It also prescribes means by which the union chosen by the majority of employees may be given official status through "certification." Finally, it imposes certain conditions with which unions must comply before they are permitted to use the services of the board.

Unfair Labor Practices. This is the term with which Title I of the act brands forbidden conduct. There are five principal unfair labor practices of employers and six unfair labor practices of unions or their agents. Those of employers were forbidden by the Wagner act of 1935 and are carried forward with a few changes into the later law. Those of unions were added by the Taft-Hartley act in 1947.

Practices Forbidden Employers. Employers are forbidden to engage in the following practices:

(a) *Discrimination for Union Activity.*—This prohibition acts as a limitation on the right of employers to hire and fire at will. It means in practice that employers may not discharge or otherwise discriminate against workers for the reason that they are or are not union members or that they have engaged in concerted activity (or refused to do so) to advance their interests.

(b) *Domination of a Labor Organization.*—This means organizing, or encouraging employees to organize, an inside labor union or it may mean merely giving financial or other support to a union which the employees have organized on their own initiative. The reason which frequently actuates employers in supporting inside unions is the desire to forestall organizers from outside. When organized from outside, employees typically affiliate their local organization with a national union and draw strength and support from it in dealing with their employer. An inside group dominated by the employer is frequently referred to as a "company union."

(c) *Refusal to Bargain.*—This is an unfair labor practice which has an exact counterpart among those forbidden to unions. The meaning of it will be described below.

(d) *Interference with Employee Rights.*—This also has its counterpart among unfair practices of unions. The rights with which interference is forbidden are the rights to join, and refrain from joining, unions

formed for the purpose of dealing with employers. As applied to employers, the term has a very broad meaning. It may include the conduct described in (a), (b), and (c) above and many other acts. Some acts which have been forbidden under this head include: Insisting on employees' signing of individual contracts in place of bargaining collectively through a union; espionage and questioning employees about their union membership; and maneuvers to weaken unions, such as transferring production from a plant where the union is strong to a plant where it has not obtained a foothold.

Discrimination for Giving Testimony.—The employer may not discriminate against an employee for filing charges or giving testimony under the Act.

Practices Forbidden Unions.—Unions and their representatives are forbidden to engage in these unfair labor practices:

(a) Coercion of employees in their right to join or refrain from joining labor organizations formed for the purpose of collective bargaining or coercion of employers in the selection of their agents in dealing with employees either when bargaining or handling grievances.

(b) Causing or attempting to cause an employer to discriminate against a worker who has been denied membership in a union for reasons other than certain ones specified in the Act.

(c) Refusal to bargain with employers, provided the union represents the majority of employees.

(d) Participation in secondary boycotts or striking and picketing for three other specified improper purposes. The purposes which are declared improper or unlawful are: (1) Organization from the top down through picketing, as when a union, without any members among employees, goes to their employer and compels him, by picketing, to give it a contract covering his employees; (2) supplanting an officially certified bargaining agent by compelling the employer to recognize the picketing union instead; and (3) forcing the solution of a dispute over work jurisdiction, as when a carpenters' union pickets an employer to compel him to let its members do work which he is having members of a machinists' union do.

(e) Charging excessive or discriminatory fees to members where the employee is permitted to hold his job only if he joins the union. There are special rules under the law which govern such compulsory membership. They are explained below.

(f) Compelling an employer to pay money, in the nature of an exaction, for work which is not intended to be performed.

Some of these unfair labor practices—those of employers—have been defined more concretely by judicial interpretation over a period of years. The one known as refusal to bargain, which is forbidden both to employers and unions, is defined at some length in the law itself. Important points in the elaboration of "discrimination," "domination," and "refusal to bargain" follow.

Discrimination Interpreted. In determining whether the discharge of an employee was for union activity or for some reason not forbidden by the law, such considerations as the following are taken into account.

1. Did the employer know of the employee's union membership? If he did not, the discharge could not have been for this reason.

2. If the alleged ground of discharge is inefficiency, were non-union employees of less efficiency for the same kind of job retained? If so, the employer's defense is weak.

3. If the discharge is said to be because the employee broke a rule against engaging in union activity on company time, are other rules against outside activity similarly enforced? If not, there is a presumption that the discharge is unlawful.

When persons unlawfully discharged are ordered reinstated, persons hired to replace them must be dismissed by the employer if necessary to make room for them. The same applies when employees are ordered reinstated after participating in a strike caused by an employer's unfair labor practice. If the strike, however, is economic, that is, for the purpose of obtaining better wages or working conditions, the strikers are entitled to their jobs back only if the jobs are still available.

Strikers or unlawfully discharged employees are not entitled to reinstatement if they have been guilty of crimes in connection with the labor dispute, have participated in sit-down strikes, or have, through their union, breached a contract with an employer.

Unlawful Aid to Unions. Support or aid which the law forbids employers to give to organizations of employees has been held to include the following procedures:

1. Suggesting the formation of a union, either personally or through supervisors, or facilitating its formation by advice or by provision of space or supplies free of charge.

2. Pressure placed on employees to join, particularly if the pressure includes threats of reprisals or promises of benefits.

3. Paying officers of the organization for time spent on the activities connected with it.

4. Eagerness in recognizing and executing a contract with the organization or giving it credit for wage increases granted, particularly if an outside union claims at the same time to represent a majority of the employees.

Duty to Bargain. The courts have held that, by making unlawful a refusal to bargain, Congress has created a positive duty to bargain in good faith. The Taft-Hartley act imposes this duty on both employers and unions, whereas the Wagner act imposed it on employers only.

The Taft-Hartley act defines the duty to bargain to include meeting at reasonable times, conferring in good faith on conditions of employment, negotiating an agreement or a dispute arising out of an agreement, and executing a written contract on request embodying the points agreed upon. The law, however, does not compel either party to agree to a particular proposal or to make a concession.

Freedom of Speech. The unfair labor practice of interference with employees' organizational rights was interpreted in the early years of the Wagner act to prevent employers or supervisors from expressing their views to employees about unions. The courts held that the words of employers were "loaded" in view of the employers' economic power over their employees. The Taft-Hartley act, however, specifically provides that expressions of opinion may not be considered evidence of an unfair labor practice unless the words contain a threat of reprisal or promise of benefit.

Union Security. This term is applied to agreements between employers and unions under which employees must belong to the union if they are to continue in their jobs. It has a very special relation to the unfair labor practice of discrimination.

It should be explained first that carrying out such an agreement by discharging an employee who is not a union member amounts on its face to discrimination in respect of union membership. The Taft-Hartley act, however, permits this exception to its ban on discrimination but hedges it about with a number of conditions.

In the first place, the law forbids the closed shop.

The *closed shop* is an arrangement under which the employer is restricted to hiring persons who are members of the union.

The law does permit the union shop or a membership-maintenance agreement—but with some "ifs."

The *union shop* is an arrangement whereby employers may hire regardless of union membership, but employees, to keep their jobs, must join the union within a stated period (30 days under the Taft-Hartley act) and must thereafter remain members. Otherwise, the employer is required to discharge them.

Membership maintenance is an arrangement whereby those employees who are members of the union on a given date or who later become members must remain members if they are to keep their jobs. An "escape period" may be allowed for resignations before the rule goes into effect.

While the Taft-Hartley act allows negotiation of union shop contracts, it allows individual states to outlaw such agreements. If a state wishes to enact a law disallowing union shop or maintenance of membership clauses, it may do so, and the state law takes precedence over the federal measure. This recognition of states rights is a one-way affair. A state may not enact a law that allows greater union security, say a closed shop, and have this law take precedence over the Taft-Hartley prohibition of such clauses. The federal law specifies that it is to be superseded by state law only if the state law is more restrictive of union security than the federal enactment. In 1960 nineteen states had enacted so-called "right-to-work" laws which outlawed any kind of union security clause.

Under the Taft-Hartley law, failure of the employees to continue their membership for any reason other than nonpayment of dues will not justify discharge. For example, if a member is expelled from the union for violating its rules of conduct but offers to pay his dues, he may not be discharged from his job by the employer because of his lapse of union membership.

If these conditions are ignored, it becomes an unfair labor practice for the employer to discharge the employee for nonmembership in a union and it becomes an unfair labor practice for the union to try to force the employer to make the discharge. Either the employer or the union or both may be required to make good the wages lost by an employee discharged under these circumstances.

Bargaining Agents. It is a basic principle of labor law that, if a majority of the employees concerned select a union to represent them in bargaining, the employer has the duty of dealing with that union. But the determination of whether a particular union is the majority's choice is beset with many practical difficulties.

The first problem is, who are the "employees concerned"? Are they the employees in one department, in the entire plant, or in some other grouping? To solve this problem, the national labor relations board is given the duty of deciding which employees are in a bargaining unit.

The second problem is, do the employees really wish the union to represent them? Some may be afraid to join the union because the employer is opposed. Or some may be afraid not to join because of pressure by fellow employees. The difficulty is solved by having a secret election conducted by the national labor relations board to determine the free choice of the employees.

Unit for Bargaining. Establishing the unit appropriate for collective bargaining corresponds, in its field, to determining in political life what classes of persons are eligible to vote in an election. The process, however, is frequently much more complicated. Bargaining units fall principally into one of the following types:

1. *Craft unit,* which consists of those employees of a firm who follow one craft or occupation, such as carpenters, molders, or machinists.

2. *Plant unit,* which consists of all employees working in one plant. In practice, clerical, supervisory, and other special kinds of workers may be excluded.

3. *Employer unit,* which consists usually of all those working for one employer, who has a number of plants. The term is sometimes extended to include all persons working for members of an association of employers, which is authorized by its members to bargain for them.

The term *industrial unit* is sometimes applied to cover plant and employer units. It is used to point a contrast with craft unit, since the industrial unit takes in all workers without distinction of special skills.

Craft unions ordinarily seek to have craft units established, while industrial unions prefer plant or employer units. In practice, however, a number of craft unions may act together through a joint council in a form very similar to an industrial union. Industrial unions, on the other hand, may make special contracts for special classifications of their members, with a result similar to that secured by cooperating craft unions.

Determination of Units. In establishing units for bargaining, the labor board first excludes all persons whose interests are held to lie with the employer rather than with the other employees. These ordinarily include executives, supervisors, foremen, secretaries, and personnel directors. The rule is that those who have power to hire and fire or whose recommendations on employment are given weight are considered to be on the side of management. Supervisory employees are excluded from bargaining units because the law excludes them from the definition of "employee."

The law also provides that plant guards may not be in the same unit with other employees, nor may they be represented by a union which is affiliated in any way with a union representing the other employees in the plant. Professional employees must be given the option of inclusion with other employees or constituting a unit of their own. Craft employees also are usually given a choice of bargaining in a separate unit.

Within these limits, the labor board usually decides the question of unit by the test of effectiveness in bargaining. This test has been interpreted to mean:

1. Where bargaining has been effectively carried on in the past, the unit used should not be disturbed. This is sometimes known as the history-of-bargaining rule.

2. When a union and an employer differ as to the proper unit, the union's preference is usually given the greater weight, provided it does not do violence to the way the employer's business is organized.

Employee Elections. An election to choose a bargaining agent will usually be held if a union can show that it has a following of 30 per cent of the employees concerned. An employer may ask for an election if one or more unions claim to represent the majority of employees. Individual employees also, with support of 30 per cent of their unit, may secure elections. If there is no legal obstacle, the board sets up a polling booth and the election is on.

Where only one *bona fide* union is seeking to be certified as agent for employees, the ballots present a choice for the union or against it. If two or more unions compete, the employee is permitted to vote for either or for no union. If no one choice receives more than 50 per cent of the votes, the choice obtaining the lowest number is eliminated and a run-off election is held.

If a union wins an election which the board directs, it is "certified" as bargaining agent. If no union is selected, collective bargaining need not take place.

A union once certified remains the bargaining agent until displaced by another in a subsequent election or until it is "decertified." Decertification by the board takes place only after a decertification election, which may be asked for by 30 per cent of the employees or by another union. If the challenge fails, the union is recertified.

National Labor Relations Board. This is the agency which is responsible for application of the National Labor Relations act as soon as an employer, a union, or an employee brings before it a situation which calls for action.

One branch of the board investigates charges of violations and, if they appear to have merit, issues a "complaint" and prosecutes the action. This branch is known as the office of the general counsel.

The prosecution is before a trial examiner appointed by the board, which consists of five members. When the trial examiner makes his decision, it becomes final after 20 days unless appealed to the board within that time. The board's decision, in turn, may be appealed to a United States circuit court of appeals and the supreme court.

The general counsel's office also conducts elections and issues certifications, but its rulings in the matter may be appealed to the board as the final tribunal. There is no appeal to the courts.

When the board finds that an employer or a union has committed an unfair labor practice, an order is issued designed to restore the status quo existing prior to the commission of the act.

The following are typical requirements in orders issued by the board:

Cease discouraging membership in union;

Cease supporting, financially or otherwise, association of employees or recognizing it for bargaining purposes;

Reinstate employees discharged because of their union activity and pay them back wages from date of discharge;

Bargain on request with union which has been chosen by majority of employees;

Post notices that the order will be complied with.

The board's orders are enforceable only by the courts, which are required on petition to review them on points of law. The courts may enforce the orders, modify them, or set them aside.

Despite the applicability of the Taft-Hartley act to many union activities, the U.S. Supreme Court ruled in 1958 that individuals could sue unions in state courts for losses sustained due to inability to work because of expulsion from a union or action of pickets during a strike. (See *Association of Machinists* vs. *Gonzales*, and *United Automobile Workers* vs. *Russell*.)

Injunctions to Stop Unfair Labor Practices. As stated above, the labor board gets its orders enforced by securing a decree from a United States circuit court of appeals. Disobedience to such orders may be penalized by fine or imprisonment. But the board has recourse also to United States district courts to secure speedier action.

The general counsel of board is authorized to seek injunctions to stop any unfair labor practice after he has issued a "complaint," that is, after he has begun formal action in prosecuting a violation. An injunction is sought at this stage only when the alleged violation is of an important character.

In respect of one group of unfair practices, however, the board is directed to seek an injunction as soon as it is determined that a complaint should be issued. This group comprises the practices listed above under unfair labor practices of unions, paragraph (d). They may be roughly identified as secondary boycotts, organizational picketing, striking to displace a lawful bargaining agent, and striking over a work-jurisdiction dispute.

These practices are singled out for special attention also in a separate section of the law by being designated as "unlawful." Persons suffering loss from such practices are given the right to sue for damages in the Federal courts without regard to the usual limitations on actions in these courts.

Suits for breach of collective bargaining contracts are given similarly privileged status in the Federal courts.

National-Emergency Disputes. The Taft-Hartley act lays down special procedures for postponing or halting national-emergency strikes, that is, strikes affecting all or a large part of an industry and imperiling the national health or safety. If the president so identifies a dispute, he may appoint a board of inquiry to report on the issues. The government may then go into court for an injunction to stop or postpone the strike until these three steps are taken: (1) The parties negotiate with governmental assistance through mediation; (2) if no agreement is reached in 60 days, the board of inquiry reports the position of the parties, which is made public by the president; and (3) the national labor relations board in the next 15 days polls employees on acceptance of the employer's last offer. If the offer is rejected, the injunction is dissolved, and the parties are left to the arbitrament of economic weapons. Settlement of the dispute, of course, at any time in this period would also lead to dissolution of the injunction.

LABOR-MANAGEMENT REPORTING AND DISCLOSURE ACT OF 1959

(Landrum-Griffin)

Presumably this law was to correct abuses in union and management behavior publicized by the McClellan Committee hearings. However, it went further than simply correcting abuses—it made a number of changes in prior labor legislation and significantly modified Federal labor policy.

The Act sought to protect the rights of union members and insure democratic union administration. Local unions must elect officers at least every three years, and nationals at least every five, by secret ballot. Locals may not raise dues without majority approval by secret ballot and certain restrictions are put on dues increases by organizations other than locals. Members are insured freedom of speech in union meetings, the right to nominate candidates, and to vote in union elections.

Unions must adopt constitutions and by-laws and file with the Secretary of Labor copies of these and a variety of reports on finances and administrative practices. Union officers are required to file reports which would show financial connections that could influence their dealings with management; employers must make reports showing dealings with union officials.

Some modifications in the Taft-Hartley law are technical. Employment, by unions, of Communists is prohibited for five years after membership. Revisions insure that, if the National Labor Relations Board does not take jurisdiction in an issue, a State agency may do so, thus eliminating a "No Man's Land" that evolved under Taft-Hartley. Secondary boycotts, attempts by a union to persuade persons not involved directly not to patronize the boycotted concern, were restricted further, but in construction and garment manufacture the provisions were softened.

In general, violations of the Act are punishable by fines and imprisonment. Administration of the Act throws a major responsibility on the Secretary of Labor. The Secretary is empowered to conduct investigations when it is believed that violations (other than those arising from the "Bill of Rights of Members") have occurred or are threatened. The numerous reports and other data required under the Act go to the office of the Secretary; he must supervise the internal affairs of unions much more closely than ever before. The results of the law depend primarily on the actions of the staff of the Secretary.

COLLECTIVE BARGAINING CONTRACTS

The purpose of collective bargaining is to arrive at a contract between employer and union which will govern relations between the parties for a definite period of time—usually a year. Among the subjects which collective bargaining contracts typically cover are these:

1. Union recognition, with a description of the unit of employees represented by the union.
2. Wage rates, possibly with provision for renegotiation after a certain time.
3. Hours of work, with provision for premium rates of pay for hours in excess of the standard day or week.
4. Holidays, with the rate of pay when work is performed on holidays.
5. Vacations, showing eligibility and length, with the amount of vacation pay to be given.

6. Seniority and other ground for promotions and for the selection of those to be laid off and rehired in business fluctuations.

7. Employee benefits, such as sick leave or pension plans.

8. Guarantees of various kinds, such as (1) an employer's undertaking not to discriminate among employees on specified grounds or (2) a union's promise not to strike.

9. Grievances, with procedures for settlement. The procedures usually culminate in arbitration of unsettled grievances arising out of disputed points in the contract or even of all disputes.

10. Union security, which might include the union shop or checkoff.

11. Termination, often with a provision for automatic renewal if neither party gives notice before a certain date that it desires a change in terms.

Limitations on Contracts. The Taft-Hartley act, as noted above, forbids closed-shop clauses. Other contract terms limited by the law are those providing for the checkoff and employee welfare funds.

Checkoff.—This is an arrangement whereby the employer holds back from the employees' pay envelopes the amount of union dues and pays the proceeds over to the union's treasurer. The law permits the checkoff only if the employee authorizes the employer in writing to make such deductions from his pay. The authorization may not be made irrevocable for longer than one year.

Welfare Funds.—The law permits the setting up of trust funds under contracts, but, if the employer contributes to such a fund, the money must be used only for genuine welfare purposes of employees and their families. Management must be given an equal voice in control of the fund, disputes to be resolved by having a third, neutral member on the governing committee.

AVOIDANCE OF DISPUTES

In advance of the acceptance of collective bargaining, a large number of employers put into practice arrangements designed to give employees a sense of unity with the enterprise, thus mitigating or obscuring any division of interest which might lead to disputes. Under collective bargaining, the approach toward elimination of controversy takes typically the form of methods for disposing of grievances. In some instances, a more positive step has been taken through mutual arrangements to increase efficiency or expand markets on the understanding that wages are to be increased, or not decreased, if the efforts are successful.

Methods adopted on employer initiative are usually considered as part of personnel management. Undertaken as a long-range means of increasing efficiency, this form of management aims to keep employees satisfied, loyal to the company, and disposed to give their best services. Methods include wage incentive systems, and granting of special benefits, such as insurance and profit sharing. Labor leaders frequently oppose their use on the ground that they detract from loyalty to the labor movement on which employees in general, it is stated, must depend for safeguarding of their interests.

Settlement of Grievances. Nearly all collective bargaining contracts prescribe steps to be taken for settlement of disputes arising under their terms and provide that no strike or lockout is to take place during the life of the contract until such steps have been taken. Some contracts go still further and prohibit all work stoppages. Under such contracts the final step in settlement of disputes is arbitration, both sides binding themselves in the contract to abide by whatever award is made.

The following generalized description illustrates the manner in which a dispute arising under a contract may be settled.

Workman Smith complains that, having been told to report for work, he did so, found no work available, and yet was not paid for four hours as required under terms of the contract applying to this situation. The foreman giving no satisfaction, Smith carries the complaint to the shop steward. The shop steward is a union member elected by the "local" for the purpose of taking up grievances of employees with supervisors. The status of shop steward is recognized by the company under the contract.

The steward is told by the foreman that he had not notified Smith to report. The dispute thus hinges on a question of fact, which must be decided on the basis of evidence, if any.

At the next meeting of the union's grievance committee, the status of which also is recognized under the contract, the steward reports the complaint, the statements of Smith and the foreman, and the evidence which each is able to adduce. If the committee, possibly after discussion with both parties, thinks Smith was mistaken, the complaint is dismissed. If it disbelieves the foreman, the chairman of the grievance committee takes up the matter with the supervisor or other superior official. Failing settlement here, an officer of the national union may be called in to speak with the highest executive officer of the company. This completes the grievance procedure where there is no absolute prohibition of strikes or arbitration clause.

Arbitration. This term applies to the settlement of a dispute by the decision of an umpire or impartial committee, both sides agreeing in advance, or being required by law, to accept the award. If acceptance is required by law, the arbitration is said to be compulsory; if by agreement, the arbitration is called voluntary.

There are two different kinds of situations to which arbitration of labor disputes is applied. One is a dispute over rights arising under a contract, such as the dispute outlined above. Arbitration in such a situation is sometimes known as arbitration of rights. This is the most usual type of arbitration.

Railway Labor Disputes. The Railway Labor act of 1926 set up a special procedure for avoiding strikes which was the precedent for the Taft-Hartley act's provision respecting national-emergency disputes described above. If a strike is threatened, the president may appoint an "emergency board" to investigate the dispute and make recommendations within 30 days. For that period and an additional 30 days the parties are forbidden to make any change in conditions, but no penalties are prescribed for violating the prohibition.

The act also provides that the national mediation board is to mediate disputes and to conduct elections to determine bargaining agents. A body known as the national railroad adjustment board is set up to settle disputes growing out of the terms of contracts. The board consists of an equal number of representatives of railroads and unions. If these members, acting in panels, fail to settle the dispute, the national mediation board appoints a chairman with power to make the decision.

LABOR UNIONS—A SUMMARY

As indicated in the foregoing account, labor unions have evolved into major types through a long period of strife, adjustment, and progress. As their membership has increased in numbers and in variety of occupation, the interests which they represent have ceased to be limited to labor and management and have involved a third party, the general public, whose disapproval or sense of unfairness could place either of the bargaining groups at a serious disadvantage. Although in most cases the leaders have been responsive to the challenge and have moved to correct injustices by or within their own organizations, there have been instances in which pressure from the public has been exerted to insure reasonableness and equity in the conduct of one group or the other. Practices on either side that the public considered arbitrary, monopolistic, or unduly selfish have sometimes led to stringent regulation by Federal authorities or to proposals for local remedies

such as the "right to work" laws that have recently been enacted in several states. Both the efforts of unions to achieve economic betterment and those of management to obtain productivity with economy have become increasingly subject to public scrutiny.

Types of Unions. Organizationally, unions may be divided into craft unions and industrial unions.

A *craft union* embraces workers in a single craft, irrespective of industry, plant, or employer. Thus all carpenters are eligible in one union whether hired by a building firm, a mining company, or a ship builder. Craft unions frequently provide insurance and unemployment benefits for members.

An *industrial union* embraces workers in a single plant or industry regardless of the type of work done by members. In mass-production industries, this type of union has advantages over craft unions, since modern factory production breaks down the older classifications of skill and craft and opens the way for enrollment of all workers.

The existence of these two types of labor organization has given rise to numerous disputes since a given craft employee may be claimed by both types.

Jurisdictional Disputes. These are controversies between two unions as to which one is entitled to enroll a certain type of worker. The term is sometimes applied to conflicts between craft and industrial unions, but it more typically describes a conflict between craft unions. Some long-standing jurisdictional disputes include one over drivers of beer trucks as to whether they belong to the brewery workers (industrial union) or to the truck drivers (craft or class union). Another involves two crafts—carpenters and machinists—and concerns work on a considerable number of jobs which had not been envisioned when the unions were chartered, such as installation of metal-frame windows.

Strikes over work-jurisdiction disputes are forbidden as unfair practices by the Taft-Hartley act, which authorizes the labor board to settle the question at issue unless the parties work out some other acceptable method of settlement.

National Labor Unions. The earlier unions in the United States adopted the craft form of organization. The Knights of Labor championed the industrial type, but the ascendency of the American Federation of Labor, representing the craft type predominantly, gave this type the advantage until the formation of a rival group in 1935, which later became the Congress of Industrial Organization. The latter body and the Federation embrace the great majority of organized workers.

The American Federation of Labor (A. F. of L.). This organization was an association of trade unions in the United States and its dependencies. Some unions, however. known as international unions, had local units in Canada also.

The basic unit in the Federation was the local union. Most local unions belonged to national or international unions, which were associated in the A. F. of L. as more or less autonomous bodies. They were chartered by the A. F. of L., and the charters could be revoked for non-payment of dues or assessments.

Other local unions were directly affiliated with the A. F. of L. and were known as federal unions. They belonged to crafts or industries for which no national union had been chartered.

Congress of Industrial Organizations (C.I.O.). Formally organized on November 16, 1938, this rival labor group stems from the Committee for Industrial Organization, a committee of the A. F. of L. formed for the purpose of promoting the industrial type of union. Its members were A. F. of L. unions of the industrial type. In 1936, these unions were suspended and later expelled. Meanwhile, many new unions were chartered by the C. I. O. before it had adopted a constitution.

The formation of the C. I. O. was in protest against the failure of the A. F. of L. to organize mass production industries, this failure being attributed to a desire to protect the jurisdictions of craft unions over skilled workers within these industries. The first fruits of the C. I. O.'s efforts were the organization of most of the steel and automobile industries.

In many other industries the C. I. O. and A. F. of L. directly competed for members, the A. F. of L. frequently opening membership to all employees irrespective of craft and thus competing on an industrial union basis.

AFL—CIO Merger. On December 5, 1955, these two great unions were merged in a single federation, The American Federation of Labor and Congress of Industrial Organizations.

Following the merger at the national level, began the slow process of merging state federations of labor (of the former A. F. of L.) and state industrial union councils (of the former CIO) and city organizations of like nature. Most, but not all, local unions are affiliated with the appropriate state and city "central labor body." The mergers of state and city bodies progressed slowly; some still were not merged late in 1958.

There remained also the problem of many international unions affiliated with the AFL-CIO with seriously overlapping jurisdiction. For example both AFL and CIO had affiliates that assumed jurisdiction over workers in aircraft manufacturing. The same situation prevailed in many other industries. Also certain craft unions of the old AFL felt they should have jurisdiction over some workers organized by industrial unions of the former CIO. Thus jurisdictional problems abound within the merged labor body.

Railway Brotherhoods. Traditionally workers on the railways were in unions unaffiliated with either the AFL or CIO. The major unions of this group are the Brotherhood of Locomotive Engineers, Brotherhood of Locomotive Firemen and Enginemen, Brotherhood of Railroad Trainmen, Order of Railway Conductors and Brakemen, and the Yardmasters of North America. The Switchmen's Union of North America is affiliated with the A. F. of L.

These are sometimes referred to as operating brotherhoods to distinguish them from unions of other railroad employees who do not actually operate trains. After the merger of AFL and CIO the Brotherhood of Locomotive Firemen and Enginemen and the Brotherhood of Railroad Trainmen affiliated with the merged federation. In addition, most of the unions of non-operating railroad employees are affiliated with the A. F. of L. Nevertheless for purposes of negotiations these unions and the operating brotherhoods frequently act through a joint body known as the Railway Labor Executives' Association.

In addition to the above there are a number of independent unions, most of them being plant or local organizations. A considerable proportion of them are successors of company-supported unions, reorganized after withdrawal of employer support.

In addition some major unions of national importance are non-affiliates of AFL-CIO. These include the United Mine Workers and the Teamsters (Chauffeurs) Union, the latter expelled from the AFL-CIO in 1957 because of its failure to remove corrupt officials from positions in the union.

EMPLOYER ASSOCIATIONS

When unions become strong, employers frequently form their own organizations to bargain on behalf of their members with the unions and to take concerted action if necessary in resisting union demands or pressing their own. Such associations may be formed on an industry basis, as among coal mine owners, or on a regional basis, taking in employers in a given area, as is done in San Francisco.

When collective bargaining has reached this stage, individual employers no longer negotiate with unions but accept the terms reached in conversations between the association and the union. Disputes become fewer. The magnitude of a possible strike or

lockout tends to impress a sense of caution on both sides. Well defined procedures are usually established for handling disagreements under the contracts negotiated. Not infrequently a permanent arbitrator is appointed whose duty is to settle such disagreements, building up a body of precedents into an accepted code of labor practices. Unions and associations in some instances work out programs of joint action to aid the industry.

WAGE AND HOUR REGULATION

While, in general, employment conditions are a matter of free arrangement between employers and employees, there are several segments of economic life in the United States in which such freedom of contract is rigidly limited by law.

Industrial employment of children is limited by all states and is prohibited for interstate enterprises by the Federal government.

Hours which women may be permitted to work are restricted in a majority of the states.

A lower limit is placed on the wages for which women may be permitted to sell their labor in approximately half the states.

Both hours and wages of industrial workers in interstate commerce, men and women, are regulated by the Federal government under the Fair Labor Standards Act of 1938.

Hour legislation is of two kinds. An absolute minimum may be imposed beyond which it is unlawful to employ a person. Or a standard may be set beyond which work must be paid for at a premium. Some state laws follow the first type. Federal legislation is of the second type, requiring that every hour worked in excess of a weekly standard must be paid for at a rate not less than 50 per cent above the regular rate of pay.

Child Labor. The first child labor law in the United States was adopted by Massachusetts in 1836. It required that children under 15 years of age employed in manufacturing establishments should be required to attend school at least three months in the year.

In 1842, the hours of children under 12 were limited to ten a day in Massachusetts; in Connecticut this provision was applied to children under 14. Rhode Island in 1853 restricted hours of labor for children under 12 to eleven a day and set an educational requirement.

In the decade of 1850-60, a number of states prohibited altogether the employment of children under certain ages in manufacturing industries. Other states limited their employment with varying requirements as to age and hours, and with varying methods of enforcement.

In 1907 the Federal government took cognizance of the problem in a comprehensive investigation into the condition of women and child wage earners. The findings of this report, added to years of effort to secure a Federal child-labor law, culminated in the passage of the Keating-Owen bill by Congress in September 1916. This act was declared unconstitutional in a 5-to-4 decision by the supreme court on June 3, 1918 (247 U. S. 251). An attempt was next made to achieve the same purpose by levying a tax of 10 per cent on the annual net profits of any establishment employing child labor in violation of the standards it set. But on May 15, 1922, this act was declared unconstitutional by an 8-to-1 decision of the supreme court (259 U. S. 20).

In 1924, Congress approved a resolution for submitting to the states a proposed amendment to the Federal constitution giving Congress the power to "limit, regulate, and prohibit the labor of persons under 18 years of age." By 1938, only 28 out of the requisite 36 states had ratified the proposed amendment. In that year the United States supreme court upheld a wage regulation law of the State of Washington in terms which led to the belief that the earlier child labor decisions would be reversed. The same year Congress passed the Fair Labor Standards act, which forbids interstate shipment of goods made at a plant where, within the previous 60 days, minors below 16 years of age (18 in hazardous occupations) were employed. The constitutionality of this provision was upheld.

Regulation of Hours by States. The earliest law in America regulating hours of work for women was passed by New Hampshire in 1847. This measure became a dead letter through the practice of employers in requiring employees to contract away their rights under the act as a condition of employment. The next such law was passed by Massachusetts in 1874. It limited hours worked by women in manufacturing to 10 daily and 60 weekly.

All such state laws until recent years applied to women and children only. Then men in certain occupational groups began to be given similar protection. Pennsylvania in 1937 passed a law applying to both men and women in all occupations. It was declared unconstitutional on technical grounds.

Regulation of Wages by States. The pioneer in legislation setting minimum wages was Massachusetts, which passed the first law of this type in 1912. It covered only women and children with provision for gradual application from industry to industry. The first such law to be applied also to men was passed by Oklahoma in 1938. It was held unconstitutional on technical grounds but upheld in other respects. Connecticut in 1939 became the first state to extend the coverage of its minimum-wage law to men. Many state wage laws apply only to certain occupations.

The prevailing pattern of state wage laws of general application calls for appointment of committees to study the need for wage minima in different industries. The recommendations of such committees, if accepted by a designated official, become effective as wage orders. In some cases the wage order is "directory" for a period, during which violation incurs the penalty of publicity only. It later becomes "mandatory," and violations then are punishable by criminal penalties.

Fair Labor Standards Act. Effective October 24, 1938, this law established in general a 44-hour week, hours worked in excess of the standard calling for pay at the rate of time and one-half. After one year, the standard week was reduced to 42 hours and a year later reached the permanent form of 40 hours.

A "floor" was placed beneath wages, it being unlawful to pay an employee engaged on work for interstate commerce a wage less than 25 cents an hour. This figure was raised to 30 cents after the first year and to 40 cents by the end of the seventh year. Provision was made for increasing the minimum wage in individual industries to the 40-cent level in less than the seven years.

In post-World War II years the federal minimum was raised to 75 cents an hour (1949) and, in 1956, to $1.00 an hour.

Exemptions. The terms of the act do not apply to agriculture or to semi-agricultural industry. Classes of workers exempt include executives and professional employees. Exemption from the hour provisions is granted for defined periods to seasonal industries. Special permits may be granted for employment, at wages below the minimum, of learners, apprentices, and handicapped workers.

Enforcement. For violation of the law, fines may be levied and second offenders may be imprisoned. Injunctions also may be issued against such practices in violation of the law as failure to pay the minimum wages or pay for overtime work, failure to keep records or falsification of records, employment of minors without permits, and shipment in interstate commerce of goods produced in violation of the law. Also, employees who believe they have been underpaid on the basis of the law may sue to recover wages allegedly due. If successful, they are entitled to collect double the amount due as wages and reasonable legal expenses in addition.

Public Contracts. Another way in which the government influences wages and hours is through the power of its purse. By requiring that all enterprises doing business with it should stipulate that, in carrying out the contract, they will observe specified standards, the government is able to extend these standards at least as widely as work done under such contracts. In practice, the influence extends much further, since a firm filling contracts both for the government and other customers frequently finds it impossible to separate the work and maintain one standard for government work and a lower standard for other work.

This form of leverage was applied by the Public Contracts act passed in 1935. Under its terms, persons bidding on government contracts are required to undertake that hours worked above eight per day or 40 per week will be paid for at time and one-half. The contractor must agree also to pay wages not below the prevailing minimum found to exist in the industry. The determination of this prevailing minimum is the duty of the secretary of labor, who bases it upon studies by a public contracts board.

Portal-to-Portal Act. This act, amending the Fair Labor Standards act and Public Contracts act, was passed in 1947 to limit liability of employers for wages of employees. Primarily it was to mitigate the effect of a decision by the United States supreme court in *Anderson v. Mt. Clemens Pottery Co.* The court held that time spent by employees in subsidiary activities outside their principal jobs, such as traveling from entrance to job and back, must be paid for as time worked. The law forbids courts to treat such time as working time unless it has been so treated by contract, custom, or practice in the plant.

Wage Stabilization. During World War II, a somewhat flexible ceiling was placed over wages as a means of controlling inflation. Employers were forbidden by the Economic Stabilization Act of 1942 to increase or decrease compensation except by permission of designated government agencies. Criminal penalties for violations were prescribed, but the chief deterrent was disallowance for income tax purposes of all compensation to an employee in connection with which a violation had occurred.

Wartime Job Control. Attempts to stabilize wages would have failed without a coordinate authority to limit shopping for more highly paid jobs on the part of employees and enticing of workers with offer of higher pay on the part of employers. Accordingly, manpower regulations were set up employing a species of job permit, or "statement of availability," without which employers subject to regulation might not hire a new employee.

UNEMPLOYMENT

The failure of the economic system to absorb in its productive processes all persons willing to work is one of the most serious problems confronting society.

Defenses against Unemployment. In seasonal employments, the laborer has tried to prolong his job by curtailing daily production until the piecework system has been substituted for the day wage. Similarly, low employment periods have been met by union men through restriction of days of work so as to make available work go around among the existing number of trained workers in the craft. Monopoly of labor supply through restricted apprenticeship and membership is another means used to prevent unemployment.

Labor-saving Machinery. There is an increasing realization among labor leaders that machinery, by increasing possible production per hour, increases possible earnings per hour. On the other hand, not only may the impact of rapid mechanization on a society geared to private profit be disastrous to those whose skill is rendered useless, but it is believed by many to be a functional cause in recurrent depressions.

Technological Unemployment. This is a term used to describe unemployment which results from the introduction of labor-saving machinery. In some favorably situated industries, those displaced through machinery may be equalled in number by those absorbed again into employment by the industries as mechanization brings enlarged demand through lower prices. But this is the exception.

Seasonal Unemployment. To a certain extent, unemployment of this type is inevitable, as for instance in farming, where the chief demand for labor is at seeding or harvest time. In other cases, buying habits of the public are responsible. Here marketing methods may tend to level out the peaks and dips of demand.

Cyclical Unemployment. The use of this term is based on the expression "business cycle," referring to the cycle, or recurrent sequence, of booms and depressions. Loss of work opportunities is the most serious feature of depressions. Not only does it fall with cruel force on those who are denied the opportunity of earning a living, but, by drastically cutting the productivity of all industry, it decreases the wealth available for distribution.

Employment Act of 1946. Consideration of the losses occasioned by cyclical unemployment was behind the declaration of congressional policy contained in the Employment act of 1946. The declaration states that it is the responsibility of the Federal government to use all practicable means, consistent with other aspects of national policy, to coordinate its efforts with those of industry, agriculture, labor, and state governments to promote maximum employment, production, and purchasing power. This is to be done in a manner calculated to promote free competitive enterprise and is to be accomplished by creating conditions affording useful employment opportunities, including self-employment, for those able and willing to work.

A council of economic advisers to the president was created for the purpose of advising both the president and a joint committee of Congress on steps advisable under conditions existing at the time.

The law does not commit the federal government to any specific action to ensure employment opportunities to all. To a great extent its effectiveness depends on the attitudes and actions of Congress when faced with a problem of excessive unemployment.

Unemployment Compensation. By far the most common measure designed to aid in meeting the problem of involuntary idleness is unemployment compensation. Each state has enacted legislation paying unemployment compensation to most workers out of work through no fault of their own. Generally these laws exempt farm workers, casual workers, and frequently workers in very small establishments. The funds are raised through taxes on employers. Benefits allowed tend to be roughly half of lost wages, up to a maximum of $30.00 to $35.00 weekly. Generally benefits may not be paid for more than 26 weeks in a year but in 1958 some states responded to encouragement by the federal government to extend the maximum duration of benefits to 39 weeks.

Some of the more powerful industrial unions, notably those in automobile, rubber, and steel manufacturing, have negotiated agreements with employers to pay supplemental unemployment benefits in addition to the state-financed unemployment compensation payment. These supplemental benefits are financed by the employer, pay no more than $25.00 weekly, and are payable for a year at maximum, usually for a shorter period. Coverage is quite limited compared to the coverage of unemployment compensation.

MARKETING

Marketing is a phenomenon of the 20th century which has developed particularly in the United States.

From one standpoint, marketing is an activity: consumers purchasing provisions or "doing their marketing"; businessmen selling products; the economy effecting distribution of goods and transfer of their title. However, marketing is more than a mere business practice; it is a pattern of the way of life which society has adopted. It is a social institution, an economic function, a business undertaking, a consumer-oriented service.

A Social Institution. Marketing is a social institution in the sense that it is the means by which contemporary society has undertaken to supply its material needs. Every society determines consciously or unconsciously its goals and the means of achieving them. Survival and consumption are always fundamental, but the means by which goods for consumption are provided differ in different societies. The processes of production and consumption are always separated; consequently, exchange by some process must occur. The market economy is one means by which exchange is effected, and marketing is a specialized aspect of the market economy.

Sanction of marketing, or any other institution or practice, stems from the very roots of a society. No foreign or unsuited system can successfully be imposed upon a society. That which is adopted is truly an expression of society itself—its chosen way of life, its values, structure, objectives. So marketing is an institutionalized manifestation of the society which it serves. It is more than a means to an end—it is part of a way of life which people have created and accepted.

Thus, marketing is not merely the means by which *business* meets the needs of society; it is the means by which *society* collectively meets its own material needs.

An Economic Process. The economy is that group of social institutions which are particularly concerned with the fulfillment of society's material objectives. Some of the institutions comprising the market economy are specialized production, profit motivation, exchange regulated by price, money and credit, private initiative, private property, and the like. Marketing is a phase of the operation of the market mechanism. It is the process of creating economic values in commodities by making them available to the market at the time and place and in the manner desired. It is supplier initiation of conception, creation, and communication of a standard of living for society. It is the means by which a uniform pattern of consumption is provided through mass distribution techniques to a large community. It is the process of effecting through the market mechanism the allocation and utilization of scarce resources.

A Business Undertaking. Business is a managed aspect of the market economy, and marketing is a phase of business management: that which relates to the analysis of markets, the conception of marketable products, their physical distribution, and transfer of title.

As a business undertaking, marketing is a broad technical activity; the general function of assembling, sorting, and dispersing goods; the control of the flow of values through successive stages of ownership; the utilization of the mechanism of the market for private and public economic and social ends. Marketing is typically a seller-initiated management process.

From the conception of "marketing" early in the 20th century, it has always been a *compound* activity and not merely the *single* process of selling, distributing, etc. Failure to recognize this characteristic of marketing has delayed the achievement of exceptional marketing success in some other countries.

A Consumer-Oriented Service. Finally, marketing is management of business enterprise based upon primary motivation to render a customer service. Marketing is characteristically a matter of viewpoint, and nothing less than consumer orientation is marketing in the highest sense.

Adoption of this viewpoint in marketing management is a contemporary development. It has long been held that business is primarily for producing profit, that it performs best when "let alone" (*laissez faire*), and that buyers should look after their own defense (*caveat emptor*). Marketing practice in the United States has shown the fallacy of this philosophy and the profitability of conforming business undertakings to the needs and wishes of the market. This viewpoint has evolved with development of scientific marketing practice.

Thus marketing is the conduct of the distributive function in business, approached from the interest of the market served. This concept of marketing is consistent with the idea of marketing as a social institution, for society sanctions only institutions which meet its needs. The marketing mechanism which is consumer-oriented fulfils both a business and a social purpose.

HOW SOCIETIES SUPPLY THEIR NEEDS

The role which marketing plays in modern society is outlined more boldly by contrasting the marketing process with its counterparts in other societies. In ancient societies, as in some underdeveloped ones even today, needs were met through exchange carried on *without markets* and *without marketing*. The market economy has evolved only during the past 400 years, since the Industrial Revolution. The practice of modern marketing began about 1900.

In general, older societies have accomplished the distribution of products by three principles of human behavior which are not primarily economic in nature: reciprocity, redistribution, and householding. A fourth principle, which is primarily economic, is that of the market organization; marketing relates only to this.

Reciprocity is that conduct of society whereby one gives from the harvests of his production, not for immediate material benefit in exchange, but for the approbation which society places on good husbandry and fine citizenship. Credit due to good behavior and civic virtue is the well-spring of motivation in such dissemination of one's goods. The recipients, according to the society and the scale of the operation, may be one's sister and her family, or a paired counterpart in another tribe or village. Supply for one's own needs is assured in the measure that he has earned social esteem through his own generosity. Social values are paramount; the economic effect is secondary. This system has been effective where society is organized on a family or kinship basis.

Redistribution is the principle employed in societies of a territorial character, under a common chief, whereby a substantial part of production is delivered to village headmen who keep it in storage. Redistribution of the provision is made according to a plan of differentiated rations to both producing and non-producing parts of the population and to members of other distant communities on ceremonial and festival occasions. Redistribution was practiced in the kingdom of Hammurabi in Babylonia and in the New Kingdom of Egypt as well as in medieval feudal systems, which were also based on this principle.

Householding is that principle of economic organization whereby production is carried on by a closed group, such as a family, a village settlement, or a political unit, for supplying the needs of the group. *Personal* self-sufficiency has never existed, and such *group* self-sufficiency is achieved only in a

fairly advanced stage of agriculture; it is not more primitive than systems of reciprocity and redistribution. Production in a householding economy is for use, not for exchange; storage may or may not be performed. In certain circumstances, surpluses may be sold, but inasmuch as gain through sale is not the motive for producing, the essential character of the economy is not disturbed thereby.

In these three forms of the economy, there is no instance of trade or markets, where equivalencies are determined and expressed as a price. Where there is no market, there obviously is no marketing.

However, before markets developed, trade existed and was widely carried on. The development of markets antedated the rise of the market economy. And the existence of the market economy was prerequisite to the modern conception of marketing.

Trade developed in three distinct and separate realms: foreign trade, local trade, and national trade. Foreign or long-distance trade arose originally out of exploration, adventure, hunting, piracy, and war. Later, it was characterized by barter, and ultimately markets for trade developed at seaports, fords, riverheads, caravan junctures, and sites of fairs. Such trade was external to the economy of a society. Its transactions were consummated by rulers and headmen; its functionaries were not middlemen, but hired servants; and its markets were segregated from local distribution by regulations prohibiting retail sale of goods by long-distance traders.

Local markets were within the towns and did not extend into the countryside. In them were dispersed products which could not stand long travel and which supplied the common needs of the community. While foreign trade was conducted *outside* the economy, local trade was made to conform to the prevailing principles of economic and social behavior. Trade was restricted in the community to prevent its encroaching upon the prevailing economic organization of society. The values of society superseded those of the local market place.

National or interior markets were not the outgrowth of either local or long-distance trade. Regulations specifically prevented such spread of trade. Rising territorial states, however, adopting a policy of mercantilism, removed barriers to trade and opened the countryside and provinces to the competitive commerce. The impetus to this move was political, for the national state was forced to draw its resources from a wider territory and to foster more extensive interchange among its regions. Freeing trade from restrictions which confined it to the town or to long-distance dealing, however, did not remove all restrictions from it. On the contrary, the national market was still kept subordinate to social objectives; practices in the new market did not interfere with the prevailing manorial economy.

Between the development of national markets and the later rise of the market economy, prevailing concepts of the relationship between the economy and society were changed. Production was carried on primarily for sale on the market; incomes were derived from sales on the market; personal gain became the principal motivation of exchange; and social values became subordinated to economic value. Such was the conceptual transition from the non-market to the market economy accompanying the Industrial Revolut on.

In their early stages, the market economy and market society were fraught with commercial tyranny and social depredations. Such was the character of trade in the United States, even until the late 19th century. Then social resistance to predatory business practices began to express itself in legislation and in other ways intended to improve trade and market practices. At the same time, scientific methods were introduced into business management. These several circumstances led to the development of the body of thought and practice known as Marketing.

SOCIAL ORIENTATION OF MARKETING IN THE UNITED STATES

The nature of marketing in any country is determined largely by two factors: 1) the character of society which determines the behavior of people in the market as consumers and as businessmen, and 2) the types and quantities of products which must be distributed.

Marketing in the United States is affected by certain basic facts, one of which is that ours is a theistic society, predicated upon the principle of man's divine rights. Precocious and preoccupied with success, however, it presents paradoxes as a market economy. Ours is a new culture. It has not been weighted with historical precedents that have hampered many countries of Western Civilization and the Oriental societies. Not only have we been receptive to new ideas, we have been quick to translate ideas into institutions, products, and practices. Willingness to experiment and to find better ways of doing things has characterized our life. This attitude has accustomed us to continual change, to anticipation that, although present achievements are good, better ones are on the threshold. While this youthful attitude has encouraged progress, it has left some traditional values undeveloped. Short-lived values have been preferred to more permanent ones; appearance has been more important than quality; and mere change has been accepted in place of improvement.

Notwithstanding the youthful character of our society, many of our attitudes are deeply rooted in ancient Judeo-Christian concepts, one of which relates to the importance and the dignity of individual man. From this stems our ideal of equality—that all men are created equal and that men should enjoy equal opportunity. This concept relates to the absence of formal class or caste structure in our society, to the provision of education for the masses, to freedom of initiative in business undertakings, to equality of the sexes, to uniformity of living level among different groups. It is interpreted in our concept of the "average man," in glorification of the "middle income" group, in protection of the "little" fellow.

Our society emphasizes also the importance of mental enlightenment. Respect for the ability to think things through has produced theories of rationalism and pragmatism and placed great hope upon science for meeting human needs. It is related to the fact that in the United States more than 38 million pupils are enrolled in elementary and secondary public and private schools, and more than 3 million in institutions of higher education. It is related also to the vast and numerous programs of adult education and executive development. Logic and reason are replacing ignorance, mysticism, and emotionalism. It has been assumed, therefore, that individuals are rational in the market place as well as in their other behavior. Standards of fairness, justice, and ethics also stem from rationality.

In an environment offering opportunity and equipped with rationalism, man in our society is under social pressure to produce—to achieve, to get ahead. Fortunately, we have been exceedingly inventive in our scientific pursuits, and rich rewards have befallen individuals. Rewards, however, rather than contributions have become the social criterion for bestowing homage and respect. Ability to show affluence and material possessions has become an important end and motivation; when satiety with things is reached the quest for power and prestige continues. The urgency to evidence success has encouraged aggression and risk taking, countenanced brashness and egoism, and deplored weakness and failure.

Toward the end of achieving its objectives, our society has widely adopted the concept of specialization. We are a society of interrelated parts and individuals, but specialization rather than integration is stressed. Occupations in both the professions and trades have taken on assembly-line characteris-

tics. Even education has become compartmented and not dedicated to development of the whole man. Society exploits specialized talents and personal idiosyncracies. The effect has been an increased dependence of the individual upon the whole, loss of pride in craftsmanship, and resort to hobbies, adult education, and vicarious enjoyment as compensation for the imbalances of over-specialization.

As the basic needs of our people have become satisfied, we have indulged in leisure, diversion, mobility, and pleasure. Approximately 20 per cent of the American families change their dwelling place every year. We travel widely. We seek comfort, ease, and entertainment, on the assumption that *now* is the time for *enjoyment*. Abstinence, sacrifice, and self-discipline are unpopular. Pleasure is pursued vigorously, usually with gadgets and extra equipment. While there has been an increase in reading and educational undertakings, we often reach for fragments of knowledge which are not integrated. Personal interests have often precluded interest in broader social issues, and satisfaction with our own institutions has prevented us from becoming sufficiently informed about those of other people.

The family, long a significant social unit, has some unique characteristics in our society. It is typically a small group expressing considerable independence, both economically and socially. It consists typically of parents and their unmarried children, although the latter often establish independent households. Since 1900, private households have increased 205 per cent, while population has increased 120 per cent. Although about one-third of our families have liquid savings and no debt, personal debt in general is commonplace. Consequently, training in personal finance and encouragement in economic independence is begun early in one's life. The family is often a unit of decision, action, and consumption.

THE AMERICAN MARKET

In this social setting lies the American market, which is the object of the marketing task. It consists of approximately 180,000,000 individuals who constitute some 52,000,000 families, about two-thirds of whom reside in urban areas. In 1958, per capita income was $1758; income per household, $6005. The division of income among households in that year was as follows:

Income	% Households	% Income
0000–$2499	21.3	5.9
$2500–$3999	19.5	11.4
$4000–$6999	38.2	37.5
$7000–$9999	13.7	20.5
$10,000–over	7.3	24.7
Total	100.0	100.0

Source: *Sales Management*, May 10, 1959, p. 192.

The geographic distribution of the market in 1958 was as follows:

Area	Population	Income	Retail Sales
North East	5.8	6.5	8.4
Middle Atlantic	19.3	22.2	20.3
East North Central	20.4	22.0	21.1
West North Central	8.7	8.3	9.1
South Atlantic	14.5	12.0	13.0
East South Central	6.8	4.6	4.8
West South Central	9.5	8.1	8.7
Mountain	3.8	3.5	4.0
Pacific	11.1	12.8	12.5
Alaska	.12	.16	.11
Hawaii	.37	.33	.26
Total	100.00%	100.00%	100.00%

Source: *Sales Management*, May 10, 1959, p. 192.

Although personal consumption is regarded as household consumption, not all of it occurs in the home. In addition, people consume in restaurants, hotels, private clubs, schools, trains and airplanes, churches, student organizations, boarding houses, and in welfare, charity, and emergency institutions. The durable and nondurable goods and services consumed through *personal* expenditures are about 62 per cent of the Gross National Product.

Business institutions constitute another large market, buying products which they either convert into other products or which they consume in their business activities. Such industrial consumers are the market for 45 per cent of all manufactured goods, 80 per cent of all farm products, about 50 per cent of all imports, the bulk of products mined and quarried, and practically all products of wells, fisheries, and hunting and forest industries.

Personal and business domestic investment accounts for another 15 per cent of the Gross National Product. This includes new construction—residential, non-farm, and other; producers' durable equipment; and changes in business inventories.

Governmental agencies—federal, state, and local—are the market for about 19 per cent of the Gross National Product. They consume vast quantities of commodities in performance of administrative work, in military activity, in carrying out public projects, in fulfilling price support programs, and in granting foreign aid assistance.

Finally, the market for some 4.5 per cent of the Gross National Product is abroad, where American products are marketed to personal consumers, business establishments, and government organizations.

PRODUCTS TO BE MARKETED

Another factor affecting the marketing task in the United States is the variety and quantity of products which are produced. In 1960, the Gross National Product amounted to approximately $500 billions. The magnitude of the marketing task, however, is a multiple of the value either of goods produced or consumed, for in the channels of distribution one product may be resold several times. For example, agricultural products may be sold at the farm, through a broker, to wholesalers, then to jobbers, then to retailers, and ultimately to consumers.

THE MARKETING TASK

Whatever the form of society and the nature of its products and disposition of its consumers, the responsibility for distributing its products constitutes a collective undertaking. In our society, this responsibility for effecting distribution and exchange is known as *the marketing task*. When transaction occurs and goods are acquired, the marketing task is fulfilled.

The performance of the marketing task in our society is a vast and complex undertaking. It employs uncounted millions of people in the marketing activity of manufacturers and other producers, in advertising agencies, research organizations, credit information bureaus, market news agencies, and transportation companies, as well as in almost 2,000,000 marketing establishments. The number employed in retail and wholesale establishments alone comprise more than one-fourth of our gainfully employed citizens.

The task to which these people are dedicated is the creation of those services required to make desired products available to consumers at the place, at the time, and in the manner preferred. The task of marketing is twofold: first, to distribute physical products; second, to provide with those products such service or services as the market may wish. Such services may include personal salesmanship, credit, delivery, adjustments, guarantees, assortment, continuous availability, convenience, pleasant surroundings, and the like. The *primary* task of marketing is the distribution of *commodities*. The

performance of related services is secondary and incidental but in our society highly important.

THE MARKETING FUNCTIONS

Circumstances of the market define the need for marketing, and this need prescribes the types of marketing service supplied. Thus because they are *functions* or variants of the marketing task to be performed, these services or processes are known as "marketing functions." The following functions are implicit in a concept of marketing:

Market Research
Conception and Identification of Products
Selling
Buying
Transporting
Storing
Market and Marketing Finance
Merchandising
Market Risk Bearing

Not all of these functions must be performed in every instance of marketing. In the simplest market situations, a minimum of marketing activity occurs. It must be remembered that, insofar as the marketing of products is concerned, it is the *product* that is wanted. The services which constitute marketing are desired and bought only in order that the *product* may be obtained at the time, in the place, and in the manner desired. The *transaction* conveying the product is the object of primary interest. Marketing services are performed only in order that the transaction may occur. Marketing, therefore, is the means by which a transaction is brought about; it is not primarily the transaction itself.

Market Conditions. A market may be defined as demand and supply existing in a relationship which results in transaction and in transfer of goods. Markets, however, have a variety of demand-supply relationships, and the state of the market determines the functions to be performed. When buyers and sellers have mutual knowledge of each other's need, transaction or fulfillment of the market may depend upon only negotiation and establishment of a price. It is impossible that such markets exist to any large extent in a vast economy, for several reasons. First, mutuality of knowledge does not exist; consequently, both buyers and sellers are obliged to share an information function. Sellers seek to know what needs exist, what capacities are unsatisfied, where markets are located. Buyers at the same time study their needs and the offerings of which they know, and they seek additional information about the market. Sellers interpret their market information into products, whose qualities they make known through means of identification and communication.

When knowledge of the market is shared by traders, transaction may still not occur because of other maladjustments of demand and supply. Space and time factors may prevent the fulfillment of a transaction, until additional services have been performed. When buyers and sellers are separated by space, transaction is dependent upon transportation. When time interferes, transaction depends upon products being stored if supply antecedes demand, or upon the transaction being financed if demand antecedes effectual demand. Acts counteracting time and space facilitate transaction and bring markets to fulfillment.

In addition to the relationship existing between any pair of demanders and suppliers who may make an individual transaction, there are other significant factors affecting the need for marketing in the *aggregate market*. A single transaction occurs at but one place and at a particular time. Satisfaction of the demand which constitutes the aggregate market requires making products available *within the bounds of the market* in the assortment, at the place, and at the time preferred by a *variety* of buyers. Transaction thus depends upon merchandising, or the providing of products for the *collective* market. To the physical product is thus added *availability*.

The service of availability is provided by the function of merchandising and also by the bearing of market risk. Unless market risks are borne, the responsibility for making goods available to the market is not undertaken.

Utility Created. In the mass market economy, marketing in some form or combination of functions is practically indispensable, for there is almost always need for one or more of the functions of transportation, storage, finance, or availability. Because value is placed upon these services, marketing, through the functions which produce these services, creates five types of economic utilities:

Information Utility, by market research, product identification, selling, and buying
Place Utility, by transporting
Time Utility, by storing
Possession Utility, by market and marketing finance
Availability Utility, by merchandising and bearing of market risk

Creation of form utility is the province of production, in contrast to marketing. The greater the demand for marketing service, the greater is the justification for incurrence of functional costs, and the greater the value which is added to products through the performance of marketing functions.

The nature of the marketing functions needs to be understood in detail, for upon them depends the system of marketing institutions and policies governing the practice of marketing.

Market Research. Research in connection with marketing includes both market research or investigation of characteristics of the market, and marketing research or inquiry into the means and practices of marketing. Both represent the quest for information to guide the economic processes of production and distribution to maximum satisfaction of society's wants and needs.

The nature of research has varied throughout the years, depending largely upon the nature of marketing problems and the prevailing concept of marketing. Its fields of study include the consumer, internal functions of business management, economics of the market, marketing channels, and trade practices. It employs both quantitative and qualitative data drawn from private and public, internal and external sources. Its methods are those of scientific inquiry developed in the physical and social sciences, including survey, observation, and experimentation. Techniques are borrowed from fields of statistics, accounting, engineering, mathematics, economics, psychology, and sociology. Among the methods of analysis employed are questionnaire survey, ratio analysis, depth interviewing, simulation, business games, correlation analysis, cost and budget analysis, copy testing, opinion research, and others.

Conception and Identification of Products. Information gathered through research is a guide to the invention and production of products for which there is a market. Products produced, however, must be recognizable as possessing qualities desired by buyers. For some products this assurance can be gained only by first-hand inspection. For others with less perceptible qualities, assurance depends upon adequate identification of the products. This is achieved through establishment of standard grades for products, through informative labeling and sales promotion, and through branding.

Standards developed in the interest of the public pertain to various aspects of identification and are usually the product of the collective efforts of agencies and businessmen. Standards convey information concerning size, quality, number of units, composition, strength, purity, etc. Among the agencies co-operating in the development of standards are the Agricultural Marketing Service of the U.S. Department of Agriculture, the Commodity Standards Division of the U.S. Department of Com-

merce, the Food and Drug Administration, the Federal Trade Commission, and the American Standards Association.

The identity of products is also established by the use of brand labeling. Using private marks of identification, producers distinguish their products both through word descriptions and through association and imagery. Symbols as well as words convey to buyers information which sellers wish them to have about their products.

Selling. Selling is the communication to a prospective buyer of information intended to show the likelihood of a product's meeting a buyer's need. It ranges in type from the mere listing of sales facts to aggressive presentation of sales claims or to efforts designed to create wants rather than merely to satisfy known needs. It includes personal selling, advertising, and other forms of sales promotion such as contests, displays, premiums, sale events, sampling, dealer aids, demonstrations, trading stamp plans, and the like.

The need for selling arises from 1) the separation of buyers and sellers, 2) buyers' unfamiliarity with new products, 3) sellers' opportunities for lowering costs through increased scale of operation, and 4) the stimulus given improvement of products and services through open announcement of offerings.

Although vast sums of money and effort are expended in selling—more for personal selling than for advertising—the beneficial contributions of this function are greater in value than the cost of performing it. Advertising expenditures are estimated to amount to between 3 and 4 per cent of personal consumption expenditures; the advertising expenses of most retail stores amount to between 1 and 2 per cent of their sales.

Buying. Buying is, in part, performance of the information function on the part of the buyer and, in part, the buyer's effort to consummate a transaction. It is a function known as procurement, purchasing, shopping, or simply "buying." It may be carried on for purposes of one's own use or as an intermediary activity on behalf of another.

Personal buying stems from the level of living which one maintains or from that to which he aspires. It is likely to conform to the pattern of consumption of the economic or social level with which one associates himself. The order in which one buys various products is determined by the priority of his need, by the channels in which his living flows, and by the appearance of especially favorable buying opportunities. Buying usually requires, first, choice between two or more potentially satisfying prospects. This may be followed by selection of a particular brand or style of produce, and by selection of the vendor from whom the purchase is to be made. Rational and emotional motivations enter into the buying calculation.

Business buying is somewhat predetermined for a distributor by what he can sell, and for an institutional consumer by the operation he conducts. The rate and timing of purchases is affected by the necessity of maintaining an inventory of supply or stock, by seasonal factors, by costs of acquisition, special buying opportunities, discounts, condition of one's liquid working capital, and the like.

Transporting. Movement of products from one place to another is feasible simply because 1) a market for them exists at a distance, in addition to or in place of a market for them at their origin, and 2) the value of the product in the distant market is sufficiently higher than in the other to warrant the incurrence of the necessary transportation costs. Such markets in different positions may be called "space markets." They are linked by transportation, the performance of which in accommodating distant markets creates place utility.

The extent to which transportation is performed in marketing depends upon several factors. If production costs are identical in different markets, products will tend to be produced in each market and not to move between them. If there is a differential in production costs, producers in the two markets compete in the intervening space to the extent that production costs plus transportation costs become equal. The differential may be so great as to permit one producer to compete even in the local market of the other. The sum of production plus transportation costs, however, may not exceed any fixed sense of value in a distant market, else it may be found that for products delivered at prices above that value no market exists. Value in the buyers' minds justifies incurrence of costs; transportation may create place utility, but it cannot create a market for that utility.

Market patterns change with changes in the variables of which transportation is a function. Thus changes in production costs, in freight rates, in methods of shipment, in insurance rates, etc. affect the markets for products and for transportation service.

Storing. The need for storage arises from the separation of markets by time. Producers frequently have a choice in disposing of their goods in the present local market, in the present distant market, or in a future market, be it local or elsewhere. Value of the product at a future time, however, must exceed present value by at least the cost of storage. Through storage, therefore, is created time utility or the service which is warranted by anticipated values in a future market.

The performance of the storage function is affected by the cost of storing, by production cost differentials at different times, and by the relative competition between time and space markets.

An important factor in storing is the financing of the investment in products during the storage period. The development of means in recent years whereby this is facilitated has made storing more feasible and has thus prolonged markets. These facilities have included bonding of public warehousemen, field warehousing, and the rise of companies financing particularly goods in storage.

Financing. Many transactions would never materialize if immediate payment of cash were always necessary. The ability to obtain goods before paying for them is often important to both businessmen and consumers. Only by so obtaining goods may businessmen have them to sell or fabricate, and so conduct their business. Likewise is this the means by which consumers may have enjoyment of products sooner than they would if cash were required. Possession, therefore, has a value to both business and household buyers, and the financing of possession creates possession utility.

Financing the market involves assuming three responsibilities: 1) providing capital for receivables, 2) assuming credit risk, and 3) performing investigation, authorization, collecting, etc. inherent in the operation. Thus is produced credit service, a utility for which there is a wide market, a variety of prices, and definite production costs. Both vendors, in connection with sale of goods, and lenders, in connection with loans, provide such credit service. All or part of these responsibilities may be shifted from vendors and lenders to an array of credit specialists which have arisen in the banking and commercial fields.

The basis of a system providing credit service is confidence in the promise to pay extended by the one who offers his credit. One's credit is good in proportion to his ability to redeem his credit through ultimate payment. Thus it is directly related to potential income, although moral considerations and other resources are also important.

Merchandising. Merchandising is that service provided in distribution which makes products available in the market at the time, at the place, and in the manner desired. In contrast to transporting and storing, which carry products into *other markets*, merchandising provides for the availablity of goods with a *given market*. It is a function which is per-

formed in storekeeping, stock keeping, etc. It caters to the desire of consumers that goods be available when they are in the market for them.

Aggregate markets, unlike single transactions, embrace a period of time and a span of space, in which all buyers desiring to make a transaction may do so. For example, the "Christmas market" covers a period of two or three months, during which some people prefer to buy early, others late. Markets for automobiles, clothing, and garden equipment are also periodic; those for grocery staples, birthday cards, and gasoline are continuous. Providing availability satisfies a value and creates a utility in addition to the mere value of the product itself. This is the contribution of the merchandising function. Merchandising differs from mere storing for value increases with storage time, whereas no such increase occurs during the time goods are in inventory for availability. To the contrary, if value does not remain constant, it may even decline toward the end of a market period.

Similarly, markets have spatial dimensions embracing a city, a metropolitan area, or a neighborhood, in which products are transported for the simple reason of making them available *in the market* rather than moving them to *other markets* where they have greater value.

Merchandising provides products not only at the time and place, but also in the manner desired. By this function are assembled goods in assortment making choice possible, goods so related as to make shopping convenient, and goods surrounded with an environment pleasant and appropriate for buying. All of these functions of merchandising provide in some way the service of availability.

Market Risk Bearing. In a broad sense, products are brought to the market only because someone assumes entrepreneurial responsibilities, including the risks which are inherent in the market situation. In a market economy, it is normal and to be expected that transactions will be consummated. It is normal also, however, that failure in the fulfillment of other marketing functions sometimes prevents the occurrence of transactions. Lack of information, faulty communication, improper estimation of the market, failure to provide goods at the place and time and in the manner desired—these occasion risk which must be borne in an economy such as we have. The dynamic nature of the market imposes also risks which result from price changes.

Marketing Processes: Wholesaling and Retailing. Although the concept of marketing may be refracted into the spectrum of marketing functions, the distributive operation itself occurs neither as a composite activity of marketing nor as the separate activities of the marketing functions. It consists rather of the complementary processes of retailing and wholesaling, retailing being selling to ultimate, household, or personal users, and wholesaling being selling to all others—to distributors and to business and institutional buyers. All of the marketing functions are performed on both levels of distribution, but the two levels represent the performance of dissimilar processes.

The wholesaling process, in general, is one of assembling products, of moving them toward their markets in bulk, to points where bulk is broken by making them available in smaller quantities to industrial buyers or to subsequent distributors. It is that stage of distribution wherein time utility is generally created and wherein major responsibility for financing distribution *within the channels* is assumed. It is the stage wherein purchases are large, consisting of great quantities of given products, but sales are large consisting of a great number of smaller quantities of a variety of products. The assembly process of wholesaling may also combine small quantities at the point of origin, as in distribution of agricultural products, before moving them on in bulk.

The retailing process, on the other hand, is essentially one of dispersion. It is a further step in the breaking down of homogeneous or heterogeneous bulk which has moved through wholesaling processes. It provides for satisfaction of the individual want or need at the termination of mass production and mass distribution. It offers availability, both through variety and assortment of products and through presentation in keeping with the time and space dimensions of the market. It furnishes information not only as to what supplies are available, but also as to where they may be obtained. It provides for, although it does not generally assume, responsibility for financing the consumer market.

MARKETING FUNCTIONARIES—THE MARKETING SYSTEM

When functions must be performed, there emerge individuals and institutions to perform them. Marketing functions are performed by a variety of functionaries. While the needs for functionaries differ with the combinations of functions inherent in different market situations, needs differ also depending upon the manner in which the functions are performed in any given situation. A range of choices lies between extremely specialized functionaries, on the one hand, and highly integrated functionaries, on the other.

One classification of functionaries is made on the basis of the extent to which they combine or segregate production and marketing. Some producers perform no marketing functions, even in connection with their own products; they are obviously specialists solely in production. Other producers undertake a full range of functions in connection with their products, some marketing them to the first specialist in the channel of distribution, others marketing them to their final market destination; thus they combine production and marketing. Still others market not only their own products, but also some purchased for resale. If their sales of purchased goods exceed the sales of goods produced, they cease to be classifiable as a producer and are in fact distributors, or specialized marketing functionaries.

Apart from producers (manufacturers, farmers, extractive industries, and others) who perform some marketing functions, the bulk of the marketing work is done by functional specialists. Some perform single marketing functions, such as transportation by carriers, storage by warehouses, financial assistance by banks, sales information by advertising agencies. Others perform not only such functions, but also through selling contribute directly to the transfer of title of goods. Those are known as *marketing establishments*.

Marketing establishments are of two types: middlemen and others. Middlemen are independent, autonomous organizations—*merchant middlemen*, who take title to the goods they handle, and *functional middlemen*, who do not take title to goods in whose distribution they assist. Other than the middlemen, there are marketing establishments which are not independent entrepreneurs, inasmuch as they are owned by producers (manufacturers' branches), by consumers (consumer co-operatives), by independent distributors (chain store warehouses), or by governmental agencies (military post exchanges). To be classifiable as marketing establishments, even those owned by producers must be physically separate from the parent producers, a separate place of business specializing in marketing.

Marketing establishments are also distinguished as *retailing establishments* and *wholesaling establishments*. Retailing establishments are those the bulk of whose sales are made to ultimate consumers. Wholesaling establishments are those whose business is primarily with industrial buyers and distributors.

Determination of the type and identity of marketing functionaries is of practical significance. Whether one is engaged in retailing or wholesaling de-

termines prices at which he buys and sells, wages which he is required by law to pay, taxes levied upon him, the market which he can reach, and the nature of his business operation. Whether he is independently or producer-owned determines the character of his competition, whether he must earn a full measure of operating profit on his distributive activity, the risks he bears, or the price at which he obtains his merchandise.

The Marketing Establishment. Collectively, the various types of marketing establishments comprise what is known as the marketing structure or marketing system. An understanding of their varying roles, their differences, and their competitive advantages requires understanding of the essential character of a marketing establishment.

Basically, it is an entrepreneurial business venture. In the process of meeting a market need, it represents an effort to maximize profit through the utilization of invested and borrowed funds in the usual fixed assets (building and equipment) and current assets (inventory, accounts receivable, and cash). Gross profits tend to be maximized by increasing the volume of sales of the enterprise. Maximization of net profit depends upon the most favorable relation between sales volume and operating costs. It may be achieved by increasing sales without a proportionate increase in costs, or by a decrease in sales with a greater than proportionate decrease in operating costs.

This expansion and contraction of income and costs results from the efforts of management to manipulate several of the fundamental characteristics of the business: the variety and assortment of items handled, the number of store units operated, the number and types of services provided, the types of clientele or markets served, the radius of the market, and the types and intensity of promotional effort employed. An infinite number of combinations of these factors is possible, but certain combinations of them have become common, and enterprises so characterized are familiar to us as our well-known types of retail and wholesale establishments: department stores, chain stores, single-line stores, merchant and functional wholesalers, manufacturers' sales branches, etc.

THE RETAILING STRUCTURE

While there is no such thing as a standard variety or assortment of goods offered in a given establishment, a large part of our marketing effort and structure has been based upon the concept of a "line" of goods. This signifies a group of products which are related through common physical properties, in use, in purchase, or in origin. The traditional "lines" have been the grocery, drug, hardware, and dry goods line. During the 19th century, those products were the principal ones marketed, and they were typically segregated in distribution and made available through what have been called "single-line stores": grocery, drug, hardware, and dry goods stores.

Multiple-Line Stores. The efforts of management to increase volume through expansion and combination of lines, thus providing a broader base for the allocation of overhead, has resulted in the fusions represented by the general store, the department store, the modern drug store, mail order house, and others, wherein products of different lines are combined, as in supermarkets, automotive supply stores, and variety stores. There has been a strong tendency in recent years for many retail stores to offer items from different lines in the name of providing shopping convenience known as "one-stop shopping."

Simultaneously, there has been a contrary trend toward line specialization through reduction of items handled. Thus have arisen such specialized retailing establishments as those handling only neckties, paint, millinery of a particular price, dietetic foods, toys, and the like. Through such restriction of the line, it is expected either that costs will be disproportionately cut or that volume will be increased through more effective promotional emphasis.

Multiple-Unit Stores. Historically, retail establishments have been operated as single units, even though several may have fallen under common ownership. Contemporary marketing, however, exploits the merchandising potentialities of multi-unit establishments linked in horizontal integration. Chain organizations and branch establishments are typical. Not only is increased volume made possible by the addition of outlets, but multiple-unit operations also provide for economies through large-scale buying, apportionment of overhead, experimentation, research, and risk. Thus have developed on the basis of multiplicity of horizontally integrated units four types of retail enterprises: 1) the corporate chain store organization, which is typically found among single line and specialty stores, although also among the smaller department stores; 2) voluntary chain organizations representing independent ownership but integrated merchandising; 3) ownership groups, as among large department stores, representing centralized ownership but decentralized merchandising; 4) branches, also typical of department stores, representing the integration not of comparable and equal units, but of dominant and subordinate ones, with centralization of both ownership and merchandising.

Multiple-Service Stores. Throughout a century, the principal service provided by retail establishments has been that of availability. Additions and subtractions of other services have from time to time been made to accommodate the market and to maximize profit. Chain stores originally represented not only a multiplicity of units, but also a reduction of the services of credit and delivery which were customarily provided by retail groceries. The department store, on the other hand, epitomizes the combination of a full range of services with merchandise: credit, delivery, returns, adjustments, guarantees, nursery facilities, club rooms, restrooms, shopper service, etc. Discount houses are typically a withdrawal of services customary in connection with durable goods, including personal salesmanship and even convenient availability, insofar as the discount house is located more or less remotely. Mail order establishments, by the very nature of their operation, curtail the service of availability, while attempting to compensate for non-store inconvenience by substitution of the service of catalogue selling, telephone ordering, and liberal adjustments.

Multiple Customers. Markets are stratified on several bases, and the effort to serve either more or fewer market classifications is a management decision which also has helped to form the retailing structure. Some establishments sell at both wholesale and retail. Some cater to high, medium, and low income classes. Some solicit the patronage of minors as well as adults. Some make direct solicitation of the consumer while concurrently selling also to other distributors. Conversely, managements contrariwise minded follow the opposite policy of serving selective types of customers in their effort to achieve their operating objectives.

Multiple Territories. As with customer types, merchants differ with respect to the distance they will go in seeking customers. Some operate wholly on a local basis, customarily providing over-the-counter sales service. Supermarkets have greatly extended the circumference of the market formerly served by the neighborhood grocer. Department stores draw patronage from large metropolitan markets and, even more extensively, through the use of mail order selling. Some enjoy even a national patronage as a result of advertising placed in such media as the *New York Times* Sunday edition.

Thus it is apparent that, while physically retail establishments may be characterized by size, loca-

tion, and commodities handled, conceptually from the management standpoint they represent so many integrations and specializations of line, unit, service, market, and territory. The manner of merchandising which these combinations provide determines the market appeal of the establishments and their competitive stature among the trade.

Environmental Influences. The managerial concept of the best way in which to perform the necessary marketing functions is not the sole determinant of the nature of the establishments which are created. Environmental influences also determine the manner in which the various factors may profitably be combined as a market offering. This is the influence which social change holds over the entire marketing process.

One need go back no more than one hundred years to observe some of the principal environmental influences which have helped to shape the retailing establishments of our marketing system.

1. Department Stores. Following the Civil War, four circumstances contributed to the growth of department stores: a) the increase of urban population, b) increased manufacture of textiles, c) increasing disposition of consumers to buy ready-made clothing, and d) a growing higher income class which constituted a market for the more luxurious commodities and services which department stores were offering.

Late 19th century improvements in urban transportation augmented department store growth by making downtown shopping areas more readily accessible to people in all sections of the widening metropolitan areas. These factors continued almost uninterrupted until the 1930's with post-war migration from rural to urban areas and with growing markets for department store type merchandise. However, growth of large metropolitan family-owned department stores was paralleled by growth of chains of smaller department stores locating particularly in the rising number of small towns. At the same time, the financial merger movement of the 1920's stimulated integration of large department stores in ownership groups for both financial and merchandising advantages. Enlargement of cities gave rise in the 1930's to department store branches in secondary shopping areas, and in the 1950's to branches in shopping centers. Complex downtown traffic problems have posed a counteracting influence upon central department store popularity and accessibility, but this has been compensated somewhat by the department store's development of parking facilities.

2. Chain Stores. The growth of retail chains, particularly in groceries, was the result of population growth prior to 1920, and of widening realization of advantages to be gained through horizontal and vertical integration and through elimination of some services. During the early 19th century, the number of chain organizations increased rapidly. They too were influenced by the mergers of the 1920's with resulting reduction in the number of chains but increase in the number of stores comprising chains. Depression conditions of the 1930's, coupled with punitive graduated license taxes imposed upon chains and the rising competition of supermarkets in the grocery field, wrought enlargement of the chain stores and reduction of their number. Later, chain groceries adapted themselves to expanding use of the supermarket techniques.

3. Mail Order Establishments. The custom of American farmers to live on their farms, in contrast to the European practice of settling in villages adjacent to agricultural areas, contributed to the crossroads location of numerous general stores combining the lines of consumer goods common in the 19th century. Their unwillingness or inability to handle the increasing number of products, or to satisfy farmers' desire for urban contacts which would break their isolation, prepared the way for the catalogue-promoted mail order selling. Such business was made feasible by improvements in rail transportation, by provision of rural free delivery and parcel post service, and by achievement of a high rate of literacy through general educational programs. The popularity of mail selling, however, met head-on the counteracting influence of automobiles and improved rural highways in the 1920's, which shifted much buying from home ordering to small town shopping. The adaptive response of mail order establishments to that development was their opening in towns of catalogue order offices, display rooms, and ultimately retail stores, which are in fact chain department stores.

4. Consumer Co-operatives. Co-operative establishments differ from those privately owned mainly in ownership and not in merchandising conception. In a given field, both have responded to the same external influences. However, co-operatives have felt the added stimulus of depression-born emphasis upon low price and savings and of socialistic philosophies antagonistic to capitalistic enterprise. Consequently, those influences, particularly during the 1930's, stimulated growth of co-operatives, but their competitive status and service to consumers are to be judged primarily from a managerial rather than from a legal standpoint.

THE WHOLESALING STRUCTURE

Social circumstances affect first that level of marketing practice which directly serves society, namely, retailing. Changes in retailing and in the retailing system in turn affect wholesaling practice and wholesaling establishments.

Whereas in retailing the character of marketing establishments is determined almost wholly by decisions made locally within those establishments, in wholesaling their character is the effect of the joint and/or separate decisions of producers and wholesale middlemen. Between them occurs such a play of integration and specialization of activities, whereby the functions inherent in a given market situation are divided, that a producer's assumption of wholesaling functions is usually attended by a corresponding reduction in wholesaling functions performed by independent wholesale middlemen. This process whereby functions of wholesaling sometimes performed by wholesale middlemen are shifted backwards or forwards in the distributive channel is termed *circumvention*, indicating a tendency to "go around" but signifying management decisions making a new allocation of the functions involved.

The performance of wholesaling occurs in three stages representing degrees of specialization and integration: 1), producers performing the entire function of wholesaling involved in the distribution of their goods; 2), producer-owned marketing establishments physically separate from the production facilities; 3), independent wholesale undertakings representing complete separation of production and marketing functions.

Channels. In a market as large and diversified as that of the United States, competitive initiative has produced a variety of marketing patterns and establishments, described as channels of distribution. A channel is the course of the title in the passage of goods from their origin to their final market. A channel has two dimensions. In a horizontal perspective, on either the retail or wholesale level, "channel" is synonymous with "outlet." The varied types of outlets, such as single-line, multiple-line, or multiple-unit outlets, constitute distinct retail channels. Vertically considered, the "channel" is the *sequence* of establishments responsible for the passage of title, combining both wholesale and retail outlets. Different retail channels or outlets are commonly served by distinct and separate vertical channels.

The circumstances of the market—of the buyer, of the seller, and of the product—prescribe the func-

tions which must be performed. Differences in market situations result in a variety of channels functioning side by side, even in the same line or trade. Dissimilar channels are also found serving in *identical* market situations, as a result of differences in competitive strategy and efficiency.

Wholesaling components of vertical channels include both *wholesale middlemen* and *other wholesale establishments* owned either directly by producers (manufacturers' sales branches) or distributors (chain store warehouses), or co-operatively by producers (producers' marketing co-operatives) or buyers (retail sponsored voluntary chain wholesale units or industrial users' co-operative buying organizations). Reflecting the needs they serve, they range from those establishments performing a minimum of functions (such as brokers and drop shippers) through those middlemen performing a wide range of functions (such as the selling agent and the regular wholesaler) to producers' own distributive outlets, with or without stocks.

The regular wholesaler represents a full combination of marketing functions; other establishments represent a lesser combination, and therefore a relegation of residual functions to other buyers and sellers in the channel.

In the channels for manufactured products, the following are the principal establishments and their functions:

I. Limited Function Middlemen

a) Not taking title.

1) *Brokers.* One of the most highly specialized independent middlemen is the broker, whose almost sole function is representation of buyers and sellers in negotiations. He does not take title, handle goods, render financial assistance, or determine the sale price. He is engaged either by buyers or sellers on a temporary basis and is paid a commission for his service. He is most useful in the sale of highly standardized goods, particularly of a seasonal nature, and in negotiating between widely scattered buyers and sellers.

2) *Commission Merchants.* Commission merchants also do not take title, but, in addition to the negotiatory functions of the broker, they may handle, or temporarily store commodities, and on occasion render financial assistance to buyers. They serve mainly in distribution of grocery specialities, and in the wholesale marketing of dry goods.

b) Taking title.

1) *Drop Shippers.* Buying, selling, and financing of marketing are the principal functions of drop shippers, who do not handle physically the commodities they sell. They deal primarily in the distribution of bulky products bought in large quantities.

2) *Cash and Carry Wholesalers.* Buying, selling, and storing are the main functions of cash and carry wholesalers, who omit delivery and marketing financing.

3) *Wagon Distributors.* Simultaneous sale and delivery are the chief functions of the wagon distributor, who omits storage and financing in the limited line of specialty items which he carries.

II. Full Function Establishments

a) Not taking title.

1) *Manufacturers' Representatives.* Manufacturers' representatives are, with selling agents, one of the two types of functional middlemen who maintain continuous contractual relations with producers whom they represent. They sell, handle products, and provide market information, but they do not buy, render financial assistance, select the market in which they sell, or determine the selling price. They serve the principal in the manner and place of his determination. This middleman is employed by producers needing economical sales assistance in selling a narrow line of products in sparce, scattered, distant, or new markets.

2) *Selling Agents.* Selling agents are independent, multiple-line establishments substituting for a manufacturer's own sales organization. They may perform all functions except buying. Handling the producer's entire output, they sell, store, finance, gather market information, determine price and territory. Combining the product with non-competing lines of other producers, particularly in the field of textiles but also in other lines, they serve manufacturers who are least able or willing to perform any of the marketing functions themselves.

b) Taking title.

1) *Regular Wholesalers.* Independent merchant wholesalers perform in some channels the dual processes of assembly and disposition. They are most useful in distributing products which, for efficiency and economy, must be gathered from many sources and distributed to many outlets and buyers. They take title, buy, sell, store, break bulk, deliver, and both gather and disseminate market information. When handling manufactured goods intended for the household consumer market, this middleman is called a wholesaler; when handling products for the industrial or institutional market, he is known as an industrial distributor. Regular wholesalers provide economical distribution for a great number of related products.

Producer-Owned Establishments. Producers desiring to perform and control their own marketing activity find certain circumstances favoring the establishment of a distributive branch, in contrast to direct distribution from the place of production. Such branches may be either with stocks or without stocks, being in the latter case sales offices. When branch distribution is undertaken, existing circumstances must warrant it. Branches without stocks are made feasible by the production of a diversified line of products, by concentrated markets, and by technical products requiring expert salesmanship. Branches with stocks are inspired by the market's need for accessible inventories for repair and replacement, for installation and repair service, and for small-scale delivery of products moved major distances in bulk for reasons of economy.

Distribution of Agricultural Products. The markets, horizontal outlets, and vertical channels for agricultural products differ from those of manufactured goods. Markets for agricultural products impose a marketing task in some respects unique. Primary production, in contrast to manufacturing, is generally on small scale, requiring assembly of products into marketable quantities before they can be economically moved long distances to urban markets where they are disseminated in vertical channels to retail outlets. On the other hand, many industrial users of agricultural raw materials, such as canners, meat packers, tanners, cotton mills, etc., are located in the vicinity of farms and purchase directly from the producers of those materials.

For agricultural commodities which must be assembled in the local areas, the establishments which have arisen there to perform this function include independent cash buyers, traveling buyers, co-operative assemblers, representatives of distant merchants and industrial consumers. Depending upon the product, these local agencies in the channel may buy, sell, store, transport, grade, finance, bear market risk, and provide market information. In the central market, where the process of dispersion begins, an important role is played by functional middlemen: brokers, commission merchants, and auction houses. Negotiating and dealing in large quantities, they facilitate the distribution of farm products to wholesalers, jobbers, and large retail chain organizations.

MARKETING MANAGEMENT

While marketing is a social phenomenon and its institutional structure is an example of economic specialization, the management of marketing is a role in business which has become highly professionalized. Within a business organization, the function of marketing is an area of decision making,

corresponding in importance to production, finance, and personnel, with which it must be integrated for effective and profitable operation. Responsibility for the marketing function, itself a complex and coordinated activity, is being placed in modern organizational structures with a position known as "Vice President in Charge of Marketing," "Director of Marketing," or "Marketing Manager." In top management deliberations, the marketing manager has a leading responsibility, inasmuch as the total undertaking of the individual firm must begin with the market—with understanding of its needs and wants, its character, size, location, etc. Marketing management is responsible for preserving this viewpoint in the various undertakings of the firm.

The Marketing Mix. Within the scope of its own technical responsibility, marketing management is charged with planning, organizing, and controlling a variety of activities which, combined in different proportions, constitute the "marketing mix." It is the administration of the means of accomplishing the marketing objective. Those means include personal selling, advertising, credit selling, product styling, packaging, branding, choice of both horizontal and vertical channels, price structure, guarantees, service policies, etc. Specialization in the performance of marketing gives rise to subordinate organizational specialization in the positions of sales manager and salesmen, director of marketing research, advertising manager, merchandising manager, manager of credit sales, service manager, adjustments manager, etc. It is the duty of the co-ordinative manager of marketing to proportion and combine these various activities of the "mix" in the manner most appropriate to the prevailing circumstances.

The actual management of marketing is regarded as a process of decision making, primarily in determination of policies and secondarily in the application of them. Decisions must be based upon a knowledge of theory and facts. Theory, embracing concepts and principles, is drawn from economic theory, sociology, psychology, law, accounting, finance, management, statistics, and mathematics, not to speak of marketing theory. The facts upon which marketing decisions are based are ascertained both within and without the business organization.

The actual processes of marketing decision making are too complex for a brief treatment of them; however, the following are some of the areas of decision and a few of the factors which management takes into consideration.

1) Market and Product Decisions. Every marketing venture begins with an assumption that a market exists. The entrepreneur must determine, however, whether it is a household or industrial market, whether demand is elastic or inelastic, whether it is an effectual or potential market, whether its wants have been articulated or must be cultivated with information, whether it is of such dimensions that it can be reached economically. It must be considered whether a product of desired character can be made to sell at an acceptable price, whether a single item or a line of products should be made, whether they should be of staple or changing characteristics, sold in bulk, packaged, or branded.

2) Channel Decisions. As the necessary channel is a function of the market, the producer, and the product, marketing management must ascertain the functions required for the distribution of a product, the costs involved, and the likelihood of selling at a price which justifies the costs. If multiple channels are required, the manufacturer's price structure must provide for both the functions performed and the functionaries that are essential in different channels.

3) Price Decisions. Price is a focal point of a variety of administrative decisions. It is in one sense an expression of the vendor's concept of his costs; it is also an indication of the buyers' valuation of the goods. Administratively, price determination is not a simple task. It is the effect of policies embodied in accounting practices, implicit in the marketing structure of the firm, or expressed in its promotional strategy. Price may be stated simply and directly as a net amount, or as a gross sum subject to trade, functional, quantity, cash, and other discounts. It may be a mill-based or a delivered price. In many other ways, price decisions are a means of management for achieving its marketing objectives.

MARKETING LEGISLATION

While sanctioning the general institution of marketing in our market economy, society has not completely surrendered control over it to the competitive business mechanism. Evidence to the contrary implied by attitudes of *laissez faire* and *caveat emptor* in trade during recent centuries, is refuted by reconstruction of social sanctions through legislation in the United States beginning about 1890. At that time, in the name of the Sherman Antitrust Act, appeared the beginnings of social policy which have since then been amplified and clarified by legislative, judicial, administrative, and "semi-judicial-administrative" agencies, in both federal and state governments. While aimed at "business," the regulation has pertained specifically to marketing—both wholesaling and retailing.

Underlying the philosophy of marketing regulation are the principles of the superiority of the interests of consumers over those of business, of the freedom to undertake and carry out business enterprise, and of conformity to fair play, insofar as that can be defined in business practice. Several lines of social policy are apparent in marketing legislation:

First, a concept of fairness in competitive price determination underlies portions of the following related statutes: The Sherman Antitrust Act (1890), the Clayton Act (1914), the Robinson-Patman Act (1936). They deal in part with the question of trade-restraining price discrimination, sanctioning price differences based upon, and to the extent of, differential distribution costs incurred in selling different quantities or under different conditions. Restraint is exercised over competition-impeding dealership contracts of vendors and horizontal agreements among competitors relating to price and trade practices.

Second, vertical agreements relating to price maintenance have been sanctioned, with exceptions in some states, by the Miller-Tydings Act (1937) and the McGuire Act (1952), as well as by similar state legislation. Such laws undertake to prevent socially undesirable predatory price-cutting practices through the interest which sellers claim to have in protection of their brand name and distributive organizations.

Third, protection of the public against false, deceptive, and misleading statements in advertising is provided in the Federal Trade Commission Act (1914) and the Wheeler-Lea Act (1938) whereby jurisdiction over this area of business practice is established with the Commission. Similar guard over statements made in product labels is effected through the Pure Food and Drug Act (1906) and the Food, Drug and Cosmetic Act (1938).

Fourth, encouragement as well as discouragement of certain marketing practices is given in the Webb-Pomerene Act (1918) and the Capper-Volstead Act (1922), which sanction agreements among competitors otherwise prohibited by the Sherman Act, in certain matters relating to export trade practice and the establishment of agricultural marketing cooperatives, respectively.

Fifth, a variety of regulation is provided in a number of lesser acts such as the Wool Products Labeling Act (1939), the Fur Products Labeling Act (1951), the Lanham Trademark Act (1946), unfair trade practice acts, municipal vending ordinances, and the like.

MARKETING IN OTHER COUNTRIES

The concept of marketing was originated and developed in the United States, but every country has its own practices and system for the distribution of its products. There are notable differences between markets and marketing in different countries; yet there are similarities which cannot be overlooked. The differences stem from the fact that different societies provide for meeting their material needs in different ways. Thus, the socially sanctioned systems reflect the productivity, the aspiration, the ideals, the needs and wants of the respective peoples. On the other hand, common to world-wide market economies is specialization giving rise to a marketing structure. Examples drawn from a few selected countries will serve to illustrate.

Mexico. Mexico typifies an under-developed agricultural nation in the process of industrializing. Its people comprise a small, literate, cultured minority and a large, illiterate, uncultured, poor majority. Trade, barter, and public market distribution have characterized rural agriculture. The poorer population presents a market for only simple necessities, whose distribution is along primitive lines. To the affluent urban dwellers a whole range of the conveniences and luxuries of American and European markets is provided.

Channels are short, in consideration of the small assembly and dispersion function yet required by the markets. Emphasis is placed upon maximizing profit in the individual transaction, and business is generally conducted without a sense of social responsibility, which is essential to the modern concept of marketing.

Credit is little used. Prepackaging and branding are increasing. Selling occurs in both personal salesmanship and advertising. Principal modernization of marketing establishments appears to be occurring on the retail level, where private supermarkets and improved farmers' markets are found in food distribution and where in the department store field Sears, Roebuck de Mexico is doing an outstanding job of industrial and merchandising development.

Switzerland. Switzerland is a highly developed small country lacking productive land and raw materials and having high density and wide dispersion of its population. With incomes yielding savings, the Swiss have a standard of living which is one of the highest in Europe and in the world. Producers of quality products, they value quality and service in what they buy.

Convenience is often desired, but it appears to be of less value than in the United States. Because no advertising appears on television or radio, a large part of the selling function is performed by sales personnel, who complete a three-year apprenticeship in certain branches of the market and who, having an excellent knowledge of the products they sell, can assist the customer intelligently. There is little tendency of customers to bargain for prices, for a one-price policy is widely adopted.

Consumers have undertaken to provide commodities for themselves at minimum prices through consumer co-operatives, such as the Migros Co-operative chain developed by Gottlieb Duttweiler, which has more than 500,000 members. It is active in the distribution of goods, insurance, and gasoline products. Research of the market is widely conducted in Switzerland; one of the principal centers for this activity is the School of Economics at St. Gall. Brand names are widely used in Switzerland, as is prepackaging.

Retail stores, on the whole, are smaller than those in the United States, although in recent years department stores and supermarkets have gained in importance. The single-line independent store is still the principal type. In wholesaling, farmers' co-operatives have assumed most of the assembly function. Manufacturers have few distributive branches.

The Soviet Union. Although the Union of Soviet Socialist Republics is based upon a political philosophy completely in contrast to that of the United States, Russia nevertheless has a marketing task of meeting the needs of its citizens. In general, both the means of production and distribution are publicly owned, and their operation is subject to governmental planning. Consumption conforms to what is made available.

In its early years, the Soviet government mistakenly attempted to eliminate marketing functionaries without providing for performance of the necessary functions, with the result that chaos was introduced into wholesale distribution. Today more attention is given to scientific marketing, although prevailing practices are still outmoded. Little use is made of brands, because almost all products are state produced. Advertising also is sparingly used. Installment credit has only recently been introduced to facilitate purchase of more expensive goods; credit payments are deducted directly from payments due the wage earner. Such conveniences as delivery, servicing, adjustments, and returns are rarely found in the Soviet trading mechanism.

Since the outlawing and elimination of private merchants in the early 1930's, the Soviet distribution system has been composed of three sectors: the state trading network, the co-operative trading network, and the free farm markets. The *Torg* is the main retail sales unit of the Ministry of Trade. It usually has subordinate to it a chain of stores in a particular city or locality selling a specified group of products. It is managed by a government-appointed official. The stores within the *Torg* system supply the main bulk of necessities to most urban customers, but there are other stores that cater to demands of the higher income groups for better quality and more diversified merchandise.

On the wholesale level, the most important state organization is the Ministry of Requisitions, which procures agricultural products delivered to the state by the collective farms in fulfillment of their compulsory obligations and in payment for the use of the tractor and machine station services. Actual wholesale distribution of industrial goods is organized around the *Prombazy*, which is a large system of warehouses receiving goods from factories and delivering to retail outlets of both state and co-operative organizations. There is also a co-operative wholesaling system.

Japan. Japan presents a market of great density with high urban concentration and low per capita purchasing power. Like its production and foreign trade, its distribution has been dominated by influential wealthy families and powerful financial institutions. Retail business is handled mainly by small shops which specialize in one or several related items. There are also numerous large and modern department stores in the large cities.

Wholesalers dominate distribution and influence heavily the practices of both retailers and manufacturers. They control distribution financing, inasmuch as banks are reluctant to make loans to retailers and producers but will discount wholesaler-endorsed drafts given by both. Wholesalers control even small details like design and style of goods; they determine the prices at which manufacturers sell, thus leaving producers to be little more than contract manufacturers. Carrying these responsibilities, however, wholesalers do not engage extensively in market research, and many of their decisions are made without much understanding of the ultimate market.

In addition to financing, wholesalers are important in the functions of assembly and distribution and in the storage of commodities. While small producers and small retailers engage somewhat in storage, wholesalers perform almost all of the storage function for large producers and for department stores, neither of whom maintains any significant inventories.

SELLING AND ADVERTISING

Among the marketing functions, two are of special importance in business practice and social influence: selling and advertising. Business efficiency as well as business morality are often judged in terms of their performance of these functions.

Selling and advertising are activities which are usually associated with business, but they are not peculiar to business. The techniques which they employ are used by government, religious, social, and other organizations as well as by business enterprises. In all instances, selling and advertising are communications functions. Selling is a personal form of communication; advertising is an impersonal form. The current significance of these functions may be considered from several standpoints: historical development, economic service, psychological implications, management role, and social impact.

Historical Development. Historically, advertising and selling have a long heritage. Personal selling characterized earliest trade transactions. It was employed by importers who, by caravans and merchant ships, brought treasures of the East to Mediterranean shores. It was also used by vendors who, in stalls at local markets and fairs, supplied the daily needs of common people in ancient times; by medieval guildsmen and itinerant merchants; by American Colonial traders, village hucksters, and metropolitan wholesalers and retailers. Advertising, too, appeared early, as wall signs in the period of the Roman empire, as shop identifications and handbills during the handicraft era, as classified and display advertisements, and as radio, television, and outdoor ads of the 19th and 20th centuries. Selling and advertising have been employed in some form in all ages; their specific expressions, however, have changed with social and technological evolution.

Economic Service. As used in business, selling and advertising render an important economic service. They influence the demand of persons who are in the market. It has long been understood in economic theory that in a purely competitive market no selling effort is exerted. Demand and supply are assumed to be known to each other, and because products are, moreover, assumed to be uniform, no amount of cost or effort expended upon promotion of sales would be economical or profitable. The presumed conditions of such a market, however, do not exist in reality. On the contrary, separated from sellers by physical distances, by levels of middlemen, and by different states of knowledge, buyers are in need of information as to what is available, where it is, and at what price. Similarly, sellers, instead of offering homogeneous, uniform products, present to the market items differentiated as a result of production policy or in consideration of market desires. Consequently, an important function of selling and advertising lies in their furnishing the market with information in order to facilitate transactions.

They are also important for the "creation" of demand. In a dynamic economy, where many people have discretionary purchasing power (more than is necessary for meeting bare essentials of living), formation of demand is susceptible to sales influences which encourage spending at the expense of saving, which reveal new combinations of pleasures in consumption, or which switch preferences from one product to another. Imaginative and aggressive selling is the means by which innovators in a free competitive market vie with one another in making a superior offering. Advertising and selling, in other words, are normal, essential, and effectual means of achieving some of the objectives of our competitive market economy.

Psychological Implications. Selling and advertising have also long been a subject of interest to psychologists, who have brought to the study of them several interpretations of human behavior. According to one theory, these functions furnish the stimuli for evoking conditioned responses on the part of consumers. Another theory holds that selling effort initiates a series of steps by which the consumer mentality is transported from interest, through desire and conviction, to action in accord with the proposition made by the seller. Still another theory holds that men are motivated not only by rationality but also by irrationality. Thus selling and advertising employ techniques for prevailing upon both the logical and the emotional faculties of people.

Management Role. However selling and advertising are conceived as psychological stimuli or as economic functions, in practice they remain activities to be administered by business management. Enterprises today are guided increasingly by objectives, in terms of which selected means are chosen. Selling and advertising are two of the means by which managers seek to achieve the maximization of sales and profits, the introduction of new products, the capturing of a share of the market, or some other objective. They are two means for achieving the marketing or sales objective designated "the marketing mix," as previously described.

Personal selling and advertising are themselves alternatives to each other, and although one may be used to supplement the other, there are bases upon which a choice between them may be made: the type of information to be conveyed, the number of people to be contacted, the budget available for promotional activities, or the facilities at the seller's disposal. In general, personal selling is employed when products are complex or technical and require detailed, interpreted sales presentations, when the number of prospective customers is relatively small, or when a service is needed in connection with the transaction. By contrast, the impersonal medium of advertising is often preferable when the obverse conditions prevail: a simple message needs to be communicated to many prospects; a step in the sales process other than the transaction needs to be accomplished; or when the timing of the sales presentation is achieved other than by a personal visit.

Social Impact. The forms of selling, while gaining business acceptance, have evoked also social appraisal, for the character of advertising and personal selling has an impact upon social conditions. Needing market information, the public is dependent upon various forms of selling. This dependence, in turn, gives the public an expectation of reliability in the information—an expectation that sellers will give an honest and fair representation of their products and services. It is recognized that in the competitive system claims and counterclaims are to be expected, and courts have sanctioned trade puffery while denying deceptive selling.

Several types of social control over selling and advertising practices have been developed: Better Business Bureaus, organizations sponsored mainly by retail businesses to police selling practices; fair trade commissions, whose responsibility is to administer laws of the state relating to unfair selling; and finally, the Federal Trade Commission. Created in 1914 with powers mainly to act upon the initiative of businessmen injured by the selling practices of others, the Commission, in 1938 through the Wheeler-Lea Act, was empowered to take, upon its own initiative, preventive measures to protect the public from misleading or deceptive advertising. Such guides to selling action have tended to aid sellers in establishing policies by which social responsibility is fulfilled.

In summary, selling and advertising are communications functions employed by business for the achievement of selected management objectives. Because they have such broad economic and social effects, they are subject to social review as well as to business appraisal.

POWER

The satisfaction of human needs rests fundamentally on labor. Consequently, the more labor procurable at the least cost in human energy, the greater is the human energy set free for other purposes—for the enjoyment of leisure, for progress, for civilization. Past civilizations were built up and supported largely on the labor of slaves maintained at a subsistence level. Modern civilization rests on the utilization of mechanical power, which, in an ever increasing degree, is made to do work formerly done by human beings. Revolutionary changes in the development and use of power have done more than any other factor to raise the standard of well-being in the 20th century.

The application of mechanical power to human productivity multiplies the amount and the value of goods which each individual worker can produce. The following table, showing the estimated daily output of various kinds of workmen in the year 1800 and in 1925, brings home vividly the advantages created largely by the use of power-driven appliances.

ESTIMATED DAILY PRODUCTIVITY PER WORKMAN IN 1800 AND 1925

Product	1800	1925
Iron	500 lbs.	5000 lbs.
Lumber	100 bd. ft.	750 bd. ft.
Nails	5 lbs.	500 lbs.
Shoes	¼ prs.	10 prs.
Coal	½ ton	10 tons
Paper	20 sq. ft.	200 sq. ft.
Bricks laid	500	3600*

*By electric brick layer.

No degree of finality is to be expected of such figures as the above. They depend first on the degree to which various labor saving devices, available to an industry, are actually adopted by the industry. They depend also on the continued discovery of still newer devices, a process which, while going on constantly, is nevertheless very unequal and largely unpredictable. An example is the mechanical blowing of glass bottles, which almost overnight multiplied many-fold the output per man. The flour milling and automobile industries represent continuous and progressive advances over decades. The figures given are regarded as conservative. Their value is chiefly in illustrating the most fundamental fact in the evolution of our economic system—the multiplication of productive capacity by the development of mechanical power.

Early Sources of Power. The adoption of draft animals as a substitute for human labor was an extraordinary advance in the economy of primitive man. This change dates from prehistoric times. Draft animals performed heavy work on the farms, as well as providing power for transportation throughout the world during the entire period of recorded history. They were also employed by the Romans and later peoples in turning mills for grinding grain. Comparatively little additional progress in the utilization of non-human power was made until the invention of steam-driven appliances for pumping water in the late 17th century. The Romans, however, are credited with the first use of the water wheel to turn grinding mills. The wheel was connected with the mill stone by a horizontal spindle through the intervention of bevel gearing.

The water wheel of the Romans was introduced into various parts of Europe and into Britain. At the time of the Norman Conquest of England, 1066 A. D., two counties alone, Norfolk and Suffolk, had 500 mills driven by water power. Windmills were introduced from the East by the Crusaders.

Steam Engines and the Industrial Revolution. The 18th century is notable for the invention of the steam engine and for the beginnings of its application to industries, notably mining, textile and steel manufacture, and flour milling. This development occurred first in England, where, in the 19th century, an industrial society first began to take shape. Urban population increased rapidly. Despite recurrent crises of overproduction, unemployment, booms, and panics, British wealth grew rapidly, due to the fact that machines driven by steam multiplied the productive power of each laborer. Steam power at the same time was vastly increasing the facilities for transportation on land and sea. By the close of the century, Germany and Belgium had been largely industrialized, but the most striking transformation of all was under way in the United States.

The Early Twentieth Century. In 1900, the United States contained two-fifths of the steam railway mileage of the world—about 198,000 miles of track. The country's installed power, not used for transportation, was about 15,278,000 horse power, of which nearly two-thirds was used for manufacturing, the balance being divided almost equally between public utility plants and mineral production. For about 88 per cent of the power the prime mover was steam, that for the balance being practically all water power.

The beginning of the 20th century was notable for two developments in the utilization of power which were of fundamental importance.

The first was the adaptation to wide practical use of the internal combustion engine. The world is most largely indebted for this device to Nicholas Otto, who in 1877 developed the first successful engine of this type, and to Gottlieb Daimler, who in 1884 adapted this engine for use in road vehicles. In 1900, Rudolf Diesel exhibited at Paris the Diesel engine, a much more economical type, particularly for heavy uses. In the following quarter-century the internal combustion engine made possible the universal employment of the automobile for transportation and travel; it also led to the solution of the problem of air travel. In marine transportation, the Diesel engine made rapid inroads on the use of steam. By 1927, the tonnage of ships constructed with oil-burning motors exceeded the year's construction of ships equipped for steam propulsion. Petroleum, the chief source of the motive power for these engines, took its place with coal as one of the most indispensable of raw materials.

The second epochal development of the 20th century in the use of power was the wide utilization of electricity as a means of distributing energy and of making it flexible in application.

Dynamos and electric motors respectively are the instruments by which power is made to take the form of electricity and by which electricity is reconverted to mechanical energy. The principle governing these machines was discovered by Michael Faraday in 1831. Important improvements were made by Werner Siemens in 1854 and by H. Wilde in 1863. In the period from 1880 to 1900, electric railways were constructed in most of the principal cities. It was not until the 20th century, however, that the importance of electricity as a form of power was adequately realized.

Technical improvements in the steam engine, the internal combustion engine, and electrical machinery were largely responsible for the phenomenal growth of power used in the 20th century. Between 1900 and 1930, the total installation of horse power in the United States increased from 15 million to more than 68 million—over 350 per cent. These figures exclude the power used in transportation, yet in 1930 the horse power of automobiles and trucks was approximately equal to the total installed capacity of power used for industrial purposes.

The use of power and machines, however, is not the only cause of increased productivity. The morale of the worker, his interest in his job, has been a factor. Improved working conditions, better pay, etc. have increased his efficiency.

PRODUCTION OF ELECTRIC ENERGY IN THE U. S., 1930–1962

Source: *The Federal Power Commission.*

Year	Electric Energy Produced				Fuel Consumed in the Year		
	Total	Hydro	Steam	Internal Comb't'n	Coal	Oil	Gas
	1,000 Kw. hrs.	1,000 Kw. hrs.	1,000 Kw. hrs.	1,000 Kw. hrs.	Short tons	42 Gal. Barrels	1,000 Cu.ft.
1930	91,111,548	31,189,554	59,293,363	628,631	40,277,989	8,804,530	119,552,711
1935	95,287,390	38,372,154	56,144,412	770,824	32,714,761	11,256,565	124,117,769
1940	141,837,010	47,321,278	93,001,735	1,531,997	51,473,881	16,325,122	180,096,185
1945	222,486,283	79,970,312	140,435,268	2,080,703	74,724,956	20,228,215	326,211,969
1950	329,141,343	95,938,317	229,543,366	3,659,660	91,870,770	75,420,490	628,918,834
1951	370,672,814	99,750,579	267,251,680	3,670,555	105,768,006	63,944,724	763,898,241
1952	399,223,620	105,102,458	290,384,847	3,736,315	107,071,241	67,218,426	910,116,741
1953	442,664,515	105,233,348	333,541,535	3,889,632	115,897,204	82,237,712	1,034,272,333
1954	471,686,354	107,068,508	360,834,386	3,783,460	118,384,671	66,744,754	1,165,498,360
1955	547,037,985	112,975,069	430,119,086	3,943,830	143,759,195	75,273,862	1,153,279,586
1956	600,667,750	122,028,608	474,552,045	4,087,097	158,278,996	72,710,841	1,239,310,686
1957	631,507,224	130,232,457	497,212,384	4,082,383	160,769,232	79,692,910	1,336,140,626
1958	645,098,000	140,262,000	500,764,000	4,072,000	155,724,000	77,668,000	1,372,853,000
1959	710,006,000	137,782,000	567,839,000	4,385,000	164,431,000	88,263,000	1,628,509,000
1960	753,350,000	145,516,000	603,342,000	4,492,000	176,634,000	85,340,000	1,724,762,000
1961	792,039,000	151,850,000	635,564,000	4,625,000	182,121,000	85,736,000	1,825,117,000
1962[p]	851,920,000	168,135,000	683,785,000	*	193,134,000	85,643,000	1,965,590,000

[p] Preliminary estimates. * Included with steam.

Electrification. Electricity is not a primary source of power, like steam, waterfalls, and gas engines. It is a means of making prime movers more useful. Through the generation of electricity by prime movers and the subsequent reconversion of this electricity into power through electric motors, primary energy can be used with greater flexibility in time and space. Power through electricity can be used *when* and *where* it is wanted far more readily than power delivered directly from steam engine or water wheel.

Not only may factories using electricity for power be located at points more advantageous for utilizing raw materials, markets, and labor, but electricity enables power to be used in private homes and on farms. This results in two chief developments of great social significance. First, labor in homes and on farms for the first time in the world's history may be largely freed from drudgery, thereby releasing an incalculable amount of human time and energy for other purposes. Secondly, factories need no longer be located in centers of congested population. New centers of industry may be semi-rural in character, with marked improvement in living conditions. Individual factories need not, as a rule, have their own power plants. Expensive and dangerous beltings and shaftings may be dispensed with. The control of machine processes is more exact and is effected with less labor.

Electricity has the further merit of being instrumental in turning power into other useful forms of service. The most obvious of these is light. The first electric lighting plant was established by Thomas Edison in Brooklyn, beginning operation on September 4, 1882. By November 1883, only 508 premises were wired for 12,732 lamps, none being in private homes. By 1937, about 21,500,000 homes in the United States were served with electricity, in addition to more than 4,000,000 commercial or industrial establishments. Since then, of course, millions of other homes and business establishments have been provided with electrical energy. Lighting now takes a variety of forms developed from the incandescent carbon lamp and the tungsten. Fluorescent lighting and neon lights have become quite common, the latter used especially for advertising purposes.

In addition to light, electric power is essential for the operation of telephones, telegraphs, and radio, where it results in the production of sound. As heat, it performs essential work in electric ranges, furnaces, irons, toasters, grills, and numerous other devices. As an agent of chemical change through electrolysis, it plays a necessary part in the chemical industry. Another important use is for the precipitation of dust from the air in factories. It is essential to the production of talking motion pictures. By facilitating automatic control of numerous processes, it releases an enormous amount

DIVISIONS OF INDUSTRY

Industry	Male	Female	Total 1963*	Total 1960
Employed Persons	43,962,000	23,186,000	67,148,000	66,681,000
Professional, technical, and kindred workers	5,363,000	3,117,000	8,480,000	7,475,000
Farmers and farm managers	2,261,000	120,000	2,381,000	2,780,000
Managers, officials, and proprietors, except farm	6,231,000	1,078,000	7,309,000	7,067,000
Clerical and kindred workers	3,046,000	7,173,000	10,220,000	9,783,000
Sales workers	2,611,000	1,637,000	4,248,000	4,401,000
Craftsmen, foremen, and kindred workers	8,218,000	242,000	8,460,000	8,560,000
Operatives and kindred workers	8,768,000	3,416,000	12,184,000	11,986,000
Private household workers	66,000	2,295,000	2,360,000	2,216,000
Service workers, except private household	3,154,000	3,572,000	6,726,000	6,133,000
Farm laborers and foremen	1,213,000	434,000	1,647,000	2,615,000
Laborers, except farm and mine	3,031,000	102,000	3,133,000	3,665,000
Industry not reported**	1,986,951	1,196,768	. . . .	3,183,719

* Figures as of March 1963. ** Data given are for 1960; later figures not available.
Source: *Department of Labor, Bureau of Labor Statistics; Employment and Earnings.*

Above Pan American Petroleum Corp. Laboratory, Tulsa, Okla., for research in chemical and energizing problems related to the production of oil and gas.
Right Goodyear Tire & Rubber Co.'s research facility, Akron, O., deals with natural and synthetic rubber, as well as vinyl, styrene, and polyester plastics.

Pan American Petroleum Corp.
and *Goodyear Tire & Rubber Co.*

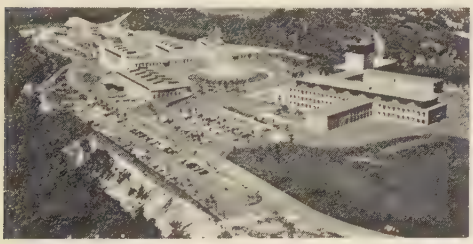
RESEARCH CENTERS

Deering Milliken Research Corp., Spartanburg, S. C., for research in mechanical engineering, textiles, chemistry, chemical technology, and electronics.

Courtesy Deering Milliken Research Corp.

Bell Telephone Laboratories, Murray Hill, N. J., for development and testing of communications equipment.

Photo Bell Telephone Laboratories



Bethlehem Steel Co.'s new $40 million Homer Research laboratories, Bethlehem, Pa., for investigating metallurgy, both process and mechanical, and related matters.

Courtesy of Bethlehem Steel Co.

Control room for checkout of Saturn I and IB boosters built by Chrysler Space Division at NASA Michoud Operations, New Orleans, La.

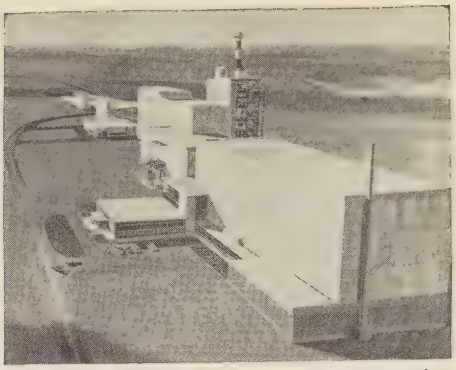
NASA

The Pet Milk Research Center, Greenville, Illinois is located strategically in Middle West dairy country.

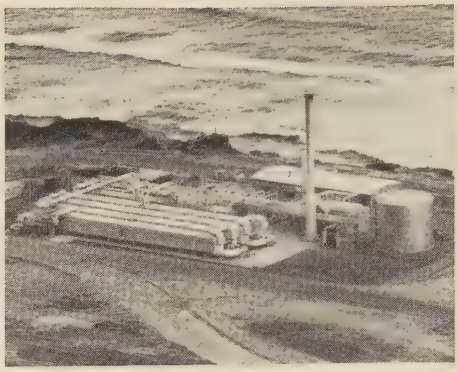
Courtesy The Pet Milk Co.

Aerial view of Union Carbide Technical Center, South Charleston, W. Va., for research on hydrocarbon gases, petroleum, coal, and aromatic chemicals.

Photo Union Carbide Corp.

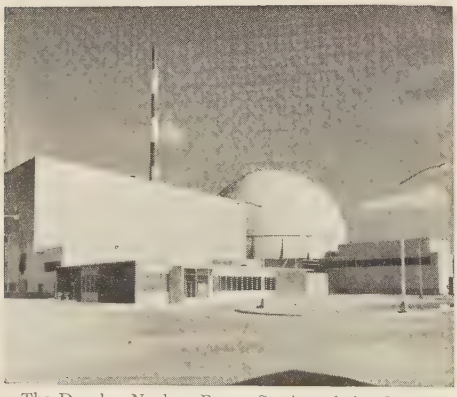


Artist's drawing shows the 75,000-kilowatt nuclear power plant under construction at Hallam, Nebraska.
Atomics International



The Saline Water Conversion plant at San Diego, Cal., uses the "flash" distillation process efficiently in making sea water fit for human consumption.

ATOMIC POWER



The Dresden Nuclear Power Station of the Commonwealth Edison Company is 50 miles southwest of Chicago. The plant has a capacity of 180,000 kilowatts.

This Shippingport, Pennsylvania, plant is the world's first full-scale atomic-electric power plant devoted exclusively to serving civilian needs.
Westinghouse Electric Corporation

A special adaptation of atomic power to peace-time uses is illustrated by the American nuclear merchant ship SAVANNAH, named for the first ship to use steam in an ocean crossing.
Maritime Administration

of human labor. A remarkable instance of such control is found in three water reservoirs at Washington, D. C. These were equipped in 1928 with automata which would report by telephone the depth of the water on receipt of a telephone inquiry from the War Department. Finally, electricity has given the world automatic refrigeration and the control of atmospheric humidity through air conditioning.

Growth of Electric Power in American Industry. The first quarter of the 20th century witnessed the electrification of over three-fourths of American industry. The following summary presents the factual basis for this statement:

In 1899, the total horse power in electric motors was 492,936 out of a total of 10,097,893 primary horse power—4 per cent of the total.

In 1927, the total horse power in electric motors was 30,361,106 out of a total of 39,040,563 of primary horse power—78 per cent of the total.

In other words, electrification in American industry rose from 4 per cent in 1899 to 78 per cent in 1927.

In the same period the amount of power developed in factories and used directly without being transformed into electricity showed only a moderate increase, reaching a high point in 1909 (13,734,597) and steadily declining thereafter. On the other hand, electricity developed in individual factories increased from 310,374 horse power in 1899 to 11,216,111 in 1927—36-fold. Electricity used in the factory but developed in central stations increased from 182,562 horse power in 1899 to 19,144,995 in 1927—105-fold.

Electric Power in Other Countries. The output of light and power in the United States is more than half that of all the rest of the world combined. Norway rates first in per capita output of electric power, followed by Canada, Switzerland, and Sweden.

Chief Sources of Electricity. In presenting the available information on this subject, it must be remembered that for a substantial part of the electricity generated there are no authentic records. Every gasoline automobile, for instance, generates electricity for setting off the cylinder explosions and for other purposes. Motor ships generate electricity which in turn drives the propelling machinery.

Most electricity, however, is generated in central plants or by individual industrial concerns which report their production. Data for 1960 disclose that electricity in the United States is generated to the extent of about 53.3 per cent from coal, 20.7 per cent from natural gas, 6.6 per cent from oil, and 19.4 per cent from hydro (water) power sources. In 1950, approximately 23 per cent of the coal, 8 per cent of the oil, practically all the water power, and 11 per cent of the natural gas were consumed in the production of electric energy. In Canada most of the electric energy is produced by water power.

Conservation of fuel is a long-range motive for preferring water power to coal or oil as a source of electricity, yet immediate economic factors are necessarily the ones which determine the development of the electric industry. Chief among these factors are the location of mineral fuels and of water-power sites in relation to the centers of population. The cost of transmission of current rises rapidly with increase of distance, not only on account of the cost of transmission lines but through losses of energy in transmission.

In the United States, over 70 per cent of the hydroelectric resources are west of the Mississippi river, while the greatest industrial demand is in the East. On the other hand, coal is plentiful in the Eastern states. This situation, together with the plentiful supply of oil, is largely responsible for the greater use of fuel for developing electric power in the United States. In Canada, however, fuel is relatively expensive, and water power is available nearer the centers of population. Consequently, electric power in Canada is almost synonymous with hydroelectric power.

Electricity Generated by Fuel. Electric generating plants operated by steam are normally located in or near industrial centers, in order to be close to their customers and in order to have available a water supply for use in condensing steam as required by the turbine type of steam engine.

Unlike hydroelectric power, the output of steam-driven generators can be counted on at all times irrespective of season. Installations may be added, unit by unit, as the market requirements demand. On the other hand, operating costs are much higher than those of hydroelectric plants. More labor is needed, and fuel must be purchased. These items, however, admit of diminution through operating and other economies. Increased firing and boiler efficiency accounted largely for a reduction, throughout the United States, of over 75 per cent in coal required per horse power as of the years 1902 and 1940. Moreover, fuel oil and gas are often found to be still more economical than coal.

Atomic Power. In 1954, the Atomic Energy Commission launched an experimental program to test different types of reactors to produce electric power. Although strongly criticized, five plants, to cost about $120 million, were developed. Results proved the technical feasibility of atomic power if not its economic feasibility in the U.S. where alternative low-cost fuels are available. In early 1962, three commercial atomic power reactors were functioning in Shippingport, Pa., Dresden, Ill., and Rowe, Mass. Power costs exceed those of conventional plants by eight to ten times.

An atomic-powered submarine, the USS *Nautilus* was launched early in 1955; during 1961, the 22nd nuclear-powered submarine was commissioned. The nuclear-powered merchant vessel *Savannah*, a 22,000-horse power ship whose keel was laid on May 22, 1958, was completed in 1961. The world's largest nuclear-powered vessel, the USS *Enterprise*, an 86,000-ton and 1101-foot aircraft carrier, put to sea on October 29, 1961, from Newport News, Va.

Hydroelectric Power. By this term is meant electricity developed by water power, usually through the medium of water turbine generators.

The first hydroelectric plant began operation at Appleton, Wisconsin, in 1882, a few weeks after the opening of Edison's electric lighting plant in Brooklyn. The Appleton plant had a capacity of 250 sixteen candle power lights. The largest hydroelectric generators include those at Niagara Falls, N. Y., where the units in operation include three 70,000 horse power turbines.

The economic advantages of hydroelectric power include the low cost of operation, since no fuel is required and very few men are needed to operate the plant. On the other hand, hydroelectric plants require a large initial investment, since complete installation for all requirements must be made at the outset, even though much of it may be usable only for a brief flood season or may not be required for years. It is often necessary also to construct dams and artificial water channels, and the power houses themselves must be more substantially built in order to withstand the surge of the water.

Tennessee Valley Authority. A new emphasis was placed on these and subsequent developments by the Tennessee Valley Authority act, approved May 18, 1933. Under this act, a government corporation, the Tennessee Valley Authority, was created not only for the purpose of improving navigation and controlling floods, but to generate and sell power with a view to determining the relative cost of public and private power operations. For this reason, the corporation (TVA) was designated by President Roosevelt as a "yardstick of power costs." The private utility industry bitterly contested the validity of the "yardstick," maintaining that the two costs were not on a comparable basis.

Another part of the TVA's purpose was declared to be the maximum utilization of electricity within its territory, this to be brought about partly by low

promotional rates and partly by education of residents in the advantages of greater use.

The TVA operates in 40,600 square miles of territory drained by the Tennessee River. It comprises parts of seven states—Alabama, Georgia, Kentucky, Mississippi, Tennessee, and the Carolinas—embracing an area inhabited by two million people, with four million more in territory within transmission range of its electric power. TVA took over Wilson Dam and proceeded to build more than 20 major dams providing, in part, a 750-mile waterway, nine feet deep, between Knoxville, Tennessee, and Paducah, Kentucky, where the Tennessee River joins the Ohio.

Electrical energy is produced by water power and by steam, with coal-generated steam plants producing nearly three-fourths of the energy today. About 60 per cent of the energy goes to the Atomic Energy Commission but 148 municipal and rural co-operatives are served, distributing billions of k.w.h. to businesses, industries, and farms.

The TVA has provided cheap electric power, flood control, improved river navigation, and extensive recreational facilities. In fiscal 1954, the TVA's power revenues were $133,948,000.

Municipal Power Systems. Prior to 1933, about 1750 municipalities operated their own electric systems as compared with 13,665 communities which were served by privately operated systems. Most of these municipal plants were small, however, and they generated little more than 4.5 per cent of total power produced. The largest included those in Los Angeles, Seattle, Cleveland, and Springfield, Ill.

With the establishment of the TVA and the building of large governmental dams in the Columbia basin and elsewhere, a powerful impulse was given to municipal power distribution. Numerous Federal loans and grants were made to local bodies for building or buying the necessary facilities, this being a means of finding a market for power developed at the dams.

The production of electric energy amounted to 795,251 million kilowatt-hours in 1959 of which nearly three-fourths was produced by private utilities. Of the electric power produced by publicly-owned utilities, 65 per cent comes from Federally-owned facilities, 20 per cent from municipal power plants, and 15 per cent from co-operatives. According to the Municipal Year Book, of the 131 cities with a population of more than 100,000 in 1961, 105 operated water supply and distribution systems, 17 electric generating and distributing systems, 14 transit systems, and 7 gas manufacturing and distributing systems.

Transmission of Electricity. One of the chief advantages of electricity as a form of power is its ability to be transmitted long distances. In 1889, seven years after the construction of the first electric plant, it was a notable achievement to transmit electricity 13 miles at a pressure of 4000 volts. Today currents of 220,000 volts are frequently sent upwards of 250 miles by straightaway transmission.

High voltage transmission systems usually employ overhead conductors. These ordinarily consist of twisted strands of copper or of aluminum wire with steel cores, supported either by poles or steel towers with arms, to which the wires are attached through the medium of insulating porcelain plates.

High voltages used for long distance transmission are transformed to lower voltages at distributing stations and substations until the current is of the proper character for the ultimate user.

Interconnection of Electric Systems. This is frequently referred to as superpower, which may be defined as a system of hydroelectric and steam generating plants within a given territory interconnected into a power pool, which draws on the various generating stations according to their capacities, subject to the dictates of economy, and dispenses electricity to various communities according to their needs. The policy of interconnecting power systems took shape in the period 1917-1919.

The advantages of such interconnection may be seen from the fact that water power is subject to wide fluctuations. During the late spring and early summer, when the rivers are full, the requirements for power are reduced by the contributing factors of daylight, temperature, and the tendency of industry to relax. During the early fall, when these requirements are at their height, the rivers are at their lowest. To cut down on requirements for reserve equipment and to provide greater security against interruptions in service, many power companies provide supplementary steam plants, which need operate only when water power is deficient.

The Electrical Power Industry. By 1937, the electrical power industry in the United States represented a capital investment of about 12 billion dollars. Annual revenue exceeded 2600 million dollars. Municipalities also had invested more than 700 million dollars in electrical properties.

Operating companies in the United States which produce electric power are required by law to be local monopolies under the control of a state regulating commission. The standard method is to place each local monopoly under the regulation of a state commission charged with the duty of seeing that the service is adequate and that the prices are just and reasonable.

In the 1930's, the Federal government became a factor in the production and distribution of electric power. Although faced with opposition from private power groups contending that they could not compete with the non-profit operations and low-interest financing of the government, public power has expanded. Major developments include the Tennessee Valley Authority and various Columbia River projects. Recently, feelings were aroused over the Dixon-Yates contract for private power expansion in the Tennessee Valley and the Hell's Canyon project in Idaho. In both cases, public versus private power has been the issue.

Electric Industry in Canada. The potential hydroelectric power in Canada is estimated at 33,617,200 horse power at ordinary six-month flow or 20,347,400 horse power at the minimum flow. Installations totaled in 1942 approximately 8,845,000 horse power. Capital invested in the industry represented about 1,564 million dollars, the annual gross revenue being approximately 152 million dollars. Over 70 per cent of all industrial and domestic power used is in the form of electricity.

The electrical industry of Canada presents two noteworthy features. One is its close association with the pulp and paper industry. Many pulp companies, having developed electricity in excess of their own requirements, found the sale of surplus current an increasingly important part of their business. The other noteworthy feature is the large part played by municipal and governmental bodies in the generation of electricity. More than one-third the electric power in Canada is generated by governmental units.

Power on Farms. The power available on farms in the United States is approximately equal to that available in the combined factories, public utility plants, and mines of the country—upwards of 60 million horse power. The horse power per capita at the service of those engaged in agriculture has exceeded that at the service of each wage earner in industry since 1870, with the exception of the period 1904-1914, when agriculture lagged behind industry in the adoption of mechanical aids to production.

In 1870 practically the entire non-human power on farms was in the form of farm animals. Even in 1900, they represented about 80 per cent of the available power, the remainder being steam engines, gas engines, and windmills. By 1923, however, according to estimates by the United States Department of Agriculture, mechanical power exceeded animal power.

INSURANCE

Few appreciate the enormous proportions attained by the insurance business. During 1957 the people of the United States paid in excess of $14,775,000,000 in premiums for insurance protection. At the close of that year various companies and institutions writing insurance in the United States held assets of over $100,000,000,000.

The basic function of insurance is the reduction of certain risks to which man and his economic ventures are exposed. Although the field of insurance is sometimes divided into the so-called "personal" and "property" lines, a more understandable approach involves a review of the major types of cover. Life and health insurance are designed to reimburse the person insured or some designated beneficiary for losses occasioned by death or disability. Other forms of insurance perform a similar function, such as liability insurance, which provides a payment to persons injured or to the estates of persons killed or injured as a result of the negligence of the insured. Workmen's compensation provides such protection when the loss grows out of a workman's performance of his duties.

Property may be damaged or destroyed, or its value impaired, by an almost countless number of perils, including fire, windstorm, explosion, theft, defalcation, or collision. In addition, accumulated property values may be reduced by the shutdown of a business due to such perils as those indicated or by the effect of a liability judgment. Some of the major lines of "property-liability" insurance include fire, automobile, marine, theft, fidelity and surety, boiler and machinery, glass, and title.

LIFE INSURANCE

Life insurance may be defined as being a "contractual arrangement, whereby, for a stipulated compensation called the premium, one party (the insurer) agrees to pay the other (the insured), or his beneficiary, a fixed sum upon the happening of death or some other specified event." With few exceptions, its real purpose is to indemnify the beneficiary for the financial loss suffered through the premature death of the insured.

Purpose and Extent. In the vast majority of instances, life insurance is taken for the purpose of protecting the family against the loss of the earning capacity of the breadwinner through an untimely death. But, in recent years, the business uses of life insurance have also shown a marvelous growth. Life insurance can be used to help offset the financial loss to a firm when a key man in the organization dies. Partners can insure each other so that funds will be available to buy out the interest of the one dying first. Stockholders in closely-held corporations often purchase life insurance which will provide the funds with which the shares of a deceased shareholder can be purchased by the firm.

To an increasing extent, also, business concerns are using the group form of life insurance, whereby large groups of employees are protected under a single policy for a stated amount for each employee, usually the equivalent of one or two years' wages.

An examination of the figures in the table entitled "Life Insurance in the United States" will make clear the extraordinary growth of life insurance in this country. Even as late as 1880, ordinary life policies numbered only 685,531 with a face value of $1,581,481,706, and industrial policies only 236,674 with a face value of $20,533,469. By the close of 1957, the number of ordinary life policies totaled over 87 million, representing more than $264 billion, while industrial policies numbered about 108 million, with a face value of about $40 billion.

In 1912 less than 50 group life insurance policies were in existence in the United States, and the total amount of insurance in force was about $13 million. The comparable figures for 1957 were 120,000 group master policies and over $134 billion in force. In the period since World War II (1947–57), group insurance has surpassed the growth of both ordinary and industrial life. The percentage increases for insurance in force for the three lines are 419, 217, and 133, respectively. These figures point up the significant growth of group insurance and the fact that industrial insurance is declining in relative importance. Whereas it comprised 16.3 per cent of all ordinary, group, and industrial insurance in 1947, the percentage declined to 9.1 per cent in 1957. Credit life insurance has grown in this same period from $1.7 billion to $19.7 billion, the largest percentage growth of any form of life insurance.

From the standpoint of invested assets, life insurance has developed also to the very forefront of financial institutions. In 1880 the total assets of American companies amounted to less than $453,000,000. At the close of 1957, however, the admitted assets of these companies totaled nearly $101 billion, an increase of almost 225-fold.

Additional forms of life insurance in the United States at the end of 1957 include veterans life insurance, with $43.9 billion in force; fraternal life insurance, with $11.7 billion (including Canada); assessment associations, with $1.6 billion; and savings bank life insurance, with almost $1 billion in force. The total figure for all forms of life insurance indicated is in excess of $516 billion. These figures testify convincingly to the wide appreciation of the value of life insurance.

Basic Principles. Life insurance differs from other forms of insurance in one very vital respect. In other forms of insurance the contingency insured against may never happen, and, as regards the great majority of policies written, does not happen. Life insurance, however, protects against the event of death, which, under a whole-life policy, is a "hazard converging into certainty." It is, therefore, necessary to provide not only against the risk of death each year, but also "to accumulate a fund sufficient not only to meet a claim whenever occurring, but also to provide at the ultimate limit of human life an absolutely certain claim if one has up to that time been escaped."

To accomplish this purpose it is necessary to have life insurance companies base their premium charges upon a so-called mortality table, which indicates the yearly probability of death at various ages.

Improving mortality over the years can be seen in the number of years a person born can expect to live. In 1900 the expectation of life at birth for all persons in the United States was 47.3 years. By 1930 the figure had risen to 59.7, and it was 69.6 at the end of 1956.

MORTALITY TABLE

Age	Number Living at Beginning of Designated Year	Number Dying During Designated Year	Yearly Probability of Dying	Expectation of Life
1	1,000,000	5,770	.00577	62.76
2	994,230	4,116	.00414	62.12
3	990,114	3,347	.00338	61.37
4	986,767	2,950	.00299	60.58
5	983,817	2,715	.00276	59.76
6	981,102	2,561	.00261	58.92
7	978,541	2,417	.00247	58.08
8	976,124	2,255	.00231	57.22
9	973,869	2,065	.00212	56.35
10	971,804	1,914	.00197	55.47
11	969,890	1,852	.00191	54.58
12	968,038	1,859	.00192	53.68
13	966,179	1,913	.00198	52.78
14	964,266	1,996	.00207	51.89
15	962,270	2,069	.00215	50.99
16	960,201	2,103	.00219	50.10
17	958,098	2,156	.00225	49.21
18	955,942	2,199	.00230	48.32
19	953,743	2,260	.00237	47.43
20	951,483	2,312	.00243	46.54

MORTALITY TABLE—Con.

Age	Number Living at Beginning of Designated Year	Number Dying During Designated Year	Yearly Probability of Dying	Expectation of Life
21	949,171	2,382	.00251	45.66
22	946,789	2,452	.00259	44.77
23	944,337	2,531	.00268	43.88
24	941,806	2,609	.00277	43.00
25	939,197	2,705	.00288	42.12
26	936,492	2,800	.00299	41.24
27	933,692	2,904	.00311	40.36
28	930,788	3,025	.00325	39.49
29	927,763	3,154	.00340	38.61
30	924,609	3,292	.00356	37.74
31	921,317	3,437	.00373	36.88
32	917,880	3,598	.00392	36.01
33	914,282	3,767	.00412	35.15
34	910,515	3,961	.00435	34.29
35	906,554	4,161	.00459	33.44
36	902,393	4,386	.00486	32.59
37	898,007	4,625	.00515	31.75
38	893,382	4,878	.00546	30.91
39	888,504	5,162	.00581	30.08
40	883,342	5,459	.00618	29.25
41	877,883	5,785	.00659	28.43
42	872,098	6,131	.00703	27.62
43	865,967	6,503	.00751	26.81
44	859,464	6,910	.00804	26.01
45	852,554	7,340	.00861	25.21
46	845,214	7,801	.00923	24.43
47	837,413	8,299	.00991	23.65
48	829,114	8,822	.01064	22.88
49	820,292	9,392	.01145	22.12
50	810,900	9,990	.01232	21.37
51	800,910	10,628	.01327	20.64
52	790,282	11,301	.01430	19.91
53	778,981	12,020	.01543	19.19
54	766,961	12,770	.01665	18.48
55	754,191	13,560	.01798	17.78
56	740,631	14,390	.01943	17.10
57	726,241	15,251	.02100	16.43
58	710,990	16,147	.02271	15.77
59	694,843	17,072	.02457	15.13
60	677,771	18,022	.02659	14.50
61	659,749	18,988	.02878	13.88
62	640,761	19,979	.03118	13.27
63	620,782	20,958	.03376	12.69
64	599,824	21,942	.03658	12.11
65	577,882	22,907	.03964	11.55
66	554,975	23,842	.04296	11.01
67	531,133	24,730	.04656	10.48
68	506,403	25,553	.05046	9.97
69	480,850	26,302	.05470	9.47
70	454,548	26,955	.05930	8.99
71	427,593	27,481	.06427	8.52
72	400,112	27,872	.06966	8.08
73	372,240	28,104	.07550	7.64
74	344,136	28,154	.08181	7.23
75	315,982	28,009	.08864	6.82
76	287,973	27,651	.09602	6.44
77	260,322	27,071	.10399	6.07
78	233,251	26,262	.11259	5.72
79	206,989	25,224	.12186	5.38
80	181,765	23,966	.13185	5.06
81	157,799	22,502	.14260	4.75
82	135,297	20,857	.15416	4.46
83	114,440	19,062	.16657	4.18
84	95,378	17,157	17988	3.91
85	78,221	15,185	.19413	3.66
86	63,036	13,198	.20937	3.42
87	49,838	11,245	.22563	3.19
88	38,593	9,378	.24300	2.98
89	29,215	7,638	.26144	2.77
90	21,577	6,063	.28099	2.58
91	15,514	4,681	.30173	2.39
92	10,833	3,506	.32364	2.21
93	7,327	2,540	.34666	2.03
94	4,787	1,776	.37100	1.84
95	3,011	1,193	.39621	1.63
96	1,818	813	.44719	1.37
97	1,005	551	.54826	1.08
98	454	329	.72467	.78
99	125	125	1.00000	.50

The assumption is that the death rate of the future will be approximately that demonstrated by the past. Given the age of the insured, the kind and amount of the policy desired, and the maximum rate of interest which the company will guarantee on its funds, it is possible to compute a premium based on the particular mortality table in use. That premium is known as the "net premium," and is intended to cover only the actual mortality cost of the company. To this "net premium" the company must add a percentage to cover expenses of operation and contingencies, thus giving the so-called "gross premium." This is the premium that is actually charged the policyholder.

Should the premium be found to be too large, owing to a more favorable death rate than was indicated by the mortality table, or because expenses are smaller and interest earnings larger than anticipated, the company may have agreed to return to the policyholder all or a portion of such gains in the form of a "dividend." When this is done, the insurance is known as "participating." When the insurance is "nonparticipating," the premium charged the policyholder is usually considerably smaller. This is due to the fact that the company, as distinguished from the policyholder, remains entitled to all the gains which may accrue.

While the premium may be increased from year to year as the age of the insured increases, this is seldom done. Experience has shown that life insurance, in order to be practicable, must be based on a uniform annual premium during the premium-paying period. Such a plan requires the company, during the early years of the policy, to charge a premium more than sufficient to pay the current cost of insurance. The excess portions of the annual premiums are thus accumulated in a fund, known as the "reserve." This will be drawn upon in later years when, owing to the increasing hazard connected with increasing age, the uniform annual premium becomes insufficient to meet the current cost.

When a large number of policies are considered, the reserve (the overcharge or unearned premium) may be defined as representing that "sum which, together with future premiums paid by policyholders, will just enable the company to meet its claims according to the mortality table in use." Accumulation of such a reserve fund is fundamental to any sound plan of life insurance. Its absence in the past has been the cause of failure of many insurance institutions. Even today, it is the one great distinguishing feature between the sound and the unsound. It is for this reason that all regular life insurance companies are required by law to operate on the so-called "legal reserve basis."

Who Can Be Insured. Unlike the various kinds of property insurance, life insurance has not been construed by the courts as furnishing contracts of indemnity for loss suffered. It is well settled in the law that an individual possesses an insurable interest in his own life to an unlimited extent. Likewise, the insured may make his life insurance payable to his own estate, or to any beneficiary he may choose to name.

In view of the above ruling, it is necessary for insurance companies to protect themselves against the acceptance of risks which are either substandard in quality or which involve amounts of insurance greatly out of line with the earning capacity of the applicants. The protection needed is secured in several ways. A medical examination of the prospect is invariably required in the case of individual applicants. This precaution may be dispensed with in the case of policies of limited size or for group insurance. The prospect is required also to give true answers to numerous questions, relating to his health, family history, habits, and other points, contained in the application for his insurance. Where the insurance applied for is apparently too large, inquiry will also be made into the financial status of the applicant.

The problem of providing insurance for substandard applicants is receiving careful study in insurance circles. It is recognized that applicants for insurance are by no means equal in the quality of the risk involved. Numerous features, involving occupation, state of health, nationality, stature, weight, family history, and various other points, need to be considered if due allowance is to be made for the actual merits of the case. It is now felt that substandard lives should be given the benefits of life insurance, although at premiums sufficiently increased to meet the additional hazard associated with the substandard character of the applicant.

Who May Be a Beneficiary. As already noted the insured has an insurable interest in his own life to any extent. Further, in the absence of policy conditions to the contrary, he may name his own estate, or any individual he chooses, as beneficiary. But what is the situation when the insurance is taken out by a person other than the one insured?

Here we unfortunately meet with a great variety of judicial decisions. With respect to ties of affection, blood, or marriage, the courts have generally held that certain of such ties create an insurable interest even though the element of financial dependence is not present. The weight of authority holds that a parent has an insurable interest in the life of a child. Husband and wife are conclusively presumed to have an insurable interest in each other's life.

As regards all other relations, however, the courts have generally taken the position that the interest of the beneficiary, when taking out the insurance, must be based upon a reasonable expectation of deriving pecuniary benefit from the continuance of the insured's life. The weight of legal opinion is to the effect that the insurable interest of a beneficiary taking out insurance "must exist at the time the contract is made and that a policy valid at its inception will not, therefore, be voided if it should happen that the interest ceases before the maturity of the contract, unless the provisions of the policy are such as to bring about that result."

A creditor has an insurable interest in the life of a debtor. This interest has been held even to survive a discharge of a debtor in bankruptcy. The only question about which there is variance relates to the amount of insurance, as compared with the amount of the debt, which the creditor may obtain on the life of the debtor.

Three important lines of judicial decisions relate to this matter. One (exemplified by Pennsylvania) limits the creditor's right to insure the life of the debtor to "an amount equal to the debt plus all premiums payable during the life expectancy of the insured according to the Carlyle Table, together with interest on the debt and premiums." Another (adopted by the United States Supreme Court and by New York) indefinitely limits the insurable interest of the creditor by providing that "the relationship between the amount of insurance and the amount of the debt must not be so disproportionate as to make the policy take on the appearance of a wagering contract as distinguished from its legitimate purpose."

Still another line of decision (exemplified by Texas) allows the creditor to secure all the insurance he may wish to take on the debtor's life, but limits his recovery, in case of the debtor's death, "to the amount of the debt and the premiums plus interest thereon, the balance, if any, passing to the debtor."

What Type of Policy to Select. When considering the leading types of policies—term, ordinary life, limited-payment life, and endowment—the average applicant unfortunately gives too little thought to the importance of making the proper selection. No one type of contract serves all persons equally well. In every case the applicant's special circumstances should be considered by the salesman, and the insurance recommended should be such as will meet the needs of the prospect.

The size of the premium varies greatly with the kind of policy, depending mainly on the extent to which a savings fund is provided for in addition to the current cost of protection. When a term policy grants protection only, and contains no savings fund accumulation, the premium outlay is small. The company's promise is limited to $1000 in the event of death during the term, nothing being paid in case of survival. The whole life policy, on the contrary, promises, not only $1000 upon death at any time, but also the same amount upon survival at age 100. As compared with short term policies, it represents a gradually increasing savings fund, thus requiring a higher premium to be paid throughout life.

The limited-payment whole life policy resembles the ordinary whole-life contract in every respect, except that premium payments are limited to a term of years, like 20 years, instead of being continued throughout life. Since the liability is the same under the two contracts, the insurance company must collect the same amount, considering an assumed rate of interest. If all payments are, therefore, completed within 20 years, as under a 20-payment life policy, the premium rate must necessarily be higher than when the payments continue indefinitely for life. As distinguished from the above, endowment insurance—using a 20-year endowment for illustrative purposes—promises $1000 upon death during the 20-year term as well as an equal amount upon survival at the end of the term. Since this policy involves, in addition to the term insurance, a rapidly increasing savings fund (amounting to $1000 in 20 years), the premium must be correspondingly large. The difference in cost between the aforementioned types of policies may be illustrated at age 25 with the following rates charged by a certain company per $1000 of insurance: 10-year term, $11.34; whole-life, $19.00; 20-payment life, $24.16; and 20-year endowment, $44.82.

Owing to the low premium, term insurance gives the largest protection for the smallest possible outlay. It, therefore, meets the insurance needs of the young man with a small income and with a family on his hands. Here no surplus earnings exist to pay for the accumulating savings fund under other types of policies. Even where there is some small surplus, it may probably be used to better advantage in the profession or business, which are in the formative stage. Moreover, in the average man's family there is a peculiarly hazardous period, the child-raising period, when the death of the income producer proves a calamity. Accordingly, many who carry a substantial line of higher premium insurance supplement the same with additional 10- or 20-year term insurance to cover the period mentioned. The total insurance is thus substantially increased without undue strain.

LIFE INSURANCE IN CANADA

(Millions of Canadian Dollars)

	1960	1961	1962
Insurance in Force:			
Ordinary	$31,016	$33,296	$35,514
Group	14,739	16,491	18,572
Industrial	1,112	1,070	1,014
Total	$46,867	$50,857	$55,100
Benefit Payments:			
Death Benefits	$ 197	$ 216	$ 229
Matured Endowments	46	47	51
Disability Payments	6	6	6
Annuity Payments	71	75	88
Surrender Values	128	136	140
Policy Dividends	113	129	143
Total	$ 561	$ 609	$ 657
Income:			
Premium Income	$ 953	$ 1,019	$ 1,083

Source: *1963 Life Insurance Fact Book* (New York: Institute of Life Insurance).

LIFE INSURANCE IN THE UNITED STATES

INCOME, PAYMENTS, ASSETS AND RESERVES OF LIFE INSURANCE COMPANIES 1900–1962 (000,000 Omitted)

Date	Premium Income	Investment Income	Total Income	Benefit Payments	Assets	Reserves
1900	N.A.	N.A.	$ 401	$ 169	$ 1,742	$ 1,443
1910	N.A.	N.A.	781	387	3,876	3,226
1920	$ 1,381	$ 383	1,764	745	7,320	6,338
1930	3,517	1,077	4,594	2,247	18,880	16,231
1935	3,673	1,399	5,072	2,535	23,216	20,404
1940	3,887	1,771	5,658	2,664	30,802	27,238
1945	5,159	2,515	7,674	2,667	44,797	38,667
1950	8,189	2,075	11,337	3,730	64,020	54,946
1951	9,040	1,948	12,012	3,984	68,278	58,547
1952	9,883	2,160	13,076	4,146	73,375	62,579
1953	10,847	2,363	14,271	4,515	78,533	66,683
1954	11,563	2,590	15,280	4,947	84,486	70,903
1955	12,546	2,801	16,544	5,382	90,432	75,359
1956	13,584	3,063	17,865	5,878	96,011	79,738
1960	17,365	4,304	23,007	8,119	119,576	98,473
1961	18,258	4,668	24,397	8,811	126,816	103,285
1962	19,373	5,044	26,000	9,325	133,291	108,384

Before 1947 the business of accident and health department of life companies was not included. N.A.—Not available.
Source: *1963 Life Insurance Fact Book.*

The essential purpose of term insurance is to protect a *known temporary hazard*, under conditions when no other form of policy can be purchased in adequate amount. Its great disadvantage lies in the fact that the temporary nature of the hazard may be misjudged. At the expiration of the term policy, insurance protection may still be needed, and yet be unobtainable because of inability to meet the medical standard. For this reason term policies usually contain a renewable provision allowing extensions of the original term period. Term policies may also be convertible, which means they may be exchanged for higher premium form by paying the extra cost. Both of these provisions are recommended if the insured's needs so dictate. Moreover, term policies, since they contain no savings feature, do not inculcate the habit of systematic thrift.

The shortcomings just noted with respect to term insurance are obviated by the ordinary policy. This represents *permanent* protection at a very moderate cost. It also combines protection with reasonable saving. Whenever possible, this type of insurance should be preferred to the term plan. Many who take term insurance could, through a little additional effort, pay the extra premium on an equal amount of ordinary insurance. Many argue that they prefer to place the difference in premium in bonds, stocks, real estate, or some other investment. Yet this seems inadvisable, even assuming the resolution is carried out, owing to the absolute security of the life insurance investment and the approximate return of 4 to 5½ per cent.

A substantial variety of special forms have become important in life insurance. The so-called "preferred risk" or "special" policies are sold at a reduced rate per $1,000 of insurance because the insured agrees to buy a certain minimum amount, such as $5,000, $10,000, or $25,000. The reduced rate represents a discount for a quantity purchase and recognition of the more careful selection process followed in reviewing applications for insurance. These contracts contain essentially the same provisions as ordinary life forms.

Another development which has appealed to many buyers of life insurance is the "family plan" under which standard packages of coverage apply to all members of the family. The insurance is generally an amount of ordinary life, such as $5,000, on the father, with perhaps $1,000 of term on the life of the wife and each child (to age 18). The premium remains constant even if the wife dies or additional children are born.

Methods of Paying the Proceeds at Maturity of the Policy. The proceeds of life policies may be paid either in a lump sum or in installments. In the latter case, commonly known as the annuity option, monthly installments are usually paid for ten or twenty years, irrespective of the life of the beneficiary and, therefore, as much longer as the beneficiary may survive the 10- or 20-year period.

The lump sum payment plan has little to commend it where the purpose of the insurance is to give an income to dependents. The fairness of giving 20 or 50 thousand dollars in one lump sum to a widow may well be questioned in these days of stock-selling ventures and the vast army of goldbrick specialists. The underlying purpose of life insurance is to *assure an income* to dependents *as long as needed*. This the lump sum payment method does not guarantee. The life annuity plan, on the contrary, "insures the insurance," and is just as necessary a form of protection to the beneficiary as the original insurance itself. It is insurance against foolish investment and reckless expenditure.

Under the life annuity plan the policy proceeds constitute an "insurance estate" administered by the insurance company. It relieves the beneficiary of all expenses of reinvestment, and of all exercise of judgment in the placing of investments and of their supervision thereafter. Administration of the insurance estate by the insurance company also compares very favorably with the administration of an estate through other channels. There are no legal contests between heirs, no legal expenses of administration, no income taxation, and no fluctuation in either the value of or the income obtained from the estate. Moreover, there is no danger of loss of the principal. The only significant danger is that the value of the proceeds will diminish due to inflation. The dollars paid the beneficiary continue at a constant amount while the purchasing power of these dollars diminishes.

INSURANCE IN FORCE, 1900–1962 (000,000 Omitted)

Year	Ordinary	Group	Industrial	Credit	Total
1900	$ 6,124	. .	$ 1,449	..	$ 7,573
1910	11,783	. .	3,125	..	14,908
1920	32,018	$ 1,570	6,948	$ 4	40,540
1930	78,576	9,801	17,963	73	106,413
1935	70,684	10,208	17,471	101	98,464
1940	79,346	14,938	20,866	380	115,530
1945	101,550	22,172	27,675	365	151,762
1950	149,071	47,793	33,415	3,889	234,168
1951	159,054	54,398	34,870	4,818	253,140
1952	170,795	62,913	36,448	6,435	276,591
1953	184,859	72,913	37,781	8,706	304,259
1954	198,419	86,395	38,664	10,241	333,719
1955	216,600	101,300	39,682	14,750	372,332
1960	340,268	175,434	39,563	31,183	586,448
1961	364,347	192,202	39,451	33,493	629,493
1962	389,150	209,178	39,638	38,011	675,977

Source: *1963 Life Insurance Fact Book.*

Disposal of Policy before Maturity. In many instances, however, life insurance policies terminate by lapse or surrender instead of by death. Various circumstances may be responsible for this, such as inability to pay premiums, death of the named beneficiary without leaving other dependents to be protected, or impairment of the insured's health to such an extent as to make further payments of premiums inadvisable in view of the "extended insurance option" granted by the policy.

Cash or Loan Value.—When a policy terminates by surrender, the insured has the option of selecting any one of a number of "guaranteed values," set forth in the contract. One of these values is called the "cash" or "loan value." This value represents the amount of the reserve value of the policy which may be borrowed, if it is intended to keep the policy alive, or which may be taken in cash, if the policy is to be terminated. Usually, such a value is granted after the third annual premium has been paid. Competition is now leading many companies to offer cash values after the first year of the policy. The amount, however, will not represent the full reserve value, in most cases, until a considerable number of years have elapsed. Usually, the full reserve value is given or loaned after the payment of ten annual premiums.

Paid-up and Extended Insurance.—Instead of the cash value of the policy, the insured may, upon terminating his policy, take either "paid-up insurance" or "extended insurance." The "paid-up insurance" represents that amount of insurance which may be purchased with a net single premium equal to the amount of the cash value of the policy. "Extended insurance," on the contrary, means insurance of the same kind on a term basis and for the original amount for as long a period as may be purchased with a net single premium equal to the cash value at the attained age.

In a typical case, the cash value of a $10,000 20-payment life policy at age 35 amounts to $682 at the end of the third year. Instead of taking the $682 in cash, the policyholder may obtain $1540 of paid-up whole-life insurance, or $10,000 of extended term insurance for a period of 7 years and 334 days. In other words, all three of these options are mathematically equivalent, assuming a given mortality table and a stipulated interest rate. Aside from these options, many companies give the insured, upon termination of his policy, the privilege of utilizing the cash value to purchase an annuity, or some other type of life insurance contract.

Industrial Insurance. As its name implies, industrial insurance is a form of life insurance especially adapted for wage-earners. Its purpose is to enable the large industrial portion of our population to have the funds necessary to meet the expenses connected with medical attendance during their last illness and to assure a decent burial. But, while these are its special purposes, industrial insurance has proved a great educator to the masses in that it has conveyed a proper appreciation of the value of ordinary life insurance.

Although originally sold on the basis of units of premiums of 5 cents a week or multiples thereof, with collection by the agent each week, improved machine accounting techniques and rising income levels for policyholders have resulted in policies being stated in terms of their face amount (usually $250–$1,000) and in monthly premium collections. Such insurance is more expensive than ordinary life, but it has served a real need in the insurance market. The average size policy in the United States in 1957 was $370. These policies contain provisions normally not included in ordinary life, such as an allowance for the insured to return the policy within 2 or 3 weeks if dissatisfied, certain disability and accident benefits, and less liberal provisions for payment of the proceeds in case of death.

With the exceptions just noted, industrial insurance is based on the same general principles that serve as the foundation for ordinary life insurance. The legal reserve basis is used and the contracts contain practically all of the leading provisions found in regular policies. Premiums are calculated upon an actuarial basis, although a different mortality table is necessary to indicate the higher death rate that prevails among this type of policyholders.

Group Insurance. This form of insurance was introduced in 1911. It is designed to enable an employer to insure employees under one policy. The employer holds a master policy, which covers the employees insured, and each of the employees so insured holds an individual policy. The premium may be paid entirely by the employer or its cost may be shared between employer and employee. At least 10 to 25 employees (depends on state law) must be covered, although so-called wholesale policies are written covering from 5 to 9 employees. Most group insurance policies are for term insurance. No medical examination is necessary. Consequently this is the only form of insurance which some people can obtain. For employees advanced in years, the cost is much less than for equivalent insurance in any other form. In case of the termination of employment, the holder of an individual policy ordinarily has the privilege of converting his insurance into some other type, on which, of course, he pays the premiums.

The employer ordinarily receives whatever dividends are paid on group policies. These may in some cases equal the amount the employer has contributed toward meeting the premium. If the dividends are less than the amount paid by the employer, the difference may be regarded as an increased wage payment or an investment in employee good will.

An important recent development is group creditor insurance under which a lending institution purchases a group contract on all borrowers to cover the loan in event of the borrower's death.

Fraternal Insurance. Fraternal societies usually observe some ritual, and their government is purely democratic. With respect to insurance, their chief purpose has been to enable the members to secure protection at the smallest possible cost.

Owing to this desire, many of the societies ignored the "reserve basis" of life insurance and charged premiums wholly inadequate to meet the necessities of the situation as demonstrated by a mortality table. Numerous failures therefore occurred. This situation led to the adoption in many states of laws making it compulsory for the orders to employ the legal reserve basis. In case of such adoption new policyholders should no longer be confronted with the fear of insecure insurance. It is due in large part to the unhappy experiences of many people with fraternal policies that this form of insurance has not shared in the rapid growth which has characterized life insurance as a whole. Although fraternal insurance in force in the United States and Canada was only about 23 per cent higher in 1957 than in 1915, the assets have risen during this period from $264 million to $2.8 billion.

Whereas an ordinary life policy is a definite promise to pay a stated sum in return for a fixed annual premium, the benefit certificate of a fraternal society has, in the past, merely recognized the holder's rights as a member n the society to share in its benefits if the same can be paid out of the assessments levied on the membership. With the adoption of actuarial methods, however, a fraternal benefit certificate can be made as definite a promise as an ordinary life policy.

Usually, the holder of a certificate can name as beneficiary only some member of his family, or other dependent recognized by the society, and for an amount not to exceed a limited sum, such as two or three thousand dollars. Many societies also extend to their members sickness and accident benefits.

HEALTH AND ACCIDENT INSURANCE

Just as life insurance serves to protect dependents against financial need through the death of the insured, so health and accident insurance are intended to protect dependents against a similar need arising out of the incapacitation of the insured through sickness or accident. For the average family this form of protection is indispensable. Industrial accidents are covered today in most states by workmen's compensation insurance. But the largest number of accidents do not occur in industry and must be covered by private insurance. Moreover, loss due to sickness is equal to many times the loss resulting from accidents. It is estimated that about 250,000,000 working days are lost annually in the United States through sickness.

Various methods of granting protection against sickness and accident have been adopted by private insurance companies. Most life insurance companies grant protection, in the form of a monthly income for life, in the event of the total and permanent disability of the insured. But fully 97 per cent of all sickness and accident claims are for temporary disability. Many accident and health companies also issue "limited policies" at comparatively small premiums since the coverage is confined to a limited number of diseases or accidents and the compensation to a comparatively short period.

Much more adequate are the health and accident policies which are "general" in their coverage. These cover against disability from every variety of sickness or accident. They may be issued either separately or in combination, that is, as either health or accident policies or both.

Under accident policies a certain principal sum, such as $5,000, is paid in the event of death, the loss of sight, both hands, both feet, or one hand and one foot. Smaller sums are paid for the loss of one eye, or one hand, or one foot. Weekly or monthly compensation is also provided either for a definite period or for life, in the event of permanent disability, and a smaller compensation when the disability is only partial. Almost invariably indemnities are doubled if the accident occurs on a public conveyance.

In health insurance no principal sum is paid in case of death, and the payments are limited to a weekly compensation for a stipulated period. Often, both health and accident policies provide for extra payments covering hospital and surgical expenses. Until recently all health and accident policies were subject to cancellation by the company. But recently various companies have undertaken to issue so-called "non-cancellable policies," which may be renewed from year to year at the option of the insured until a stipulated age is reached.

AUTOMOBILE INSURANCE

There are five different types of insurance which come under this head: bodily injury liability, property damage liability, collision, comprehensive, and medical payments.

Bodily injury liability insurance is for the purpose of protection against legal claims arising from personal injuries or death caused by the use of a motor vehicle. The policy covers the person or corporation responsible for the operation of the car. It usually covers also any person whom the policyholder or the adult members of his family may permit to drive the car, provided the driver is legally licensed. The usual protection afforded by the policy covers the defense of all claims and suits for injury and the payment of any costs assessed against the insured, up to the limit of the policy, which may range from $5,000 for one person and $10,000 for all claims arising from one accident to as much as $300,000 and $1,000,000 limits, respectively. Financial responsibility laws, found in most states, place pressure on drivers to buy insurance.

Property damage liability insurance protects against losses incurred through damage done by use of the car to the property of other people. In case the damaged property cannot be used and its withdrawal from use imposes additional losses to its owner, these losses, assessed against the insured, are also covered by the policy. But the policy does not cover damage done to the car of the policyholder.

Collision insurance covers damage to the policyholder's car caused by collision with any other object, either moving or stationary. If the driver strikes a tree, the policy protects him no less than if he collides with another car. The amount which he can collect, however, is limited to the actual cost of suitable repairs or the actual value of the car at the time of the accident. Moreover, the accident must have taken place within certain specified geographical areas. Under many policies, no indemnity can be collected unless the damages are over a certain minimum amount called the deductible.

Comprehensive insurance pays for all physical damage to the vehicle, with certain exceptions specified in the contract. Such losses to the insured car as fire, hail damage, lightning, theft, or glass breakage are covered to the extent of the actual cash value of the item damaged.

Medical payments coverage provides for reimbursement to the insured for any medical expenses incurred by himself or persons in the car, to the limits stated. Automobile policies now also include a lump sum payment for death and a weekly benefit for total disability.

EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION INSURANCE

Although both relate to industrial accidents, the distinction between these two kinds of insurance must be kept clearly in mind. Employers' liability insurance has been defined as "indemnity to the insured and not insurance for the injured." This means that, with the exception of expenses incurred with respect to the handling of notices of accident, claims, and lawsuits, the insurance company is under no further obligation until the insured (the employer) has actually been obliged to pay money to the injured party by virtue of a legal judgment obtained in a court of competent jurisdiction.

Employers' Liability Insurance. The employers' liability policy covers "against loss from liability imposed by law upon the insured," and expressly excludes any workmen's compensation allowance, as hereinafter defined. Ordinarily, the face of the policy consists of two limits—so-called "first" and "second" limits—the first amounting to a maximum of $5000 in case of injury to one person as the result of a single accident, and the second to a maximum of $10,000 in case of injury to two or more persons as the result of one accident. The policy usually continues to run for a year and therefore covers succeeding accidents, each to the extent indicated above. The limits, moreover, may be arranged to suit the convenience of the employer, upon a proper adjustment of the premium charged for the regular limits just mentioned.

In most instances, the rate represents a percentage of the employer's entire pay roll, and the aggregate premium payment is based upon an average of previous annual payrolls for a designated period. At the end of the year, however, when the year's pay roll is definitely known, an adjustment is made. If, owing to poor business and resulting small employment, the annual payroll happens to be less than the estimated one, the company returns a proportionate share of the premium to the insured. Similarly, if larger, the insured is obligated to the company for the payment of an additional premium, measuring the extent to which the actual payroll exceeded the estimate.

Laws Formerly Adverse to Employee. Since employers' liability insurance indemnifies "against loss from liability imposed by law upon the insured," it is important to note the nature of the law of the particular jurisdiction under consideration as it governs the liability of employers. Prior to 1837, the common-law relation between employer and

employee was similar to the legal relation between strangers. Following that year, however, a vast mass of special law between employer and employee—so-called judge-made law—developed both in England and in America.

The adverse character of this law from the employee's standpoint is indicated by the following doctrines or practices: (1) the *contributory negligence doctrine*, which held that an employee must show his freedom from negligence, and cannot collect if he has failed to use reasonable care and if that neglect contributed to his injury; (2) the *fellow-servant rule*, which provided that an injured employee could not recover from the employer if the injury was caused by the negligence of a fellow servant; and (3) the *assumption of risk rule*, which was to the effect that "an employee entering employment is held to assume and consent to the ordinary and obvious risks incident to the employment."

With the increasingly harsh application of these rules, various statutes were enacted with a view to increasing the employee's protection. But this tendency was soon counteracted by the development of the "*contracting-out privilege*," according to which the employer could request his employees to contract away their rights under the law, thus relieving the employer of all liability in case of injury.

Under such a system of law it naturally followed that little financial redress was obtainable for injured employees. Criticism of the system was well merited, but should have been directed against the law itself, and not against the form of insurance which merely sought to protect against the law as it existed. The fault was with the system of law. This forced upon the employee the burden of proof and yielded substantial compensation to only a small proportion of injured employees. This system led also to excessive delay owing to the slow operation of court trials. These proved exceedingly wasteful, in time and attorneys' fees, to both employer and employee.

Workmen's Compensation Laws. In view of such shortcomings it was only natural that the public should demand a more definite and rational system of law with respect to employers' liability for industrial accidents. This was accomplished through the passage of so-called workmen's compensation laws. Within the decade 1910–20 practically every industrial state of the Union enacted such legislation.

While lacking uniformity in details, the various laws have a common purpose. All of the objectionable doctrines mentioned in the preceding paragraphs are abrogated. Employers who refuse to come under the act are compelled to take their chances in a court of law without the support of any of the aforementioned legal rules.

All features of administration are clearly defined and are designed to overcome the delay occasioned under the previous system. Specific payments are provided for each of the following: death, total disability, partial disability, or specific injuries. The compensation is based upon the wage of the injured person; and, in addition, in the event of death, upon the number and the degree of consanguinity of the dependents.

All compensation is paid in installments, in the same manner as the wages were payable, unless allowed otherwise by the authorities administering the act. All employers, if choosing to come under the act, are compelled to protect their legal obligation under the law through insurance. In most states, the insurance may be taken either with a state fund or with a stock or mutual company. In most instances self-insurance is permitted only when authorized by the administrative authorities, and may subsequently be revoked at any time. A few states make it compulsory to take the insurance in the state fund. Whatever insurance institution is selected, the policy must be based on the compensation law under consideration, and any provisions to the contrary are declared null and void.

FIRE INSURANCE

Fire insurance easily ranks as the most important form of indemnity in the field of property insurance. This line of insurance also embraces such perils as windstorm, riot, explosion, water overflow, vandalism, landslides, and collapse. Also, contracts protecting the insured against consequences of such perils which cause his business or residence to be closed to occupancy are part of the fire insurance field. An important development in this area is the *homeowners policy* under which practically all causes of loss to the home are covered, along with some liability and theft insurance.

Purpose of Fire Insurance. Like other forms of insurance, fire insurance has for its fundamental purpose the "substitution of certain for uncertain loss." In this way, as regards a great and ever-present hazard, it serves to stabilize business, to reduce all costs to consumers, and to enhance production by eliminating fear of loss and by increasing initiative.

Fire insurance also serves as the support of commerce and of industry, in so far as it and its companion, marine insurance, are the basis of our whole credit system. The significance of this function becomes apparent when we reflect that fully 90 per cent of the world's business is conducted on credit, and that nearly all transactions involving goods, buildings, and ships, are confronted with the danger of ruinous loss through fire or marine disaster.

As has been elsewhere stated: "It can be shown in a hundred ways that fire and marine insurance have become absolute necessities of trade, without the assuring protection of which the large undertakings of today would be a gigantic gamble and would never be attempted if liable to miscarry through a single fire or marine disaster. As it is, enormous sums are borrowed on stocks and bonds and warehouse receipts; merchants sell their wares on credit; investors furnish millions for the upbuilding of vast industries supporting whole towns; capitalists make loans on buildings worth many times the value of the ground upon which they are built—all being willing to do this because they know that the insurance policy stands as collateral between them and loss."

Personal Character of the Contract. Fire insurance policies are personal contracts, that is, strictly speaking, they do not insure the property but the persons who own the same or have an interest therein. Two buildings may be just alike in all respects, except that one is owned by an honest person whereas, with respect to the other, the owner may be grossly careless or even inclined to profit from a dishonest fire. The importance of this factor cannot be overemphasized. Probably no other type of contract places one party (the insurer) so much at the mercy of the other (the insured). With reference to over-insurance, therefore, as well as the determination of rates, it is highly important that the insurance company should know the character of the owner of the property to be insured.

Nature of the Indemnity. The fire insurance contract is also one of indemnity for actual loss. Irrespective of any value stated in the policy, insurance companies are not liable for more than the "actual value of the property at the time of the fire." Any other rule might work the greatest injustice to companies, and might even result in fraud, owing to the constant and frequently great fluctuations in values as regards both buildings and goods. Should companies be obliged to pay the full face of the policy in the event of total loss, irrespective of an actually lower value, the policyholder would be enabled to profit from a fire. Such a result is contrary to the very idea of "indemnity," which "implies that the insured should be compensated for loss actually incurred, but should never find the insurance contract a source of profit."

Two other concepts, relating to the nature of the indemnity, should be mentioned. Only the loss of material values is indemnified, i. e., the fair cash market value of the property at the time of the fire. Sentimental values, such as those associated with gifts, documents, and objects of art, are not covered unless there is an express agreement to the contrary. In case of inability to reach a fair settlement with the insured as to the fair value of the property damaged or destroyed, the insurer is given the option, under the terms of the policy, of replacing or reconditioning the property. Moreover, in the event of agreement as to the value of all the property, damaged and undamaged, the insurer is given the option of settling at that figure and taking title to the undamaged portion.

Restriction of Liability. The company's liability is also limited to "loss or damage directly traceable to fire." Small fires, working through a chain of circumstances, such as charged wires and explosives, may result in enormous loss for which the insurer becomes liable. In all such cases the question is: "Is fire the real cause, and if so, is the sequence of events between the origin of the fire and the destruction of the property an unbroken one or has some outside force, such as an act of God, intervened to bring about or increase the loss?"

Who May Insure. Since fire insurance policies are contracts for indemnity and not for profit, it follows that only those who have a pecuniary interest—an insurable interest—in the property under consideration have a right to insure. Insurable interest, however, has been given a very broad meaning by our courts. Eliott defines it as "every interest in property or in relation thereto, or liability in respect thereof, of such a nature that a contemplated peril may directly damnify the insured."

Such an interest does not necessarily imply ownership or even possession of the property. Thus insurable interest has been held to extend to the following: (1) custodians of property intrusted to their care, to the extent of their interest or liability, such as administrators of estates, agents in property held for the principal, assignees in insolvency, trustees, common-carriers, warehouse men, and commission merchants; (2) creditors or debtors, such as mortgagees, debtors with respect to property seized for debt, pledgees to the value of the property pledged, and those who have by agreement expended money on the property of others; and (3) those possessing contract rights depending upon the preservation of the property, such as consignees and consignors, contractors whose payment is deferred until completion of the contract, patentees possessing a right to royalties, and even insurers in the property they have insured.

The last illustration serves as the basis for the important practice of reinsurance, whereby an insurance company may reduce its risk by reinsuring all or a part with other insurers, who, in turn, may pass on a part of their risk to still other insurers.

Use of a Standard Policy. In probably no form of insurance is it so essential to have a uniform or standard policy as in fire insurance. Prior to 1870 there was an utter lack of uniformity, one form of policy prevailing in Boston and others in New York, Philadelphia, and other centers. To make the situation worse, certain companies undertook to enlarge their business by issuing apparently attractive policies. Other companies sought to defraud the insured through skillfully drawn policy clauses.

The first state to attempt a remedy was Massachusetts, which adopted a standard form in 1873, and later, in 1880, made the same mandatory for all companies writing insurance in the state. New York followed in 1887, and the so-called New York Standard Fire Policy, although improved from time to time, has been adopted as the standard in numerous other states. Even where not enacted into law, this policy is generally used by all the companies.

Standard policies are necessarily drawn to meet a general situation, and cannot be designed to cover the numerous special needs surrounding the many different types of property or the various insurable interests therein. All such exceptional circumstances must be arranged for through so-called "endorsements" attached to the policy.

Coinsurance. With comparatively few exceptions, fire insurance on commercial and industrial properties is written subject to coinsurance. This means that the insured will have any claim paid in the proportion that the insurance taken bears to the insurance required. The advantage offered the insured for accepting a coinsurance clause is a reduced rate per $100 of insurance.

For example, with a building valued at $10,000, let us assume that the insurance required is $8000 (80 per cent), that only $4000 of insurance was taken, and that a loss of $2000 occurred. Under the circumstances the $2000 loss is paid only in the proportion that $4000 (the insurance taken) bears to $8000 (the insurance required), or to the extent of only one-half, or $1000.

Usually the amount of insurance required is 80 per cent of the value, this percentage representing the proportion of the property value subject to destruction by fire. Where, however, the property is subject to total destruction, a 100 per cent coinsurance clause may be used. In other cases much lower percentages, as, for instance, 70 or even 50 per cent, are applied.

Where property appreciates materially during the term of the policy, it is highly important that the owner should correspondingly increase his insurance in order to comply with the coinsurance requirement. The purpose of coinsurance is to secure justice between property owners and to enable the companies to derive an adequate premium income. The overwhelming majority of fires result merely in partial losses. In most large cities, probably 80 per cent of the total fire loss results from fires that damage the insured property 20 per cent or less.

If the rate of premium is to remain the same, irrespective of the amount of insurance, and all losses are to be paid in full up to the face of the policy, it would follow that many owners, in their desire to evade their just share of the community's fire tax, would venture taking out just enough insurance to cover their probable partial losses. Yet the very factors which induce them to pursue this policy, such as good construction and nearness to a fire department, have already been considered and allowed for in a reduced rate of premium.

Moreover, many business men, owing to the demands of creditors or their own unwillingness to take reduced insurance, would be obliged to pay premiums on a large volume of insurance at an increased rate, because those taking little insurance are deriving in claims, on the average, more than they are paying for. Where it is not desired to scale down claims as the insurance decreases, the companies may agree to pay all claims in full, irrespective of the amount of insurance taken. This can be done by increasing the rate as the insurance decreases. The two plans may be adjusted to a mathematical equivalent. The latter method is usually employed in communities where the application of coinsurance is forbidden by a so-called anti-coinsurance law.

OCEAN MARINE INSURANCE

This form of insurance has for its purpose the indemnification of interested parties "against loss, damage, or expense, occasioned accidentally in connection with vessels, cargoes, and freight charges, through any of the numerous perils incident to transportation by water." The principles of ocean marine insurance have generally been adopted in inland marine insurance, which is used to cover property being moved (or in many cases while stationary) on land and certain restricted water bodies.

Extent of Field Covered. In recent years the coverage has become so broad as to make the term "marine insurance" virtually synonymous with "transportation insurance." In fact, the so-called "warehouse to warehouse clause," used in insuring cargo, covers goods from the time they leave the shipper's warehouse in the interior—through all the various stages of the journey, rail, truck, dock, steamship, and port of destination,—until they reach the warehouse of the consignee in the foreign country.

Perils Covered. Unlike fire insurance, marine insurance covers a multitude of causes of loss. To quote the policy, they include, among others, perils of the sea, men-of-war, fires, enemies, pirates, rovers, thieves, jettison, and barratry of the master and mariners. By endorsement the policy may also be made to cover loss, in the case of vessels, through explosion, damage to machinery and latent defects, and in the case of cargo, through theft, pilferage, nondelivery, and breakage. Under so-called "builders' risk policies" all hazards connected with the construction, launching, and trial trips of vessels are also covered.

Types of Losses Covered. Policies of marine insurance may vary according to the type of losses they cover. Marine losses are either "total" or "partial." Total losses, in turn, may be either "actual" or "constructive," the latter comprising those cases where the property has not actually been destroyed but where the cost of repairing or reconditioning is so great, as compared with the restored value, as to make the attempt financially inadvisable.

Partial losses may be classified as "general average," "particular average," and "salvage." General average has been defined as comprising "losses and expenditures which result from the sacrifice of any interest voluntarily made by the master of the vessel, in time of real distress, for the common safety of vessel, cargo, and freight, and which must be repaid proportionately by all the parties benefited." Any partial loss which does not meet this definition is regarded as a "particular average loss." "Salvage" represents the remuneration recoverable under maritime law by a salvor for saving property at sea.

"Full-form policies" cover all of the aforementioned types of losses. Often, however, contracts are limited to only "total" or "partial" loss, and sometimes to only certain kinds of partial loss.

CORPORATE BONDING, TITLE AND CREDIT INSURANCE

Among the many other types of property insurance, mention should be made of corporate bonding, title insurance, and credit insurance. A surety bond has been defined as a "written obligation to pay a sum of money under one or more expressed conditions, among which may be found negligence, breach of trust, disobedience of a law, failure to pay a judgment, failure to pay a debt voluntarily assumed, and other conditions under which losses may be sustained by personal acts." Hundreds of kinds of policies are issued by bonding companies today to meet every possible variety of obligation. Broadly speaking, however, these bonds may be classified as falling under fidelity, public official, court, license, franchise, permit, and depository bonds.

Title insurance, as defined elsewhere, "promises to protect the owner of real estate, or the lender of money thereon, against loss or damage, not exceeding the amount stated in the policy, sustained by reason of any defect of title assumed under the policy, or because of the unmarketability of the title or by reason of unknown liens or encumbrances against the property at the time the policy is issued."

Credit insurance has for its purpose "the indemnification of losses, coming within the coverage of the policy and exceeding the normal loss of the business under consideration, suffered by manufacturers and jobbers through the insolvency of their customers."

BUSINESS CYCLES

It is a matter of historical observation that aggregate business activity pursues a distinct course of expansion and contraction, prosperity and depression. This more or less rhythmic succession of business conditions is known as the *business cycle*. The layman refers to its alternative phases as good times and bad times.

Prosperity is characterized by full employment. Consumers and businesses spend freely, frequently with borrowed money, and prices are firm or rising. Profit margins are generally favorable. New enterprises are undertaken and old businesses expand. The total output of the economy increases and a spirit of optimism prevails. Depression is associated with opposite conditions. There is widespread unemployment and jobs are scarce. There is a reluctance to spend, accompanied by a contraction of credit. Prices usually decline and profit margins narrow or disappear. Business firms contract, some failing altogether. Total output of goods and services declines and optimism gives way to fear and pessimism.

The Business Crisis. The change in business activity from prosperity to depression is almost always abrupt and decisive. It usually is possible to identify a point in time when prosperity culminates and the business organism breaks down. This is the *business crisis*. There is a sudden and widespread reversal of business attitudes and activity. Hence the crisis is frequently referred to as a crash or a bust.

The Panic. Frequently in the 18th and 19th centuries the prosperity phase of business cycles was associated with the doubtful and unscrupulous promotion of some particular enterprise accompanied by excessive and unsound credit expansion. Normal business investment was displaced by frenzied speculation in the particular object of the promotion, land, some commodity such as copper or gold, railroads, or, as in 1903, in the stock market in general. Ultimately some prominent firm or individual became overextended in the speculation and was forced to liquidate his holdings. The speculation mania was broken and alarm and mistrust ran through the business community, especially among financial institutions. The abrupt reversal of outlook resulted in the calling of loans, a desperate scramble for money, frantic sale of securities and commodities, and sharp declines in prices. Instead of the pessimism of a normal business crisis, the community was gripped by overpowering fright. There were unreasoning runs on banks, frequently followed by bankruptcies. When the business crisis is so violent, it is called a *panic*. There were about 10 such panics in the United States prior to the last one in 1929. Changes in the Federal laws controlling banking and stock exchanges make such panics extremely unlikely in the future.

Causes. The annals of business record crises from the beginnings of commercial capitalism. There is little doubt that crises are as old as trade itself. However, up to the Napoleonic era of the early 19th century, and to a limited extent thereafter, each crisis had a special cause usually of a non-business nature. The business reversals were attributable to what we would now call random events such as a bad harvest, riots, wars, or acts of God. The periods of depression were viewed as abnormal deviations from the normal course of prosperous economic growth.

As capitalism matured and modern industrial economies developed, crises became more regular in occurrence and more similar in nature, especially in their financial aspects. Instead of being viewed as random abnormal events, they became recognized as a recurrent and inherent feature of a business economy. Statisticians detected a rhythm and regularity which seemed periodic and the concept of a business cycle evolved. Although modern data do not sup-

port the thesis of periodic recurrence, the name "business cycle" has remained, and more or less regular fluctuations are considered a normal attribute of modern business societies.

A problem of such long standing and such social importance has attracted many great minds to its study. Consequently there are many theories or explanations of business cycles.

Since many of the theories differ more in their emphases than in fundamentals, most of them may be classified under one of four headings: business economy theories, monetary theories, savings and investment theories, and physical or "real" theories. The physical theories attribute business fluctuations to meteorological conditions, the weather, and their effects on crop yields. They have not been seriously considered in the 20th century and are completely repudiated by modern economics. The other three are summarized.

Business Theories. These explanations rest on the general hypothesis that prosperity, through its effects on business expectations, breeds maladjustments which ultimately undermine prosperity. They run somewhat as follows. Business is speculative by nature and therefore prosperity breeds overoptimism and overexpansion. Productive capacity and goods are created in anticipation of future markets and inventories are accumulated. This process strains the capacity of the whole economy. Labor efficiency declines as marginal workers are employed, wage rates rise, raw materials rise in price, credit becomes scarce, and interest rates rise. Eventually costs rise faster than selling prices, profits are reduced, and some of the weaker businesses fail. These conditions convert overoptimism into overpessimism and contraction begins. Inventories are reduced, loans cancelled or paid off, and prices decline. These developments set the stage for recovery, optimism returns, and the process is repeated. These theories are realistic and conform with observed behavior, but they are somewhat superficial. They are more descriptive than explanatory.

Monetary Theories. These explanations emphasize the key role of the money supply and bank policies. They may be summarized in the following manner. Economic activity expands and contracts with changes in total spending, and this spending is done with money. Spending is influenced largely by changes in the supply of money. In a modern credit economy, bank deposits constitute the main form of money. Consequently the behavior of banks in expanding and contracting the money supply is responsible for business fluctuations.

In the early phases of prosperity, banks extend credit at low interest rates. This leads to business expansion, inventory accumulation, and the spread of optimism. This process gains momentum until the banks are unable or unwilling to continue the credit expansion and interest rates rise. Businesses are forced to curtail activities and reduce inventories. The decline begins. When contraction has gone far enough, bank reserves are adequate for a new round of expansion. These theories overstate the influence of money in that they fail to recognize that bank credit policy responds mainly to other business stimuli.

Savings and Investment Theories. These theories are more general and analytical than the others. They do, however, usually incorporate elements of the other two in them. Most currently accepted explanations are of this type. A general outline of such theories is as follows.

In a modern business economy, any given level of production generates a flow of money income equal to it. That is, the total market value of the goods produced is distributed among the populace in the various forms of income payments such as wages, rents, profits, etc. If the total of income payments is spent, the spending will exactly absorb the output, and that level of production will be perpetuated. This exact balancing of the flow of production and the flow of spending would constitute an equilibrium from which the economy would not fluctuate. The existence of business cycles stems from imbalances between these two flows. The imbalances occur through the savings and investment processes.

Since, historically, business cycles have not been government caused but are distinctly an attribute of a private enterprise economy, we may, for purposes of analysis, assume government to be non-existent. Or, more realistically, we may assume government to be neutral in its effects on business fluctuations, which it would tend to be, if its budget were in balance.

Total spending in the private sector of the economy is the sum of consumer spending plus business investment spending. Total private spending must equal private incomes after taxes, if the economy is to remain in equilibrium. Income receivers as a group typically save part of their incomes; thus consumer spending is less than total income and production. This leaves some income, the savings, available for investment spending. If businesses decide to invest an amount exactly equal to these savings, the total flow of consumer and business spending will equal the flow of incomes. The economy would not fluctuate under such conditions.

Saving out of income is carried on by the populace at large, including business firms, for various reasons, many of them habitual in nature. The decisions to save are changeable and largely independent of business investment plans. Investment is carried on by business firms mainly to exploit the profit opportunities of new resource discoveries, new technology, new products, and population growth. These decisions are largely independent of the savings plans of the public.

Thus savings decisions and investment decisions are carried out by different groups with different motivations and independent of each other. Furthermore, the nature of each is such that both are quite variable. There is no assurance that plans to save will match plans to invest. For this reason the flow of total spending can have a tendency to either exceed or fall short of the total income flow. Since equilibrium requires a balance of the two flows, this imbalance leads to fluctuations.

If technological developments, discoveries, population growth and related stimuli are such as to cause investment plans to exceed planned savings, banks can create money through credit expansion—thus lending non-saved money. This permits the total spending flow to exceed the income flow. Equilibrium is destroyed and the economy expands until the flow of production and income rises to a level equal to the new spending level. At first such expansion is usually real in that physical output expands along with the monetary expansion. Once all labor and other resources are employed, any further expansion must be strictly monetary, and inflation sets in. Whether the expansion is real, monetary, or both, it continues until the income and spending flows are again in balance. At this point, savings out of the enlarged income flow would equal the investment spending and equilibrium would be reestablished. The expansion or the new equilibrium may continue for an indefinite period of time—business cycles vary in duration.

If for some reason investment plans should become less than planned savings, due either to an increase in savings or to a decline in investment, savings will begin to pile up in banks and other financial institutions. The spending flow becomes less than the income flow. Inventories accumulate and production is reduced. The income flow declines until it is in balance with the spending flow. At this lower level of income, savings would be reduced to equal investment and the contraction would cease. Equilibrium would exist at this depressed level until either savings or investment decisions changed so as to set off a new expansion.

This analysis stresses the divergence between the plans to save and the plans to invest. Actually it is

possible that savings and investment may be planned equal, and still turn out unequal, causing fluctuations in the economy. In some instances new products and new technology may stimulate investment plans which equal savings. But the actual investment may require such radical shifts in the structure of output that it is impossible to move the men and resources quickly enough. In such instances actual investment would be forced to fall short of plans and thus be less than savings. This could lead to a decline in output attributable to resource immobilities.

The numerous variations of the general savings and investment theory of the business cycle differ in their emphases on particular explanations of the imbalance between savings and investment. Some observers stress underconsumption or oversaving, suggesting that ours is a wealthy society which chronically saves more than it can profitably invest. Others stress the irregularity of technical innovation and the consequent violent fluctuation in investment. Still others stress the immobility of resources. All, however, fit under the general theory. One of the continuing problems of business cycle research is to ascertain the significant causes of saving and investment imbalance.

Possibility of Control. In view of past experience and the nature of business activity, it is not considered possible entirely to eliminate business cycles while still maintaining a private enterprise economy. However, some control is possible and fluctuations may be modified.

To the extent that cycles are accentuated by overoptimism and speculation during prosperity, government, through the control of banking, can curtail credit whenever signs point to excessive borrowing. In this way purely monetary and inflationary expansion can be curbed. This should make less severe the declines following an expansion. Likewise, centrally-controlled banks can be liberal in their credit policies during a decline, thereby relieving some of the stress on business and reducing the number of failures. It was to facilitate such policies that the Federal Reserve system was revamped in 1935. See *Federal Reserve System.*

Experience demonstrates, however, that these monetary controls are of limited effectiveness. Modern savings and investment theories of the cycle suggest the possibility of stronger control measures through the taxing and spending policies of the Federal government. It was stated earlier that a balanced Federal budget is neutral in its effects on the business cycle. An unbalanced budget is not neutral and can be used to offset imbalances between savings and investment. The use of the Federal budget as an economic stabilizer is referred to as *counter-cyclical fiscal policy.*

A balanced budget means that taxes are equal to government spending, which means that the government extracts from the income flow by taxation an amount equal to what it extracts from the production flow by its spending. Under such conditions any imbalance between total spending (including government spending) and total income (including taxes) would stem from the private sector of the economy.

Economic contraction and expansion are situations of imbalance between income and spending. If the economy is declining, income is greater than spending because savings are greater than investment. The government can counteract the decline by unbalancing its budget so as to spend more than it taxes, financing the difference by borrowing. In this manner government increases public spending more than it reduces private spending, thereby causing total spending to rise. This brings spending and income into equality, halting the decline.

If the economy is in an expansion running into inflation, spending is greater than income because savings are less than investment. The government can curb the inflationary expansion by unbalancing its budget so as to tax more than it spends. The excess revenue can be used to pay off past borrowing or to add to the government's cash balance. This action would decrease private spending more than it increased public spending, causing total spending to decline. Income and spending are made equal and the expansion ceases.

Since periods of depression and prosperity are approximately balanced in duration, the government could alternately increase and reduce its debt, thus acting as a stabilizer without going progressively farther into debt. The policy then becomes essentially one of timing public expenditures. However, for this policy to control the business cycle completely, the government would need the ability to forecast business conditions perfectly and the administrative and political flexibility constantly to adjust its taxing and spending activities. Furthermore, the economy itself would need be sufficiently flexible to permit the shift of labor and capital back and forth between the production of public and private goods.

None of these conditions are fully satisfied. Consequently, there is no present hope for a completely stable economy. However, experience in the three cycles since World War II shows that fiscal policies can ameliorate cyclical fluctuations. A major depression such as occurred in the 1930's is reasonably certain not to develop again.

Explanatory Table. In the examination of the table which follows, the above discussion should be borne in mind. Under the heading "Special Causes," attention is drawn only to particular events which precipitated the crisis, it being unnecessary to mention in each case the general causes of overspeculation and its concomitants. Similarly, in the column headed "Special Consequences," no mention is made of the normal features accompanying and succeeding the crisis—the fall in prices, slack trade, unemployment, and so forth—unless these features showed some special character worthy of notice. For reasons indicated in the article, none of the business contractions since World War II have been severe enough to be called crises.

IMPORTANT BUSINESS CRISES

Date	Countries Chiefly Affected	Special Causes	Special Consequences	Period of Depression
1809	England, United States	Speculation connected with Napoleonic war which led to credit and note inflation.	Bullion committee's recommendation for resumption of cash payments not accepted; depreciation of notes continued.	2 years
1815	England . .	Close of Napoleonic wars; vast production of English manufactured goods which European countries were too much impoverished to buy.	Much unemployment, machine-breaking, fall of prices.	About 2 years
1836–1839	England, U. S. A., France, Belgium . .	Railway speculation in England and U. S. A. Land speculation and paper money inflation in U. S. A. Collapse occurred simultaneously in England, Ireland, and U. S. A., in 1836. Bad harvest of 1838 caused another crisis in which Bank of England was threatened with ruin.	Failure of many banks and speculators; much unemployment. Drain of bullion from England was finally checked by raising discount rate and by aid of Bank of France. Bank Act of 1844.	7 years

IMPORTANT BUSINESS CRISES—Con.

Date	Countries Chiefly Affected	Special Causes	Special Consequences	Period of Depression
1857	United States, nearly all other countries . . .	American crisis due to great discoveries of gold, railroad extension, development of banking and speculation. In England, overdevelopment of credit system.	Suspension of Bank Act in England. Very great unemployment in all countries.	3 years
1866	England . .	Wild speculation in limited liability companies, excessive borrowings by means of "finance bills," unsound banking practices.	Universal distrust of English investments. The failure of the weaker banks left the well-established banks stronger. The practice of giving accommodation bills was checked.	About 1 year
1869	United States	Operations of Jay Gould, made possible by unsound paper money system.	Many failures. (Black Friday, Sept. 24, 1869).	
1873	Nearly all countries	Payment of French indemnity to Germany loosed a speculative mania in Germany and Austria; railway boom in U. S. A.; excessive construction of permanent works and "overproduction" at high prices. Collapse spread from Vienna to New York, which was swamped with unmarketable railway securities.	Failures of banks and commercial houses; unemployment (3,000,000 "tramps" in U. S. A. during winters of 1873 and 1874). Shrinkage of prices, stagnation, glut.	6 years
1882	France, England . . .	Wild speculation inspired by Union Generale, a company promoted among French and Austrian Catholics to destroy financial supremacy of Jews.	Collapse of this company and of the boom in general. Long period of depression.	5 years
1884	United States	Railroad speculation; large foreign wheat crops caused low prices for American grain and lessened American railroad earnings.	Very low prices.	2 years
1890–1894	England ("Baring crisis"), Germany, France . .	Speculation in South America. Revolution in Argentina.	Support of the Bank of England, aided by the Bank of France, averted panic, and no widespread failures followed.	4 years
1893	United States	Good harvest of 1891 stimulated all sorts of business; but smaller harvest of 1892, low agricultural prices, heavy gold exports, fear that gold standard might be abandoned, and doubtful bank loans occasioned a crisis.	Widespread failures, unemployment, and industrial unrest; march of Coxey's Army. Political and tariff uncertainties prevented thorough recovery until latter part of 1897.	4 years
1900	England, Germany, France	Great prosperity in England in 1898; business further stimulated by war in 1899 till it reached highest point in 1900 and then receded; high taxation and dear coal (both due to South African war) held responsible.	In England, unemployment but no spectacular failures. In Germany alarming failures occurred.	4 years
1903–4	United States	Decline of security prices after speculation of 1900 and 1901, precipitated by withdrawal of European funds—("Rich man's panic").	A few corporations failed, idle money accumulated in banks, but abundant harvests of 1904 hastened recovery	About 1 year
1907	United States, Europe . .	Failure of Knickerbocker Trust Co. inaugurated panic in New York which spread over the whole country. American panic caused rise of bank rates in London, Paris, Berlin, and intensified depression there.	Failures, but not on a very extensive scale. U. S. government aided banks; Clearing House certificates issued; gold shipped to U. S. A. from Europe. This crisis strengthened movement which led to Federal Reserve System.	1½ years
1914	United States, Europe . .	Crisis due to general overspeculation suddenly transformed into a special financial crisis by the outbreak of World War I.	Many normal features of depression disappeared in the increased business activity due to the war.	About 2 years
1920–1922	United States, England, Europe . .	Increase of productive capacity in victorious countries accompanied with loss of purchasing power in defeated countries partly due to collapse of national currencies. Cessation of wartime demand for goods.	Widespread unemployment and business losses; famines and pestilence in some countries.	Less than 2 years in the United States. Continued depression in England and Europe
1929–1933	World wide except in Russia . . .	Cumulative result of over expansion in agricultural and industrial productiveness. Reparations and war debt payments combined with trade restrictions.	Unprecedented unemployment. Practically all countries off gold standard. Banking crisis in United States. Free play of economic forces curbed by governments—"economic planning."	About 8 years
1937–1938	United States	Sharp change of federal fiscal policies from deficit to balanced budget. Excessive credit restraint by Federal Reserve Banks.	Renewed large government deficits	About 1 year
1945	United States	Reconversion from a war to a peacetime economy. Sharp reduction in defense spending.	None. Surprisingly rapid recovery.	Less than 1 year
1948–1949	United States	Rapid inflation following end of wartime price controls.		About 1 year
1953–1954	United States	Close of Korean War and sharp reduction of military spending.	Exceedingly liberal credit policies.	1 year
1957–1958	United States	Excess industrial capacity developed in preceding boom. Cutbacks in defense spending.	Large Federal deficit.	About 1 year.

INVESTMENTS

INVESTMENT has been defined as the exchange of money for property rights from which a gain is expected. This definition must be qualified somewhat for the purpose of the present discussion. All such exchanges are not investments in the true sense of the word. The true investor receives his gain in the form of an annual income upon his commitment rather than from an appreciation in the value of his investment. One who buys American Telephone and Telegraph Company stock to procure an annual income of five per cent is an investor; another who buys the same security in anticipation of a rise in price is a speculator. A true investment, therefore, is a commitment of capital (1) for use in production; (2) entrusted to the management of another; and (3) for which the primary purpose of the investor is to receive income by reason of the use in production.

In making any investment, the individual investor should be primarily concerned with the safety of the principal amount invested and with the certainty and regularity of income. In addition, the investor will be interested in marketability and yield. An absolutely safe investment does not exist. Since safety is a relative term, all securities have a certain element of risk. The yield which the safest security offers may be considered as the true rate of investment income. The higher yield obtainable from all other securities may be considered as a premium received for the additional risk assumed in the purchase of securities less desirable than the best. The yield on long-term United States government bonds may be accepted as the "true" rate at any given time.

Since no security other than those issued by the United States government is completely safe, a basic principle of investment is "diversification." Diversification involves selecting investments in several different securities or areas so that gain in one may be used to offset losses in another. Diversification is obtained by investing in different types of securities (bonds, stocks, etc.), securities in different industries (railroads, utilities, steel, etc.), securities with different maturity dates (short-term, long-term, no maturity, etc.), or securities in companies operating in different geographic areas.

Determination of Yield. The annual return or yield of an investment is the percentage relationship between the amount of the annual income obtained therefrom and the amount invested. In the case of stocks, the method of determining current yield is fairly simple. The rule is to divide the number of dollars received in annual dividends per share by the number of dollars paid as the original cost per share. To illustrate: a certain stock pays dividends at the rate of $9 per share and is quoted at $180; 9 divided by 180 gives 5 per cent, which is the current yield.

The determination of bond yields is somewhat more involved as the good bond will be paid at par at maturity date regardless of the purchase price. If the bond is purchased below par, it is assumed that the holder will receive, in addition to the annual interest, an increase in the value of the bond as the bond approaches the due date. Conversely, if the bond is purchased above par, the holder is obliged to charge against his current income a certain amount to cover the decrease in the value of the bond as it nears maturity.

To illustrate: a 6 per cent bond due in ten years is quoted at 105; from the annual income of $60 on a thousand dollar bond, a deduction of $5 must be made for premium write-off, leaving $55 net return. This is divided by the average investment of $1025 (average of $1050 cost price at time of purchase and $1000 maturity value) for a yield of 5.37 per cent net to maturity. The amount of the premium write-off was determined by dividing the number of dollars paid as premium ($50) by the number of years (10) in the period during which the bond will run.

Classes of Securities. Investment securities may be divided into two classes, owner obligations (preferred and common stocks) and creditor obligations (bonds, notes, debentures, etc.). A fundamental difference exists between owners and creditors. The owners (stockholders in a corporation) are a part proprietor in the enterprise and must be prepared to share both in profits and in losses according as the business prospers. The stockholder in a corporation is normally limited in loss absorption to the amount of his investment in the corporation. The creditor (bondholder, etc.) has legally loaned money or capital to the business and, therefore, expects the payment of interest regularly and of principal at maturity, regardless of the incidental prosperity of the company. If the company cannot pay the creditor his interest when due or his principal at maturity, the creditor has the right to sue and demand foreclosure on the assets of the business.

The income of a bondholder is said to be fixed, regular, and certain within limits. This is because the bond bears a fixed rate of interest, such as 5 per cent; because the interest must be paid regularly irrespective of earnings; and because default in payment to the bondholder usually brings foreclosure upon the corporate property or a reorganization of the enterprise.

The income of the stockholder is not so satisfactorily assured. The amount will depend upon the prosperity of the company and the discretion of the directors of the corporation. During poor years, his income may cease entirely. His right to receive income is subordinate to that of all others who have a claim against the corporation.

Preferred stockholders are owners who normally have a preference to earnings over other stockholders (common stockholders). Preferred holders will receive their stated dividend before common stockholders receive anything. However, their dividend income is normally limited to a stated maximum amount, while common stockholders have no limit on the amount they may receive. While preferred stockholders have a right to receive their dividend before common stockholders, they do not have the right of foreclosure on property for nonpayment as creditors do. If the company pays no dividends to its common stockholders, it is under no obligation to pay anything to preferred stockholders. Preferred stockholders normally have a preference over common stockholders as to assets in the event of dissolution. However, in dissolution, creditors would have to be paid in full before preferred stockholders could receive anything.

Creditors are divided into two major classes: secured and unsecured. Secured bondholders are protected by a mortgage or certain corporate property in addition to the legal promise to pay. Holders of unsecured bonds (debentures) do not have a lien on specific property but do have all the rights of general creditors including the right of suit and foreclosure.

Tests of Investments. What comprises a good investment? Of many attributes, the most important are: (1) safety of the principal; (2) satisfactory income; (3) marketability; (4) a favorable tax position; (5) a satisfactory denomination and maturity date; and (6) a good collateral value.

Safety of principal depends chiefly upon the true value of the assets of the company which is, in turn, dependent upon the earning power of those assets. Satisfactory income comprehends both stability and amount of income. This depends upon the nature of the business and the efficiency of the management. The amount of income received on any investment should be adequate to compensate the investor for

the risk he undertakes. Marketability of a security means that it can be disposed of at a fair price in a reasonable time. Marketability depends in part upon the volume of the security outstanding in the hands of the public, but much more largely upon the reputation of the company. These are the three major tests, and unless the prospective security meets each of these satisfactorily, the other tests may be eliminated.

Public Bonds. Public bonds may be divided into two classes: federal and municipal. Federal bonds are the bonds of the United States government. They are regarded as the premier investment security of the country because they are secured by the credit of the United States. Bonds guaranteed as to principal and interest by the United States government are in the same class. No question exists as to the ability of the government to arrange payment at maturity. The market price of the bonds will change from month to month with changes in the market rate of interest, but this is in no way attributable to apprehension over their repayment.

Municipal bonds comprise state, county, city, and all local government obligations. These bonds are often desirable investment securities. They are secured by the taxing power of the communities. While it is true that the respective states are sovereign powers and, as such, cannot be sued in the event of default of payment of their bonds, it is also true that constitutional restrictions upon the creation of debt have kept the bond issues within conservative limits. There has been no default in the payment of state bonds since the early 1890's. The value of a state bond depends upon (1) the good faith of the people, (2) the financial standing of the state, and (3) the constitutional restrictions on the amount and purpose of issue.

County and city bonds are also highly regarded as investment securities. Unlike a state, a municipality may be sued. The first test, therefore, is ability to pay. Experience has shown that a net debt of ten per cent of the value of the taxable property marks the ordinary limit of safety in municipal borrowing. For small communities, seven per cent is a safer limit. The second test is validity of issue. Unless the bonds have been issued in accordance with existing laws, there is constant danger that the issue may be declared invalid. The average investor is not in a position to pass upon questions of validity. His chief protection is to buy municipal bonds only through reliable bond houses which have had the advice of counsel in this respect. The third test is the good faith of the citizens of the municipality with regard to the payment of their debts. State, county, city, and local government bonds are regarded as tax-exempt securities, as the income received is exempt from Federal income taxes.

Corporate Securities in General. Corporate securities include the stocks and bonds of all privately-owned profit corporations. They are generally divided into railroads, public utilities, financial, and industrial. From the standpoint of investment desirability, corporate securities range from very good to very bad. In general, the nature of the business has material effect upon the prosperity of the companies. The income of public utility companies has a greater inherent stability than that of industrial companies. Consequently, the utilities are more highly regarded in the investment field.

The stability of income depends upon the product the corporation makes or the service it sells and upon the character of the management. The bonds of Pacific Gas and Electric Company are better than those of Bethlehem Steel Company because there is a more constant demand for electricity than for steel products. Also, the bonds of a company which is efficiently managed by men of great ability are better than those of another company which is less fortunate in this respect.

The strength of a corporate security may best be judged from the financial statements of the company and from past payment records. The balance sheet shows the assets and liabilities; the income statement shows the income and expense items and the profit or loss for the period covered. Past payment records give an indication of future payments and trends. From the balance sheet may be determined the valuation of assets which represent the capital behind the stocks and bonds. From the income statement may be judged the earning power of the company. Of the two, the earning power is by far the more significant.

Before purchasing any security an individual investor should make a careful study of all available information pertaining to the particular industry, company, and security. In the case of many large companies, there is a considerable volume of material available through banks, brokerage houses, and libraries. Certain financial services are available through the above sources which summarize information on securities and/or corporations of interest to the general public. These services offer up-to-date data through daily, weekly, or monthly supplements to annual publications. The leading services are Fitch Investors Service, Moody's Investors Service, and Standard & Poor's Corporation. A considerable amount of investment information can also be obtained from current business magazines and newspapers.

Railroad Securities. From the time railroads were first constructed in this country until the time of World War I, railroad stocks and bonds enjoyed a high rating in investment circles. With the introduction of other forms of motive transportation (especially the automobile and truck) railroad earnings have trended downward. The tremendous increase in traffic during World War II greatly improved the position of railroads and enabled many of them to pay off millions of dollars of indebtedness. This improvement in financial position carried into the early postwar period, but competition from other forms of transportation continued to increase and the railroads again experienced a long-run downward trend. Railroads operate under supervision of a government board—the Inter-State Commerce Commission—which is instructed to regulate rates and service from the public point of view. This regulation has created additional problems for railroad management.

Not all railroad securities are equally desirable or undesirable. Some roads have established excellent reputations due to the efficiency of management and the location of the line. Atchison, Union Pacific, and Norfolk and Western are among these lines. Roads which have not fared so well are illustrated by Seaboard Air Line, New Haven, and Chicago Great Western.

Railroad companies issue more different classes of securities than any other enterprise. The senior bonds are those which are protected by a first lien or mortgage on the property. Junior bonds follow senior issues in their claim and are given names such as consolidated, general, refunding, and debenture. The rolling stock is usually bought on the installment plan and is financed through the sale of equipment trust certificates which are generally very safe investments. Most railroads issue both preferred and common stock.

Public Utility Securities. Public utility securities comprise those issued by electric light and power companies, by natural and artificial gas companies, by water companies, by electric railways, and by telephone and telegraph companies. The types of securities issued are much simpler than in the case of the railroads. They comprise mortgage bonds, collateral trust notes, debenture bonds, preferred stocks, and common stocks.

The utility companies (particularly the electric and gas companies) enjoy many advantages over other corporations. They operate under public service commissions in the different states which set rates sufficiently high to insure a fair return. They

have a virtual monopoly in supplying their product under the franchises granted by the communities in which they operate. The demand for their products is growing steadily. Rate increases seem to have little effect on demand for their products. High grade public utility bonds have taken the place formerly held by railroad bonds as the safest corporate bonds.

Prior to World War II, the best-known public utility securities were those issued by the large holding companies in the field. These holding companies do not conduct any direct operations but simply buy and hold the securities of operating companies, frequently managing them and financing them through other subsidiaries. Since the gradual enforcement of the Public Utility Holding Company Act of 1935, holding companies have become much less important in the field and the leading companies today are primarily operating companies or holding companies with only one layer of operating companies beneath them.

The chief tests of public utility securities are the earnings records and the rate of return. Operating companies should have earned the total interest charges an average of four times per year during the preceding seven years. The rate of return tends to be lower than for comparable railroad and industrial securities due to the reduced risk of public utility investment. A third test of importance is the location of the communities served. In this connection, the effect of competition with publicly-owned utilities along with the rate of growth of the community should be considered.

Industrial Securities. Industrial securities comprise the stocks and bonds issued by all privately-owned corporations outside the railroad, public utility, and finance fields. Industrials include agriculture, manufacturing, wholesaling, retailing, service, mining and petroleum industries. Thus, it is difficult to generalize about the field as a whole due to its diverse nature. Generally, industrial corporations issue primarily common stock. Only a small percentage of the companies have preferred stock or bonds outstanding. When bonds are outstanding, they are generally less important percentagewise to the company than they are for utilities and railroads.

The profits of industrial companies vary to a marked degree with changing business conditions. When business is booming, most industrial companies realize large profits; when business is dull, many suffer losses or barely avoid them. Retailing, service, food processing, and tobacco companies tend to fluctuate less with business conditions than do other types of industrials.

Industrial securities, notably the common stocks of companies which are leaders in essential and growing industries, have gained greatly in public esteem in recent years. Common stocks of these companies are particularly popular as a hedge against inflation as it is anticipated that their earnings and market price will increase as prices of goods and commodities increase. Considerable caution is necessary in choosing good industrial securities.

In testing industrial securities, consideration should be given to the nature of the industry and the type of product or service handled. The growth rate of the industry as well as of the specific company should be considered along with past dividend record. Stability and trend of earnings becomes particularly important in choosing a good industrial investment.

Investment Companies. Investment companies or trusts are financial organizations which make a business of investing the funds supplied by their shareholders in selected stocks and bonds, the investors sharing in the income and profits from the securities held by their company, according to the number of shares they own. These companies have proved attractive to small investors, with perhaps little knowledge of financial markets, because the companies are managed by specialists in the investment field, and because the "mutual fund" permits the buying of a diversity of investments, thus minimizing the risk of loss.

There are two main types of investment companies, the "closed-end" company which has a set capitalization, and the "open-end" company which keeps offering new shares for sale. The companies are regulated by the Federal Investment Company act of 1940, and have, since 1950, been obliged to conform to the rulings of the Securities and Exchange Commission in their dealings with the public and with their stockholders. They are also subject to state regulation.

Real Estate Mortgages. Real estate mortgages have long been one of the most popular forms of investment in this country. The chief concern of the investor should be to secure ample margin of safety. In no case should the mortgage exceed two-thirds of the conservative value of the property pledged. The average investor should avoid all but first mortgages and then only on property which is more likely to appreciate in value than to decline. Moreover, he should invest with particular care during times when rents are abnormally high as this condition makes for inflated real estate values. The mortgage should contain a condition that the entire principal becomes immediately due and payable in the event of default. The average investor in mortgages should confine his holdings to residential property. "Special utilizations," such as office buildings, hotels, and stores, are likely to have wide fluctuations in value. Mortgages on vacant land are likewise inadvisable.

Foreign Securities. Two primary reasons exist for foreign investing: At times, the income return in the domestic market declines to such an extent that investors are compelled to invest abroad to get a satisfactory yield, even at the increased risk of loss. The second reason is the desire to facilitate the financing of foreign trade. Long-term credits make a strong appeal in international trade and are made possible through the willingness of the nationals of the exporting countries to advance the necessary funds by purchasing foreign securities offered directly or indirectly in payment.

Foreign investment (other than in Canadian securities) is not recommended for the average investor due to the high degree of risk involved and the possible problems of fluctuating exchange rates.

Effect of Taxation. Present tax laws materially affect investment income. The Federal normal and surtax applies on all bond interest with the exception of municipal and certain government bonds. In addition to the Federal taxes, many of the states impose additional taxes upon income.

Current income taxes are established on a graduated scale under which those having the largest income are required to pay the highest rate of tax. The maximum is over 75 per cent for the Federal tax. This means that more than three-fourths of the taxable income is taken from the wealthy investor by the government. As a result, rich investors have been driven to purchase tax-exempt securities. Consequently, tax-exempt securities are selling at too high a price (conversely, too low a yield) to make them attractive to the average investor in the lower tax brackets.

The fact that capital gains are taxed at a maximum of twenty-five per cent has made them more desirable to wealthy investors than dividend or interest income. Thus, certain investors will give up stability of income for gains made through buying and selling securities.

Economic Conditions. Business conditions are constantly changing. Periods of prosperity and depression have followed alternately during the entire commercial experience of this country. Interest rates are high when business is active, and

low when business is dull. Stock prices are high when business is booming, and low when business is poor. Bond prices, peculiarly, are low during periods of activity and high during periods of inactivity. See *Business Cycles*.

The most favorable time to buy stocks is when prospective earning power is good but has not yet been reflected in the market, and the most favorable time to sell is when the price already discounts a long period of increasing profits. The most advantageous time to buy bonds is when market interest rates are high, and the best time to sell bonds is when interest rates are low.

Needless to say, there is no unfailing method of telling when the conditions are ripe for buying and selling, since only later events can provide the answer to the question of whether given conditions are the end of a "movement" or midway within it.

Security Regulation. The Federal securities acts consist of a series of measures passed in the period 1933–40 inclusive with amendments since that time. These statutes are all concerned with the subject of investment and are designed to protect the investor against fraudulent and misleading practices as well as against irrational actions on his own part. The first of these measures is the Securities Act of 1933 which calls for registration of most large new issues of securities. The Act does not attempt to control the quality of the issues, but rather it is an attempt to give the investor complete and accurate information regarding potential investments. The Securities Exchange Act of 1934 was designed to control certain types of manipulations on security exchanges and to make information available on issues traded on organized exchanges. Other Acts in this group deal with public utility holding companies, over-the-counter securities, corporate reorganizations, bond indentures, investment companies, and investment advisers.

The administration of these Acts is in the hands of the Securities and Exchange Commission. This is a Commission of five members appointed by the President with the consent of the Senate. The SEC accepts all registrations of new issues and polices the organized security exchanges and security dealers. The basic philosophy of the commission and the legislation which it has fostered is to place the potential security purchaser on a more equal plane with the seller so that the purchaser may make rational and intelligent investment decisions.

Security Middlemen. Corporate securities are purchased generally through investment bankers, security dealers, and brokerage houses. Publicly-traded securities are normally not purchased direct from the issuing company. Investment bankers act as dealers rather than brokers and normally handle new issues of securities or very large offerings in the secondary market. Brokerage houses act as agents for buyers and sellers and accept a commission for their services. They deal primarily in the secondary markets. Secondary markets are those in which securities are bought and sold after the original sale by the issuing corporations. Organized security exchanges (such as the New York Stock Exchange) are the major secondary markets. However, large numbers of securities are bought and sold in the secondary market outside the organized exchanges by brokers and security dealers. This is called the over-the-counter market.

UNITED STATES SAVINGS BONDS

The unprecedented magnitude of governmental borrowing in World War II and since has been met to some extent by United States Savings Bonds. As a medium of investment for people of moderate means, these securities have proved unparalleled in popularity.

Among the reasons for their attractiveness to the mass of the people are:

1. They are made available in small denominations.
2. They can be liquidated without loss at any time after a minimum period.
3. Their purchase is supported by patriotic motives.
4. During most periods of time, they have offered the best return available for minimum risk fixed-value investment.

Purpose of Savings Bonds. Savings bonds grew out of the old postal savings system bonds. Prior to 1935, persons with postal savings accounts could exchange their savings for postal savings bonds. When issuance of postal savings bonds was discontinued in 1935, the government brought out savings bonds to take their place. Series E savings bonds were first issued in 1939. The guaranteed redemption value forestalled losses to the investor while the graduation of yield, rising in later years, discouraged liquidation before maturity. Thus, these bonds became ideal for defense and war financing.

An additional merit in this type of financing for government is that, unlike borrowing through the banking system, it does not create inflationary tendencies. Savings bonds may not be purchased by commercial banks and, therefore, cannot be used as a base for further credit expansion.

During World War II, the savings bond, renamed defense savings bond and later war savings bond, assumed an additional function of great importance. The war economy brought a huge increase in purchasing power accompanied by a diminution of goods and services available for purchase. To avoid the bidding up of prices, a draining off of purchasing power became essential. The leading instrument available for this purpose was the war savings bond.

Following World War II, the bonds were renamed savings bonds and have continued to be important in government finance although the total amount outstanding has not risen to any great extent in recent years.

Features of Savings Bonds. There are two major series of savings bonds of interest to the average investor. These are Series E and Series H bonds.

Series E bonds are discount bonds. They are sold at 75 per cent of their face value. Interest is not paid semi-annually as in the case of most bonds; instead, bonds are redeemed at face value at maturity with the gain on cost representing the interest on the bonds. Series E bonds have had varying rates of return and in 1958 the rate was changed to 3¼ per cent by making the bonds mature in 8 years and 11 months. The amount which will be paid on redemption before maturity is stated on the bond and is so figured as to give an increasing yield the longer the bonds are held. Thus, if a bond is held only five years, its net yield to redemption will be 2½ per cent rather than the 3¼ per cent net yield to maturity if held 8 years and 11 months. Series E bonds may be redeemed at any time after six months after purchase and may be purchased in amounts up to $20,000 per investor per year. They are non-negotiable, but a fixed market for them is maintained at all times by reason of the fact that they are redeemable at definite prices.

Series H bonds carry the same interest rate but are current income bonds. They are issued in larger denominations (smallest is $500) and mature in ten years. The interest checks vary in amount from small to large as the period of time the bond is held increases. Series H must also be held to maturity to obtain the 3¼ per cent yield.

All existing Series E and H savings bonds have provision for extension beyond the stated maturity if the investor so desires. They may be held an additional ten years with the same yield to maturity for the second ten years. A substantial number of matured bonds have been held by investors for continued investment.

MONEY AND BANKING

WHY do men engage in business? Primarily for the purpose of profit. Business is fundamentally a matter of the production and of the distribution of commodities. Therefore, business men might normally expect to profit in proportion as they assist in production and in distribution. But profit under modern business conditions does not arise precisely in this manner.

Production and distribution should be the two most important factors in everyday commerce. But the business man is constantly obliged to subordinate them to two other factors vastly different. He engages in business for profit. Profit is measured by the difference in prices, buying and selling. So commercial men constantly watch price and profit as essential factors in determining conditions of production and of distribution.

Both price and profit are money concepts. Price is the amount of money for which commodities are exchanged. Profit is the relationship between cost and selling prices. If selling price exceeds cost, a positive profit results; if selling price is less than cost, a negative profit, or a loss, results.

If money were a mere go-between, serving simply to facilitate the transaction of commerce, with a stable value of its own, a study of its principles would be of limited service. But money itself is ever changing in value, thus contributing, in a manner not popularly understood, to price changes and to fluctuations in business conditions.

What Is Money? Money has been defined as anything which is universally acceptable in final payment for goods and services. Gold coins have come nearest to meeting this definition. One dollar, which is the monetary unit in the United States, is defined as 13 $^{5}/_{7}$ grains of pure gold. Other forms of currency, such as silver and paper notes, have their face value fixed by law in terms of gold. In physical use, they have supplanted gold although gold remains legally the basis of their value.

Money does not necessarily have to be gold. In bygone days commodities such as wheat, tobacco, or salt have served as media of exchange. The American Indians used wampum, or shells, for money. Gourds were formerly used as money in Haiti, and the monetary unit of Haiti still carries that name. The Latin word for money, *pecunia*, is derived from *pecus*, "cattle," and survives in the English word pecuniary, thus reflecting an early use of cattle as money. Silver has been a rival of gold in the most advanced countries of the world for thousands of years and was not decisively replaced by it until the 19th century. Gold was first coined by Croesus, king of Lydia, in the 5th century B. C.

While gold today serves as a monetary standard rather than actual money used physically in transactions, its position is due to the fact that it was long the most popular form of actual money. It has many attributes which make it especially valuable both as money and as a monetary standard:

It has beauty. Gold is used universally in the arts to add beauty to articles of all description.

It is almost indestructible. Gold resists corrosion by powerful acids.

It is large value in small bulk. One million dollars is represented by less than three cubic feet of gold. This fact makes gold convenient to transport, and economical to store. The Spartans made their coins of iron to prevent exportation of money.

It is homogeneous. Pure gold is all of the same grade. There are many grades of cotton and of wheat but only one of pure gold.

It is both malleable and tenacious. This makes it particularly adaptable for coining.

It is scarce. All the gold stocks in the world assembled, would make a block less than 40 feet square. Moreover, the supply cannot be rapidly increased. The annual production, even under the most favorable conditions, has never exceeded 5 per cent of the existing stocks. This tends to give a stability in value greater than that of any other commodity.

Other commodities have certain of these attributes, but in the case of no other metal does the combination exist so favorably. Even if gold were not used as money, it would still retain its value as one of the most desirable and most useful commodities of commerce.

The Functions of Money. Money serves four important functions in commerce: It is used as a medium of exchange, as a standard of value, as a store of value, and as a standard of deferred payment. As each function differs materially from the others, it should be fully appreciated that money bears a fourfold burden rather than serves a single function.

Money is most popularly known as a medium of exchange. Without money, men with commodities and services to dispose of, would be compelled to exchange them directly for other commodities or for other services. The farmer who produces wheat and desires shoes would be obliged to find some one who had shoes to exchange and who wanted wheat. Under a monetary system, producers simply exchange their production for money, and exchange the money for the commodities and services desired. The barter system of exchange is both slow and inconvenient; the money system has made possible a method of exchange infinitely more efficient.

Complementary with its use as a medium of exchange, money serves as a standard of value. Value is expressed in terms of price. Value and price, however, are not the same. Value is a relationship; it means the worth of one commodity in terms of other commodities. A decline in the value of one commodity must mean a corresponding increase in the value of another commodity or in the value of other goods. Hence, the total value of all commodities cannot change. But the general price level can change, since the value of all commodities is expressed in terms of a single commodity, gold. When gold falls in value, all prices tend to rise; when gold rises in value, prices tend to fall. By reason of this function, one has but to know the price of any commodity to appreciate its value in terms of all other commodities. If wheat is quoted at one dollar a bushel, corn at 50 cents, and oats at 25 cents, it is apparent that wheat is twice as valuable as corn and four times as valuable as oats, and that corn has double the value of oats. This function of money in acting as a common denominator of values is decidedly useful. One likes to remain acquainted with the relative values of different goods without necessarily desiring immediately either to buy or to sell.

Money serves as a store of value. People often have goods or services to dispose of without a concurrent desire for other commodities or services. By exchanging the goods immediately for money, one may hold the money indefinitely, awaiting the desired time for exchanging for other commodities. In the meantime, the money represents so much stored value. In much the same way, money serves as a basis for the security underlying credit transactions. The reserves which banks must maintain are usually in the form of impounded money which is really stored value.

Money serves also as a standard of deferred payment. All credit transactions represent the postponed payment of money. If the transaction is not immediately completed, there must be some agreement between the buyer and the seller, or between the borrower and the lender, as to the method of settlement at the due date. The purchasing power of the money may substantially change in the meantime; nevertheless, the number of dollars agreed upon remains the basis of the settlement.

BANKING POWER OF THE UNITED STATES**
Source: *Treasury Dept., Comptroller of the Currency*

Item	All Banks†	Commercial Banks*	Mutual Savings Banks
Number of Banks .	13,933	13,418	515
Loans & Discounts	154,843	125,450	29,393
Investments . . .	102,541	90,675	11,866
Cash & Balances with Other Banks	57,487	56,551	936
Total Assets . . .	322,336	279,503	42,833
Capital, Surplus & Undivided Profits	26,296	22,528	3,768
Total Deposits . .	287,991	249,504	38,487

*National Banks, State Commercial Banks, and Private Banks. †Except for number of banks, all figures are in millions of dollars. **Assets and Liabilities of all active banks in the U.S., January 1, 1962.

The Purchasing Power of Money. The purchasing power of money is its worth in exchange for other commodities. It is highly desirable that this power be stable but experience has shown that such is far from the case. When prices advance, the purchasing power of money falls; when prices decline, the purchasing power rises. Prices were much lower in 1913 than in 1920. In 1913, one dollar would have purchased one bushel of wheat; in 1920, one dollar would have bought less than one-half of a bushel. In 1932, it would have bought two bushels. On an average basis, one dollar in 1920 would have exchanged for but 40 per cent of the commodities it would have commanded in 1913 and for 135 per cent of those it would have commanded in 1932. Expressed the other way, it would require $2.50 in 1920 or 74 cents in 1932 to buy the same commodities one might have purchased for one dollar in 1913.

Changes in price levels, therefore, represent concurrent changes in the value of money. It is important to appreciate that these changes exert large influence upon business conditions. It profoundly affects credit transactions, since it creates risk for both parties. It affects production as changes in the value of materials during process interfere with expected profits. Since interest on debt and various other charges are fixed, the effect on profits is much greater proportionately than the alterations in price level would suggest.

But most important is the fact that prices do not change uniformly. There is a wide variance both in degree and in time. The position of the farmer in 1932 was very unfavorable because the prices of farm products had fallen much farther than other prices. The usual sequence of price changes is as follows: first, in the basic raw materials, such as pig iron, copper, wool, rubber, wheat, cotton, corn, etc.; next, in semifinished goods, such as cotton cloths; and later, in finished products. Then wholesale prices are affected, followed at a definite interval by retail prices. Wages are usually the last to be affected.

The Measurement of Prices. The general level of prices is measured through the use of index numbers. Current prices on a great many commodities are taken and a general average is secured after giving weight in accordance with the importance of each commodity. Several of these indices are compiled on a weekly basis. This permits one to judge the general trend of prices, not only from week to week, but also over a period of years. The United States department of agriculture issues a monthly index of wholesale prices based on 1926 as 100. At its high point in 1920, it was above 154, and it declined by 1932 to less than 70, where it had stood in 1903. Within the period 1903-32, therefore, prices more than doubled and then fell below their original level. The index numbers are used inversely to measure the purchasing power of money. The dollar of 1926, which was worth $1.43 in 1903, fell to 65 cents in 1920 and rose to more than $1.43 in 1932.

What Establishes the Value of Money? Money is a commodity itself, and, like all other commodities, its value is determined by the relationship between demand and supply. The demand for money constantly varies. Of course, in the popular sense, there is no limit to the demand for money. The ordinary person really does not demand money, but rather the goods or the services which money commands. The true demand for money comes only from those who have goods or commodities to sell. It, therefore, depends upon the volume of transactions, upon the population, and upon the extent of the use of credit. The volume of transactions depends largely upon the quantities of goods produced in the community.

The supply of money is the amount in circulation. Very little money is hoarded. The chief value of money is in exchangeability. Money must be kept in action, since idle money earns nothing. The person who has money "idle" in a bank expresses a condition which is pertinent to him only. The bank has the money constantly at work.

The extent of the use of credit naturally affects the demand for money. At least 75 per cent of the ordinary business transactions are on a credit basis.

A most peculiar relationship exists between the demand for and the supply of money. The supply always equals the demand. A bushel of wheat has the power of satisfying only so much hunger, but a given quantity of dollars may satisfy any demand, however large, for money. The adjustment is taken up in price levels. If, at current prices, there is a demand for six billion dollars for exchanges, and only five billion is available, the supply will automatically equal the demand through a decrease of one-sixth in price levels.

Why Prices Rise and Fall. The price of any commodity, therefore, depends upon two different sets of conditions: (1) the value of the commodity, which is determined by the demand and the supply of that commodity, and (2) the value of money, which is determined by the demand and the supply of money. Wheat will *rise* in price under any one of the following conditions, other factors remaining unchanged: (1) an increase in the demand for wheat; (2) a decrease in the supply of wheat; (3) a decrease in the demand for money; and (4) an increase in the supply of money. Wheat will *fall* in price under any one of the following conditions, other factors remaining unchanged: (1) a decrease in the demand for wheat; (2) an increase in the supply of wheat; (3) an increase in the demand for money; and (4) a decrease in the supply of money.

It is self-evident that the total value of the money in any nation is irrespective of the number of monetary units in circulation. To double the number of units in circulation simply serves to double prices, rather than to double the value of money. One important reason why prices rose so high in the United States during and following World War I was because of a large increase in the currency in circulation and the velocity or speed with which it was spent. The reason why the German mark, for example, fell so low was primarily because Germany issued so many marks. The value of each monetary unit decreases in proportion as the total number of units is increased.

An equation of exchange is the most convenient approach to the study of the interdependent and interacting forces that effect changes in the level of prices in general. The most familiar form of the equation of exchange, expressed in algebraic terms, is that developed by Irving Fisher as follows: $MV + M'V' = PT$. In this equation, M equals the average quantity of money, including metallic and paper money, in circulation during a year's period, V represents the velocity or speed of circulation of money, which means the number of times the total supply of money turns over during the course of a year in facilitating trade. If the velocity of circulation of money happens to be twenty-five, only one

twenty-fifth as much money is required as if its velocity were one.

The rapid turnover of money increases the efficiency of its use. M′ stands for the average quantity of money substitutes, or the rights to receive money, in circulation subject to check. Actually, the "dollar on deposit" as represented by M′, directly facilitates much more trade than the "circulation dollar," represented by M. V′ represents the velocity of circulation of bank deposits, the number of times on the average that the "dollar on deposit" does duty in an exchange transaction annually. P represents the average price paid for all units of goods acquired in an exchange transaction, and T represents the total number of units so exchanged, or the volume of trade.

If the algebraic symbols are translated into their meanings, the equation of exchange may be expressed as follows: the average quantity of money in circulation, multiplied by its velocity of circulation, plus the average quantity of bank deposits for checking, multiplied by their rate of turnover, equal the average price per unit paid for goods multiplied by the volume of trade. Apparently, the total of money payments for goods plus payments through bank deposits transfer must equal the total value of all the goods acquired in exchange. The equation, by transposition, may be written: $P = \frac{MV + M'V'}{T}$. This equation indicates that prices vary directly with the quantity of money and of substitutes for money, together with their velocities of circulation, and inversely with the volume of trade. The algebraic equation sets forth the proper relationships of the factors involved; it does not, however, offer a complete explanation of price changes.

Of course, if there is an increased demand for money proportionate to the increased supply, the value of each unit will remain unchanged. But the European experience has been a large arbitrary increase in the supply, regardless of the demand.

The Use of Credit. The extent of the use of credit has been given as one of the factors affecting the demand for money. Credit is the power to obtain goods or services by giving a promise to pay money at some time in the future. Credit is usually divided into two classes, general acceptability and limited acceptability. Credit is essentially a promise to pay money, and, if the credit is in the form of an instrument which is universally acceptable in payment of goods or services, it becomes of general acceptability. A Federal Reserve note is credit of general acceptability as it is freely accepted in payment of debts. In this same class are silver certificates, treasury certificates, United States notes, and coins other than gold.

A bank check is an instrument of limited acceptability, since it will be accepted only by those who are acquainted favorably with the drawer of the check. And likewise are promissory notes, drafts, and acceptances. Bank loans and buying on open account are also examples of credit of limited acceptability.

PUBLIC DEBT OF THE UNITED STATES

Source: *U.S. Treasury Department*

June 30	Amount in Millions of Dollars	Per Capita Dollars
1800	83	15.87
1900	1,263	16.56
1920	24,299	228.33
1930	16,185	131.49
1940	40,440	308.29
1945	258,682	1,855.90
1949	252,770	1,694.00
1950	257,357	1,696.11
1951	255,221	1,653.50
1952	259,105	1,649.98
1953	266,071	1,666.80
1954	271,260	1,670.17
1955	274,374	1,660.56
1956	272,825	1,621.82
1959	284,706	1,607.57
1960	286,331	1,586.07
1961	288,971	1,574.80
1962	298,201	1,600.53
1963	305,860	1,619.32

What We Own. What and how consumers, businessmen, government units and others save and invest determines the wealth of our country. Stocks, money, bonds, property of all kinds—these make up the stock of American wealth. The facts about them are statistically summarized and analyzed in the following distribution of American items of wealth which determine our living standards:

IN HOMES	1950	1960
Automobiles	36,292,703	61,431,000
Telephones	40,709,398	74,057,000
Television Sets	10,600,000	46,200,000
Radios	39,281,250	50,279,000
Electric Washers	25,563,800	49,300,000
Vacuum Cleaners	19,660,500	38,425,000
Electric Refrigerators	29,500,000	50,656,000

Source: *Statistical Abstract.*

Credit thus serves as a medium of exchange in over 75 per cent of the daily business in the United States. The demand for money as a medium of exchange is therefore materially affected by the use of credit. Credit does not displace money; it makes money more efficient. Yet, in times of financial panic, prices drop because of an increase in the demand for money for which credit cannot be substituted.

Credit does not increase the supply of money. It does increase the efficiency of money and so lessens the need of it. Since goods can be bought with credit as well as with money, an increase in the volume of credit advances prices as effectively as does an increase in the volume of money.

Credit of General Acceptability. In order that credit may gain general acceptability, all persons in the community must be willing to accept it. For this to result, credit must have four attributes: (1) the promisor must be one in which the people have confidence; (2) credit must be in convenient denominations; (3) it must be easily recognizable; and (4) it must be difficult to counterfeit. Practically all the currency in circulation in this country is credit of general acceptability.

Credit of Limited Acceptability. The most important form of credit of limited acceptability is the bank check. As is discussed later, business obligations are settled customarily with check payments. Technically, a check is an order to the bank to pay money to the payee. In practice, this seldom happens as the payee deposits the check in his own bank for collection. The banks offset balances against each other rather than actually pay the checks in full in cash. This greatly reduces the demand for money.

The Gold Standard. Each nation has its own distinctive unit of money. If commerce is to be carried on readily between nations, it is essential that there should be some common standard for determining the relative values of the national currencies. This standard is provided by gold. When a nation defines its unit of currency as a definite weight of pure gold, it is said to be on the gold standard.

The American dollar is now defined as $13^{5}/_{7}$ grains of pure gold. Otherwise stated, an ounce (480 grains) of gold is worth $35.00.

The gold content of the dollar was originally 24.75 grains, being so defined in 1792. In 1834, it was altered to 23.22 grains.

The gold dollar retained its 1834 value for a century. In 1933, Congress authorized the president to reduce its gold content by as much as 50 per cent. On January 31, 1934, President Franklin D. Roosevelt established its present value.

Modification of Gold Standard. A nation may be legally on the gold standard yet the circulation of gold may be modified in various degrees. The chief restrictions include:

1. Circulation of coinage is forbidden, but paper money is convertible into gold bars or bullion. Countries having this system are said to be on the *gold bullion standard.* The purpose is to discourage the circulation of gold, which can be used more economically as a basis for credit money. See *Advantages of Credit Money.*

2. All domestic circulation of gold is forbidden, both that of coin and of bullion.

3. Export of gold is forbidden except under governmental license.

Devaluation. When the United States suspended the operation of the gold standard in 1933, restrictions numbered 2 and 3 were used. At the same time all gold was nationalized. By this move the Federal government obtained all "profit" from the procedure by which the same amount of gold was made to represent 69 per cent more dollars.

Of this profit, amounting to about 2,800 million dollars, approximately two billion dollars was used as a *stabilization fund,* the purpose of which was to keep on an even keel the exchange rate between the dollar and other currencies.

Devaluation of the currency has the tendency of raising domestic prices. It acts most quickly on those of goods which are bought abroad, the effect then spreading slowly to other prices. Until this process is completed, there is a stimulus to export trade.

Stabilization of Currencies. The chief purpose of a freely operating gold standard is to make possible the conversion of one national currency into others at an approximately constant level. Such conversion is known as foreign exchange. See *Exchange.*

In practice, such conversion is a market transaction, the price of each currency being determined by supply and demand. Price changes in foreign exchange, however, usually receive an automatic check when they rise above, or fall below, a certain point. When gold flows freely, this point is known as the *gold shipment point.* Under managed currencies, it is known as the point of support or the *stabilization point.*

The gold shipment point may be defined as the point of price increase in a foreign currency at which it becomes more profitable to ship gold instead of buying the foreign currency.

Thus, under a free exchange system, if the Canadian dollar were in such demand by Americans wishing to send money to Canada that they bid up the Canadian dollar to $1.02, it might be more profitable to buy a dollar's worth of gold and ship that instead. The gold shipment point in this case would be $1.02.

In theory, inequalities in the distribution of gold among nations should be self-correcting. When one country receives an unduly large supply, prices would normally rise, as explained in the paragraph *Why Prices Rise and Fall.* This rise would make it easier for foreign countries to sell in that market and harder for producers there to sell abroad. Hence the imports would tend to be larger than the exports, and would have to be paid for by the export of gold. This in turn would tend to lower domestic prices and encourage export trade.

Difficulties in Maintaining the Gold Standard. Many obstacles to this self-corrective process have arisen. In the first place, the increase of gold may or may not be followed by a proportional increase of currency and credit, which are actual determinants of price level. Central bank policies and national habits may prevent such increases in money and credit. The normal effect of the gold influx is thereby "sterilized." This result occurred in France and to a certain extent in the United States in the years 1928-30, when these two countries together acquired about two-thirds of the world's monetary gold.

Again, even though the price level does rise, tariff barriers and other trade restrictions may be imposed so as to prevent the inflow of goods. Other countries, therefore, have no opportunity to acquire claims to the excessive gold so as to bring about its redistribution.

PER CAPITA NATIONAL INCOME: UNITED STATES AND SELECTED FOREIGN COUNTRIES
(U.S. Dollars of Current Purchasing Power)

Country	1935	1939	1949	1953
United States	443	522	1,453	1,908
Australia	...	416	679	921
Canada	315	371	870	1,318
France	275	...	482	600
Germany	349	...	320	482
India	...	...	53	59
Japan	61	...	100	197
United Kingdom	418	...	773	930

Managed Currencies. The great depression beginning in 1929 led to partial or complete suspension of the gold standard by every nation in the world. Stability of exchange rates was made to depend on action by governments or central banks. Such action is known as currency management.

The plan adopted by the United States, as by Great Britain, was the use of a stabilization fund, mentioned above. Thus when the dollar price of the pound or franc deviated by a certain amount from a point chosen as normal, the Treasury of the United States would buy or sell pounds or francs until the normal price was restored.

Many other countries met the situation by limiting transaction in foreign currencies so as to make purchases balance sales. German nationals, for instance, could not obtain dollars until American nationals had purchased an equivalent value of marks.

The Rate of Interest. Interest is the cost of borrowing money. The rate changes with conditions of business, and is determined, not by the demand for and the supply of money, but by the demand for and the supply of loanable funds. The business man seldom withdraws actual money at his bank when arranging a loan. He secures a credit to his deposit account which he draws against in payment of his obligations.

The average business man is a constant borrower at his bank. He needs additional capital for the

MONEY IN CIRCULATION (IN MILLIONS OF DOLLARS)
Source: U. S. Treasury Department

June 30	Total	Gold Certificates	Silver Dollars	Silver Cert.	Subsidiary silver	Minor Coin	U. S. Notes	Federal Res. Notes	Fed. Res. Bank Notes	Nat'l Bank Notes
1939	7,047	72	42	1,454	361	155	266	4,484	26	187
1942	12,383	59	66	1,754	504	213	317	9,310	19	139
1943	17,421	57	84	1,649	610	236	322	13,747	584	132
1944	22,504	54	103	1,588	700	263	322	18,750	597	126
1945	26,746	52	125	1,651	788	292	323	22,868	527	120
1946	28,245	50	140	2,025	843	317	317	23,973	464	114
1950	27,154	41	170	2,177	964	361	321	22,759	274	86
1955	30,229	34	223	2,169	1,202	432	319	25,617	162	66
1960	53,071	30	305	2,127	1,484	549	318	27,094	100	56
1962	33,770	29	360	2,008	1,663	629	318	28,622	85	53

expansion of his business and secures it through his bank. The extent to which he borrows depends upon the relationship between the cost of borrowing—the rate of interest—and the return he can obtain in his business from the added investment. There must be a profit margin, else he will not borrow. Low rates of interest therefore encourage borrowing by business men and make for increased business activity. High rates of interest discourage borrowing and make for decreased business activity.

Money in the United States. The present monetary system of the United States is on a gold monometallic basis, which means that a single metal, gold, is the basis of our monetary system. Although our monetary unit, the dollar, has been fixed by executive order of the President at $13^{5}/_{7}$ grains of pure gold, coinage has not been authorized. Gold coins in the Treasury are multiples of the dollar before it was devalued.

Credit Money in the United States. Credit money is also called representative money. All money which circulates freely in the United States is credit money. This applies to silver as well as to paper money.

It should be remembered that the silver dollar takes its monetary value in the United States from the fact, not that it is made of a precious metal, but because it is convertible into $13^{5}/_{7}$ grains of pure gold. Although individual holders may not thus redeem their silver dollars, since gold has been nationalized, it is sufficient that the conversion is possible in foreign exchange transactions.

If one were to melt down a silver dollar into silver metal, the metal itself would be worth possibly only fifty cents. It is only when silver has a market price of $1.29 an ounce that the silver in a silver dollar is worth one dollar in gold.

Silver in Monetary System. By the Silver Purchase act of 1934, Congress directed the Treasury to purchase silver and add it to the monetary stock of the nation until its value, computed at $1.29 an ounce, was one-fourth that of the total money stock, or until the market price of silver reached $1.29 an ounce. The difference between what the Treasury pays for silver and the value of the silver when minted is known as *seigniorage*. It represents a profit to the Treasury.

The difference between the American silver dollar and a silver-standard monetary unit, such as that used formerly in China, is that the American silver dollar's value does not depend on the market value of silver; the other's does. The American silver dollar is arbitrarily valued in terms of gold.

Advantages of Credit Money. The wide use of credit money as a substitute for real money both in this country and abroad is due to two important advantages:

It is more economical. The use of credit money, which is easily manufactured, relieves the demand for gold, which is much more difficult to produce.

It makes possible an elastic currency supply. In view of the fact that the demand for money is constantly changing, it is highly desirable that the supply be regulated accordingly; otherwise, price levels will constantly fluctuate. Elasticity of currency means the power to expand and to contract according to the needs of business. The supply of gold currency in circulation may be increased or decreased only with extreme difficulty; the supply of paper currency—credit money—may be easily regulated, as is illustrated in the use of Federal Reserve notes in the United States.

Federal Reserve Notes. The most important currency used in the United States today is the Federal Reserve Note. These are issued by the Federal Reserve Banks and are essentially promissory notes of these banks. For each of these notes outstanding the Federal Reserve Bank must maintain reserves of 25 per cent in gold certificates, representing an equivalent amount of gold held by the U.S. Treasury, and collateral of 75 per cent in gold certificates, eligible paper, or government bonds.

DEPOSITS IN UNITED STATES BANKS

(in millions of dollars)
January 1, 1962
Source: *Comptroller of the Currency, U.S. Treasury Department*

State	Total	Demand	Time*
Alabama	2,192	1,518	674
Alaska	213	118	95
Arizona	1,463	945	518
Arkansas	1,424	1,064	359
California	27,083	14,232	12,851
Colorado	2,323	1,579	744
Connecticut	5,289	1,932	3,357
Delaware	908	575	333
Dist. of Columbia	1,646	1,209	437
Florida	5,264	3,672	1,592
Georgia	3,125	2,240	885
Hawaii	782	417	365
Idaho	685	435	250
Illinois	19,092	12,807	6,286
Indiana	5,123	3,349	1,774
Iowa	3,340	2,316	1,025
Kansas	2,602	1,952	650
Kentucky	2,626	2,052	574
Louisiana	3,148	2,339	809
Maine	1,138	387	751
Maryland	3,259	1,840	1,420
Massachusetts	12,077	4,908	7,169
Michigan	9,345	4,763	4,582
Minnesota	4,846	2,894	1,952
Mississippi	1,442	1,068	374
Missouri	6,540	4,845	1,695
Montana	864	568	296
Nebraska	1,784	1,482	302
Nevada	493	275	218
New Hampshire	1,041	277	763
New Jersey	9,179	4,361	4,818
New Mexico	770	550	220
New York	71,850	36,934	34,917
North Carolina	3,211	2,341	871
North Dakota	771	470	301
Ohio	11,926	7,094	4,833
Oklahoma	2,925	2,290	635
Oregon	2,220	1,165	1,055
Pennsylvania	17,322	9,380	7,942
Rhode Island	1,514	512	1,002
South Carolina	1,110	890	220
South Dakota	808	530	277
Tennessee	3,625	2,447	1,178
Texas	13,462	10,217	3,246
Utah	1,062	628	435
Vermont	552	158	394
Virginia	3,552	2,120	1,433
Washington	3,367	1,912	1,455
West Virginia	1,340	872	468
Wisconsin	4,975	2,821	2,154
Wyoming	455	292	164
United States	287,155	166,040	121,116

* Includes postal savings.

Federal Reserve Notes may be created by rediscount operations. Jones, a rancher in Montana, borrows $500 from the National Bank of Butte for sixty days to enable him to market his wool crop. The banks may rediscount the promissory note given by Jones with the Federal Reserve Bank of Minneapolis, receiving Federal Reserve Notes. When Jones repays his loan, the rediscount can be paid off, and the Federal Reserve Notes retired.

This is an example of a traditional rediscount. The commercial bank rediscounts its customers' promissory notes with the Federal Reserve Bank. The provision of this facility was one of the most important innovations of the Federal Reserve Act. However, today banks do not have to rediscount their customers' promissory notes in order to obtain funds from the Federal Reserve Banks. They can obtain advances secured by government securities. Under the Banking Act of 1935 the Federal Reserve Banks can also make longer-term advances secured by any assets which the Federal Reserve Banks approve, but only at an interest rate ½ of one per cent above the rediscount rate.

Rediscounts and advances need not result in the creation of Federal Reserve Notes. The funds may just be added to the reserve balances which the

member banks are required to hold with the Federal Reserve Banks. See *Pooling of Reserves.* Similar results can be obtained through purchases of government bonds by the Federal Reserve System. See *Open Market Operations.* Today most money is created by the latter method.

Legal Tender. Any form of currency which the law states must be accepted in payment of obligations is known as legal tender. Since 1933, all forms of United States currency have been legal tender. Before that date, a large proportion of it was not, notably Federal Reserve notes and silver certificates. But since all forms of currency bore the promise of the government to redeem in lawful money on demand, the distinction between what was and what was not legal tender was of little practical importance.

Money and the Banks. In the popular sense, banks are institutions where money is stored for safe-keeping. This is far from being the case, however. A bank may be holding many thousands of dollars on deposit for its patrons. But, under ordinary circumstances, only a very small fraction of this amount is carried as money in the vaults of the bank. One may wonder why banks are willing to safeguard the funds of their depositors without making a charge for the service. The answer is that the bank loans out the deposits to borrowers and receives interest payments upon the loans. In some cases, the bank shares this revenue with its patrons by paying interest on the deposits. National banks are forbidden to pay interest on demand deposits.

Kind of Banks. Just as there are different kinds of stores at which we may purchase various kinds of commodities, so there are various kinds of banks with which to do business. The percentage of the country's banking strength represented in the Federal Reserve system is evidenced by the following statistics:

NUMBER OF BANKS IN THE UNITED STATES

June 30, 1963

Member banks		6,058
National banks	4,537	
State banks	1,521	
Non-member banks		7,935
Mutual savings banks	511	
Other non-member banks	7,424	
Total number of banks		13,993

Numerically, over 46 per cent of the banks of the country are members of the Federal Reserve system. The vast majority of the country's banks are commercial banks.

Commercial Banks. Commercial banks are banks for business men. They accept deposits subject to check, which means that the depositor may at any time, without notice, draw against his deposit by writing out a check. This means that the bank must exercise extreme caution in loaning out the funds on deposit, since it can never tell in advance just when the depositor is going to withdraw his funds. The bank knows from experience, however, that it is extremely unlikely that all the depositors will ask repayment on the same day. It knows also that the new deposits each day tend to equal the amount of the withdrawals. Consequently, it feels safe in loaning out the largest share of the funds on deposit.

Sometimes a rumor of unsatisfactory conditions at a bank will cause depositors to become apprehensive of the safety of their deposits and will result in large withdrawals in short intervals. This is known as a "run" on the bank. Unless the bank can meet the sudden demand, it will be obliged to suspend operations. It was chiefly to meet this situation that the Reserve banks were formed. They enable a hard-pressed bank to turn some of its loans into cash to pay insistent depositors.

This machinery, particularly as recently liberalized to permit rediscounting of "approved" assets instead of "commercial paper" only, is designed to make longer-term loans no less safe for commercial banks than the 60- and 90-day loans to which they largely confined themselves in the past.

Bank Deposits. Banks accept funds on deposit from their patrons and make a corresponding credit in the deposit book of the patron and on their own books of account. It should be appreciated that the funds deposited immediately become the property of the bank and that the depositor becomes a creditor of the bank to that amount. Items which are payable at other banks are credited conditionally, subject to collection. If payment is refused at the other bank, the credit at the first bank is canceled.

Deposits are of two kinds, demand and time. A demand deposit is subject to withdrawal at any time at the option of the depositor. A time deposit may not be withdrawn before the expiration of the definite period for which the deposit was made. Time deposits are more satisfactory to the bank, because the institution knows in advance when withdrawal may be expected. Banks having their deposits insured by the government are forbidden to pay interest on demand deposits.

Deposit Insurance. Through an agency known as the Federal Deposit Insurance Corporation, the United States government insures all deposit accounts in all member banks of the Federal Reserve system and in other banks which are willing to pay for the service. On the failure of one of these banks, depositors are paid up to the amount insured.

Each deposit is insured up to $10,000. Cost of the insurance is defrayed by a levy of $^1/_{12}$ of one per cent on total deposits. All national banks having deposits insured are required to join the Federal Reserve system, but state banks may insure without joining.

Bank Checks. A check is an order drawn upon a bank by one who has funds in that bank to pay a certain sum to another party upon demand. The party to whom the check is payable may possibly present the check to that bank and secure cash from the bank. More probably, he will deposit the check in his own bank for credit to his account. Each day the banks exchange these checks, usually through a clearing house. In this way, the payee receives his funds without being obliged personally to present the check for payment, and the banks are relieved of the obligation of carrying large cash reserves to meet checks presented by individuals for payment. The depositors in a certain bank may during one day draw checks aggregating $10,000; yet that same day the bank may receive in deposits $15,000 in checks on other banks. The net result is an increase of $5000 in the funds of the bank, despite the fact that checks for $10,000 were drawn against it.

Payment by check is the most popular method in this country. At least three-quarters of the daily business transactions are settled on this basis.

Bank Loans. From the banker's viewpoint, he is in business to make loans. Deposits and withdrawals are simply a service which he offers as an inducement for customers, but which, of themselves, bring no profit to the bank. The bank profits, as has been stated before, from the interest it receives upon its loans.

Loans differ in thousands of ways. One man desires to borrow $1000 for ten days to meet his payroll at a time when his cash balance is low; a second man desires to borrow $10,000 to finance the purchase of one hundred shares of United States Steel Common Stock as a speculation for an indefinite period; a third man wishes to borrow $5000 for five years to buy a home; and so on. The first two men may receive accommodation at a commercial bank, but the third man will normally go to a savings bank.

Commercial loans should never exceed one year at the outside. A depositor is usually permitted to borrow in proportion to his bank balance. If he is well and favorably known, he will secure the credit upon his simple promissory note; otherwise, he may be obliged to pledge collateral as security. The more

marketable the collateral, the more satisfactory it is to the banker. The interest charge is usually collected in advance when the loan is made. The bank is usually less interested in what the borrower is going to do with the funds than it is in the chance for repayment; yet the two are closely interrelated. Often the depositor is expected to allow a part of his loan—about one-fifth—to remain on deposit to permit the bank to carry an adequate reserve.

Banks loan in proportion to their deposits. It is a popular misconception that banks make large profits because they loan in excess of deposits. A bank can loan in excess of its cash reserve but not conservatively in excess of its deposits. For the ordinary bank, the loans average about three-quarters of the deposits.

The total loans outstanding in the banks of the United States run into enormous figures. At the present time, the total is over 20 billion dollars.

Basis of Credit Granting. If the nature of the loan is satisfactory, the question whether or not it will be granted by the bank becomes almost purely a matter of the personal equation. The banker considers capital, capacity, and character. The *capital* of the prospective borrower is his financial worth, and this is shown by the statement of his assets and liabilities which ordinarily he is asked to submit. His *capacity* is his ability successfully to engage in business, and this is shown by the earning power he has demonstrated in the past. His *character* is his personal integrity, and this is reflected by his standing in the trade and by his reputation for honesty. The banker considers all three carefully in reaching his decision.

Rediscounting Loans. Banks which are members of the Federal Reserve system are permitted to rediscount customers' promissory notes. All loans are not eligible for this purpose, especially those which are made for stock speculation. The Cleveland Trust Company may lend $5000 to a manufacturer in Cleveland, and then have the Federal Reserve bank of Cleveland rediscount it, in the same manner as was previously mentioned in connection with the Montana bank. The rediscount privilege greatly increases the lending power of the member banks. But, more important, it allows the bank quickly to convert loans into cash in times of emergency. It is this rediscount privilege which is one of the strongest features of the Federal Reserve act.

Other Types of Loans. Other types of loans handled by commercial banks include drafts and acceptances. Brown in Albany buys merchandise from White in Buffalo on terms of thirty days. White may immediately draw an order upon Brown, payable in thirty days, and have this order, or draft as it is called, discounted at his Buffalo bank in the same manner in which he would discount his personal promissory note. An acceptance is a draft which bears the written acceptance of the party upon whom it is drawn that payment will be made when due. Many firms now have their customers sign acceptances upon receipt of goods. In this manner the firm is able to receive immediate payment through discounting the acceptance at its local bank. Otherwise the firm would have to wait until the invoice was due before receiving the money.

Types of Commercial Banks. Commercial banks are divided into two classes, depending upon the method of incorporation. National banks receive a Federal charter. State banks receive charters from the states in which they are located.

National banks are required to operate under the provisions of the National Banking act. The minimum capital is $25,000 for a country bank and $200,000 for a large city bank. Loans cannot be made to any individual in excess of ten per cent of the capital of the bank. They were formerly permitted to issue circulation notes backed by government bonds, but this privilege was discontinued on August 1, 1935.

GROWTH OF UNITED STATES SAVINGS IN SELECTED MEDIA

(In Billions of Dollars, at Year-End)

Year	Total	Savings Assns.	Mutual Svgs. Banks	Comm'l Banks (Time Deposits)	U. S. Savings Bonds
1944	86.3	6.3	13.3	23.9	40.4
1945	104.0	7.4	15.4	30.1	48.2
1946	111.8	8.5	16.8	33.4	49.8
1947	118.1	9.8	17.7	35.2	52.0
1948	123.5	11.0	18.4	35.8	55.0
1949	127.8	12.5	19.3	36.1	56.7
1950	131.2	14.0	20.0	36.3	58.0
1953	150.9	22.9	20.9	43.5	57.7
1954	167.8	27.3	26.3	44.7	57.7
1955	166.6	32.2	28.1	48.4	57.9
1956	174.0	37.1	30.0	50.6	56.3
1960	313.5	62.1	36.2	67.5	45.7
1961	337.1	70.8	38.2	74.8	46.4
1962	368.6	80.3	41.3	88.1	46.8

Source: *Federal Reserve Bulletin.*

National banks are permitted to have branches within states which grant this privilege to state banks. National banks must be members of the Federal Reserve system and of the Federal Deposit Insurance Corporation.

State banks operate under the banking laws of the respective states. These laws vary widely but, in the main, follow closely the Federal law. State banks are permitted, though not required to join the Federal Reserve system if their capital is over a certain specified minimum.

Federal Reserve System. The Federal Reserve system is the machinery by which a central control may be exercised over the expansion and contraction of credit. Since credit is the life blood of trade and the state of trade governs the well-being of almost the entire population, the Reserve system may be said to be the most potent instrument for good or ill in American economic life.

Before this machinery for credit control is described, it should be noted that it cannot actually produce credit if there is no demand for credit, that is, if people do not wish to borrow. What it can do is to make credit easier or more difficult to obtain.

The Reserve system comprises 12 Federal Reserve banks and upwards of 6400 member banks. The Federal Reserve banks are located in the following cities: Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, Saint Louis, Minneapolis, Kansas City, Dallas, and San Francisco. Each Reserve bank may have branches.

The Federal Reserve banks are bankers' banks. Except under certain emergency conditions, they deal only with other banks. Their capital is subscribed to by the member banks to an amount equal to 6 per cent of the capital and surplus of each subscribing bank. Each Reserve bank is permitted to pay to stockholders from its earnings a cumulative dividend of 6 per cent of its paid up capital. The balance is transferred to reserve.

Purposes of the System. The two most important dates in the history of the Federal Reserve system are 1914 and 1936.

On the first of these dates, the system was established and most of the mechanisms were set up by which credit may be controlled.

On the second date, 1936, additional controls were provided, and all of them were placed in the guiding hands of one authoritative commission, known as the board of governors of the Federal Reserve system. The enabling law was passed in 1935.

The Reserve banks were created in the first place to prevent recurrence of the "money squeeze" known as the currency panic of 1907. They provided elasticity of currency, as explained under the paragraph *Federal Reserve Notes.*

The system was strengthened in 1936 to avoid, as far as possible, a recurrence of an unstable boom, such as that which preceded 1929, and the collapse of credit which followed.

The following paragraphs outline the chief features of the system. Under the headings *Pooling of Reserves*, *Rediscount Rate*, and *Open Market Operations* are described the credit control methods originally provided. The additional controls established in 1936 are explained under the headings *Raising of Reserves* and *Margin Requirements*, while, under *Board of Governors*, is described the way in which central control may be exercised.

Pooling of Reserves. Each member bank is required to keep on deposit with the Federal Reserve Bank of its district a sum which constitutes the member bank's legal reserve. This reserve must be maintained at a certain minimum percentage of deposit liabilities, the percentage depending on the type of deposit and the location of the bank and being subject to change by the Board of Governors of the Federal Reserve System. See *Raising of Reserves*.

Lower reserves are required against time deposits than against deposits payable on demand. All member banks have been classified according to their location as either Central Reserve City (New York and Chicago), Reserve City (other major cities), or Country banks. In the original Federal Reserve Act the reserves against demand deposits were specified as 13 per cent, 10 per cent, and 7 per cent, respectively. Subsequently these ratios have been changed. At the end of 1957 they were 20 per cent, 18 per cent, and 12 per cent, respectively.

The Federal Reserve Banks are also required by law to hold minimum reserves. These are in the form of gold certificates, and must constitute 25 per cent of all deposits and Federal Reserve Notes outstanding.

To illustrate: A bank in New York City may have a million dollars in demand deposit liabilities. It must maintain a deposit of $200,000 (20%) at the Federal Reserve Bank of New York. Against this deposit the Reserve Bank must maintain a balance of $50,000 (25%) in gold certificates.

This pooling of reserves in a central institution has at least two distinct advantages. It reduces to a minimum the transfer of actual cash from one part of the country to another. When a check on a member bank in Bangor, Maine, is paid by a member bank in Fresno, California, money is not sent from Bangor to Fresno in settlement, but the transfer is effected by a debit and credit entry in the Federal Reserve books. This entry signifies the transfer of a definite amount of ownership in the so-called gold settlement fund, which is held in Washington. It is due to this procedure that there is usually no collection charge for checks drawn on member banks.

A second advantage from the pooling of reserves is the protection afforded a sound member bank when its deposits are withdrawn too rapidly. The Federal Reserve bank is in a position to come quickly to its support with enormous resources.

The means by which a member bank may command the liquid resources of the Reserve bank are normally two. It may rediscount "eligible paper" which it holds, as explained in the article *Federal Reserve Notes*, paying interest at the regular rediscount rate or at a slightly higher rate if the paper represents longer-term loans. Or it may borrow on its own promissory note secured by eligible paper or United States government obligations, such as Liberty bonds and treasury certificates.

FEDERAL RESERVE SYSTEM*

ASSETS AND LIABILITIES OF ALL MEMBER BANKS

(All money in millions of dollars)

	1940	1950	1962
Loans	$15,321	$44,705	$118,637
U. S. Gov't Obligations	15,823	52,365	52,968
Other Security Investments	5,982	10,354	24,093
Total Deposits	56,430	133,090	219,468
Demand Deposits	33,829	90,306	124,085
Time Deposits	12,178	29,336	79,716
Capital Accounts	5,698	9,695	19,854
Number of Banks	6,486	6,873	6,049

*Source: *Federal Reserve Board.*

Rediscount Rate. The Federal Reserve banks may exert a considerable effect on the expansion or contraction of business by two devices. One is raising or lowering of the rediscount rate. The other is known as open-market operations.

By raising the rate of interest charged member banks when they wish to borrow on eligible paper, a Reserve bank not only discourages borrowing but serves notice to the business community that it regards current expansion as excessive. On the other hand, by lowering the rediscount rate, it encourages borrowing and the consequent expansion of credit.

Open-Market Operations. By this term is meant the purchase or sale of government securities and bankers' acceptances by the Federal Reserve banks. These operations automatically expand or contract the nation's currency in circulation. When Jones sells a $1000 bond to Smith, there is merely a transfer of funds or credit from one individual to another. But when a Federal Reserve bank buys a $1000 bond, it issues new currency in payment. When it sells a bond, it retires the currency which it receives. Since the currency so created or destroyed may be made the basis of many times its face value in bank credit, it may be seen how large an influence the Reserve banks can exert on business conditions.

Raising of Reserves. This is the first of the new controls introduced into the Reserve system in 1936. Its purpose is to prevent a credit inflation by cutting down the amount of loans member banks may make. This is accomplished through raising, by a maximum of 100 per cent, the proportion of deposits which banks must keep in reserves. Under this rule, a New York bank might be required to maintain with a Reserve bank 26 per cent of its deposits, one in Dallas, Texas, 20 per cent, and one in Lincoln, Nebraska, 14 per cent, at a maximum.

Margin Requirements. To check speculation on the stock exchanges, those in control of the Reserve system are empowered to set rules to govern the amount of money which may be lent to finance the purchase of a given value of securities. This applies both to member banks and to brokers doing business on stock exchanges. See *Margin*.

Board of Governors. The most important change in the banking system effected in 1936 was to place authority in the hands of the reserve board. The old board had the right to recommend use of controls and to see that policies pursued by the twelve Reserve banks were within the law. Actually control over each of the twelve banks was exercised by officers of those banks, who were private bankers and not public officials. Concerted action by the entire system was difficult if not impossible to effect.

The new board, consisting of seven members appointed for 14 years by the president, with the advice and consent of the Senate, is armed with actual control. Its decision is mandatory in setting the rediscount rate, reserve requirements, and margins for security speculators. Policies for open market operations are set by a committee consisting of the seven board members and five representatives of the Reserve banks, chosen regionally.

Furthermore, the presidents of the twelve Reserve banks must be acceptable to the board of governors. Additional assurances that the system shall be operated in the public interest rather than for the profit of bankers include a provision that members of the board of governors may not return to the private banking business for two years after the expiration of their terms of office.

The policy of the board is insulated from influence of the executive branch of the government through a requirement that the terms of members

expire in rotation at two year intervals. It would take six to eight years for a president to have his appointees form a majority of the board.

The reason for this precaution is to prevent the government from using the banking system as a source of indefinitely large Federal loans if the Federal Reserve board does not agree with the policy.

Government as Banker. The Federal government began providing credit for its citizens with the establishing of the Farm Loan Banks in 1916. See *Farm Loan Banks*. These banks were provided for farmers who demanded mortgage money for farm property at rates comparable to those prevailing in cities.

Both World War I and World War II brought a vast expansion in government lending. Through the War Finance Corporation, Federal funds were advanced to private corporations for the purpose of enabling them to forestall serious failures in financial institutions during the deflation period of the early 1930's. Banks, insurance companies, and later, railroads, states, school districts, and even private individuals were beneficiaries. The Federal Deposit Insurance Corporation was created by the Act of 1933 and made permanent in the Banking Act of 1935. Through this act the insurance of deposits was made mandatory for members of the Federal Reserve system and optional for sound non-member banks. Deposits in insured banks are fully protected up to $10,000 for each depositor. This provides 100 per cent insurance coverage to the vast majority of all the depositors in the insured banks of the country.

Federal Credit Unions. Two forms of credit constitute the credit structure of American business: investment credit and commercial credit. The Federal government adopted the National Banking Act of 1863 by which it chartered national banks; about 5000 such banks were in existence at the beginning of 1951. Twelve Federal Reserve banks were chartered by the U. S. Government in 1914 and since then have established 24 branches. In 1916, the Federal Farm Loan act authorized the creation of special types of mortgage banks, designed to help finance agriculture. In 1932 a system of Federal Home Loan banks was established to provide a nationwide credit facility to mortgage lending institutions to help meet extraordinary needs of savers and borrowers. In the same year the Reconstruction Finance Corporation was created by Congress to help meet an emergency situation. With a capital of 500 million dollars, the RFC loaned to banks themselves funds to liquidate frozen credits and to strengthen their capital structures. The Home Owners Loan Corporation provided capital for individual home purchasers and, in the financial operations of World War II, the Reconstruction Finance Corporation, through such affiliates as the Defense Plant Corporation and the Defense Supplies Corporation, provided investment of billions of dollars.

In 1933 there were organized the Federal Farm Mortgage corporation, to refinance farm mortgages in distress, and the Home Owners Loan Corporation, to provide emergency relief to home owners under threat of foreclosure of their homes, and to refinance their homes on easier terms that they might retain ownership. During their statutory lending period, 1,017,821 loans were made in the aggregate amount of $3,093,451,321. Financial institutions and individual lenders received $2,750,000,000 from the HOLC for frozen mortgages and paid $490 million to local cities and towns for delinquent taxes of its borrowers, and taxes on its own acquired properties. 800,000 homeowners were saved from loss of their property through foreclosure. Liquidation of the Corporation was completed in October 1950, and in the following year $14,023,649.82 was paid to the Treasury of the United States.

Additional banking aid for farmers includes: 12 intermediate credit banks, which discount agricultural paper as the Federal Reserve banks do commercial paper; 12 production credit corporations, which lend money for general farm transactions much as the Federal Land banks do for purchase of farms; and one central bank and 12 regional banks for financing farm co-operatives. In all these agencies, the government owns the stock but most of the capital comes from private investors.

Thousands of co-operative savings and loan associations have been organized pursuant to the Federal Credit Union act of 1934 and subsequent amendments, and pursuant to similar legislation enacted in all but a few of the 50 states.

Savings Banks. As the name indicates, savings banks aim to provide a place to safeguard the savings of the people. The funds are invested in securities of the highest class, and the income is distributed to the depositors in the form of interest. In New York State, all savings banks are mutual, which means they are owned by and operated for the depositors. The entire investment income becomes the property of the depositors after the payment of expenses. The entire amount is seldom distributed, however, as a certain part is placed in a surplus account for the protection of the accounts. It is the custom to limit the maximum balance to a few thousand dollars.

Savings and Loan Associations. This type of financial institution is chartered by both state and Federal governments. All federally chartered associations use "Federal" as a part of their corporate name. In certain areas state-chartered associations use building and loan association, building association, homestead association, and co-operative bank, as a part of their corporate name. The two major functions of savings and loan associations are to accept savings from the public in large and small amounts, regularly or irregularly, at the convenience of the savings customers. Investments are generally limited by Federal or State law to loans for building or buying homes, and U. S. Government obligations. To a limited degree funds can be invested in loans on other types of real estate. As a result of specialization in home financing, savings and loan associations provide more home loans than any other type of financial institution.

The channeling of these funds into home financing not only encourages and makes home ownership possible, but performs a basic economic function by providing jobs for construction workers, income for suppliers of materials and orders to factories.

All Federally chartered associations are required by law to be members of the F.S.L.I.C. State-chartered associations are insured upon application and meeting the F.S.L.I.C. requirements. Of the

UNITED STATES FOREIGN AID
(millions of dollars)
July 1, 1945 to July 1, 1963

Region	Total Aid	Military Aid	Aid Other than Military
Western Europe (Excl. Greece and Turkey)	39,210	15,166	24,044
Eastern Europe	1,546	....	1,546
Near East (Incl. Greece and Turkey) and South Asia	15,028	4,911	10,217
Africa	1,344	92	1,252
Far East and Pacific	22,159	9,636	12,523
Latin America	4,720	774	3,946
Other International Institutions and Unspecified	2,184	340	1,844
Total	86,294	30,920	55,374

Source: *U.S. Department of Commerce.*

6300 associations in existence, 4500 are members of the F.S.L.I.C. The Federal Home Loan Bank System (see below), of which all insured associations are members, makes available credit to meet unusual demands and for seasonal mortgage lending.

Federal Savings and Loan Insurance Corporation. This Corporation was created in 1934 by an Act of Congress to insure savings accounts in savings and loan associations, up to the legal authorization of $10,000. The original capital of $100 million was provided by the Federal government. This has been retired in full by the Corporation. The premium for insurance protection is paid by the insured associations at a rate fixed by law, currently 1/12 of 1 per cent on insured accounts.

In the event of default by an insured institution, the Corporation, as soon as possible, pays the saver up to 100% of insurable limit in cash or makes available an insured account in another insured association. In order to prevent default, the Corporation is authorized to take steps to restore an insured association to normal operating conditions.

Federal Home Loan Bank System. Federal Home Loan Banks were established in 1932 by an Act of Congress to provide a system of reserve credit banks for thrift institutions of the savings and loan type engaged in long-term home mortgage financing. Twelve regional Federal Home Loan Banks, and the districts they serve, are designated by the Federal Home Loan Bank Board. Membership in a Federal Home Loan Bank is by approval by the Federal Home Loan Bank Board, upon meeting eligibility requirements.

Principal functions of these banks are to provide additional liquidity for members by making advances when needed to meet unusual or heavy withdrawal demands and to meet seasonal mortgage lending demands. The Federal government supplied the initial capital of $125 million; this has been fully retired. Each member association is required to hold stock equal to 1 per cent of its total mortgage loans and is entitled to obtain advances on an unsecured basis for a term up to one year or on a ten year term basis where the loans are secured by mortgage loans. The system raises its funds through consolidated obligations of the twelve banks in the system. Members of the bank system may deposit funds with the Bank of which it is a member.

Federal Housing Administration. This corporation was established in 1934 to insure mortgage loans made to finance the construction, improvement or purchase of all types of residential property. Loans made on the FHA plan are originated by any type of financial institution that is making mortgage loans. The loans to be insured are submitted to the FHA and upon acceptance a premium is paid by the borrower of ½ of 1 per cent per annum. The protection of insurance is given to the lender in return for his willingness to make high percentage, long-term loans. Whereas most lending institutions are confined, on their loans on residential property, to 60 to 80 per cent of value, FHA loans can be made for as high as 95 per cent.

The Veterans Loan Guarantee. As a part of the Veterans Rehabilitation Act of 1945, provision was made for loans to be made by private lending institutions to veterans for as much as 100 per cent of the purchase price or the construction cost of homes for terms up to 25 years at a rate of 4 per cent. The lenders making these loans were originally protected with a guaranty up to $2000 or 50 per cent of the loan. These guarantees were increased in 1950. In the first five years of the operation of this program, 2½ million veterans acquired homes on this plan.

MONEY UNITS OF PRINCIPAL COUNTRIES

With Equivalents in United States Dollars

Country	Monetary Unit	Value in U. S. Dollars*	Country	Monetary Unit	Value in U. S. Dollars*
NORTH AMERICA:			Netherlands	Guilder	0.276
United States	Dollar	$1.00	Norway	Krone	0.14
Canada	Dollar	0.925	Portugal	Escudo	0.034
Mexico	Peso	0.08	Spain	Peseta	0.016
Costa Rica	Colon	0.15	Sweden	Krona	0.193
Cuba	Peso	1.00	Switzerland	Franc	0.231
Dominican Republic	Peso	1.00	Turkey	Lira	0.111
Guatemala	Quetzal	1.00	Yugoslavia	Dinar	0.003
Haiti	Gourde	0.20			
Honduras	Lempira	0.50	ASIA:		
Nicaragua	Cordoba	.142	Burma	Kyat	0.21
Panama	Balboa	1.00	China	Yuan	**
El Salvador	Colon	0.40	India	Rupee	0.21
SOUTH AMERICA:			Iran	Rial	0.013
Argentina	Peso	0.055	Iraq	Dinar	2.80
Bolivia	Peso Boliviano	0.008	Israel	Pound	0.333
Brazil	Cruzeiro	0.002	Japan	Yen	0.0027
Chile	Escudo	0.09	Jordan	Dinar	2.80
Colombia	Peso	0.51	Korea	Hwan	**
Ecuador	Sucre	0.055	Lebanon	Pound	0.456
Paraguay	Guarani	0.016	Malagasy	Dollar	**
Peru	Sol	**	Pakistan	Rupee	0.21
Uruguay	Peso	0.135	Philippines	Peso	0.50
Venezuela	Bolivar	0.298	Thailand	Baht	.048
EUROPE:			Viet-Nam	Piastre	**
Austria	Schilling	0.038	AFRICA:		
Belgium	Franc	0.02	Ethiopia	Dollar	0.402
Denmark	Krone	0.144	Ghana	Pound	2.80
Finland	Markka	0.31	Libya	Pound	2.80
France	New Franc	0.202	Republic of So. Africa	Rand	1.40
West Germany	Deutsche Mark	0.25	Saudi Arabia	Riyal	0.222
Great Britain	Pound	2.80	Sudan	Pound	2.87
Greece	Drachma	0.033	United Arab Republic	Pound	2.87
Italy	Lira	0.016	AUSTRALIA:		
Luxembourg	Franc	0.02	Australia	Pound	2.24
			New Zealand	Pound	2.78

* Value given is the official par rate established with the International Monetary Fund October1963. ** No par value established.

BUSINESS, BANKING, AND LEGAL TERMS

THE everyday life of the average man or woman brings frequent occasions which demand the ability to understand and use many terms peculiar to business, banking, or the law. To know the nature and the meaning of commercial forms and legal instruments is to be acquainted with the necessary working tools of the business world. Every person needs to know what these tools are and how they are used.

The treatment of the topics in the following dictionary of business, banking, and legal terms is adapted to meet such everyday needs. This alphabetic list will supply definite information upon specific subjects, and it will supplement with greater detail the chapters that precede it in the department of Economics.

Acceptance. A term designating any bill of exchange which has been accepted by the drawee—the party upon whom it is drawn.

The term is used with reference to the act of the drawee in accepting the bill of exchange, by writing upon the face of the bill the word "accepted" and signing his name as acceptor. The date of acceptance and the place of payment are generally added. These, however, are not essential to the validity of the acceptance. After the bill has been accepted, it becomes the direct obligation of the acceptor, and the drawer of the bill then becomes liable to pay the amount of the bill only in the event that the acceptor does not pay it.

A bank or banker's acceptance is a bill of exchange of which the acceptor is a bank or trust company or some other financial person, firm, or corporation which makes a business of lending its credit by accepting bills of exchange.

A trade acceptance is a bill of exchange drawn by a seller upon a purchaser to cover a current sale of goods. Ordinarily, the trade acceptance is drawn by the seller payable to himself, and the acceptance of the bill by the purchaser converts the bill into what is substantially the same as a promissory note. The trade acceptance, however, bears upon its face the statement: "The obligation of the acceptor hereof arises out of the purchase of goods from the drawer"; and it is made a crime under the Federal laws to use a trade acceptance in interstate commerce for any other purpose than in payment for an original purchase of goods. See *Bill of Exchange, Payee.*

Acceptor. One upon whom a draft or bill of exchange is drawn, and who, by writing his acceptance upon the face of the bill, has undertaken to pay the amount of the bill.

Acceptor for Honor. One who accepts a bill drawn upon another, in order to prevent the bill from being protested for nonacceptance or nonpayment. Thus the acceptance is deemed to be for the "honor" of the person upon whom the bill is drawn.

Accommodation Paper. An instrument by which one person lends his credit to another. Usually, but not necessarily, the transaction involves no financial profit to the person lending his credit. The accommodation may take the form of signing a note as maker or endorser, or of drawing, accepting, or endorsing a draft or bill of exchange, or otherwise affixing one's name to a commercial instrument in such manner as to become liable in the event that the instrument is not paid when due by the person receiving the accommodation.

Accounts Payable. Sums owed by a person, partnership, or corporation to others upon open account, the obligations not being represented by notes, bills, or other instruments of indebtedness. See *Bills Payable.*

Accounts Receivable. Sums due to a person, partnership, or corporation from others upon open book account, the obligations not being represented by notes, bills, or other instruments of indebtedness. See *Bills Receivable.*

Accrued Dividends. A term improperly applied to dividends which have not been paid or declared, but which are loosely regarded as having "accrued" because the stock upon which the dividends are payable entitles the holder to cumulative dividends at a specified rate. In fact, a stockholder can have no right to dividends until they have been declared by the board of directors of the company. See *Preferred Stock.*

Accrued Interest. While interest upon an obligation usually becomes due and payable at the termination of some definite period or periods of time, the interest upon the obligation, in fact, accrues from day to day. In the purchase and sale of securities between interest payment dates, the amount of interest accrued must be added to the face value of the obligation in order to determine the actual present value. Similarly, an exact statement of the financial condition of a business at any particular moment must include among the liabilities of the company the item of accrued interest upon interest-bearing obligations of the company held by others. A similar item will also be included among its assets, representing interest accrued upon interest-bearing obligations of others held by the company. Interest already due and unpaid is not properly included in the item of accrued interest.

Active Stocks. Stocks that are frequently bought and sold in considerable quantities upon the general market.

Actuary. One whose business is the calculation of insurance risks and premiums.

Ad Valorem Duties. Tariffs imposed upon articles according to their value.

Affidavit. A written statement sworn to or affirmed before some person who has authority by law to administer an oath. Affidavits are prescribed by law for proper execution of many documents. They are frequently used in place of oral evidence at court trials. Their proper substance is confined to statements of fact regarding which the witness has certain knowledge. Making a false statement in an affidavit is the crime of perjury.

Agent. One hired to carry on certain activities for an employer. The person employing the agent is known as the principal, and is bound by any acts performed by the agent within the scope of the agent's employment. The principal is liable also for any damages sustained by third persons from wrongful acts committed by the agent in the course of his employment.

Frequently it is difficult to distinguish an agent from an independent contractor. Under a mere agency, the employer may direct and supervise the work of his agent, both in large matters and in details. In the case of the independent contractor, this power of supervision does not exist.

Amortization. The periodic setting aside of revenue or earnings in a definite proportion to the initial cost of machinery, plant, or other capital investment, for the purpose of providing a fund with which to replace the machinery or equipment when it has become worn out.

The term is applied also to the building up of a fund for the retirement of a loan when it becomes due.

Ancillary Receiver. A receiver appointed in a state or a district other than the one in which the principal or original proceedings have been begun. The duties of an ancillary receiver are to gather in and administer property in the state or the district of his appointment. See *Receiver.*

Annuity. An annuity has been defined as a series of equal payments made or due at equal intervals of time. Although the term is most commonly associated with payments made at stated intervals to insurance policy holders or beneficiaries, it applies also to bond coupons, preferred stock dividends, and other periodic payments.

Arbitrage. The almost simultaneous purchase and sale of foreign exchange, securities, or commodities in two or more different markets with the motive of making a profit.

Assay Office. A bureau of the United States mint, in which the weight and fineness of metals used in the coining of money are tested and certified.

Assessed Valuation. The value placed upon property by government officials as a basis for the imposition of taxes. Frequently the assessed valuation of property is considerably below its real or market value.

Assessment. (1) A tax or charge imposed upon properties to defray a part of the cost of a local improvement by which most, if not all, of the properties are directly benefited. Assessments for paving and cleaning streets, for installing sewers, and for widening streets are of this character.

(2) A levy made by a company upon its shareholders for the purpose of securing additional capital. The stock of most business corporations is today nonassessable if the par value of the stock has once been fully paid in cash or its equivalent. However, stockholders in banking and similar corporations are generally subject to assessment to make good any impairment of capital.

Assets. Anything of material value belonging to a person, firm, or corporation. The term includes, not merely real property and tangible personal property, but also good will, copyrights, patent rights, and all other rights, privileges, franchises, and property interests having value.

Assignee. One to whom any contract, right, security or interest has been assigned.

Assignment. The transfer to another of one's interest in a contract, security, or any other thing of value. Except in the case of negotiable instruments, an assignee receives no better title to the thing assigned than his assignor had.

A "general assignment for the benefit of creditors" is sometimes made by a debtor who is insolvent or financially

embarrassed. The assignment takes the form of a transfer, by the debtor, of all his assets to a trustee. The purpose of such an assignment is to show the good faith of the debtor and his willingness to distribute his assets among his creditors. If satisfied that the debtor has not withheld assets from the trustee, the creditors will join in a composition agreement whereby each creditor agrees to accept, in satisfaction of the debt, a certain percentage of the amount due him. If all the creditors join in the composition agreement, the property of the debtor can be equitably distributed among the creditors, without the stigma and the wastage of assets which bankruptcy proceedings would entail. Any group of creditors, however—sometimes one creditor is sufficient—may refuse to enter into this plan for an informal distribution of the debtor's assets, and may insist upon formal bankruptcy proceedings; and the general assignment is itself a sufficient ground for the institution of bankruptcy proceedings against the debtor.

Assumed Bonds. Bonds issued by one corporation and assumed by another, as a result of a merger or consolidation of the two companies, or as a result of the acquisition of the control of the former company by the latter. The bonds so assumed become the liabilities of the second corporation as though such bonds had originally been issued by it.

Attachment. A writ issued by a court of competent jurisdiction, authorizing the seizure of a person or of designated property.

Audit. An examination by an accountant of the books of a person, firm, or corporation, to determine whether there are any arithmetical errors or fraudulent entries in the accounts, or whether any improper methods of accounting have been employed.

Available Assets. Unencumbered real or personal property that can be sold, pledged, or mortgaged as security for a proposed indebtedness.

Balance of Trade. The relation between the merchandise exports and imports of a country. When the exports exceed the imports during any period, the balance of trade is said to be "favorable." When imports exceed exports, the balance of trade is "unfavorable." It is so regarded largely because an excess of exports is likely to be accompanied by an influx of gold—in payment of the excess of products sent abroad. And, vice versa, an excess of imports may result in an outward flow of gold.

In actuality, however, an excess of imports frequently indicates merely that the citizens of a country have lent or invested heavily abroad and are receiving the income upon their investments, or repayment of the principal, in merchandise. When this is the case, there can be no harm in an "unfavorable" balance of trade.

Balance Sheet. A statement of the assets, liabilities, and net worth of an individual, firm, or corporation as of a certain date.

Bank Acceptance. See *Acceptance.*

Bank Balance. The amount credited to a customer by a bank at any particular time. This sum does not represent actual currency in the custody of the bank to the amount of the balance; rather, it represents the amount of an obligation due from the bank to the customer. In the ordinary deposit in a commercial bank, the amount of this balance is subject to withdrawals upon written orders called checks, drawn by the depositor upon the bank.

Bank Book. A book, issued by a bank to a depositor, in which the deposits made with the bank are recorded. The bank book issued by the ordinary commercial bank is nothing more than a receipt; and a transfer of the book by the depositor to another, whether as a gift or for value, will not ordinarily transfer the ownership of the deposit. A bank book, issued by a savings bank, however, is for many purposes regarded as a symbol of the deposit itself; and, in some states, a gift, or a transfer for value, of a savings bank book gives to the transferee a valid claim against the bank, to the extent of the deposit represented by the book.

Bank Discount. Simple interest deducted in advance from the face value of a loan, the principal of which is payable at a definite future date. By thus taking the interest before it is earned, a slightly higher rate of interest than the rate nominally charged is actually received by the bank, since the full amount of the principal is never turned over to the borrower. Banks, however, are very generally permitted to indulge in this practice, even though the interest which they thus obtain is in excess of the legal rate of interest.

Bank Draft. An order in writing, drawn by one bank upon another, directing the latter to pay a designated sum of money to a third person. The draft may be payable at sight, that is, on demand, or at a definite or determinable future time.

Banker's Acceptance. See *Acceptance.*

Bank Examiner. Both state and national banks, as depositories of the funds of the general public, are subjected to stringent control and supervision by state and Federal authorities. This control is exercised by examinations of the banks, made periodically by bank examiners acting under the authority of the Comptroller of the Currency, the Federal Reserve, the Federal Deposit Insurance Corporation, or the banking department of a state. Such examinations supplement and check the statements which banks are required to furnish, setting forth in detail their financial condition. Any fraudulent or false entries or unsafe practices discovered by the bank examiners are reported to the proper officials, and the bank guilty of the improper practice or false entry is promptly required to rectify the situation. These examinations serve as a safeguard against dishonest and improper practices by banks and bank employees.

Bank Note. An instrument containing a promise of a bank to pay to the bearer on demand a definite sum in legal tender. These notes commonly bear no interest. When safeguarded by an adequate redemption fund, so as to be redeemable upon presentation by a holder, and when carefully limited and supervised by governmental authorities, bank notes may circulate at par as a part of the paper currency of the country. The Federal Reserve note is the only bank note currently issued in the United States. See *Federal Reserve Notes.*

Bankrupt. One who has been adjudicated a bankrupt, in proceedings under the National Bankruptcy law.

Bankruptcy. Proceedings under which the property of an insolvent debtor may be distributed ratably among his creditors under the supervision of a court, and the bankrupt be thereupon discharged of his debts. Bankruptcy proceedings thus serve two purposes: (1) the equitable distribution of the property of the debtor among his creditors; (2) the release of the debtor from his obligations, giving him a fresh start in the business world.

Bankruptcy proceedings in the United States are governed by the Federal Bankruptcy act of 1898 and the amendments thereto. Under this act, proceedings may be either "voluntary" or "involuntary." In the former, the debtor himself institutes the proceedings by filing a voluntary petition showing that he owes debts to the amount of at least $1000, which he is unable to pay. In involuntary proceedings the creditors file the petition. Three or more creditors with unsecured claims amounting to at least $500, or, if there are fewer than twelve creditors, one creditor with a claim amounting to $500 may institute the proceedings.

A debtor may be adjudicated an involuntary bankrupt only if, within four months prior to the filing of the petition, he has done one or more of the following acts: (1) concealed, removed, or otherwise fraudulently disposed of property with intent to hinder, delay, or defraud his creditors; (2) transferred property, while insolvent, to any creditor, with intent to prefer that creditor over others; (3) permitted a creditor to obtain a preference by legal proceedings, as by attachment or levy upon goods of the debtor, and failed to vacate the preference at least five days before a sale under the levy or attachment; (4) made a general assignment for the benefit of creditors; (5) being insolvent, applied for a receiver, or if a receiver has been appointed at the request of creditors.

Wage earners and farmers cannot be adjudicated bankrupts. Claims for torts, that is, injuries to person or property, usually may not be proved in bankruptcy proceedings, and are not affected by the discharge of the bankrupt.

Bank Statement. A statement issued by a bank or trust company, setting forth in detail its assets and liabilities, together with its capital accounts.

Bar Gold. Gold in the form of bars, of a specific weight and fineness. When gold is shipped from one country to another in payment of obligations, it is shipped in the form of bar gold.

Bar Silver. Silver in the form of bars, of a specific weight and fineness.

Bear. A stock or commodity speculator who gambles on the prospect of prices going down. The "bear" sells, for future delivery, stock or wheat which he does not then have, expecting to cover, that is, buy in, at a lower price than that for which he has agreed to sell, at some time before delivery must be made.

Bear Market. A condition of declining prices in securities or commodities, generally accompanied by little activity in the market and by a general depression in trading.

Bear Panic. When those who have sold "short" in any security or commodity find that the market is rising, they attempt to cover in order to keep their losses as low as possible. When the rise in prices is very sudden or very pronounced, the haste of the "bears," to cover their sales by buying in on the market, reaches the point of a veritable panic. See *Cover*, *Selling Short*.

Bear Raid. A concerted movement by those traders who make a business of selling "short" on stock or commodity exchanges, the purpose of which is to cause the market price of a certain stock or commodity to fall. This result is effected by sales of the stock, against which the raid is directed, at prices below the true market value of the stock. In the case of a successful "bear raid," these sales, which usually provide for delivery at some future time, result in a very pronounced temporary fall in the price of the stock, the public being afraid to hold a stock, the price of which is apparently on the down grade. When the market price has thus been hammered down to an artificially low price, the bears "buy in" and so cover at a profit their earlier sales for future delivery.

Bids and Offers. The rules of the New York stock exchange provide definite terms upon which bids and offers must be made and construed in dealings upon the exchange. These are: "cash," that is, for delivery upon the day of contract; "regular way,"—for delivery upon the business day following the contract; "at three days,"—for delivery upon the third day following the contract; "buyers' or sellers' options,"—for not less than four days nor more than sixty days. Unless otherwise specified, bids and offers are deemed to be "regular way."

Bill of Exchange. An unconditional order in writing, addressed by one person (called the drawer) to another (called the drawee), requesting the person to whom it is addressed to pay on demand, or at a fixed or determinable future time, a definite sum of money to the order of a third party (called the payee). Often the term "draft" is used in the United States particularly with respect to domestic bills of exchange.

A check is in effect a bill of exchange drawn upon a bank, payable upon presentation or at sight. See *Acceptance*, *Check*, *Draft*.

Bill of Lading. A receipt and contract given by a railroad or other carrier, stating that the goods described have been received by the carrier for transportation to a designated point, and setting forth the terms of the contract between the carrier and the shipper under which the goods are transported. There are two kinds of bills of lading in use in the United States. One is the so-called "order bill of lading," and the other the so-called "straight bill of lading."

In the "order bill of lading," the carrier undertakes to deliver to the *order of* a designated person, and only upon the surrender of the document. In the "straight bill of lading," the carrier merely undertakes to transport and to deliver to the person named as consignee in the bill of lading; the surrender of the bill of lading is not made a condition precedent to the surrender of the goods by the carrier.

The distinction between the order bill and the straight bill has become very important by reason of the effect which the law has given to order bills of lading. Since the order bill may be negotiated from one holder to another by mere endorsement and delivery, and since the carrier undertakes to deliver the goods represented by it only upon a surrender of the document, the order bill has come to be dealt with commercially as the symbol of the goods. Thus loans are frequently made upon the security of properly endorsed bills of lading, the lender being protected by the assurance that the carrier will not deliver the goods represented by the bill of lading except upon the surrender of that instrument properly endorsed.

In order to further the use of the order bill of lading as an instrument in commerce and as the basis for the advance of credit to owners of goods in transit, most states have passed the Uniform Bill of Lading act, which makes the order bill of lading in effect a negotiable instrument and protects from loss all bona fide purchasers of such bills, as well as persons who lend upon the instruments, even though the bill of lading itself may have been lost by, or even stolen from, the true owner. The Uniform Bill of Lading act also forbids any attachment of, or interference with, goods in transit represented by an order bill of lading, unless the negotiation of the bill has first been enjoined and thus its transfer to a bona fide purchaser or lender has been rendered impossible. The Uniform Bill of Lading act has been passed by Congress, and has thus been made applicable to all shipments in interstate and foreign commerce.

The straight bill of lading possesses none of these peculiar attributes that the law has given to the order bill. The straight bill of lading, therefore, does not in any sense represent the property in the possession of the carrier, and cannot form the basis for a loan upon the goods. The duty of the carrier, where a straight bill of lading has been issued, is merely to deliver to the person named as consignee, and this duty remains unchanged and unaffected by any attempted dealing with the bill of lading.

Bill of Sale. A written instrument transferring or assigning, from one person to another, personal property or an interest therein.

Bills Payable. Obligations owing to others, represented by bonds, notes, or other instruments of indebtedness.

Bills Receivable. Obligations due from others, represented by notes, bills, or other instruments of indebtedness.

Bimetallism. The free and unlimited coinage of two metals as the basis of the monetary system.

Black Friday. September 24, 1869. A day when the "bears" of the New York stock exchange were practically ruined by a "bull" movement engineered by Jay Gould and Jim Fisk, which caused an unprecedented rise in the prices of speculative stocks upon the exchange. The movement was precipitated by the redemption by the United States of $4,000,000 of its bonds in gold.

Blanket Mortgage. A mortgage which covers several different properties, or one mortgage which is issued in place of several existing mortgages. Such a mortgage is not necessarily a first mortgage.

Block of Stock. A number of shares of stock held by an individual or by a group in a particular corporation.

Bond. A long term instrument by which a person, corporation, or government agrees to pay a certain sum of money on a determinable date. Bonds are usually given under seal and, in many states, are enforceable for a period of twenty years after their maturity; while the ordinary promissory note, or contractual obligation, is not enforceable after the lapse of six years from the date when the obligation matured.

Bonded Debt. The amount of the indebtedness of a government, a corporation, or an individual, represented by bonds issued and outstanding. The bonded debt is taken to represent the fixed or permanent indebtedness, as opposed to current or short time indebtedness, which must be paid or renewed currently.

Bonus. Stocks and bonds are frequently sold under a plan which purports to give to the purchaser a "bonus"—a nominal interest in the corporation in excess of the amount paid by the purchaser for the securities. Thus, stock selling schemes have frequently provided for the sale of two classes of securities or two classes of stock, the purchaser paying the par value of one class of security and receiving in addition thereto a further interest in the company as a bonus.

A not unusual plan is to offer one share of preferred stock having a par value of $100, together with one share of common stock also having a par value of $100, for a total purchase price of $100, the common stock being thrown in as a "bonus." In fact, stock which is thus issued as a bonus is valueless until some surplus has been created in the corporation beyond the amounts actually received by the company in exchange for the stock issued. Moreover, persons who receive stock as a bonus, pursuant to such a selling plan, may, under some circumstances, be compelled later to pay the par value of the stock so received to the corporation or to its creditors. This is true even though the stock which they have received as a bonus purports on its face to be fully paid and nonassessable. The newer plans for the flotation of stock avoid some of the legal dangers heretofore involved in the acceptance of bonus stock, by issuing the bonus stock without any nominal or par value.

The term "bonus" is frequently used also with reference to the sum paid by a borrower to a lender or his agent, as a consideration for granting or obtaining a loan. Frequently the bonus is merely an attempt to circumvent the usury laws, and, where that is the case, the law will see through the device and deem the loan usurious and unlawful.

Books Closed. The books of a corporation are usually closed as of a certain date, for the purpose of determining what persons are entitled as stockholders to share in a dividend to be declared, or in other distributions to be made by the company, or to determine who are entitled to vote as stockholders in any stockholders' meeting of the company. During the period when the books are closed, no transfers of stock are made on the books of the company. For all corporate purposes, the holders of record, as of the date upon which the books are closed, are deemed the stockholders of the company until the books are again opened to transfers of stock.

The term "books closed" is sometimes used also with reference to subscriptions to a new issue of securities, when the issue has been fully subscribed. In the event of oversubscription, the issue is frequently prorated among all who have sent in subscriptions. But, unless the right to prorate the issue among the subscribers has been specifically reserved in the offer of sale of the securities to the public, a

subscriber is not obligated to accept less than the full amount called for by his subscription.

Book Value. The value of the assets of a company as set forth upon the books of the company.

The book value of a share of stock issued by a company, as distinguished both from its par value and from its market value, or selling price on the market, may be obtained by dividing the net assets of the company by the number of outstanding shares. If the books of the company are accurately kept, the book value of any share of stock is thus a closer approximation to the amount of capital investment represented by each share than either the par or the market value of the stock.

Boom. Unusual activity and enthusiasm in any line of business, or prosperity in business generally, resulting in a marked rise in prices, employment, output, and profit.

Bottomry. Lending money upon the security of vessels or their cargo.

Bourse. The stock exchange of Paris; by extension, any exchange in continental Europe.

Break in the Market. A sharp and rapid decline in the prices of stocks or bonds, generally coming at the end of a period of violent speculation and rising prices.

Broker. One who, for a commission or other fee, buys or sells personal or real property for others.

Brokerage. Fee charged by a broker for his services.

Bucket Shop. An establishment operated by irresponsible brokers, generally not members of any recognized exchange, who, when they receive orders from their clients to buy or sell, do not in fact make the purchase or sale, but merely make entries upon their own books. Instead of being actually executed, orders received are simply "bucketed," figuratively, thrown into a bucket. Thus the bucket-shop broker stakes his judgment against the judgment of his own client. For example, in the event that a client has sent in an order to purchase, and the particular stock thereafter falls in price, the broker can purchase the stock at the lower price, when a sale is actually demanded by the client. In such a case, he may pocket, not merely a commission upon the purchase and sale, but also a profit equivalent to the difference between the amount for which the client bought and the amount at which the client directed the broker to sell.

Where the orders to buy and the orders to sell any particular stock are substantially even over a period of time, the bucket shop may with a fair degree of safety make two sets of commissions without in fact executing any of the orders. But, where buying and selling orders do not remain even, the bucket shop in an adverse market may lose heavily and be unable to meet its commitments to its clients. The rules of stock exchanges uniformly forbid "bucketing" orders, and, under the laws of most states, this practice has been made unlawful.

It has been said that the term "bucket shop" originated from the practice, at one time common in the Chicago grain exchange, of calling in outside brokers, who had no regular connection with the exchange, when business became dull. These outside brokers were carried to the floor of the exchange, huddled together in an elevator, and each group so invited came to be called a "bucket full of brokers." The "bucket shop" was, therefore, synonymous with a brokerage house maintained by a broker of no recognized standing.

Bull. A speculator in the stock market who gambles upon the expectation of a rise in prices; one who manipulates the market in such a manner as to bring about a rise in prices.

Bullion. Uncoined gold or silver, generally in the form of bars or ingots, ready to be turned into coins. Bullion is frequently used in payment of obligations due from persons of one country to those in another. See *Dollar Exchange*.

Bull Market. A bull market is one of activity and rising prices. The term is particularly applied to such a condition in the stock market.

Buyer's Option. A special term applied to a contract permitted by the rules of the New York stock exchange, whereby the buyer of stock is not compelled to accept and pay for the securities purchased until the expiration of a specified time. The buyer has the privilege, however, of demanding delivery of the stock upon one day's notice. The rules of the New York stock exchange provide that such a contract must be for a term of not less than four days and not more than sixty days. A buyer's option, the term of which is four days, is called "buyer's four"; if the term is ten days, it is called "buyer's ten"; and so forth.

Buying Outright. A purchase of stock or other security by a payment of the full purchase price at once or within a definite period after the purchase. This is distinguished from buying "on margin," where only a portion or percentage of the purchase price is paid by the purchaser, the remainder of the price being loaned to the purchaser by the broker. See *Margin*.

Callable Bonds. Bonds issued with a right reserved by the issuing corporation to redeem or "call" the issue, in whole or in part, after a specified date, at a designated price. The "call" price is generally five to ten points above par. A redemption provision is now commonly inserted also in issues of preferred stock.

Call Loan. The lending of money repayable on demand. Loans of this character are very common in New York City, where brokers and speculators upon the various exchanges borrow large sums of money from the banks upon securities as collateral. In this type of loan, both the borrower and the lender have the right to terminate the loan at any time. The advantage to the bank of such a loan is that it enables the bank to make some profitable use of its available funds during any period of temporary abundance; while leaving the bank free to terminate the loan at any time, should any extraordinary demand for cash arise. Its advantage to the borrower is that, as soon as the temporary need of cash or credit has passed, the loan may be repaid and the incurring of interest may at once be terminated.

Calls. Transactions upon stock and commodity exchanges in which one person is given an option to require another to deliver a specified amount of stock or of a commodity at a particular price at any time within a specified period. A "call" is frequently referred to as a "buyer's option."

The term "call" is used also with reference to a notice issued to stockholders or subscribers to the stock of a corporation, requiring payment to the corporation of sums upon stock purchased or held by them. In this sense a "call" may be issued either before or after the stock has been paid in full. If issued prior to full payment, it is nothing more than a notice that an installment is due upon the purchase price of the stock. Where a call is issued after the stock has once been fully paid for, it amounts to an assessment of stockholders to enable the corporation to carry on its business.

Most stock is now issued as nonassessable after it has once been paid for in full. In that event, a "call" of the latter character cannot be made. If it is in need of further capital, a corporation must then issue additional securities to be taken up either by the existing stockholders or by the general public. See *Buyer's Option*, *Callable Bonds*, *Put*.

Capitalism. The economic system of private enterprise in industry and trade in which capital and capitalists play the chief rôle, subject to regulation by the state. Capitalism emphasizes freedom of individual initiative in business. Its greatest development has been since the Industrial Revolution in the 19th century, but it has been known to most civilizations.

Carrier. Any person or company that purports to engage in the business of transporting passengers or freight for hire. The more appropriate term is "common carrier," the term "carrier" being used as a colloquial abbreviation of the longer term. Included within the general class of common carriers are railroads, steamships, ferries, street railways, airplanes, trucks, and other vehicles which make a business of carrying persons or property from one place to another. An elevator has been held not to be a common carrier.

From the early days of feudal England down to the present time, common carriers have been subjected to special rules of law, at least with respect to the transportation of property.

From early times, too, the law limited the charge which a common carrier may make, for transporting persons or property, to such sum as was deemed a reasonable compensation for the service rendered. In modern times, common carriers have come to be strictly regulated by statutes administered by governmental commissions; and the more important carriers, such as the huge railroad systems and steamship lines, as well as street railway systems, are looked upon as quasi public corporations. The Interstate Commerce act, originally enacted by Congress in 1887, and amended from time to time since then, created a commission with power to regulate the service rendered and the rates charged by any carrier engaged in interstate traffic. The commission may also prescribe rules to insure safety of operation. In most states, there are similar regulatory statutes.

Carrying Charges. Interest on moneys advanced by banks or brokers, insurance, storage charges, and similar costs incurred by one who has purchased goods or securities on credit or on margin.

The term is sometimes used also as the equivalent of "fixed charges," that is, costs incurred regardless of the volume of operations or the amount of business done.

Cashier's Check. A check issued by a bank, usually signed by the cashier (whence the name is derived), and drawn against the bank itself or against a metropolitan bank with which the drawing bank keeps an account. New York funds are generally provided in the form of cashier's checks. The cashier's check differs radically from an uncertified check drawn by a depositor of the bank. The cashier's check gives the holder an obligation against the bank itself, while the ordinary check gives the holder no claim against the bank, but only a claim against the depositor in the event that the check is not honored.

Center Spread. A preferred position for advertisements, since the two facing pages offer a continuous surface and the double-page text and illustrations can be printed on a large sheet with no interference from center margins or "gutters."

Certificate of Deposit. A certificate or receipt, in which a bank acknowledges that it has received a certain sum of money from the person to whom the certificate is issued, and agrees to pay the sum to the person named in the certificate, or to his endorsee, upon demand or at a definite future date. Such a certificate is usually negotiable and bears interest. The amount represented by a certificate of deposit is generally not subject to withdrawal by check. In the case of a time certificate of deposit, that is, one payable at a definite future date, the holder of the certificate is not regarded as a depositor of the bank. A bank book issued by a savings bank is, for some purposes, equivalent to a certificate of deposit.

Certified Check. A check having the word "certified" stamped or written upon it, and bearing the signature of an official of the bank upon which the check is drawn. The effect of the certification is merely to furnish a guarantee from the bank that the amount to the credit of the drawer of the check is adequate to meet the check, and that the amount of the check will be set aside for the purpose of paying the check when presented for payment. It is not true, as is sometimes thought, that a certified check constitutes a direct obligation of the bank to pay the amount of the check. Thus, if the check is a forgery, the bank may subsequently refuse to pay the check, even though it be certified, without liability to any holder or endorsee. Or, if the check has been fraudulently raised before certification, a subsequent holder of the check can recover only the amount for which the check was originally drawn.

Chattel Mortgage. A lien given upon personal property, generally as security for a loan or other obligation. Nominally, a chattel mortgage takes the form of a transfer of title of the personal property to the person to whom the mortgage is given (called the mortgagee). In almost all states, however, a chattel mortgage is now regarded, not as a transfer of the title to the property, but as merely giving a lien upon the property.

Generally, a chattel mortgage, to be valid against creditors of the mortgagor or against subsequent transferees of the property, must be recorded in the city or town where the mortgagor resides. Chattel mortgages usually provide for a sale of the property in the event of nonpayment of the debts they are given to secure. The method of sale, however, is usually expressly prescribed by statute.

Check. A check is a written order directed to a bank, requesting the bank to pay a specified sum of money to the order of the person named in the check or to the bearer of the check. A check does not operate as an assignment of any part of the deposit maintained by the drawer in the bank on which the check is drawn. The check, therefore, gives no direct right to the payee or holder of the check against the bank.

A check payable to "cash" is equivalent to a check payable to bearer, and may be negotiated from one person to another without endorsement. It is the practice of banks, however, to require one who presents a check payable to bearer or payable to cash to endorse the check. Such an endorsement, however, merely operates as a receipt to the bank.

Checks should be presented promptly for collection or payment. Where a check is not presented promptly for payment and the bank upon which it is drawn becomes insolvent during the interval, the holder may in some cases be compelled to shoulder the loss. Moreover, death or bankruptcy of the drawer of the check renders the instrument void, and relegates the holder to the status of a mere general claimant against the drawer's estate.

C. I. F. An expression used in quoting prices, particularly in the export trade, to indicate that the price includes the cost of the goods plus insurance and freight.

Clearing House. The place at which the banks of a particular city or vicinity meet daily for the purpose of presenting checks drawn upon each other. A definite debit or credit balance against or in favor of each of the member banks is made on the basis of these balances.

The method by which the clearing house operates is as follows: Each bank sends a messenger to the clearing house with the checks which it has received that are drawn against the other members of the clearing house. Each bank assorts the checks it receives, placing all of the checks drawn against one bank in an individual folder, to which is attached an itemized statement of all of the checks contained and their total amount. Each bank has a designated desk at the clearing house, and, at an appointed time, a gong is sounded and the messenger of each bank distributes to the desks of the other banks the checks drawn upon the latter, retaining a duplicate memorandum of each amount. When the distribution is complete, each bank is in possession of all the checks which have been drawn upon it and deposited in other banks. The amount of such checks is then totaled, and, in the event that this total exceeds the amount of the checks presented by it against the other banks, a debit balance is entered against the bank. In the event that the amount of checks presented by any bank against the other banks exceeds the amount of checks presented by the other banks against it, a credit balance is entered for the particular bank.

If there is a debit balance, the amount thereof is paid by the particular bank to the clearing house; if there is a credit balance, the amount of the credit is received by the bank having the credit balance from the clearing house. Under the Federal Reserve system, member banks may use the reserve banks as clearing houses.

In the larger cities, clearing house organizations have functions wider than those of the ordinary clearing house.

Clearing House Balance. Applied both to an amount due from a clearing house to a creditor bank and to an amount due from a debtor bank to the clearing house. In the former case the balance is called a favorable balance, and in the latter it is called an adverse balance, at the clearing house.

Co-insurance Clauses. Under a co-insurance clause, the insured party agrees to maintain other insurance in an amount equal to a specified percentage of the property's total value. If the insured should carry less than this designated percentage, the payment for any loss he incurs would be reduced in proportion to the percentage by which he has fallen below the co-insurance requirement stipulated by the insuring company.

Collateral Loan. A loan secured by a pledge of securities or other personal property.

Collateral Note. A form of note commonly used by banks and other financial institutions making secured loans. This type of note not merely recites the promise of the borrower to pay but also sets forth the terms upon which the security is deposited with the lender. The terms of the collateral note are designed to relieve the bank or other lender from the obligations imposed by law upon pledgees who undertake to sell the pledged property.

Collision Deductible Insurance. If an insuring company should assume entire coverage for loss resulting from automobile collisions, the premium it would have to charge would be very high, and to many owners would seem almost prohibitive. However, if the insured agrees to assume liability for a certain amount of the damage, for example, the first $100, the premium can be greatly reduced. In that case, a great many small claims would not need to be brought to the attention of the insuring company. Its only liability would be for damage in excess of the deductible amount.

Commercial Agencies. Organizations which make a business of compiling and furnishing to their subscribers information with respect to the assets and liabilities, promptness of payment of obligations, and general solvency and credit of individuals, firms, and corporations engaged in business. This information is given out in the form of general ratings, furnished to all subscribers, and in special reports with respect to any particular concern, furnished upon the special request of a subscriber.

Dun and Bradstreet, Inc. is the leading commercial agency in the United States. The credit ratings and reports given by this agency constitute an important basis for extending or withholding of credit to prospective borrowers or to purchasers on credit.

Commercial Paper. Notes of business concerns of national reputation, which are purchased by so-called note brokers and then distributed by them among various banks and investors throughout the country. The broker usually makes a profit or commission of one-quarter of one per cent upon the principal of these notes. By using this type of commercial paper, these large borrowers are able to borrow at a lower rate than they would be compelled to pay for current loans obtained from local banks.

This type of security, by reason of its general marketability, has come to be highly regarded throughout the banking community as an excellent mode of investment for superfluous funds and as a secondary reserve. The notes,

commonly in amounts of $2500 and $5000, usually run for a period of six months, and can be made to bear such a maturity as will fit in with the needs of the banks purchasing the securities. While these notes are not guaranteed by the houses which buy and sell them, the larger note brokerage houses have made a practice of virtually protecting their purchasers against loss, both by thorough examination of the businesses of those whose notes are purchased and by taking control of such businesses, if necessary, in order to save purchasers from loss.

Commission House. A firm which buys and sells commodities or securities, as a broker or agent for others, receiving a commission on the purchases or sales, or upon both, in compensation for the service rendered.

Common Stock. That class of stock which is entitled to receive dividends or otherwise share in the earnings of a company only after all preferential rights to payments out of the earnings of the company have been satisfied. The term common stock is also used with reference to all of the stock issued by a corporation where only one class of stock has been created. Usually the control of the company is vested in the holders of the common stock. This, however, is not necessarily so, and sometimes the holders of preferred stock are given an equal or greater share in the control of the corporate affairs.

While the common stock usually receives no dividends until the preferential dividends to which any class or classes of preferred stock may be entitled have been paid, the common stock is normally entitled to receive all of the surplus after the preferential payments to the preferred stockholders have been made. The relative rights of holders of any particular issue of preferred or common stock depend, however, upon the special provisions of the certificate of incorporation of the company which issues the stock, and, to determine what these rights are, resort must always be had to the certificate.

Usually, the holder of preferred stock is assured the more continuous and steady return upon his investment. On the other hand, the common stock carries with it the possibility of great profits, in the event that the enterprise proves especially profitable. See *Preferred Stock.*

Consignee. A person named in a bill of lading as the one to whom goods are to be delivered by a railway or other carrier.

Consignment. Goods are said to be shipped upon "consignment" when they are forwarded by a seller, called the principal in the transaction, to a broker or sales representative, pursuant to an arrangement whereby the broker is to sell the goods and remit to his principal the proceeds less his commission, the broker undertaking no responsibility for the purchase price of the goods until they are actually sold. However, when a sale has in fact been made, if the goods were shipped upon consignment, the broker becomes personally responsible for the sale price, less the commission to which he is entitled. In this respect, such a broker is similar to a "*del credere factor*" who insures the financial responsibility of his purchasers.

Consignor. One who delivers goods to a railway or other carrier for transportation to a designated point.

Consols. The name applied to the 3 per cent "consolidated annuities," sometimes referred to as "consolidated threes," issued by the government of Great Britain, entitling the holder to a certain sum from the government annually. These annuities are obligations of the British government, but differ from bonds in that they have no definite date of maturity. The government, however, reserves the right to pay the principal represented by the securities at any time. They are, therefore, in a real sense, mere annuities—a promise by the government to pay to the owner of the consol a certain amount annually.

The full name, "3 per cent consolidated annuities," had its origin in the fact that this form of obligation was issued to replace the entire or consolidated debt of Great Britain, and a purchaser received 3 per cent annually upon the amount paid to the government for the consol.

Controlling Interest. A phrase used to indicate a person, or a body of persons united in mutual interest, who have secured the right, by purchase or by proxy, to vote a majority of the shares of capital stock in a corporation at any stockholders' meeting.

Convertible Bonds. Bonds which are issued subject to a provision for their surrender and cancellation at some future time and the issuance of stock in their place. The provision for conversion may make the conversion optional in the bondholder or in the company, or may be made absolute upon the fulfillment of some condition, depending in each case upon the particular provision contained in the bond.

Corner. The acquisition by an individual, or by a group of speculators, of the larger part or of all of the available supply of a particular stock, or of a commodity such as cotton, wheat, copper, or sugar. When a corner has been successfully effected, one who has sold the stock or commodity short, or who must have the commodity to carry on his business, is compelled to pay any price demanded.

The most notable corners in American financial history were the successful corner of Harlem Railroad stock by Commodore Vanderbilt in 1863 and the attempted corner of gold by Jay Gould in 1869.

Corporation. A corporation is a legal creation whose rights and liabilities as a single person are stated in its charter. The most common form is the joint stock corporation, which is organized for the profit of its members, known as stockholders. Stockholders are not liable for the corporation's debts. Consequently, capital may be invested in a corporation without jeopardizing the estate of the investor. Stockholders have no claim on the corporation's assets. Hence the corporation may carry on indefinitely, irrespective of the death or withdrawal of any of the investors. Through these two advantages, the corporate form of organization has made possible the concentrations of capital on which modern industrial society rests.

A corporation is formed by applying to the state or Federal government for a certificate of incorporation. When granted, this document entitles the corporation to carry on the type of business described therein. The business is managed by officers chosen by a board of directors, who have previously been elected by the stockholders. A typical set-up would be a board of directors consisting of three or more people and executive officers known as president, vice president, secretary, and treasurer.

The owners of a corporation are the stockholders. Their degree of ownership depends on the number of shares of stock they hold and on the special rights which these shares may confer. Profits are distributed to the shareholders at the discretion of the directors. See *Common Stock, Preferred Stock.*

Cost, Insurance, Freight. See *C. I. F.*

Country Banks. A term sometimes used to designate Federal Reserve member banks in small communities. They are required to hold lower legal reserves than are city member banks.

Coupon. A certificate attached to a bond, representing the interest for a given period, to be detached and forwarded to the corporation or government which has issued the bond when such interest becomes due. The coupon generally bears the name of the debtor or obligor upon the bond, the number of the bond, the rate of interest, and the amount due or payable upon the coupon.

Coupon Bonds. Bonds issued with coupons attached, representing the interest falling due from time to time. The interest upon coupon bonds is obtained by detaching or clipping the coupons as they fall due and forwarding them to the debtor corporation for payment.

Cover. Where a person has sold for future delivery stocks or commodities which he does not actually own at the time he makes the sale, he is said to "cover" when he buys in such stocks or commodities.

Curb. The name given originally to the group of brokers who formerly made a practice of meeting daily in Broad street, New York, one block from the New York stock exchange. There they bought and sold securities of both the better and the cheaper grades. This practice of congregating at a point near the financial center of New York City, for the purpose of engaging in stock transactions, began as early as 1869, and continued until 1920, when an ordinance was passed by the city of New York prohibiting the carrying on of brokerage transactions upon the public streets. As a result of the enforcement of this ordinance, the so-called curb brokers organized and erected their own exchange, which is called the American Stock Exchange. Here is now carried on the business which formerly was transacted upon the street and sidewalks of Broad Street.

Currency Denominations. Identification of denominations of U.S. currency is made in terms of the portraits they carry as well as the amount printed on their face. Historical celebrities associated with the different denominations are as follows: $1, Washington; $2, Jefferson; $5, Lincoln; $10, Hamilton; $20, Jackson; $50, Grant; $100, Franklin; $500, McKinley; $1,000, Cleveland; $5,000, Madison; $10,000, Chase; $100,000, Wilson.

Current Assets. Assets which are readily convertible into cash and which change in amount from day to day. Cash on hand, bank deposits, merchandise, and accounts and bills receivable are all regarded as current assets.

Current Liabilities. Obligations which fall due from day to day or which will mature in the near future. Included within this designation are accounts payable, notes payable, wages unpaid, interest due or accrued, and similar obligations which are immediately payable or of short term duration.

Cutting a Melon. An extraordinary distribution by a corporation of accumulated profits or surplus in the form of

either cash dividends or stock dividends. In the case of a holding corporation, the "cutting" may take the form of a distribution of securities of the subsidiary companies controlled by the holding corporation.

Dating. An agreement between a buyer and a seller of goods, providing that the date of purchase shall be deemed to be of a later date than the actual date of purchase. The purpose of "dating" is to extend the period or term of credit beyond that normally allowed.

Days of Grace. The laws of many states formerly allowed the obligor or debtor, upon a note or other commercial instrument, three extra days after the date of maturity within which he could pay the amount of the instrument without subjecting the instrument to protest or dishonor. Days of grace have now been abolished in nearly all states. In some parts of Europe, however, days of grace are still granted.

Debenture Bonds. In the United States, an evidence of indebtedness issued by a corporation and not secured by a mortgage or other lien upon property of the corporation. Such a bond is similar to an ordinary promissory note, except that it normally runs for a longer period.

Deed. An instrument signed and sealed, purporting to convey an interest in real property from one person to another

A *quitclaim deed* is one in which the grantor purports merely to convey such right, title, or interest as he may have in the property described in the deed. Such a conveyance does not carry with it any representation of ownership vested in the grantor, and, in the event that it is later discovered that the title to the property is encumbered or was vested in some other person than the grantor, no recourse can be had against the grantor.

A *warranty deed* is one in which the grantor covenants that he is the owner of the property and that there are no encumbrances upon the property (except such as are expressly excluded from the covenants), and that the grantee will enjoy quiet and peaceful possession of the property. A grantor who executes a warranty deed may be called upon to defend the title to the property, should the grantee's title or possession be attacked. He may also be compelled to respond in damages, should the title prove to be defective.

Deferred Dividend. When dividends are not regularly paid upon preferred stock, carrying cumulative dividends, such unpaid dividends are regarded as "deferred," and ordinarily must be paid before any dividends can be paid upon the common stock.

Demurrage. A charge imposed upon a shipper for detaining a railroad car, or other vehicle of transportation, for a longer time than that allowed by the agreement with the carrier for loading or unloading the cargo.

Deposit. Funds deposited with a bank, entailing an obligation upon the bank to repay an amount equal to the sum deposited. The ordinary deposit with a commercial bank involves an undertaking by the bank to honor withdrawals, in the form of checks drawn upon the account, until the amount of the deposit is exhausted. A deposit of this character is a "demand deposit," being payable at any time upon presentation of a check or order drawn upon the bank.

Deposits in savings banks are usually withdrawable in whole or in part only upon presentation of the bank book. Such deposits are also usually "time deposits," and nominally are payable only after the lapse of a definite period—frequently 30 days—after notice of the intended withdrawal has been given to the bank. Many commercial banks and trust companies now accept deposits in so-called "special accounts," which are in fact similar to the type of deposit formerly typical of the savings bank. These accounts draw interest quarterly or semiannually, and sometimes are made subject to withdrawal only at definite future dates or upon the lapse of a prescribed period after notice of intended withdrawal, as is the case of savings bank deposits.

Depreciation. Diminution in the value of any property, real or personal, whether due to ordinary wear and tear or to any other cause resulting in the lessened value of the property, during any period of time.

Direct Mail Selling. This term usually applies to letters, booklets, brochures, or a combination thereof, addressed to individual prospects and designed to secure an order without the necessity of visits by a salesman. Successful selling by direct mail depends upon several factors, including an article, product or service that is not too expensive, yet costing enough to absorb its share of the selling campaign; a list of prospects carefully selected and with verified up-to-date mailing addresses; and a sales presentation that is interesting in content and attractive in form, besides being complete enough to answer a prospect's questions. The usual sequence of 1) getting attention, 2) arousing interest, and 3) creating desire is essentially the same in direct mail campaigns as in personal selling.

Discount. This term has several meanings. It is applied to a loan made by a bank to a customer upon his note, where the interest which is to accrue upon the loan during the term of the note is deducted in advance. Thus, if a customer wishes to borrow $1000 for six months at 6 per cent, the bank "discounts" his note and credits him with the sum of $970. The $30, which is deducted from the principal of the loan, is termed discount or unearned interest, and the entire transaction is called a "discount."

The term discount is applied also to the purchase by a bank, from the payee or holder, of a note having a definite maturity. In such a purchase, as in a direct loan upon the paper of the borrower himself, the interest to become due upon the note during the term it has to run is deducted in advance, and the net proceeds only are credited to the seller of the note.

Discounts are sometimes distinguished from "loans," the latter term being applied to demand obligations, having no definite date of maturity, the interest upon which cannot be computed and deducted in advance of the termination of the loan.

Another use of the term discount is with reference to the amount or percentage by which the market price of a particular kind of domestic or foreign currency, or of a bond or other obligation, falls below its nominal or par value. Thus, when bonds of the United States government, having a face value of $100, sell for $98, they are said to sell at a discount of $2 or of 2 per cent.

Dishonor. The refusal of one upon whom a draft or bill of exchange is drawn to pay or to accept the bill in accordance with the terms of the instrument.

Dividend. A proportionate distribution of past and/or present earnings by a corporation among its stockholders. Where the stock of the company has a nominal or par value, the dividend will be payable in terms of a certain per cent of this nominal or par value. Where, however, the stock has no nominal or par value, the dividend merely represents a distribution of cash among the stockholders, out of the earnings or surplus profits of the company, in proportion to their respective holdings in the company. The laws of practically all the states prohibit the payment of dividends to stockholders except out of earnings or surplus profits, in order that the capital of the corporation may be kept intact for the benefit of creditors. Any violation of this prohibition usually renders the directors participating in the declaration or payment of the dividend guilty of a crime.

A stock dividend is entirely different from a cash dividend, and represents merely a distribution of additional evidences of ownership in the corporation, no property of the company being turned over to the stockholders.

Dollar Exchange. Bills of exchange, drawn in foreign countries upon banks or business concerns of the United States, and payable in United States currency.

Domestic Exchange. Drafts or bills of exchange, drawn upon banks or commercial houses located in New York or other important commercial centers, used in making remittances from one part of the country to another. Bank drafts upon New York City formerly constituted the greater part of domestic exchange. In recent years, however, bank drafts upon Federal Reserve banks have in large measure replaced drafts upon New York.

Double Taxation. Frequently the same person or the same property is taxed by more than one governmental authority. The most common instance of double taxation of this sort is taxation by both the Federal and the state government. But sometimes the same person or interest in property may also be taxed by more than one state. Thus, where a person residing in the state of New York owns property which is physically present in the state of Ohio, a tax may be imposed by both states, one by reason of jurisdiction over the person owning the property, and the other by reason of jurisdiction over the property or "*res*" itself.

Likewise, where two different states or countries impose income taxes, a tax may be imposed by one state or country, by reason of the income being derived within the limits of its territorial sovereignty; and an income tax may be imposed upon the same income by another state or country, by reason of its jurisdiction over the person earning the income. Frequently, too, succession or inheritance taxes seem to operate to impose double or multiple taxation, where the decedent was a resident of one state and had property subject to the jurisdiction of other states. Double or multiple taxation of this sort may sometimes appear to operate unjustly, but the courts have uniformly held that such taxation is entirely lawful and constitutional.

Draft. A written order drawn by one party (drawer) directing a second party (drawee) to pay a definite sum of money to a third party (payee). The drawer and the

payee may be the same person. Also, the drawee and the payee may be the same person. Thus three parties, but not necessarily three persons, are involved. A draft may be drawn payable at sight or on demand, that is, upon presentation; or it may direct payment at a definite or determinable future time. A draft is a bill of exchange. In the United States, however, the term draft has come to be applied to ordinary domestic or inland bills of exchange, as distinguished from bills of exchange used in foreign commerce.

Duebill. A written nonnegotiable acknowledgment of a credit to the account of the person to whom the bill is addressed. This type of instrument is usually given by merchants to persons who have purchased goods and have subsequently returned them.

Earnest Money. A sum paid at the time of making an offer or of entering into an agreement of purchase, as evidence of the good faith of the person making the offer or entering into the agreement. In contracts for the sale of personal property, the law has laid stress upon, and has given important legal effect to, the giving of earnest money at the time a transaction is entered into. Thus, under the Statute of Frauds—originally enacted in England in 1666—an oral agreement for the sale of personal property was not valid if the consideration involved was in excess of the sum of ten pounds, unless, at the time the agreement was entered into, a part payment of the purchase price was made. This part payment was regarded as the earnest money which made the transaction enforceable. This provision of the Statute of Frauds has been adopted in one form or another in most of the states in this country. In the case of real property, however, the giving or withholding of earnest money has no effect upon the legality or legal enforcement of a contract of sale, although earnest money frequently accompanies an agreement to purchase real property.

E. & O. E. Abbreviation for "errors and omissions excepted." This term appearing upon any financial statement negates any representation of the one furnishing the statement that it is absolutely accurate. Its use absolves the one furnishing the account from personal liability for errors in the statement, other than those due to fraud or willful misrepresentation.

Employee Benefit Plans. In the policy and practice of an increasingly large number of companies, there is a tendency to supplement the direct payment of wages or salaries to employees by "fringe benefits" of various kinds. Examples are group insurance, pension plans, and profit-sharing, either current or deferred. Such items are incorporated in "package agreements" between the firm and its employees. Among the advantages cited for benefit plans is that they improve the morale of the working force, give employees a feeling of security, reduce turnover of personnel, and increase efficiency by creating a climate of good will in labor-management relations.

Endorse. To write one's name upon the back of a note, check, or other instrument, for the purpose of transferring the instrument to another, or for the purpose of lending one's credit as a guarantor of the payment of the obligation. An endorsement by one whose name already appears upon the instrument as a payee or endorsee should be made without variation from the form in which it first appears upon the instrument. An endorsement, however, is legally sufficient if, in fact, the person who endorses the instrument is the same person as the one to whom the instrument was payable as payee or endorsee.

Endorsee. One to whom a note or other negotiable instrument has been transferred by endorsement by the holder of the instrument.

Endorsement, Anomalous. Where one who is not a party upon the face of a note or other instrument writes his name upon the back of the instrument, as a guarantor of its payment at maturity, such endorsement is termed anomalous.

Endorsement, Restrictive. An endorsement which indicates that the holder or endorsee of the instrument is not the owner of the instrument, but has merely been intrusted with it for certain definite purposes specified in the restrictive endorsement. Thus, a note or check may be restrictively endorsed, "Pay to the First National Bank for collection only," or "Pay to John Jones as agent," signed by the holder of the instrument.

Endorsement, Special. Where a payee or endorsee of a note or other instrument, upon transferring it, designates upon the back of the instrument the particular person to whom or to whose order the instrument shall be paid, such endorsement is termed a special endorsement. When an instrument has been thus endorsed, it may be further negotiated or transferred only by an endorsement of the person named in the special endorsement.

Endorsement without Recourse. See *Endorser.*

Endorser. One who has signed his name upon the back of a note, check, or other commercial instrument, to lend his credit to the maker or to the holder of the instrument, in which case he may be an anomalous endorser; or one who, being the holder of the instrument, endorses the instrument in order to negotiate it or sell it to another. Unless an endorser has signed his name "without recourse," he may be held liable for the payment of the instrument, in the event that the maker fails to pay it at maturity. The endorser may, however, be released from liability if the instrument is not duly presented to the maker and protested, and notice of the protest given to the endorser within 24 hours.

Escrow. An instrument deposited with a third party, to be delivered to the grantee named in the instrument upon the performance of some condition or upon the happening of a certain event.

Excess Profits Tax. A federal levy imposed several times throughout the twentieth century during war periods. The tax base is that portion of profit that is above normal for the industry, each firm being given a choice of alternative methods of defining abnormal profit.

Exchange. Claims upon foreign merchants or banking institutions, usually in the form of bills of exchange or drafts accepted or drawn upon them, arising out of the export of goods to foreign countries or out of other international transactions. These instruments are bought by persons who are obliged to make remittances to such countries. The result of this buying and selling of "exchange" is that claims by individuals in one country against individuals or banks in another country are offset by claims which individuals in the latter country have against individuals and banks in the former country. In this way, the actual shipment of gold from one country to another is to a very considerable extent, avoided.

Excise. Any tax imposed by a government upon commodities manufactured, sold, or used, or upon activities carried on, within its territorial jurisdiction. The tax upon cigars and cigarettes, and the tax upon liquors, formerly constituted the most important excise taxes in the United States. In recent years the scope of excise taxes in the United States has been very much widened.

Ex Dividend. Literally, without dividend. When stock is sold during a period when the stock books of the particular company are closed in anticipation of the payment of a dividend, no transfers of ownership being recorded by the company during this period, the stock is said to sell on the market "ex dividend." This is because the purchaser of the stock during such a period will not be entitled to receive the dividend about to be paid by the company.

External Loan. A loan which a country obtains by selling its bonds or other obligations to investors in other countries; it is to be distinguished from an internal loan, which is obtained by the sale of securities to the country's own citizens. Frequently, in the case of an external loan, securities are made payable in the currency of the country in which they are intended to be sold.

Face Value. The value noted upon the face of a check, note, bond, certificate of stock, bank note, or unit of currency. The term "face value" is used in contradistinction to the actual value of the instrument, which may be either greater or less than its face value. See *Par.*

Factor. One who sells goods for another upon commission. See *Agent, Consignment.*

Farm Loan Bank. Banks organized pursuant to the Federal Farm Loan act of July 17, 1916. This act provided for the creation of a Federal land bank in each of twelve designated farm loan districts. Most of the original capital was provided by the Federal government, but now all the capital of the banks is owned by national farm loan associations. The act provides for the lending of funds to farmers, but only upon the security of first mortgages on farm land; and the loans are to be made, not directly to the farmer, but through advances to local farm loan associations. In order to obtain a loan under the provisions of this act, an intended borrower has to become a member of one of these associations and subscribe to stock in the association to an amount equal to at least 5 per cent of the amount to be borrowed. The land banks charge interest at the rates of 4 per cent to 6 per cent. The act provides also that the mortgages shall run for not less than 5 nor more than 40 years.

F. A. S. Free alongside ship. This term is used to indicate the extent of the obligation of the seller with respect to delivery of goods sold. Where the goods are sold "F. A. S.," the seller's obligation is fulfilled when the goods are delivered to a wharf from which the goods can be loaded

into a vessel for transportation to the port of destination. Where it is necessary to carry the goods from the wharf to the vessel by means of small tugs or lighters, the seller would be obligated to bear the expense of this part of the transportation in addition to carrying the goods to the wharf.

Federal Reserve Bank Notes. Currency formerly issued by Federal Reserve banks in denominations of one, two, five, and ten dollars, secured by deposit, with the Secretary of the Treasury, of certain issues of United States bonds to an amount equal to the bank notes issued. In 1945 the Federal Reserve banks lost the right to issue these notes.

Federal Reserve Notes. Currency issued by Federal Reserve banks, secured by a gold certificate reserve of at least 25 per cent of the amount of the notes issued, and by commercial or other eligible paper to the extent of the remaining 75 per cent. In emergencies the legal reserve requirements of the reserve banks may be suspended by the Board of Governors of the Federal Reserve System. The Federal Reserve note has introduced an elastic element into the currency of the United States. Its volume can be increased or decreased in accordance with seasonal and extraordinary demands.

Federal Reserve Ratio. The ratio which gold certificates held by Federal Reserve banks as backing for their notes bear to total deposits and notes outstanding. Twenty-five per cent is the legal minimum.

Fee Simple. The absolute, unconditional ownership of real property. The fee simple is the highest estate known to the law. The ownership of the fee simple in any particular parcel of property is not inconsistent with the existence of restrictions or encumbrances upon the property.

Fiduciary. One who occupies a position of trust, or who receives and dispenses funds for another. Executors, administrators, trustees under wills and deeds of trust, directors of corporations, agents, committees of the estates of lunatics, and guardians of infants are all within the general class designated as fiduciaries.

Firm. Descriptive term applied to prices of securities or commodities when there appears to be no tendency toward a fall in prices, and when the supply at the price quoted does not appear to be in excess of the demand. When prices are "firm," a rise in prices may normally be expected.

First Mortgage Bond. A bond secured by a first or prior lien upon a part or all of the assets of the company issuing the bond. The extent of this lien depends upon the particular terms of the mortgage in each case. Some so-called "first mortgage bonds" cover only a very limited part of the tangible assets of the issuing company. Others purport to cover not merely specific physical property described in the mortgage, but also property both tangible and intangible which may subsequently be acquired. In the event of a default in the payment of interest or principal upon first mortgage bonds, a foreclosure of the mortgage securing the bonds would bar all secondary or subsequent liens or mortgages upon the property.

Fiscal Year. Any twelve consecutive months used as a period of financial accounting by an individual or a corporation. The fiscal year of any business concern may or may not coincide with the calendar year.

Fixed Charges. The fixed expenses of a business, which can be determined in advance, and which do not vary in proportion to the amount of business carried on. Fixed charges include interest upon bonds or other fixed or long-time indebtedness, taxes upon property, rent, insurance, and depreciation.

F. O. B. Free on board. This term is used in price quotations to indicate the extent of the undertaking of the seller with respect to defraying the cost of transportation, at the price quoted. Thus, if flour is quoted at ten dollars a barrel, f. o. b. cars Buffalo, the seller undertakes merely to deliver the flour to the railroad company at Buffalo, and the cost of transportation from that point on must be borne by the purchaser.

Foreclosure. A remedy provided by the law for realizing upon the security given for a loan or other obligation, in the event of a failure of the obligor or debtor to comply with the terms of his agreement. The usual mortgage upon real property, for example, provides that in the event of a failure to pay any installment of principal when due, or to make any payment of interest within thirty days after the payment is due, the mortgagee may sell the property at a foreclosure sale and receive payment out of the proceeds of the sale. If, upon a mortgage foreclosure, the amount received from a purchaser is more than sufficient to satisfy the claim of the mortgagee and the expenses of sale, the surplus is turned over to subsequent lienors or, if there are none, to the mortgagor.

The term foreclosure applies, not merely to the sale of real property to realize upon sums advanced upon real property as security, but also to sales of personal property under like circumstances. A foreclosure sale may take place also to satisfy a judgment obtained against the owner of the property or to obtain payment of taxes which have been imposed upon the property.

Fractional Currency. Coins of less than one dollar.

Fully Paid. Stock is "full paid" or "fully paid" when it has been completely paid for by the stockholder and no further payment or assessment can legally be demanded from or imposed upon the stockholder by reason of his ownership of the stock. In order that stock be fully paid, it must have been issued in exchange for cash, property, or services having some reasonable relation in value to the par value or amount of the stock issued.

The practice of issuing so-called fully paid stock, bearing a par value of a particular amount, for worthless patents, fictitious good will, and highly overvalued services of promoters, together with the associated practice of issuing shares of stock as bonuses to subscribers or purchasers of stock, has rendered this term in practice almost meaningless. The misleading character of issues of this sort has led to the introduction of non-par-value stock. This becomes fully paid when any sum, however small, is paid to the corporation for the stock, if the agreement between the stockholder and the corporation does not require any further or other payment.

Funding. The floating of a new issue of securities to pay off obligations which have matured or are about to mature. The term is used also with reference to the replacing of a number of outstanding issues of securities by a single new issue, generally for a longer term than the outstanding issues. Such a funding plan frequently provides economies in administration, in addition to extending the period during which the obligations will remain outstanding.

Futures. Contracts for the delivery of stocks or commodities at a future date. Dealing in futures is a very legitimate and even a necessary element in the conduct of some businesses. Thus, a flour manufacturer, in order to make his plans of production for the ensuing quarter or half year, must make his purchases in advance of his actual needs. Only by so doing can he, with any safety, make quotations to his customers for future delivery to them. But speculators upon the commodity and stock exchanges deal in futures in a manner which amounts to plain gambling. These speculators, however, by selling for delivery in the future, relieve the business man of the risks incident to possible fluctuations in prices, and enable him to do business upon a safe, carefully calculated basis.

Garnishee Proceedings. Legal proceedings by which a creditor reaches an obligation owed to his debtor by a third person. Thus, if A owes B $50 and C owes A $50, B may garnishee the sum which C owes to A and thus obtain payment of B's claim against A. In these proceedings, C, the debtor's debtor, is known as the garnishee.

Gold Basis. The currency of a country is said to rest upon a "gold basis," when a certain quantity of gold by weight constitutes the basic monetary unit and standard of value of the country. Most countries have currencies on a gold basis as a matter of law but not as a matter of practice since the unit of currency is not exchangeable with gold at the statutory rate. For an explanation of this paradox, see *Managed Currencies*.

Gold Bond. Long-term debt instruments payable in gold coin and issued by governmental units and by private corporations in the days of the gold coin standard. The term "gold" in this connection was intended to promote the sale of such bonds by promising their redemption in the legal tender of that day. After the gold coin standard was abandoned and the dollar was devalued (1934), the Supreme Court refused to enforce payment of the bonds in an amount of dollars having the same total gold equivalent as the dollars originally lent. The Court held that the value of the dollar is determined by its purchasing power rather than its gold equivalent.

Gold Certificates. Paper money issued by the Treasury and which was formerly circulated as legal tender but now severely restricted in use. It represents gold in an amount equal to the face value of the certificate, deposited with the Treasury.

When all gold was called in to the Treasury in 1933, gold certificates also were taken out of circulation. They now serve as legal reserves of the Federal Reserve banks.

Gold Reserve. The term applied to the stocks of gold in the various government depositories, the largest being Fort Knox in Kentucky.

Good Will. Reputation enjoyed by a company or its product, which gives to the product a ready and wide marketability. Frequently, good will constitutes the most valuable single asset a business possesses. Where the good will has been acquired through the expenditure of large sums in advertising, it is deemed proper accounting to set forth as an asset the good will achieved by the advertising at a valuation approximately equal to the sum spent in advertising.

Greenbacks. See *United States Notes.*

Gresham's Law. The principle of public finance, according to which, if there is an excess of money of different kinds in a country, the better money, that which intrinsically is more valuable, will go out of circulation or will leave the country, and that kind of money which is of less intrinsic value will tend to become the sole currency of the country. Thus, depreciated paper currency, so long as it continues to circulate as money, will tend to drive gold out of circulation entirely, the gold finding its way into industry or to foreign countries in payment for imports.

Guarantee. The undertaking by one who is not a direct party to a transaction to perform the promise or obligation made or assumed by another, in the event that the latter does not himself perform the promise or obligation. Bonds of subsidiary corporations are frequently guaranteed by the principal or holding corporation. It is not legally possible, however, for a company to guarantee the payment of the principal or interest upon its own bonds or the payment of dividends upon its own stock. For, in order to have a true guaranty, there must be three parties in the transaction,—the creditor, the debtor, and the guarantor.

Hedging. Either buying or selling in such a manner as to curtail threatened losses through speculative sales or purchases in stocks or commodities. Thus, for example, a speculator agrees to deliver a certain number of units of stock or of a commodity at a certain price at a future time. He intends to cover the sale by purchasing at some time before delivery is due, at a price lower than that named in his contract of sale. Prices then begin to advance in such a manner as to indicate that there probably will be a continuous advance rather than any decline in prices. The speculator will then at once "cover" by buying in the amount of stock or commodity that he has sold, and thus limit his loss to the difference between the price at which he has sold and the price at which he has covered.

High Finance. A popular term applied to the large scale promotion of financial ventures which yield unconscionably great profits to the promoters and yet successfully evade any civil or criminal liabilities.

Holder in Due Course. One who has acquired a promissory note or other negotiable instrument for value, without notice of any defect in the instrument or in the title of the transferor. A holder in due course may ordinarily recover upon the instrument, regardless of defenses claimed by the maker or by other parties to the instrument. The defense of forgery, however, is available even against a holder in due course.

Holding Company. A corporation whose chief function is the holding of stock in other corporations, the latter being sometimes referred to as its "subsidiaries."

Honor. The act of paying or accepting a check, draft, or bill of exchange upon presentation by the holder, in accordance with its terms.

Hypothecation. Depositing stocks or bonds with a creditor as security for the payment of a debt.

Inactive Account. An account of a depositor in a commercial bank or trust company, against which few or no checks are drawn. Many commercial banks now pay interest upon inactive savings accounts at rates as high, or nearly as high, as those paid by savings banks; while checking accounts which are regarded as active receive no interest upon balances, or interest at considerably lower rates.

Inactive Stocks and Bonds. Stocks and bonds which are seldom bought or sold or quoted upon the exchanges.

Income. Gains received in any form capable of valuation, including compensation for services rendered, interest, dividends, gains from sales and exchanges of personal or real property, profits derived from the conduct of a business, and any other thing of value received during any period. Under the Federal income tax law, the value of gifts received is taxable at graduated rates.

Income Tax. Federal, state, or city levies imposed upon a person and measured by the income he receives. A state may impose an income tax by reason of the fact that gain has been derived from sources within that state's jurisdiction, even though the person upon whom the tax is imposed has never been, by citizenship or residence, or otherwise, personally subject to the jurisdiction of the state imposing the tax. Income taxes are direct and usually are characterized by progressive rates.

A second type of income tax is one imposed on corporations. As levied in the United States, it presents two differences from the income tax on individuals.

First, the rate is not increased to so high a figure for large incomes. Prior to 1934, a flat rate on earnings was applied irrespective of the amount of earnings. In that year for the first time a slightly higher rate was imposed on larger profits. The change was designed to encourage small enterprises.

Secondly, higher rates are imposed on companies which retain larger proportions of their earnings to add to surplus. First used under the Revenue act of 1936, this principle is for the purpose of encouraging larger distributions in dividends. The money thus distributed is taxable under the individual income tax schedules, which, for wealthy individuals, run to much higher rates than schedules applying to corporations.

Indenture. An agreement or deed under seal, executed by two or more persons. The origin of the term was in the practice, now obsolete, of executing an agreement in duplicate, or in as many counterparts as there were parties, the copies being separated unevenly in such manner as to create indentures, those in one copy fitting into those in another.

Inheritance Tax. Federal and state levies upon the succession to property of a deceased person. Thus, the term "transfer" tax or "succession" tax is sometimes applied to this tax.

Usually, an inheritance tax is imposed upon the entire estate of the decedent by the state in which he resided at the time of his death, regardless of the situs or physical location of the property left by him. Most states, however, also impose a so-called inheritance tax upon the transfer of property from a deceased person to his heirs at law, or other beneficiaries, if any of the property of the deceased lies within the territorial limits of those states. A so-called inheritance tax is sometimes imposed upon a beneficiary also, by reason of his succession to property, whether under a will or by operation of law, even though the property had no situs or physical presence within the taxing state and the decedent had no residence or domicile there.

Insolvent. Formerly one was deemed insolvent if he was unable to meet his obligations as they matured. The repeated failure of anyone engaged in business to pay definitely maturing obligations upon their due dates was regarded as conclusive evidence of his insolvency.

The term has acquired a new meaning. This meaning has been legislated into legal and commercial usage by the Federal Bankruptcy act of 1898. This act defines an insolvent as one whose liabilities exceed his assets at a fair market valuation. Obviously, under this latter definition, one who fails to meet his obligations as they mature may nevertheless be solvent.

Interest. A periodical return paid for the use of money or other capital. Fundamentally, interest is regarded as a compensation paid to those who deprive themselves of the present use of their funds or capital, in order that these funds may be put to productive and profitable employment. The rate of interest, from the economist's viewpoint, is therefore determined by two factors—the amount necessary to induce individuals to sacrifice the present for the future, and the amount of additional value that can be created by using the capital thus set aside in producing goods to be consumed in the future.

Interim Certificates. Frequently, in the reorganization of corporations, considerable time is consumed in carrying into effect the plans of reorganization. It is then customary for stockholders who join in the plan of reorganization to deposit their certificates of stock with designated trustees or with a stockholders' committee, who act for the participating stockholders. These trustees—commonly a single trust company is designated to perform this function—issue to the stockholders interim certificates in exchange for the stock certificates deposited with the trustees. The interim certificate is issued only as a temporary evidence of the interest of the holder. When the reorganization has been completed, the interim certificate is surrendered to the trustees, and the new securities to which the stockholder is entitled, under the reorganization, are then issued to him in exchange for the interim certificate.

Interlocking Directorate. The holding by the same persons, of directorships in two or more corporations. When the corporations have dealings with each other, the results may be prejudicial to the interests of one corporation or the other, or outsiders. This circumstance has given rise to criticism of the practice and to restriction of it by Federal law in several fields.

Internal Loan. A government loan, the securities for which are intended by the government for flotation and sale primarily among its own citizens; as distinguished from an external loan, which is intended primarily for foreign investors. See *External Loan.*

Inventory. An itemized statement or schedule of the assets of an individual, a firm, or a corporation, usually accompanied by a statement of the value of each of the separate items set forth in the schedule.

Investment Banker. One who buys securities wholesale and sells them retail. It is the practice of the well

established investment bankers to underwrite or purchase blocks of new securities of corporations and then to market them to their customers. The investment banker is thus the connecting link between persons who have funds in large amounts to invest and persons actively engaged in existing industries or in the promotion of new enterprises.

Invoice. Statement furnished by a seller to a buyer, setting forth in detail the character, quantity, and price of goods sold, and any other terms of the sale.

Jetsam. Goods thrown overboard to lighten a vessel in distress.

Judgment. A determination of a judicial tribunal, reached at the conclusion of legal proceedings. The judgment may impose upon the defendant an obligation to pay a certain sum of money; it may order him to do or to refrain from doing certain acts; or it may merely state a conclusion of law as to what are the rights of the parties.

Judgment Debtor. A debtor against whom a creditor has obtained from a court a judgment which has been placed on record.

Judgment Note. A promissory note containing a power of attorney, authorizing the holder of the note to confess judgment on behalf of the maker or obligor in the event the note is not paid at maturity. The purpose of such a provision is to avoid the necessity of bringing formal legal action against the maker for the recovery of the amount due upon the note. In many states such a power of attorney, if incorporated in the note itself, is given no legal effect.

Killing. The making of exceptionally large profits in a speculative transaction. The word "coup" is sometimes used in a similar sense.

Kiting. A method of obtaining from banks the use of funds for a short period, without paying interest therefor, by the exchange of checks between two or more individuals having accounts in different banks. Thus, if A desires the use of $1000 and is unable or unwilling to borrow the sum from a bank, he may, by prearrangement with a friend, B, who has an account in another bank, request the friend to forward to A a check for $1000. A deposits B's check in the bank with which A keeps his account, and receives credit therefor immediately. A then draws upon the amount thus placed to his credit in his bank, either by obtaining cash from the bank or by issuing checks, to pay his current obligations.

Before B's check reaches the bank with which B keeps his account—and several days may elapse between the deposit of the check in A's bank and its presentation to B's bank—A forwards to B a check drawn upon A's bank for a similar sum, and B deposits the check of A in B's bank, thus obtaining a credit upon the books of the bank sufficient to meet the check drawn by B in A's favor. B then draws a second check in favor of A in the sum of $1000, or in some other sum, which A again deposits in the bank with which A deals. Again A forwards a check to B in a similar amount, which B deposits in time to meet the second check drawn by B in favor of A. By continuing this exchange of checks, it is possible for A to carry indefinitely a fictitious credit in his favor, upon which he can draw in the form of cash or otherwise, depending upon the practice and rules of the particular bank.

Kiting is, therefore, merely a method of taking advantage of the delay incident to the collection of checks. Ordinarily, depositors are not expected to draw checks unless they have on deposit, at the time the check is drawn, sufficient funds to meet the checks. Where depositors adhere to this proper banking practice, banks receive the use of the funds deposited during the several days, or sometimes more, that elapse before a check is presented for payment. Banks feel that they are justly entitled to this use of funds while checks are in transit, and frown upon depositors who deprive them of this advantage.

Lamb. An amateur speculator upon the stock market who is shorn of his money as the lamb is shorn of its fleece. Thus, buyers of worthless securities, or others deprived of their savings in near-fraudulent transactions, are said to have been "fleeced."

Latin Union. Agreement in 1865 of France, Belgium, Italy, Greece, and Switzerland to adopt a common gold monetary unit as the basis of their systems of currency. In Italy this monetary unit was called the lira; in Greece, the drachma; and in France, Belgium, and Switzerland, the franc. The unit was equivalent to 19.3 cents in United States currency. World War I disrupted the agreement.

Lawful Money. A term covering broadly any form of currency in common use, whether or not it be legal tender in a technical sense. Prior to 1933, Federal Reserve notes, silver certificates, and national bank notes were lawful money but were not legal tender. In that year the distinction was wiped out as affecting currency in the United States. See *Legal Tender*.

Legal Investment. By law, savings banks, commercial banks, and insurance companies are required to invest their funds in limited classes of high grade securities. These securities consist of Federal, state, county, and municipal bonds; first mortgages on real estate in an amount not exceeding, under the laws of most states, 60 per cent of the value of the real property; and bonds of certain designated railroads. A further limitation with respect to investment in railroad and municipal bonds is frequently imposed, to the effect that the bond of a particular municipality or of a particular railroad may not be the subject of investment if there has been, at any time during the preceding five years, or sometimes a longer period, a failure to pay interest upon its bonds; and, in the case of some railroad bonds, if there has been, for a certain period preceding the investment, a failure to pay dividends.

Either by statute or by repeated rulings of the courts, fiduciaries (in which class are included trustees under wills and under deeds of trust, executors and administrators, and guardians of the estates of minors and incompetents) are required to invest the funds of the trust estate in securities which are legal investments for savings banks. This rule, where not prescribed by statute, is not an absolutely hard and fast limitation upon the investments of fiduciaries. But, if investments are made in any other securities or property than the so-called "legal investments," the fiduciary runs a very serious risk of being held liable personally for any diminution or depreciation in the value of the principal of the estate.

Legal Rate of Interest. The maximum rate of interest fixed by the laws of a state or country as a lawful charge for the use of money. Each state in the Union may fix its own lawful rate of interest. Where individuals of different states, having different legal rates of interest, are involved in a transaction, that rate governs, which is fixed by the laws of the state in which the transaction takes place, or in which it is to be performed.

Where interest in excess of the rate allowed by law is charged, the rate is usurious, and the lender is guilty of usury. Under the laws of most states, if the facts are proved, the lender can then recover neither the interest nor the principal. In some states usury is also made a misdemeanor, punishable under the penal law.

Legal Tender. Currency which a creditor is compelled to accept in payment of a debt, in the absence of an express agreement prescribing the specific kind of money to be paid by the debtor. No further interest on the debt may be collected once legal tender has been offered in payment of the principal.

Before 1933, when all lawful money in the United States was made fully legal tender, gold certificates, gold coin, United States notes, originally issued during the Civil War and known as greenbacks or legal tenders, United States treasury notes of 1890, and silver dollars were full legal tender in unlimited amounts. Silver coins of less than one dollar were legal tender to the amount of ten dollars in any one transaction; also nickels and pennies up to 25 cents. See *Lawful Money*.

Letter of Advice. A formal notification sent by the drawer of a bill of exchange to the one upon whom the bill is drawn, generally a banking house with which the drawer has made arrangements for the acceptance of bills drawn by him, advising the latter of the drawing of the bill and of the amount and terms of the instrument.

Letter of Credit. A formal letter, issued by a bank or banking firm at the request of a customer, requesting correspondents of the bank to honor drafts drawn by the person named in the letter of credit, and to charge the amounts thereof to the issuing bank.

Letters of credit are of two general classes—travelers' letters of credit and commercial letters of credit. The traveler's letter of credit is merely a letter addressed generally to the correspondents of the issuing bank, introducing the person for whose benefit the letter has been issued, and requesting that his drafts be honored up to a named amount by any correspondent bank. The signature of the one in whose favor the letter is issued is written at the bottom of the letter at the time it is issued. With this letter in his possession, a traveler may, at the office of any correspondent bank, obtain currency in any sum up to the amount named in the letter of credit, by writing a draft for the amount desired. The signature upon the draft is compared with the signature upon the letter of credit, and, if it appears to be in proper form, the desired funds will be paid to the holder of the letter of credit in any form of currency he may desire. Whenever any payment is made pursuant to the letter of credit, an entry is made on the reverse side of the letter, showing the date of payment, the bank making the payment, and the amount paid. Travelers' checks issued by express companies and also by the Bankers' Trust Company of New York City, on behalf of the American Bankers' Association, are a simplified form of the letter of credit.

Commercial letters of credit are drawn by a bank at the request of a customer, usually in order to facilitate purchases abroad. Thus, if an importer desires to purchase goods in a foreign country on credit, he obtains a letter of

credit from his bank or from another bank with which his bank has made arrangements for the issuance of letters of credit. This document may be addressed to a foreign correspondent of the issuing bank, or it may be addressed by the issuing bank directly to the foreign exporter.

The letter in effect is an undertaking or a guaranty that the issuing bank will accept and/or pay all drafts drawn in accordance with the terms specified in the letter of credit. Where the letter specifies that drafts will be honored only when accompanied by negotiable bills of lading, consular invoices, and, sometimes, also by policies of insurance, the instrument is called a "documentary" letter of credit. Where there is no requirement that drafts shall be accompanied by bills of lading or other instruments of title, the letter is called a "clean" letter of credit.

The letter may be a "revocable" letter of credit or an "irrevocable" letter, depending upon the particular terms of the instrument. In the former, the bank reserves the privilege of withdrawing the credit at any time before drafts have been drawn against it. Where the letter is "irrevocable," it remains in effect until it is exhausted or expires by its terms.

Where the letter of credit is forwarded first to a correspondent of the issuing bank, and the correspondent notifies the exporter and undertakes on behalf of the issuing bank to accept drafts drawn by the exporter, pursuant to the letter of credit, the letter is said to be "confirmed." Where, however, the correspondent or notifying bank merely advises the exporter of the receipt of the letter of credit, without itself undertaking to accept or guarantee drafts drawn against it, the letter is "unconfirmed."

Lien (*lē'ĕn*; *lēn*). A legal right of a person to detain or control property belonging to another until certain charges upon it have been paid, or until some pecuniary claim against the owner has been satisfied.

Lighterage. Transferring goods from a dock or wharf to a lighter or barge, and then from the lighter or barge to a ship, or vice versa. The term is applied also to the expense involved in thus loading or unloading a vessel. This expense will be incurred whenever the shallowness of the water or the lack of proper dock facilities makes it impossible to load or unload directly from wharf to ship.

Limited. See *Ltd.*

Limited Partnership. A partnership in which the liability of one or more of the members is limited to the amount invested in the business. Such a partner, in the event of the insolvency of the partnership, cannot be held liable for any of its obligations beyond the amount which, under the partnership agreement, he has undertaken to place at the disposal of the business.

Usually, limited partnerships are strictly regulated by statute, the purpose of such regulation being to provide adequate notice to the public of the limited liability of one or more of the partners. These laws generally provide that the active management of the partnership shall be vested solely in the general partners—those members of the firm who are liable, without limitation, for any and all debts contracted by the partnership.

Liquidation. The conversion of the assets of a corporation, firm, or partnership into cash, and the distribution of its assets among the creditors and stockholders or other persons having an interest in the company or business.

A liquidation is known as a "voluntary" liquidation where it results from the mere desire of the owners of the business, or the stockholders of a corporation, to terminate the business and distribute its assets. The liquidation is a "forced" liquidation where the pressure of creditors has thrown the business, or has threatened to throw it, into receivership, and liquidation is the only method by which creditors can receive payment of the sums due them.

Listed. Before a stock or bond may be bought and sold on any of the larger stock exchanges, the security must be submitted to the governors of the exchange or to a special committee appointed to pass upon the character of the security and the qualifications of the corporation issuing the stock or bond. Certain definite requirements usually must be met to qualify the security for listing. When the stock or bond has been approved as fulfilling these requirements, it becomes "listed" on the particular exchange.

Sometimes the term listed is used with reference solely to listing on the New York stock exchange.

Lombard Street. The name applied to the financial section of London, of which Lombard street forms a part. The use of this term corresponds to the use of the term "Wall Street" in this country, as expressive of the entire metropolitan financial district.

Ltd. Abbreviation for the word limited, required to be included in the names of companies organized under limited liability statutes in Louisiana, Great Britain, Canada, and in some other countries. The term "Ltd." is used with the same purpose and effect as the abbreviation "Inc."—which is more commonly used in the United States—to indicate that the company is one in which the liability of the stockholders is limited to the amount invested in the corporation.

Manifest. A complete list of the passengers or freight carried upon each voyage made by a vessel. This list must be signed by the captain or other person in charge of the ship. If a passenger ship, it must contain, in addition to the name of every passenger, a complete record of the voyage, including particularly the name of the port of embarkation and that of the port of landing. Where the manifest covers a shipment of freight, it must contain the name of each shipper or consignor, the character of the freight, the number of packages, and the ports of loading and destination.

Margin. A sum deposited with a broker for the purchase of stocks or commodities on speculation. The "margin" so deposited constitutes a protection against loss to the broker, in the event of a fall in the value of the securities purchased. The amount of the margin required by the broker varies with the speculative quality of the security or commodity to be purchased for the customer. In the case of stocks traded on national exchanges, margin rules are set by the Federal Reserve Board of Governors.

Whenever the price or quotation of a security purchased for a customer on margin falls to such a point that the margin is reduced below the stipulated percentage, the broker calls upon the customer for additional margin. If this is not forthcoming, the broker "sells out" the customer before the fall in price has completely wiped out the margin deposited.

Matched Order. An order to buy, given simultaneously with an order to sell a similar number of shares of the same stock or an equal quantity of a commodity. Such an order really amounts to a fictitious sale and gives an appearance of activity in the particular stock or commodity which has no basis in actual demand. The purpose of "matched orders" is usually to cause an artificial or temporary rise in prices. Penalties are prescribed against traders on national exchanges who use this device. Detection is a duty of the Securities and Exchange Commission.

Mechanic's Lien. Under the laws of many states, one who performs labor or provides materials used in the construction of a building may obtain a lien upon the building for the value of the labor or materials rendered, by filing a notice in the office of the county clerk or registrar of deeds. Such a lien is called a mechanic's lien. The purpose of these statutes is to provide security and some assurance of ultimate payment to those who render services or provide materials by which the owner of the building benefits.

In order to obtain a mechanic's lien, it is not necessary that the work or materials be rendered directly to the owner at his request. A notice of lien may be filed by one who performs work for a contractor or subcontractor. But, in that event, under the laws of most states, the lien is valid only to the extent to which money is or may become due from the owner to the contractor or subcontractor, by reason of work performed upon the structure. The filing of a notice of a mechanic's lien, therefore, operates as a notice to the owner that, if any sums are or may become due to his contractor, he must set aside out of these sums, an amount sufficient to pay the mechanic's lien asserted against the building. To avoid double payment, it is customary for the owner to require a contractor to file a bond, protecting the owner against the possibility of having his property subjected to liens of persons hired by the contractor to perform services upon the building.

Middleman. One who stands between the producer or manufacturer and the consumer. Distributors of all kinds, such as jobbers, wholesalers, retailers, brokers, factors, and commission merchants, are included within this class.

Money. Any recognized medium of exchange. In a more limited sense, and as the term money is now commonly used, it applies to the currency either issued or recognized by governmental authority, whether or not it is legal tender. See *Legal Tender.*

Money Order. An order payable at sight to a person designated in the instrument, the amount to be charged to the account of the drawer. Money orders are issued by express companies and by the post-office department of the United States government, and, more recently, also by bankers' associations. They are quite similar to cashiers' checks in their essential character and in the purpose which they serve. By reason of their almost universal acceptability and further by reason of the fact that they are made payable to a designated party—so that one not entitled to the money order cannot avail himself of it—they provide a safe and convenient means for transmission of payment through the mails.

Moratorium. An act of the government providing that, during a certain period, creditors shall have no right to bring proceedings against debtors for the collection of debts.

Mortgage. Technically, a transfer of title to real or personal property as security for a loan or other obligation.

Formerly a mortgage was deemed to convey to the mortgagee the ownership in the property subject to defeasance; that is, subject to termination upon payment of the debt for which the mortgage was given as security. Today, however, mortgages, upon either real or personal property, are commonly regarded as giving to the mortgagee merely a lien upon the property mortgaged, and not as conveying any actual rights of ownership.

In most states, statutes provide specifically how mortgages may be foreclosed in the event of nonpayment of the debt for which the mortgage was given, the purpose of these statutes being to protect the mortgagor—the one who gives the mortgage—from a forfeiture of his interest in the property.

In order that the mortgagee shall have a valid lien upon the property mortgaged, as against a person to whom the property may be sold by the mortgagor, or, in most states, even as against judgment creditors of the mortgagor, the mortgage must be recorded. If the mortgage is upon real property, it will be recorded in the office of the clerk or the registrar of deeds of the county where the property is located. Chattel mortgages must generally be recorded in the office of the clerk of the town or municipality in which the mortgagor resides.

Mortgage, Insured. Congress set up in 1934 a Federal Housing Administration, one of whose functions is to insure approved mortgages on homes The mortgage is insured in favor of the lender of the money, and the insurance is paid for by the borrower. If the borrower defaults, the housing administration makes good the loan. One purpose of the law is to create a class of negotiable mortgages. Insurance eligibility requirements vary from time to time, depending upon economic conditions.

Mortgage Bond. A bond secured by a mortgage upon real or personal property.

Municipal Bonds. Obligations of a city, school district, incorporated village, or other municipality, issued to provide funds for municipal purposes. The term is sometimes used more broadly to include the obligations of the state as well.

National Bank. A bank organized under the National Banking law of the United States, and subject to regulation by Federal authority. The present national banks have been organized pursuant to acts passed on February 25, 1863 and June 3, 1864, as a part of the general financing plan of the Northern states during the Civil War. These banks were specifically given the power to issue bank notes upon depositing with the Treasury certain types of bonds of the United States. When the eligible types of bonds were called for redemption in 1935, the note-issuing privilege of the national banks lapsed. All national banks are required to be members of the Federal Reserve system and of the Federal Deposit Insurance Corporation.

Negotiable Paper. A check, draft, bill of exchange, or other commercial instrument payable to bearer or to order, the title to which may be transferred by delivery or by endorsement. An instrument is not negotiable unless it is payable to "bearer" (or a recognized equivalent of the term bearer, such as "cash") or to "the order of" a designated person. In order to be negotiable, the instrument must have also a definite or ascertainable date of maturity, and must contain an unconditional obligation to pay a definite sum of money. One who acquires a negotiable instrument for value, prior to maturity and without notice of any defect in the title of previous holders of the instrument, usually may recover against those who appear to be liable upon the instrument, irrespective of any defenses which they may claim or possess against previous holders of the instrument.

Negotiable Securities. Bonds payable to bearer and therefore transferable by delivery, as distinguished from registered bonds, which can be effectively transferred only by changing the registration of the bond at the office of the issuing corporation.

Net. A term applied to a price or to an amount after all discounts and other deductions have been made.

The net weight of a commodity sold in a container is the weight of the contents alone, free from the container.

No Account. When a check, drawn upon a bank in which the drawer is not a depositor, is presented at that bank, it is stamped with the words "no account."

No Funds. When a check is drawn upon a bank in which the drawer has or has had an account, but which has no funds to his credit when the check is presented for payment, the check is returned with the words "no funds" stamped upon its face. Where the drawer of the check has some funds on deposit, but not enough to meet the check, the words "insufficient funds" are stamped upon it.

Nonassessable. A term applied to stock in a "limited liability" corporation, which has been paid for in full, and the owner of which, under the terms of the issuance of the stock, cannot be required to make further contributions to the capital or business of the corporation. When such stock has once been fully paid for, the ownership of it entails no further liability on the part of the owner, either to the corporation or to its creditors.

No Protest. An instrument that is not subject to protest is marked with these words. See *Protest.*

Note. An unconditional written promise to pay a specific sum of money at a definite or determinable future date, signed by the person making the promise.

Oath. In law, an oath is a solemn affirmation, usually accompanied by a set formula, such as the words "I do hereby solemnly swear that", etc. One who swears falsely is liable to criminal penalties in nearly all jurisdictions.

Option. A right or privilege to buy (or sometimes to sell) property upon designated terms. An option differs from a contract in that the person to whom the option is given is under no obligation to buy or to sell, whichever the case may be. He may or may not exercise his privilege, as he chooses. In order that an option may be valid and binding, usually something of value must be given to the person granting the option. Otherwise, it is a mere offer, which may be withdrawn at any time.

Outlawed. A colloquial term applied to the barring of rights by the failure to enforce them within a certain period.

The practical administration of justice requires that a definite limitation be placed upon the time within which those who claim rights against others shall enforce these rights in courts of justice. The principle upon which statutes of limitation rest is that the facts about a matter are likely to be obscured by the lapse of time, and also that it is socially desirable that a long existing situation should not be disturbed by reason of long past events.

The period within which an action must be commenced upon a note or other contractual obligation is, under the laws of most states, six years. An instrument under seal, however, does not become outlawed in some states until twenty years have elapsed from the date when the obligation matured. Tort actions—actions for injuries to person or property—are usually "outlawed" in two, three, or four years, the term varying in different states.

Overdrawn. When a depositor draws checks to an amount in excess of the credit to his account, his account is said to be overdrawn. Where such an overdraft is permitted by a bank, it constitutes, in effect, a loan by the bank to the depositor. Such a loan, however, is not represented by any written instrument from the depositor to the bank, and is therefore deemed a highly objectionable bank practice.

Paper Money. Any paper currency, whether or not it is legal tender.

Par. The face value of a note, security, or other instrument. A stock or bond is said to sell at par, above par, or below par, accordingly as its sale price is equal to, greater than, or less than, the nominal value stated upon the instrument itself.

Pass Book. A term sometimes applied to a bank book. See *Bank Book.*

Payable to Bearer. An instrument payable to "bearer" is payable to the holder of the instrument, and may be transferred from one holder to another by mere delivery, without endorsement. Where an instrument is made payable to "cash," it is regarded as payable to bearer.

Payee. The one to whom a note, draft, or other instrument is made payable.

Payor (Payer). The maker or drawer of a promissory note, or of a similar instrument.

Personal Property. Any property, whether tangible or intangible, that is not affixed to land. Stocks, bonds, jewelry, furniture, live stock, automobiles, trade-marks, good will, patents, and leases for definite periods of years are all included within the general class of personal property.

Pit. The trading room of the Chicago board of trade, in

which grain, rye, oats, barley, and other commodities are bought and sold.

Point. The unit used in designating the extent of a rise or fall in the market price of a security or a commodity. A point may indicate different amounts for different securities or commodities. Thus, a rise or fall of a point in the quotation of a stock ordinarily indicates a rise or fall of one dollar. In quotations of cotton, a point is $\frac{1}{100}$ of a cent, and a rise of 25 points in the price of cotton would indicate merely an increase of one-quarter of a cent per pound. In foreign exchange, a rise of one point would mean normally an increase of one cent in the exchange value of the foreign monetary unit.

Pool. A combination of individuals or interests for the purpose of creating an artificial rise or fall in the price of securities or commodities dealt in upon the stock or commodity markets. The members of the pool combine their resources and, under the management of a designated individual or group of men, buy and sell in a particular stock or commodity with the purpose, either of hammering down the price of the stock or commodity, or of artificially raising the price to a point that will enable them to unload the security or commodity upon the public at a profit. The method of operation most frequently used is the following:

A particular stock is chosen as a desirable one with which to execute the series of maneuvers which it is expected will yield a profit to the members of the pool. A large quantity of this stock is bought up quietly at the normal price. The members of the pool then engage in sales to and from one another, sales which by reason of the ultimate identity of interest of the parties to the pool are in fact fictitious or "wash" sales. When a block of the stock is offered upon the stock market by one member of the pool, it is promptly purchased by another member of the pool. As additional blocks of stock are offered, the stock is bought up at continually rising prices by members of the pool. By this series of operations, the price of the stock is artificially raised to a point much higher than its actual or true market value, and, when a favorable moment arrives, the pool unloads the stock upon the public at this artificially created high price. As soon as the unloading has been effected, the bottom falls out of the stock, and the innocent purchasers upon whom the stock has been unloaded by the pool find that their stock cannot be sold at anywhere near the price which they paid. A pool which operates in this fashion is sometimes called a "bull" pool.

In a "bear" pool, the members of the pool combine their resources and proceed to sell a particular stock or commodity at the current price for future delivery. They then, by actual sales of the stock or commodity in the market at continually falling prices, as well as by fictitious transactions, "hammer down" the price of the stock or commodity to a point where they can cover at a profit the sales which they have made. Just as in the "bull" pool, the repeated purchases of the stock at a continually rising price cause the price of the stock to rise abnormally, so, in the "bear" pool, the psychological effect of a continuous series of sales, at a steadily falling price, results in a demoralization of the market.

Operations of these types on national security exchanges were forbidden by law in 1933; those on the commodity exchanges, in 1936. Security traders are now required to obtain licenses from the Securities and Exchange Commission; commodity traders, from the Commodities Exchange Commission. The penalty for engaging in pool operations may be revocation of the trader's license.

Postdated Check. A check bearing a later date than the date upon which it was actually drawn. A postdated check will not be honored by a bank until the date indicated upon the check arrives.

Power of Attorney. A writing or instrument signed by one person and giving to another person authority to perform certain acts on behalf of the signer of the instrument. A power of attorney, in most states, must either be witnessed, or be acknowledged before a notary public or other official authorized to take acknowledgments. The power of attorney may be very general in its scope, or it may be limited to a single specific act.

A power of attorney may be terminated at any time by the grantor of the power, unless the holder of the power of attorney has some pecuniary interest of his own which would be violated or infringed by the termination.

For some purposes, a power of attorney may be conferred by one person upon another by mere oral or parol authorization, without any instrument in writing. An authority conferred in this manner is more properly termed a mere agency rather than a power of attorney.

Preferred Creditor. A creditor entitled to payment of his claims before the claims of mere general creditors are paid. Whether a creditor has a preferred claim becomes important where a debtor has become insolvent or has been adjudicated a bankrupt. Claims arising out of personal services rendered within two years of the filing of a petition in bankruptcy are entitled to a preference, and such claims must be paid in full before other debts may be paid.

Preferred Stock. Stock in a corporation, which confers upon the holder a prior right to dividends or to payment out of the assets of the corporation, in the event that the corporation is dissolved.

The usual preference given to holders of preferred stock is one entitling the holders to dividends of a certain per cent upon the par value of their stock in each year, before any dividends shall be paid to holders of the common stock. This preference as to dividends may be either cumulative or noncumulative. If the dividend preference is cumulative, then, if no dividends, or dividends less than the amount of the dividend preference, are paid in any year upon the preferred stock, the amount unpaid must be paid to the holders of the preferred stock before any dividends can be paid upon the common stock in any subsequent year. If the preference as to dividends is noncumulative, then, if no dividends are paid upon the preferred stock in any year, such omission of dividends does not affect the relative rights of the holders of preferred and common stock in any subsequent year, the prior omission of payment of dividends to the preferred stockholders being entirely disregarded.

Generally, the dividends which holders of preferred stock may receive from the corporation are limited to a definite rate or amount. Thus, if the preferred stock entitles the holder to dividends of 7 per cent upon the par value of the stock, all of the profit in any year, in excess of the dividends to which the preferred stock is entitled, goes to the holders of the common stock. This, however, is not necessarily the case. For, in the absence of a provision limiting the holders of preferred stock to dividends of a certain per cent, preferred stockholders are entitled to share equally with the common stockholders in any excess profits distributed by the corporation, after the common stockholders have received dividends at a rate equal to that paid to the holders of the preferred stock. See *Common Stock*.

Premium. When any security having a par value sells at a price above par, it is said to be quoted at a premium.

The term is used also in transactions in international or foreign exchange, with reference to the amount above the normal exchange rate at which any particular currency is quoted. And where different kinds of money, such as gold and silver, or gold and paper, are used simultaneously within a country, gold will be quoted at a premium whenever the paper currency, or the currency having a lower intrinsic value, is issued in such a quantity as to cause the public to lose confidence in it. In such a case, gold is driven out of monetary uses, and gold coin is bought and sold as a commodity rather than dealt in as mere money or currency. See *Gresham's Law*.

Principal. The capital sum due upon a bond or other obligation as distinguished from the interest which accrues or becomes due upon the principal from time to time.

Profiteering. Selling goods or services at a price yielding an unusually large profit. In 1918, Congress passed a law designed to prevent and punish profiteering in certain businesses. This law, however, was held unconstitutional.

Promissory Note. An instrument containing an unconditional promise to pay a definite sum of money to a particular person or to his order, or to bearer, either on demand or at a definite future time. A promissory note may be either negotiable or nonnegotiable. It is nonnegotiable when it is payable to a definite person only, and not to his order or to bearer.

Promoter. One who makes a business of floating or financing new enterprises or of obtaining additional capital for already existing enterprises.

Pro Rata. In proportion to their respective rights or liabilities. Thus, it is the policy of the law that creditors of an insolvent debtor shall share pro rata in his assets; that is, in proportion to their respective claims. Conversely, where several persons are engaged in a joint enterprise, it is the policy of the law that they shall, as among themselves, be liable pro rata for any obligations incurred; that is, they share the burden in proportion to their interests in, or contributions to, the enterprise.

Protest. The formal step necessary to fix the liability of the endorsers of a check, note, or other instrument which has been presented to the maker or acceptor for payment and has been refused. In the case of a note or of a draft or bill of exchange payable at a definite future date, the instru-

ment must be presented formally to the maker or acceptor during business hours upon the date of maturity. If the instrument is not paid before the close of business on that day, the notary who made the formal presentation of the instrument for payment certifies over his seal and signature that the instrument was presented and payment was refused. This certification is the "protest" of the instrument.

It is not necessary, in order that the maker of a note shall remain liable upon the instrument, that the note be presented and protested for nonpayment.

Proxy. An authorization from one person to another to act in his place and on his behalf. It is customary for stockholders of a corporation to vote their stock by proxy; that is, by executing a written authority authorizing another to act on their behalf at a meeting of the stockholders. Persons who occupy positions of trust, such as directors of a corporation, cannot act as such by proxy.

Put. An agreement to accept and pay for a certain amount of a stock, or of a commodity, at a fixed price at any time before the expiration of a designated period.

Pyramiding. Buying additional blocks of a particular stock or commodity upon margin, with the book profits yielded by a rise in prices. Thus, a customer requests a broker to buy 100 shares of a particular stock at 25 dollars a share, on a five-point margin, that is, a margin of 20 per cent, and gives directions to the broker to buy additional stock upon the same margin upon each advance in the market price of the stock. If the stock advances five points, the broker, under his instructions, will buy another hundred shares upon a similar margin upon the basis of the five-point paper profits yielded by the first purchase. As the stock continues to rise in price, the paper profits furnish additional margin for further purchases, until a large quantity of the stock has been purchased; and, if the stock so purchased is unloaded before a fall in the price of the stock, a very handsome profit upon the original investment will result.

Quotation. A price bid or asked for a stock, bond, or commodity. Sometimes a quotation may represent an actual market price based upon actual sales.

Rate of Exchange. The actual price at which a unit of currency of one country exchanges for a unit of currency of another country. Under normal conditions, the monetary unit of one country has a definite par in terms of the currency of any other country, generally based upon the amount of pure gold represented by the respective monetary units. When exchange is at par—one of the possible rates—, then the currency of one country has a value, in transactions with persons of the other country, equal to the relative amount of gold represented by the monetary units.

Where paper currency which is not redeemable in gold, circulates within a country, a new element is introduced. The currency of such a country will be exchangeable for the currency of other countries at a rate established by other factors. Under "managed currencies," such as Great Britain's became in 1931 and that of the United States became in 1933, the par may be set by tacit agreement and with an eye to its effect on internal prices. Each government, in such cases, uses a large "stabilization fund" to support at a definite level the value of its own currency through buying or selling those of other countries.

Rating. The credit worth of an individual, firm, or company, as estimated by Dun and Bradstreet, Inc., or any other recognized mercantile agency.

Real Property. Land and all things permanently attached to the land. Thus, real property includes structures erected upon the land and intended to remain affixed for an indefinite time, minerals, water flowing through the land, trees and other issues of the soil (excepting crops which are planted and reaped yearly or more frequently), rights of way and other easements, and rights of every nature in land and in waters, not including, however, leases for years or mere licenses.

Rebate. A return of part of a sum received for goods or for services rendered. At one time it was customary for railroads to make rebates to large or favored shippers. The result of this practice was that certain large corporations were able to save sufficiently upon their transportation costs to undersell their smaller or less favored competitors. The result of this was to crush the smaller concerns out of existence. The Interstate Commerce Act of 1887 and the amendments which have since been made to that act have had, as one of their chief objects, the prevention of this practice. Under this act, the giving of a rebate by any railroad or other common carrier in interstate commerce was made a crime.

Receiver. Person appointed by a court to manage the property of a person or a company, pending the termination of legal proceedings affecting the property or its owner. Thus, a receiver may be appointed to receive the rents and profits of a property with respect to which mortgage foreclosure proceedings have been instituted. Similarly, a receiver may be appointed to receive the rents and profits of property the ownership of which is disputed.

The type of receiver that is most common, however, is the receiver who is appointed ostensibly to take over the assets and continue the business of a corporation, pending its dissolution. Frequently this means of preserving the property of a corporation until its affairs can be liquidated is abused by those in charge of the affairs of the corporation. Thus, the receiver may be appointed at the behest of friendly creditors, with the sole purpose of preventing unfriendly creditors from pressing their claims and levying execution upon the property of the company. No bona fide purpose to dissolve the corporation or to liquidate its affairs then exists; but the protection which receivership proceedings provide against the collection of claims by creditors is obtained. In these cases, therefore, a receivership merely grants the corporation a moratorium—a suspension of payment of its debts—and serves no other purpose than to carry the corporation through temporary financial straits.

Refunding. Floating a new issue of securities to replace outstanding issues which are about to mature.

Registered Bonds. Bonds payable to a definite person designated in the face of the bond, and transferable only by endorsement properly witnessed and by an entry of the transfer upon the books of the issuing corporation. Where the bond is registered not merely as to principal but also as to interest, the interest is paid by check to the record holder of the bond, without the necessity of the transmission of any coupons to the corporation. When the bond is registered as to principal only, and not as to interest, it usually bears coupons representing the interest due or to accrue upon the bond, the coupons being payable to bearer and cashed upon presentation as they mature.

Registrar. One who records original issues and transfers of stock or bonds of a corporation. The functions of the registrar generally include the duty of safeguarding against a fraudulent or erroneous overissue of stock or bonds by the officers of the corporation. The registrar must then make certain that no certificates of stock or bonds are issued unless they are part of a duly authorized original issue or are issued in place of surrendered and canceled certificates of like amount.

Reserve. Funds set aside to meet a contingent or definite future expenditure.

Most corporations have a reserve for obsolescence and depreciation, the purpose of which is to provide a fund with which to replace capital assets when they have become worn out or useless. Where a company carries its own insurance—that is, does not take out insurance with regular insurance companies, but carries its own risks as to fire loss or other damage—a reserve will be accumulated from year to year so that, in the event of a loss by fire or otherwise, there will be sufficient funds set aside to cover the loss. It is also customary for companies that have issued bonds or other long-term notes to set aside annually a certain amount as a so-called reserve, with which to fund or pay the bonds or notes when they become due. Banks are required by law to maintain a reserve consisting of cash or its equivalent, amounting to a certain proportion or percentage of their deposits. See *Bank Reserves.*

Rights. The term applied to the privilege given to existing stockholders of a corporation to purchase a proportionate number of shares of any new issue of the company's stock.

Under the law which has grown up with respect to the rights of stockholders in corporations, a stockholder is entitled to subscribe to any new issue of stock that the corporation may make, in proportion to his holdings in the corporation, before the stock may be offered to the general public. Where the outstanding stock of the corporation has a market value higher than par, this privilege of purchasing stock of the new issue, at par or at any price lower than the market quotation for the outstanding stock, is a valuable one. Thus, assuming that there are 10,000 shares of the stock of a corporation outstanding, the shares having a par value of $100, but selling on the market at $150, if a new issue of 5000 shares is to be offered at $100 per share, each stockholder would be entitled to purchase one share of the new issue for each two shares which he already owns in the corporation. The holder of 100 shares would then be the owner of 50 so-called "rights," a right being the privilege of purchasing one share of stock of the new issue. If the new stock is issued at $100 and the stock outstanding is quoted

at $150, then the value of a right would be something less than $50. These rights may be bought and sold and, in the case of stocks having a wide market, are sometimes the subject of considerable speculation.

Savings Banks. Banks organized for the purpose of receiving deposits from small savers, and utilizing these savings in the form of investments in high-grade bonds and in loans upon real estate. Savings banks are very strictly regulated by statute in nearly all states, with the purpose of insuring the utmost safety to depositors. Thus, savings banks are generally prohibited by law from investing their funds in other than Federal, state, or municipal bonds and bonds of certain designated railroads, and in loans secured by first mortgages upon real estate, where the loan is not in excess of 60 per cent of the value of the property. Generally, deposits in savings banks are not subject to check or to withdrawal upon demand, although banks frequently waive the requirement that they receive a certain period of notice of an intended withdrawal.

Scalper. One who obtains inside information of events likely to affect the price of securities, and utilizes this information to his own profit by buying or selling upon the basis of his advance information. This practice is called "scalping the market."

Scrip. A form of promissory note or certificate of indebtedness, issued by a corporation to its stockholders in lieu of cash dividend payments. A corporation will resort to the use of scrip dividends when, although the profits of the company are such as to warrant some return being made to the stockholders upon their holdings in the company, the amount of actual cash on hand is not enough to permit immediate payment of cash to the stockholders.

Second Mortgage. A mortgage upon property which is already subject to a prior or first mortgage. Mortgages are called first, second, third, or fourth mortgages, according to the order in which they have been placed upon the property, and they are entitled to payment out of the property in order of their priority. Thus, if a second mortgage is foreclosed on default in the payment of interest or principal, the property can be sold only subject to the first mortgage. In other words, only the equity of the owner above the first mortgage can be relied upon to pay the amount of the second mortgage. In the event that the interest or principal due upon the first mortgage is not paid when due, the first mortgage may be foreclosed, and, in that event, the amount of the first mortgage must be paid out of the proceeds before any sum will be paid to the holders of the second or subsequent mortgages. If, after payment of the amount of the first mortgage and the expenses of the foreclosure sale, there is any residue, this will be paid to the second and subsequent mortgagees or lienors, in order of their priority.

Secured Creditor. A creditor who has security or collateral, in the form of personal or real property, for a sum due him from a debtor.

Securities. Stocks, bonds, and other evidences of indebtedness or of ownership in a corporation.

Seigniorage. Charge made by a government for coining bullion into money.

Sellers' Option. A contract entered into in a stock or commodity exchange, whereby the seller is given the option of delivering at any time during a specified period upon one day's notice to the buyer. Under New York Stock Exchange rules, the period of a sellers' option cannot be less than four days nor longer than sixty days. "Sellers' option four" or "sellers' option ten" designates the period during which delivery may be made. See *Bids and Offers, Buyer's Option.*

Selling Short. Selling for "future delivery." One who sells short makes an agreement whereby he agrees to deliver at a future time, a stock or commodity which he does not possess at the time he enters into the contract to deliver, with the expectation that he will be able to purchase the stock or commodity, before delivery is due, at a lower price than he sold for. One who habitually sells short is called a "bear." See *Bear.*

Shave. The fee or commission taken by a broker or by a lender of money for obtaining or granting a loan. Generally, where the shave goes to the lender, it is merely a device to cover a usurious rate of interest. Thus, if one goes to a money lender and desires to borrow $900 in cash, the money lender will sometimes require, not a note for $900, bearing the legal rate of interest of 6 per cent, but a note for $1000. The difference between the amount given to the borrower and the amount named in the note is the amount of the "shave" taken by the lender. To avoid possible penalty for making a usurious loan, notes given by borrowers are frequently "purchased" by the lender from a third party, who is in fact a straw man in the transaction. By this device, what is in fact a direct loan is made to appear to be a "purchase," it being perfectly lawful to purchase a note, at any discount, however large.

Shoe String. When a person trades in stocks or commodities on margin, with a very limited capital, he is said to be "trading on a shoe string."

Sight Draft. An order due and payable upon presentation to the person upon whom it is drawn. The ordinary bank check is, in effect, a sight draft. See *Draft.*

Silent Partner. One who has money invested in the business of a partnership and shares in its profits and losses, but whose interest in the business is not known to the general public. A silent partner is usually liable without limit for all of the debts of the partnership but only for those incurred while he maintained his interest in the business. He may, however, retire from the partnership at any time without giving notice to the public. See *Limited Partnership.*

Silver Certificate. Paper currency issued by the government of the United States as a substitute for, and representative of, silver dollars deposited with the United States treasury.

Simple Interest. Interest computed on the principal only. Simple interest is to be distinguished from compound interest. In the latter, at regular intervals, interest due or accrued is added to the principal, and interest is computed thereafter upon the principal plus the interest so credited.

Single Standard. A phrase used to describe a monometallic monetary system in which one metal is used as the sole standard of value. Formerly, nearly all countries had a bimetallic system, or double standard, in which both silver and gold were freely coined at a certain ratio. Values were then determined in terms of either silver or gold. England was the first country formally to adopt the single gold standard, the act accomplishing this reform having been passed in 1816. The single gold standard was formally adopted by the United States in 1900.

Sinking Fund. A fund created by setting aside periodically, out of earnings or revenue, sums with which to pay bonds or other long-term obligations when they mature. A sinking fund may be created also for the purpose of replacing worn-out machinery or other capital assets. See *Amortization.*

Specie. Coin, or metallic money.

Spot. A term used in quotations on commodity exchanges to indicate that the price is for immediate delivery and cash payment.

Standard Weight and Fineness. A phrase referring to the weight and purity of the metal in a monetary unit established by law. Thus, the gold dollar, existing since 1934 only in the form of bullion, has a standard weight of $15^5/_7$ grains, $^9/_{10}$ fine, that is, $^9/_{10}$ pure gold and $^1/_{10}$ copper alloy, or $13^3/_7$ grains of pure gold.

State Banks. Banks organized under the laws of a particular state and subject to state regulation. Savings banks, trust companies, and all types of commercial banks, except national banks, Federal Reserve banks, and farm loan banks, are "state banks."

Sterling. Abbreviation for the pound sterling, the unit of the English monetary system. For nearly a century the pound sterling at par was equivalent to $4.86. In early 1962 its par was $2.80.

Sterling Exchange. Bills of exchange payable in pounds sterling, and drawn upon London banking houses.

Stock. The capital stock of a corporation represents the amount invested by stockholders in the business of a corporation. From the point of view of the law, the capital so invested represents a fund to which creditors may look for payment of debts incurred by the corporation.

The capital stock of a corporation is usually divided into a number of shares which are held by the various stockholders of the company. These shares, evidenced by certificates of stock, represent the proportionate interest which each stockholder has in the corporation.

Stock Certificate. A printed or engraved certificate issued as an evidence of ownership of stock in a corporation. This certificate must be signed by authorized officials of the

company; sometimes also by a "registrar of transfers."

Stock certificates may be transferred by endorsement upon the reverse side of the certificate, or by a separate instrument of transfer. The transfer, however, vests no rights in the one to whom the transfer is made, as against the corporation, until a record of the transfer has been made on the books of the corporation.

Under these statutes, if a certificate is endorsed in blank by the holder of record, it becomes similar to a negotiable instrument, the ownership of which can be transferred by mere delivery from one person to another. Under the Uniform Stock Transfer act, which has been adopted in a majority of states, one who, in good faith, purchases a certificate which bears a valid endorsement may obtain a good title even though the certificates have been stolen from, or lost by, the true owner.

Stock Dividend. Nominally, a distribution of surplus or earnings to stockholders, in the form of additional stock, rather than in the form of cash. The use of the term distribution, in connection with stock dividends, is, however, misleading. For, in a stock dividend no property is turned over by the corporation to its stockholders. The stockholders merely receive additional evidences of their ownership or interest in the company. Thus, if a stock dividend of 100 per cent has been declared and made by a corporation, each stockholder merely holds two shares of stock where he formerly held one. The net assets of the company remain unchanged, and the proportionate interest of each stockholder in the net assets of the company remains the same. His interest in the company, however, is evidenced by a greater number of shares of stock.

Where the stock has a par value, a stock dividend operates to convert surplus on the books of the company into capital stock.

Stockjobber. A dealer in stocks of doubtful character.

Stop-loss Order. An order left by a customer with his broker directing the broker to sell stock owned by the customer in the event of a fall in the price of the stock below a certain point. The object of such an order is to check further loss where there appears a definite tendency to a decline in the price of the stock.

Where a stock or commodity has been sold short by the customer, an order would be placed with the broker to buy as soon as the price had risen to a definite point, in order to avoid greater losses, which would be incurred if the customer were compelled to cover at a still higher price.

Stop Payment. An order by a customer to a bank, directing it to refuse payment of a check or other instrument drawn by the customer upon the bank, or made payable at the bank.

A bank owes no obligation to the holder of a check drawn upon the bank by a customer, in the absence of a certification of the check by the bank. The bank may, therefore, with entire impunity, refuse payment of a check upon which the drawer has stopped payment. If the check, however, has been transferred by the payee or any other holder to a bona fide purchaser, either by endorsement or, if payable to bearer, by delivery, then the drawer of the check may be held liable to such a transferee for the amount of the check. No claim, however, can be made against the bank by any holder or transferee of the instrument.

Subpœna. A writ issued by a court of law commanding a person to appear on a certain day and at a place designated under a penalty for nonappearance or default.

Subpœna Duces Tecum (*sŭb-pē'nà dū'sēz tē'kŭm*). A court order in an action, directing a witness to bring with him any books, documents, or other papers in his possession or control which may or can be used as evidence. Such an order must describe with reasonable clearness what is wanted.

Supplementary Proceedings. A statutory remedy brought against a judgment debtor in aid of execution, for the purpose of locating and setting apart property of his to be applied in satisfaction of the judgment.

Surplus. The net worth of a firm or corporation, above its capital or capital stock. The term nominally includes both earnings from business operations and increases in the value of capital assets.

Tare. The difference between the gross and the net weight of an article in a container or vehicle. The gross weight of a barrel of flour is the total weight, including the container. The net weight is the weight of the flour itself. The difference between the gross and the net weight is the "tare."

Teller. A paying teller is an officer of a bank who pays out cash over the counter upon checks and other instruments made payable at the bank.

A receiving teller is a bank officer who receives and counts sums deposited with the bank, giving receipts for the funds deposited.

Ticker. An instrument, operated by telegraph, which automatically types messages transmitted from a central station. The instrument is used in brokers' offices, primarily for receiving prompt information with regard to stock transactions.

Time Deposit. A deposit of funds with a bank, under an agreement that the bank shall be entitled to the use of the funds for a definite period, or until a certain number of days have elapsed after notice has been given of an intention to withdraw the deposit. Deposits in savings banks are normally "time deposits."

Trade Acceptance. See *Acceptance*.

Trade Discount. A deduction, usually on a percentage basis, from the retail or "list" price of goods, allowed to a merchant by the manufacturer or jobber.

Trade-Mark. A special mark or symbol used for the purpose of identifying a certain product, or the products of a certain merchant or manufacturer. A trade-mark is protected under the law against use or appropriation by others than the one first to use the particular mark. The purpose of this protection given by the law is chiefly to prevent fraud upon the public.

Trade-marks may be registered at the United States patent office. Such registration does not add to the rights already possessed, without registry, by the owner of a trade-mark. Registration, however, provides conclusive evidence of a time since which the trade-mark has been used, and may prove of considerable value in the event of any litigation respecting the particular trade-mark.

Transfer Agent. Custodian of the stock book of a corporation, whose duty is to record transfers of stock and to issue new stock certificates in place of the surrendered certificates.

Transfer in Blank. Normally, stock is transferred by delivery, accompanied by an endorsement upon the reverse side of the stock certificate, made by the one in whose name the certificate has been issued. Where the name of the person to whom the stock is transferred is left blank, the stock certificate is said to be endorsed "in blank," and may then be transferred from one person to another by mere delivery, without further endorsement.

The stock is not effectually transferred, as against the corporation, however, until an entry of the change of ownership has been made upon the books of the corporation. And all rights of participation in benefits accruing to stockholders, including the right to dividends and the right to vote at stockholders' meetings, are determined by the record of stock ownership kept by the corporation.

Treasury Certificates. Short-term obligations bearing interest, issued by the United States government.

Treasury Notes. Paper currency issued by the United States government at intervals beginning in 1862. The term is also used to denote an intermediate credit instrument issued and sold by the United States Treasury. This act directed the purchase, by the secretary of the treasury, of 4,500,000 ounces of silver monthly, the silver to be paid for with treasury notes redeemable on demand in gold or silver. These notes were legal tender for all public and private debts. The total amount of notes so issued was $155,931,002. In 1900, Congress passed a law providing for the cancellation and retirement of these notes as rapidly as the bullion which had been purchased with the notes was coined into silver dollars and subsidiary silver. As rapidly as treasury notes have been retired, pursuant to the provisions of this act, silver certificates have been issued in their place.

Trust Companies. Corporations organized under state and federal laws, usually with powers to carry on a general commercial banking business and to act in various fiduciary capacities. These fiduciary capacities include acting as an executor under a will; administrator of the estate of a deceased person; trustee under a will, a deed of trust, or a mortgage indenture; guardian of the estate of an infant; committee of the estate of an incompetent; registrar and transfer agent of a corporation; and fiscal agent for a person, a corporation, or a municipality.

Trustee. One to whom property or rights are transferred, to be administered for the benefit of a certain person or group of persons known as the beneficiaries of the trust, or the *cestuis que trustent*.

A trustee under a will or a deed of trust is usually given the custody of property or securities, for the purpose of collecting and distributing the income for a designated period—during the minority of an infant or during the life of the beneficiary—the principal to be preserved intact by the trustee and distributed to certain persons at the termination of the trust.

A trustee under a corporate mortgage is appointed to safeguard the interests of numerous bondholders scattered throughout the country. It is the duty of such a trustee to see that the corporation which has given the mortgage does nothing to lessen the value of the property which forms the security for the bonds issued.

Underwriting. An agreement to share in the risk of a proposed venture or undertaking. Before the rise of the large insurance corporation, it was customary for a group of capitalists to underwrite a policy of fire, marine, or other insurance, each underwriter, or person who subscribed his name to the agreement, undertaking to pay a definite proportion of the loss.

The term is now frequently applied to an agreement by private banking houses, or by other dealers in securities, to provide a market for a proposed issue of bonds or other securities. Such an underwriting agreement normally contains a promise by the underwriters that they will dispose of a certain proportion of the securities to the general public on or before a certain date, and, if all of the securities are not taken up by the general public, that the underwriter will himself purchase the remainder. Where the proposed issue is large, a number of private banking houses form a "syndicate" and together underwrite the issue. They then proceed to use their joint efforts to dispose of the stock to the public. A generous commission is usually paid to the underwriters for the service rendered.

Unearned Increment. The increase in the value of land, resulting from an increase in population or from any other cause not traceable to the expenditures or efforts of the individual owner.

United States Notes. Paper money of the United States, originally issued under the act of February 25, 1862. This currency was merely a promise by the government to pay the bearer, on demand, the face amount of the note in gold. In fact, however, the notes were not redeemable until 1879, when specie payments were resumed by the government. These notes, when issued, were expressly made legal tender for all debts, and were received in payment for all public dues except customs and excise taxes. By reason of their legal-tender quality, they were popularly called "legal tenders." They were also called "greenbacks," from the color of the reverse side of the notes.

Unlisted Securities. Stocks and bonds not listed upon the recognized stock exchanges. Frequently the term is applied to any security not listed upon the New York stock exchange. See *Listed*.

Upset Price. The price below which a security or a commodity will not be offered; as, for example, by an auctioneer at a public sale.

Voucher. A receipt, evidencing a payment of money, together with a statement of the items for which the payment was made.

Wall Street. Name popularly given to the financial district of New York City, of which Wall street itself forms the center. At the corner of Broad and Wall streets are the New York Stock Exchange, the banking house of J. P. Morgan and Company, the Bankers' Trust Company, and the United States Branch Treasury.

War Baby. A corporation engaged in the sale of war materials, which sprang into existence, or came out of obscurity, and made large profits as a result of the war. The stock of such a corporation was also sometimes referred to as a "war baby."

Warehouse Receipt. A receipt issued by a warehouseman, evidencing a deposit of certain goods with him. The warehouse receipt may be negotiable; that is, it may run to the bearer or to the order of the depositor of the goods, in which case it may be transferred by delivery or by endorsement from one holder to another. When a negotiable receipt has been issued, the goods will be surrendered by the warehouseman only upon a surrender of the receipt. For many purposes, such a receipt may then be dealt with in commerce as though it were the goods themselves, since the possession of the receipt gives control over the goods. Thus, banks frequently make loans upon these negotiable receipts as collateral, and the goods themselves are bought and sold in the market by mere negotiation or delivery of the receipt.

The Uniform Warehouse Receipt act, which has been passed in most states, is designed to further the commercial dealing in negotiable warehouse receipts as the representatives of the goods. This act, however, differs from that governing negotiation of "order bills of lading," in that a pledgee or purchaser of a warehouse receipt from or through a thief or a finder gets no title to the receipt or to the goods represented by it.

Warrant. In law, a warrant is a precept, or writ, issued by a court, authorizing a public official to do some special act; as, for example, to make an arrest. In business, a warrant is a written authorization proceeding from a competent source to a proper individual, conveying power to receive either money, its equivalent, or other personal property, or to pay money to one who is entitled to receive it. In England, the term is in general use to designate a receipt for goods which have been deposited in a warehouse, showing the date of entry, the person or persons to whom the goods are deliverable, the date upon which rent commences, and all other details necessary to identify the particular parcels for which the warrant is issued. The warrant is transferable by endorsement.

Warrant, Bench. A warrant issued by a court "in bench," authorizing an officer to arrest and bring before the court persons who are in contempt, or who have disobeyed a court order, or who have been indicted. The name distinguishes this writ from warrants issued by inferior judicial officials.

Warrant, Search. A written authority of state, issued by a court, directing some judicial officer to examine a named place for articles alleged to be unlawfully concealed there. The articles most commonly searched for are stolen and embezzled goods, counterfeit money, gambling implements, and other unlawful possessions.

Wash Sales. Fictitious sales made for the purpose of creating an artificial market price for a stock or commodity. Wash sales on national exchanges are now forbidden under penalty of law. See *Pool, Bear*.

Watered Stock. Where stock has been issued, having a total nominal or par value in excess of the capital actually invested in a corporation, the stock is said to be "water." And the amount of stock issued in excess of the actual assets held by the corporation is called "water." The result of watering stock is to mislead creditors of the corporation and the general public who form a market for the sale of the stock of the corporation.

When, As, and If Issued. Frequently, when a corporation plans to issue stock or bonds to the public, a campaign for the sale of the securities will be undertaken before the necessary legal steps involved in creating the new issue of securities have been completed. The corporation, or the banking house through which it has arranged to dispose of the securities, in order to safeguard itself against the possibility of some legal obstacle preventing the proposed issue, will then offer the securities to the public "when, as, and if issued." In the event that, for any reason, the securities are not issued, the corporation or the banking house through which it operates will then not be liable to those who have given orders for the proposed stock or bonds.

Will. A formal, written instrument executed pursuant to provisions prescribed by law, providing for the distribution of the property of the testator—the person making the will—at his death. Normally, a will may be revoked or amended by the testator at any time before his death.

Under the laws of most states, a will is invalid unless it is subscribed by the testator and declared by him to be his last will and testament, in the presence of two witnesses who, at his request, also subscribe their names to the will in the presence of the testator and in the presence of each other. In some states, three witnesses are necessary. Under exceptional circumstances, as in the case of a soldier dying on the field of battle, the ordinary formalities necessary to render a will valid may be omitted.

Without Recourse. One who endorses a note, check, or other commercial instrument is usually liable to subsequent holders of the instrument, in the event of the nonpayment of the instrument at maturity, if proper presentation and protest of the instrument is made. If one desires to relieve himself from this liability, he must prefix or append to his endorsement the words "without recourse." His endorsement then merely operates to transfer such title as he has to the instrument, and carries with it no implied promise to pay the instrument in the event that the maker does not pay it at maturity.

Woman's Signature. The proper signature of a married woman is that of her legal name, which is made up of her given name followed by the surname of her husband. It is not unusual, and is generally regarded as lawful, for a woman to use her maiden name followed by the surname of her husband. The prefix "Mrs." forms no part of the legal name of a married woman.

AGRICULTURE

THE story of agriculture, like the story of the human race, begins in prehistoric times. Nevertheless, to a certain limited extent, it can be told. Through the discovery of various tools used by the ancient races, scientists have been able to trace the development of man, from the stone ages, through the periods when bronze implements were substituted for stone and when iron displaced bronze. By a somewhat similar method, the story of prehistoric agriculture has been pieced together.

Emerson has written that "the first farmer was the first man," but, according to archeological records, the earlier man knew nothing of agriculture. He was a hunter who was probably forced by hunger to eat wild fruits, grasses, and roots, when he could capture no game. Such was the condition of the men of the Paleolithic or Old Stone age. They were hunters and fishers who had fire and probably the bow and arrow, but no domestic animals, with the possible exception of the dog.

Prehistoric Agriculture. Sometime during the Paleolithic period, possibly some 25,000 to 50,000 years ago, man acquired his first ideas of planting the edible seeds from wild plants, thus producing crops of grain. The men of the next period, the Neolithic or New Stone age, not only polished their stone tools and kept dogs, sheep, goats, and oxen, but also learned to raise wheat, barley, and millet. Where wheat was first found is an unsolved question that has provoked much discussion. Many scientists now believe that it originated as a wild grass, somewhere in the region of the eastern Mediterranean. The grain was gradually improved and ultimately carried to all parts of the earth. It did not reach the American continent until after Columbus' voyage, nor was it known in Australia until 1788.

Although Neolithic man had learned some of the benefits of keeping domestic animals and of planting grain, he nevertheless depended on hunting and fishing for a large part of his food and clothing. But the hunters slowly changed their modes of living to those of shepherds or farmers. Some tribes increased their herds of cattle and sheep, and adopted the nomadic life necessary to guarding their animals and leading them to new pastures. Others found that in certain rich valleys food was most easily obtained by erecting permanent dwellings and devoting their energies to tilling the soil. From farming settlements of this kind, made in Mesopotamia and Egypt, came the first civilized communities of which any record can be found.

Ancient Agriculture. Five thousand years before Christ, both in the valley of the Nile and in the rich country between the Tigris and Euphrates rivers, crops of bearded wheat, six-rowed barley, millet, flax, and durra, which is a variety of sorghum, were raised by tillage and irrigation. The earliest Egyptians seem to have known onions, garlic, radishes, beans, chick-peas, lentils, and the castor bean. Cattle grazed on the grass covered range; poultry and swine were well known; sheep were raised for their wool, goats for their milk, and camels and donkeys for burden bearers. Horses were not introduced until 1900 B. C., when the nomadic shepherd kings from Asia conquered the country. For fruit the Egyptians had watermelons, grapes, olives, figs, pomegranates, and dates.

On coming further down the scale of time, we find that the Greeks raised wheat and barley as their chief cereals, and that they had hemp as well as flax. They had mules and commonly kept swarms of bees. To the vegetables known to the Egyptians, the Greeks added beets, cabbage, lettuce, turnips, kidney beans, and garden peas. Naturally they did not have the date palm, but they had the almond tree, and also apples, quinces, cherries, pears, and plums. The Greeks are said to have been the first to apply manure to the fields, and to plow under a growth of green lupine in order to enrich the land.

The Romans gave much attention to agriculture, and fortunately left many accurate records telling of their crops and the methods used to produce them. They carefully plowed and harrowed their fields and were acquainted with methods of drainage. Oxen were used as work animals on the Roman farms, and mules as beasts of burden. Much attention was given to breeding fine horses, sheep, swine, cattle, many kinds of poultry, and even hares, fish, snails, and dormice. Oats and rye, celery, peaches, apricots, and melons were added to the list of products known to the older nations, and alfalfa was raised for fodder. Milk was obtained chiefly from sheep and goats, and was made into cheese by curdling with lamb's or kid's rennet. As the Romans came into possession of great tracts of land taken from vanquished nations, they developed an extensive system of working large foreign estates by means of slaves. The popular demand for the division among the common people of these great holdings of state-owned land was resisted by the aristocratic possessors, and this dispute led to one of the greatest internal struggles in the history of Rome.

Medieval Period. During the dark ages which followed the conquest of Rome, agriculture made very little progress, for the conquerors were a warlike people who had reached a stage of development not far above the pastoral. There were, however, two agencies that carried on agricultural work with great activity. In Spain, the Moors, or Arabs, who were also great engineers, brought in rice, cotton, and sugar, and when necessary used irrigation to bring the land to a high degree of cultivation. At the same time, in western Europe, the members of many religious brotherhoods studied the manuscripts left by the Romans, and worked with great energy to improve on the crops and the methods of producing them. Much later, toward the end of the middle ages, the people of the Low Countries—the Netherlands and Belgium—gained a great reputation as farmers and dairymen, and northern Italy was so intensively cultivated during the 13th and 14th centuries that it not only supported a large population, but it also exported much grain.

Contemporary with the development in Europe, the Chinese, and the Incas of Peru had reached a very high state of agricultural production. Both nations understood the use of fertilizers and of methods of irrigation. The important crops of the Chinese have for centuries been wheat, rice, tea, cotton, and silk for which large amounts of mulberry leaves are required. The ancient Peruvians terraced the hillsides in order to make use of all available ground. Their principal crops were corn, potatoes, and cotton; much coca also was grown for the alkaloid contained in its leaves. The chief beast of burden was the llama, and the alpaca was raised for its hair. Neither of these nations has made any permanent impression on modern methods of agriculture. The civilization of the Incas is extinct, and the typical Chinese farmer of today still prefers the methods of cultivation used by his ancestors of one or two thousand years ago.

Modern Improvements. The two greatest improvements in modern agriculture may be said to be due to the proper rotation of crops and a chemical knowledge of fertilizers. The value of the first was demonstrated when Lord Townsend established in England the Norfolk system, consisting in the annual rotation of wheat, turnips, barley, and clover. This permitted half of the land to be used for grain, while the other half produced fodder with which to fatten cattle. Under this system, the land was neither exhausted by the continuous growth of one crop nor unproductive from lying fallow, cattle raising was promoted, and much of the product of the land was returned to it as manure.

A knowledge of the chemical composition of plants and of soils came at first from the work of Liebig in the beginning of the 19th century. This led to the scientific use of artificial fertilizers containing potash, phosphorus, and nitrogen. Breeding experiments have led to better types of all farm animals, and, by means of modern methods of transportation, the most satisfactory breeds of plants or animals can be quickly sent to any part of the world.

Investigations in agricultural science are promoted by the governments of practically every civilized nation, with the result that modern agricultural practice is based on knowledge rather than on the Chinese system of adherence to the ways of their ancestors.

AGRICULTURE IN THE UNITED STATES

The first farmers of North America were the Indians, who, long before the coming of the white race, were accustomed to raise beans, pumpkins, squashes, peppers, onions, sunflowers, tobacco, and, most important of all, maize or Indian corn. This was most fortunate for those pioneers who arrived in 1607 and 1620, for, without the corn which they obtained from the Indians, the settlers both of Jamestown and of Plymouth would have starved during their first winters in America.

First Experiments. The early history of agriculture after the arrival of the settlers is one of adaptation and adjustment. The summers at Jamestown were so warm that it seemed that semitropical vegetation should be successful. Consequently, pineapples, French grapes, olives, figs, ginger, and sugar cane were planted, and attempts were made to raise silkworms. Naturally these undertakings, begun in ignorance of the colder winters, were failures. Furthermore, because of the high summer temperature and very rich earth, the wheat plant grew luxuriantly but failed to produce much grain. Tobacco was an early success and proved so profitable that all other crops were neglected until laws were made requiring each planter to raise a certain amount of corn and other food products.

In New England, a friendly Indian named Squanto taught the newcomers to plant corn. The earth was exposed to the sun by girdling the trees and burning the branches and underbrush. Four grains of corn and two beans were then dropped at four-foot intervals into openings made with an ax or hoe. If possible, a fish was placed in each hill for fertilizer. Later, when the plants were high enough, the ground was piled up around the base of the stalks. White potatoes, which are native to South America, were brought from England by the settlers and were not previously cultivated by the Indians, although the natives in the South were well acquainted with the sweet potato. Cattle and hogs, both in the North and in the South, were allowed to run wild in the woods, where they developed rapidly and often formed large herds.

Experiments gradually taught what crops were most satisfactory and profitable in each section. Buckwheat was introduced into New York by the Dutch in 1625. Apples were planted on Governors island in Boston harbor, and the first fruit was picked October 10, 1639. Cherries were brought first to Virginia, in 1641. Rice, which in 1647 had been a failure in Virginia, was tried at Charleston in 1693, and, together with indigo, soon became the principal crop of South Carolina and Georgia. Long fiber or sea-island cotton was introduced into these states in 1786, and, by this time, the best crops were so well established that, except for sorghum and alfalfa, nothing new was introduced during the next century.

Regional Differences. Agriculture as practiced in the southern colonies soon became differentiated from that in the North.

In New England the growing season was shorter. Land was harder to prepare for use because of its stony character and the extensive forests. Help was hard to obtain and the climate did not lend itself to any one highly profitable crop. Consequently each family raised most of the products necessary for its subsistence—grain, vegetables, fruit, cattle, swine, and other farm animals. Lumbering, fishing, and shipbuilding sometimes provided auxiliary sources of income.

In the South, however, the land was richer and the growing season was long and warm. Rice, indigo, sugar cane, and cotton proved highly profitable, especially when cultivated on a large scale with the help of cheap labor. This was supplied by indentured servants, convicts, and, later, by Negro slaves. The typical farm, or plantation, was about 5000 acres, about 50 times the size of the Northern farm. It was operated as a source of profit for the owner rather than as a means of family subsistence.

Cotton. The use of the newly invented spinning jenny and power loom between 1767 and 1790 produced a large demand in England for American cotton. In 1793 the difficult problem of separating the cotton fiber from the seeds was solved by Eli Whitney's invention of the cotton gin. The result was a vast increase in cotton production, exports rising 200 fold between 1791 and 1803. Its cultivation, formerly confined to Georgia and North Carolina, had, by 1815, spread north to Virginia and west and south to Alabama and Mississippi. As the soil became exhausted under this one-crop agriculture, new land was brought under cultivation in Louisiana, Texas, and Oklahoma. The United States instantly assumed and maintained a position of dominance in the world's cotton production. The cotton crop was admirably adapted to Negro labor, a fact which made Negro slavery the outstanding feature of Southern economic life until the Civil War.

Wheat and Corn. While the South was devoting all its energies to the production of cotton, settlers were moving west across the northern and central states. By its policy in granting small homesteads, the government encouraged family-sized holdings. Labor was difficult to obtain, since few men cared to work for others when they could take up new government land at a very small cost and work for themselves. The farmers produced principally corn, wheat, and other grains, besides potatoes, fruit, and live stock. Much of the grain was fed to live stock, which commanded a ready and profitable market. Excess production was sold in the South.

In the meantime the cultivation of corn in the region lying roughly between the winter wheat area and the spring wheat area increased rapidly. This region became known as the corn belt. It included chiefly western Ohio, Indiana, Illinois, Iowa, Missouri, eastern Nebraska, and southeastern South Dakota. The corn was partly exported, but principally it was used to fatten hogs. The United States thus became the largest producer of corn and of hogs.

Farm Animals. Cattle and hogs were first brought to Florida from the West Indies in 1638; to Newfoundland by the Portuguese in 1553; and to Canada and Virginia in 1608. Although horses were taken to Florida in 1527, all of these were killed, and it was not until 1838 that others were imported. In the early days the sheep were small, with a light coat of coarse wool, the hogs were long-legged and thin, the cattle were light and wiry, and the cows produced only enough milk for their calves. Gradually, however, fine animals were imported from Europe, and, from these, careful breeding produced the splendid present-day herds of dairy and beef cattle, the enormous short-legged pork- and lard-producing hogs, sheep that yield from 15 to 30 pounds of wool at a clip, and flocks of hens that average at least 120 eggs a year instead of one or two dozen.

POPULATION: TOTAL AND FARM, UNITED STATES, 1917-1960

Year	Total Population 000 omitted	Farm Population		Year	Total Population 000 omitted	Farm Population	
		Number 000 omitted	% of total			Number 000 omitted	% of Total
1917	103,052	32,326	31.4	1939	130,642	29,388	22.5
1918	104,266	31,741	30.4	1940	131,820	29,047	22.0
1919	104,935	30,886	29.4	1941	133,076	28,786	21.6
1920	106,089	31,556	29.7	1942	134,483	27,895	20.7
1921	108,023	31,638	29.3	1943	136,278	25,757	18.9
1922	109,676	31,558	28.8	1944	138,016	24,647	17.9
1923	111,476	30,873	27.7	1945	139,584	24,342	17.4
1924	113,573	30,493	26.8	1946	141,032	25,543	18.1
1925	115,402	30,440	26.4	1947	143,478	26,147	18.2
1926	117,007	30,162	25.8	1948	146,044	25,093	17.2
1927	118,628	29,647	25.0	1949	148,562	25,134	16.9
1928	120,135	29,599	24.6	1950	151,132	24,335	16.1
1929	121,453	29,564	24.3	1951	153,699	23,276	15.1
1930	122,775	29,447	24.0	1952	155,761	24,283	15.6
1931	123,841	29,723	24.0	1953	158,313	22,679	14.3
1932	124,658	30,229	24.2	1954	161,191	21,890	13.5
1933	125,401	31,198	24.9	1955	164,303	22,158	13.4
1934	126,192	31,071	24.6	1956	167,261	22,257	13.3
1935	127,057	30,887	24.3	1957	170,293	20,396	11.9
1936	127,886	30,420	23.8	1958	173,260	20,827	12.0
1937	128,649	29,903	23.2	1959	177,131	21,172	12.0
1938	129,589	29,573	22.8	1960	179,323	20,541	11.4

FARM POPULATION BY STATES, 1960*

State	Population	State	Population	State	Population
Alabama	1,475,019	Louisiana	1,196,416	Ohio	2,583,235
Alaska	140,400	Maine	472,151	Oklahoma	863,498
Arizona	331,545	Maryland	846,857	Oregon	668,565
Arkansas	1,020,969	Massachusetts	846,048	Pennsylvania	3,217,315
California	2,144,049	Michigan	2,084,062	Rhode Island	116,591
Colorado	461,157	Minnesota	1,291,298	South Carolina	1,401,208
Connecticut	549,667	Mississippi	1,357,336	South Dakota	413,334
Delaware	153,504	Missouri	1,443,256	Tennessee	1,702,261
Florida	1,290,177	Montana	336,310	Texas	2,392,207
Georgia	4,762,880	Nebraska	645,277	Utah	223,469
Hawaii	148,811	Nevada	84,574	Vermont	239,960
Idaho	350,094	New Hampshire	253,155	Virginia	1,762,036
Illinois	1,940,843	New Jersey	692,413	Washington	909,965
Indiana	1,752,349	New Mexico	324,544	West Virginia	1,149,320
Iowa	1,295,025	New York	2,450,379	Wisconsin	1,429,598
Kansas	849,870	North Carolina	2,754,234	Wyoming	142,515
Kentucky	1,684,941	North Dakota	409,738	Total	54,054,425

* Figures include persons living on farms or in places of less than 2500 population.
Source: *Bureau of the Census*

NUMBER, ACREAGE, AND VALUE OF FARMS BY STATES

State	Number of Farms				All land in Farms (thousands of acres)			
	1940	1945	1950	1963	1940	1945	1950	1963
Alabama	231,746	223,369	211,512	115,788	19,143	19,068	20,889	16,543
Alaska	*	*	*	367	*	*	*	888
Arizona	18,468	13,142	10,412	7,233	25,651	37,856	39,916	40,203
Arkansas	216,674	198,769	182,429	95,007	18,045	17,456	18,871	16,459
California	132,658	138,917	137,168	99,274	30,524	35,054	36,613	36,888
Colorado	51,436	47,618	45,578	33,390	31,527	36,218	37,953	38,787
Connecticut	21,163	22,241	15,615	8,292	1,512	1,593	1,272	884
Delaware	8,994	9,296	7,448	5,208	896	923	851	763
Dist. Col.	65	40	28	N.A.	2	2	1	N.A.
Florida	62,248	61,159	56,921	45,100	8,338	13,084	16,528	15,237
Georgia	216,033	225,897	198,191	106,350	23,684	23,676	25,751	19,658
Hawaii	*	*	*	6,242	*	*	*	2,462
Idaho	43,663	41,498	40,284	33,670	10,298	12,503	13,224	15,232
Illinois	213,439	204,349	195.268	154,644	31,033	31,602	30,978	30,327
Indiana	184,549	175,970	166,627	128,160	19,801	20,801	19,659	18,613
Iowa	213,318	208,934	203,159	174,707	34,149	34,454	34,265	33,831
Kansas	156,327	141,394	131,394	104,347	48,174	48,589	48,611	50,153
Kentucky	252,894	238,501	218,476	150,986	20,294	19,725	19,442	17,031
Louisiana	150,007	129,295	124,181	74,438	9,996	10,040	11,202	10,347
Maine	38,980	42,184	30,358	17,360	4,223	4,613	4,182	3,082
Maryland	42,110	41,275	36,107	25,122	4,198	4,200	4,056	3,457
Massachusetts	31,897	37,007	22,220	11,179	1,938	2,078	1,660	1,142
Michigan	187,589	175,268	155,589	111,817	18,038	18,392	17,270	14,783
Minnesota	197,351	188,952	179,101	145,662	32,607	33,140	32,883	30,796
Mississippi	291,092	263,528	251,383	138,142	19,156	19,617	20,711	18,630
Missouri	256,100	242,934	230,045	168,672	34,740	35,278	35,123	33,155
Montana	41,823	37,747	35,085	28,959	46,452	58,787	59,247	64,081
Nebraska	121,062	111,756	107,183	90,475	47,344	47,753	47,467	47,756
Nevada	3,573	3,429	3,110	2,354	3,785	6,178	7,064	10,943
New Hampshire	16,554	18,786	13,391	6,542	1,809	2,017	1,714	1,124
New Jersey	25,835	26,226	24,838	15,459	1,874	1,818	1,725	1,379
New Mexico	34,105	29,695	23,599	15,919	38,860	49,608	47,522	46,293
New York	153,238	149,490	124,997	82,356	17,170	17,568	16,017	13,490
North Carolina	278,276	287,412	288,508	190,567	18,845	18,618	19,318	15,888
North Dakota	73,962	69,520	65,401	54,928	37,936	41,001	41,194	41,466
Ohio	233,783	220,575	199,359	140,353	21,908	21,928	20,969	18,507
Oklahoma	179,687	164,790	142,246	94,676	34,803	36,162	36,007	35,801
Oregon	61,829	63,125	59,827	42,573	17,988	19,754	20,328	21,236
Pennsylvania	169,027	171,761	146,887	100,052	14,594	15,020	14,113	11,862
Rhode Island	3,014	3,603	2,598	1,395	222	265	191	138
South Carolina	137,558	147,745	139,364	78,172	11,239	11,022	11,879	9,150
South Dakota	72,454	68,705	66,452	55,727	39,374	43,032	33,786	44,851
Tennessee	247,617	234,431	231,631	157,688	18,493	17,789	18,534	16,081
Texas	318,002	384,977	331,567	227,071	137,683	141,338	145,389	143,218
Utah	25,411	26,322	24,176	17,811	7,302	10,309	10,865	12,689
Vermont	23,582	26,490	19,043	12,099	3,667	3,931	3,527	2,945
Virginia	174,885	173,051	150,997	97,623	16,445	16,358	15,572	13,126
Washington	81,686	79,887	69,820	51,577	15,182	16,720	17,369	18,717
West Virginia	99,282	97,600	81,434	44,011	8,909	8,720	8,215	6,063
Wisconsin	186,735	177,745	168,561	131,215	22,876	23,615	23,221	21,156
Wyoming	15,018	13,076	12,614	9,744	28,026	33,117	34,421	36,200
Total	6,096,799	5,859,169	5,382,162	3,710,503	1,060,852	1,141,615	1,158,566	1,223,508

* Statistics not available.
Source: *Department of Commerce, Bureau of the Census*

NUMBER, ACREAGE, AND VALUE OF FARMS BY STATES

State	Average Acreage per farm		Total Value (thousands of dollars)			Average Value per Farm $		Average Value per Acre $	
	1950	1963	1945	1950	1959**	1950	1963	1950	1963
Alabama	98.8	142.8	559,743	1,016,866	1,528,000	4,624	12,780	48.08	89.45
Alaska	*	2,419.6	*	*	20,000	*	48,379	*	19.99
Arizona	3,833.7	5,558.2	289,876	637,466	3,148,000	47,040	269,724	15.97	48.53
Arkansas	103.4	173.2	622,770	1,151,146	1,694,000	6,151	18,915	61.00	109.19
California	266.9	371.5	5,484,549	5,907,555	13,863,000	40,543	131,212	161.35	353.12
Colorado	832.7	1,161.6	564,504	1,234,994	2,151,000	26,164	61,494	32.54	52.94
Connecticut	81.5	106.6	263,023	315,251	380,000	20,011	47,372	247.77	444.13
Delaware	114.3	92.9	72,694	97,141	191,000	12,569	34,551	114.11	235.98
Dist. Col	45.2	*	4,961	.....	*	4,871	*	3,688.41	*
Florida	290.1	337.8	498,400	905,658	3,523,000	15,081	73,554	54.85	217.72
Georgia	129.9	184.8	654,244	1,114,506	1,968,000	5,336	17,944	43.28	97.08
Hawaii	*	394.4	*	*	*	*	*	*	*
Idaho	328.3	452.4	493,331	965,498	1,934,000	22,475	50,528	73.01	111.69
Illinois	158.6	196.1	3,662,545	5,394,905	9,692,000	16,550	61,946	136.90	315.87
Indiana	118.0	145.2	1,868,351	2,858,969	4,955,000	14,575	38,489	136.34	265.02
Iowa	168.7	193.6	3,611,140	5,506,670	8,606,000	27,566	49,150	160.71	253.82
Kansas	370.0	480.6	1,971,331	3,198,628	5,043,000	24,756	48,084	65.80	100.04
Kentucky	89.0	112.8	1,015,796	1,572,256	2,259,000	7,192	15,269	80.87	135.37
Louisiana	90.2	139.0	472,328	920,939	1,765,000	7,011	23,719	82.21	170.63
Maine	137.7	177.5	159,681	226,518	255,000	7,587	14,756	54.17	83.11
Maryland	112.3	137.6	354,807	507,225	954,000	4,212	39,095	125.0	284.12
Massachusetts	74.7	102.1	265,232	314,710	357,000	13,683	31,692	189.54	310.14
Michigan	111.0	132.2	1,199,290	1,704,440	2,805,000	10,965	25,535	98.52	193.15
Minnesota	183.6	211.4	1,833,761	2,777,316	4,752,000	15,749	32,605	84.46	154.22
Mississippi	82.4	134.8	647,562	1,147,791	2,032,000	4,421	14,292	55.42	105.97
Missouri	152.7	196.5	1,526,961	2,235,939	3,663,000	9,776	22,094	63.66	112.40
Montana	1,688.7	2,212.8	517,891	1,007,206	2,341,000	2,766	76,761	17.00	34.69
Nebraska	442.9	527.8	1,699,210	2,735,039	4,239,000	25,960	46,796	57.62	88.66
Nevada	2,271.2	4,648.7	71,956	160,342	391,000	36,078	141,974	22.70	30.54
New Hampshire	128.0	177.5	80,395	124,845	119,000	8,921	18,046	72.85	105.00
New Jersey	69.5	89.2	292,981	505,278	741,000	19,635	46,397	292.84	520.12
New Mexico	2,013.7	2,908.0	326,751	765,101	1,339,000	26,837	68,233	16.10	23.46
New York	128.2	163.8	1,087,522	1,467,452	196,000	11,847	23,936	91.62	146.13
North Carolina	67.0	83.3	1,002,983	1,905,714	3,071,000	6,490	15,475	98.65	185.61
North Dakota	629.9	754.9	708,322	1,188,860	2,161,000	18,014	38,978	28.86	51.63
Ohio	105.2	131.8	1,868,351	2,858,969	453,000	14,575	32,583	136.34	247.11
Oklahoma	253.1	378.1	1,106,154	1,851,460	3,028,000	13,045	31,710	51.42	83.86
Oregon	339.8	498.8	697,775	1,275,156	2,018,000	19,963	43,608	62.73	87.42
Pennsylvania	96.1	118.5	1,008,574	1,509,651	2,181,000	10,349	21,892	106.97	184.65
Rhode Island	73.5	98.8	35,610	44,328	58,000	16,941	37,571	232.02	379.98
South Carolina	85.2	117.0	440,632	830,349	1,270,000	5,648	15,685	69.06	134.01
South Dakota	674.0	804.8	764,300	1,402,235	2,343,000	20,830	40,852	31.31	50.76
Tennessee	80.0	102.0	870,948	1,431,966	2,117,000	6,154	13,288	77.26	130.30
Texas	438.5	630.6	3,574,998	6,718,426	12,429,000	20,269	51,787	46.21	82.11
Utah	449.4	706.8	261,818	525,657	903,000	19,146	42,391	47.67	59.50
Vermont	185.2	244.2	134,576	196,405	237,000	10,343	19,837	55.68	81.49
Virginia	103.1	134.4	868,806	1,277,240	1,843,000	8,449	18,635	82.02	138.60
Washington	248.8	362.8	900,184	1,499,140	2,788,000	20,744	47,590	86.78	131.14
West Virginia	100.9	137.7	341,008	487,209	460,000	5,852	10,230	59.31	74.27
Wisconsin	137.8	161.2	1,434,295	2,056,925	2,788,000	12,220	21,309	88.58	132.16
Wyoming	2,727.1	3,704.7	232,043	473,287	805,000	33,352	79,447	13.75	21.39
Total	215.3	329.7	46,388,926	75,829,925	127,855,000	13,941	*	66.64	*

* Statistics not available. ** Latest available.
Source: *Department of Commerce, Bureau of the Census*

In the second half of the 19th century the western plains supported huge herds of cattle on unfenced ranges. As the area of cultivation was extended, the ranges were fenced off, but the amount and the quality of beef production increased as a result of better breeding. The fattening of cattle for market, like the raising of hogs, became especially important in the corn growing regions because, by feeding the grain to animals, a higher-priced product was obtained. For the same reason the combination of grain raising and milk production was profitable near the large cities.

Farm Machinery. In the first half of the 19th century, farming was carried on almost entirely by hand labor with the help of a few simple tools, much as it had been since the dawn of history. From 1830 to 1860, horse-drawn implements were made available in considerable variety, but only after the Civil War was there a sweeping adoption of them. Seeders and cultivators replaced the hoe; mowing machines, the scythe, reapers, the cradle; threshing machines, the flail. Among scores of other important farm machines are cream separators and milkers, corn cutters, hay loaders, and manure spreaders. Illustrative of the economic and human value of such devices is a statement issued by the United States department of agriculture, that the human labor required to produce a bushel of grain had decreased on the average from 3 hours and 30 minutes in 1830 to 10 minutes in 1896, the cost of this labor declining from 17¾ cents to 3⅛ cents. In the 20th century this reduction in cost was carried very much further as the result of the application of power to agriculture.

Power Farming. In 1870, practically the entire non-human power on farms was in the form of farm animals. Even in 1900 they represented about 80 per cent of the available power, the remainder being steam engines, gas engines, and windmills. By 1919, however, the number of horses and mules on farms reached its maximum, 26,436,000, and thereafter declined with increasing rapidity. By 1923, mechanical power exceeded animal power, the principal forms being stationary gas engines, gasoline tractors and trucks, steam engines, electricity, and windmills. In the years from 1920 to 1940, the number of tractors on farms increased over 14-fold, and was approximately 1,400,000 by 1940. The total power available on the farm is approximately equal to that at the service of the combined factories, public utility plants, and mines of the country—over 60 million horse power.

The use of the tractor has made it possible for individuals to work much larger areas than formerly. Plowing and cultivating can be done much more quickly and at the most suitable time. Harvesting wheat with the combine, which cuts and threshes in a single operation, greatly reduces the cost of this process when a sufficiently large area of suitable land is worked. The use of the combine in the United States increased 20-fold from 1923 to 1927. The corn harvester, corn husker, silage cutter, and silo filler eliminate the most laborious and costly part of hand labor in raising corn. Even in the raising of cotton, mechanical methods have made rapid headway, particularly in western Texas and Oklahoma. The tractor-drawn plow, the "sled", which strips the cotton bolls, opened and unopened, at a single operation, and the cotton cleaner, used in connection with the gin, radically reduce the unit cost of production.

Automobiles and trucks effect great saving of time in marketing and in moving about the farm, making possible the cultivation of more land at a greater distance from shipping points. Electricity has been made increasingly available to farms, so that many minor operations can be performed through electric motors, particularly dairying and household operations, by which much of the former domestic drudgery is eliminated. Radio is utilized both as entertainment and for obtaining weather and market reports.

Economic Change. The pressure of demand, the scarcity of labor, and the attractive prices for farm products occasioned by World Wars I and II hastened the adoption of labor-saving devices and the use of power machinery on the farm. The result after World War I was a world-wide surplus, despite Russia's withdrawal from the export market, and prices fell rapidly. War-impoverished importing nations lacked purchasing power and the increasing replacement of the horse by the automobile cut down the market for hay and oats. The productive capacity of Canada, Argentina, Australia, and certain other ccuntries had increased at even faster rate than that of the United States. The result was a market in which only the most efficient producers could make a profit. Road and other improvements increased taxes while farm income decreased. Small-scale farmers were forced, in large numbers, to abandon their farms. The earlier scale of land values was completely upset, with the resulting failure of many banks.

Between 1920 and 1930 there was a net decrease of farm population in the United States of about 3 millions, which was only slightly increased later. Cultivated land also decreased by more than 13,000,000 acres. Yet, in the same period the total crop production increased about 20 per cent and the productivity of each worker increased by about 30 per cent. This situation indicated, after World War I, heightened efficiency of agriculture, but the distress caused by the process made the relief of agriculture a political question of importance.

Today American farms are outstanding in producing food to feed, not only Americans, but people more or less dependent upon the United States for subsistence since World War II.

CIVILIAN CONSUMPTION OF PRINCIPAL FOODS

(in pounds per capita)

Source: *Economic Research Service*

Foods	1957–59 Average	1950	1962
Red meats	156.6	161.0	163.7
Poultry meats	33.5	37.8	37.2
Eggs (number)	356	326	32.4
Fluid milk and cream	337	314	311
Cheese	7.9	8.6	9.2
Butter	8.2	7.4	7.2
Fats and oils*	37.1	37.9	39.4
Fresh fruits	98.8	92	88.7
Processed fruits	48.2	48.6	48.9
Fresh vegetables	104.3	105.1	102.9
Processed vegetables	52.7	54.7	57.6
Potatoes	103	103	102
Sugar	96.1	97.8	97.2
Corn products	27.3	28.1	29
Wheat flour	120	118	115
Coffee	15.8	15.9	15.8
Tea	.6	.6	.68
Cocoa beans	4.0	4.4	4.1

*Excluding butter.

Agricultural Adjustment. The first governmental attack on the problem was an attempt to

FARM TENANCY

Source: U. S. Bureau of the Census

Year	Farms Operated by Tenants	Total Farms	Tenancy as of % of total
1900	1,295,000	4,565,000	28.4
1910	2,355,000	6,362,000	37.
1920	2,455,000	6,448,000	38.1
1930	2,664,000	6,289,000	42.4
1940	2,361,000	6,097,000	38.7
1950	1,444,000	5,382,000	26.8
1959	759,952	3,710,292	20.5

support prices of farm products. Tried out in 1929-33, it failed because of uncontrolled production.

The second attack was through the Agricultural Adjustment act of 1933. This law empowered the secretary of agriculture to pay producers for withholding a proportion of their normal acreage from production of certain basic crops. The law was declared unconstitutional by the Supreme Court in January 1936. This act was supplemented by the Agricultural Adjustment Act of 1938, which had the following principal features designed to provide an "ever normal granary":

Acreage allotments are made annually for growing these major crops—corn, wheat, cotton, rice, and tobacco. Farmers who consent to abide by the allotments and who observe specified soil-conserving practices obtain benefit payments based on various factors and preference in access to federal crop loan facilities. If any major crop is estimated to be above normal by a certain amount, marketing quotas are set which, if made effective, may not be exceeded by farmers without payment of a fine. Such quotas become effective only if approved in a referendum by at least two-thirds of the farmers affected. Wheat crops may be insured with the Federal Crop Insurance Corporation on payment of a premium either in cash or wheat. The secretary of agriculture is authorized to make so-called parity payments to producers of the major crops if funds are appropriated for the purpose.

Parity payments are payments designed to raise farm per capita income to the point at which it bears the same relation to non-farm per capita income as farm income bore to non-farm income in the period from August 1909 to July 1914.

Co-operatives. The procedure of pooling farm produce in America for the purpose of selling it to better advantage is carried on voluntarily by farmers through associations known as Co-operatives.

The Capper-Volstead act of 1922 protected these associations at first, when properly conducted, from prosecution under the antitrust laws. They are fostered by a co-operative division of the farm credit administration, which disseminates information concerning supply, demand, prices, and those practices found advantageous by co-operative organizations.

Another form of co-operative enterprise which, in America, has developed chiefly in farm communities is the so-called "consumer" co-operative. Its aim is to secure for members the price benefits of large-scale buying. In many cases, these associations own their own stores, warehouses, and factories. Business done through them by farmers reached a pre-war high of $250,000,000 in 1938. They have been chiefly active in the purchase of gasoline, seed, and fertilizer and in the building and operation of rural electric distribution systems under the encouragement of the rural electrification administration.

The increase in business done by farmers' marketing and purchasing co-operatives since 1915 is shown by the following table:

AGRICULTURAL CO-OPERATIVES
Source: *Farm Co-operative Service*

Marketing Season	Number	Estimated Membership (thousands)	Business (Millions of $)
1915	5,424	651	636
1925	10,803	2700	2400
1930	11,950	3000	2400
1935	10,500	3660	1840
1940	10,600	3400	2280
1941	10,550	3600	2840
1942	10,450	3850	3780
1943	10,300	4390	5160
1944	10,150	4505	5645
1945	10,150	5010	6070
1946	10,125	5436	7116
1947	10,135	5900	8635
1948	10,075	6384	9320
1949	10,035	6584	8726
1950	9,997	7054	10,473
1961	9,163	7203	12,414

Of the total for the 1961 season, the marketing co-operatives did $9,941,915,000 worth of business as against $2,472,286,000 by the purchasing co-operatives.

OPERATIONS OF CO-OPERATIVES, 1961
Source: *Farm Co-operative Service*

Leading State	Associations Number	Membership Number	Business $1000
California	420	127,530	1,285,416
Minnesota	1,159	601,530	867,022
Iowa	618	427,750	704,315
Illinois	447	470,225	670,399
Wisconsin	688	400,690	655,465
New York	410	146,085	611,852
Texas	515	179,360	600,041
Ohio	269	322,745	598,352
Kansas	344	204,840	444,361
Indiana	134	422,000	412,820
All others	4,159	3,900,140	5,564,158
Total	9,163	7,202,895	12,414,201

Chief Crops for United States 1930-1962

Source: *Economic Research Service; Dept. of Agriculture*

Year	All Corn	Oats	Barley	Sorghums for grain	Wheat	Rye	Buckwheat	Rice
	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bags
1930	2,080,130	1,274,592	301,619	37,561	886,522	45,383	6,967	20,218
1935	2,299,363	1,210,229	288,667	57,610	628,227	56,938	8,488	17,753
1940	2,457,146	1,246,450	311,278	85,824	814,646	39,725	6,476	24,495
1944	3,087,982	1,149,240	276,275	184,978	1,060,111	22,525	8,956	30,974
1945	2,868,795	1,523,851	266,994	96,063	1,107,623	23,708	6,467	30,668
1946	3,217,076	1,477,573	265,059	106,025	1,152,118	18,487	6,812	32,497
1947	2,354,739	1,176,142	281,868	93,217	1,358,911	25,497	7,177	35,217
1948	3,605,078	1,450,186	315,537	131,384	1,294,911	25,886	6,085	38,275
1949	3,238,618	1,254,855	237,071	148,299	1,098,415	18,102	4,956	40,737
1950	3,057,803	1,410,464	303,533	233,278	1,019,389	21,257	4,439	38,689
1951	2,941,423	1,316,396	254,668	159,265	987,474	21,410	3,340	43,805
1952	3,279,403	1,260,127	226,014	83,024	1,298,957	16,046	3,205	48,107
1953	3,192,491	1,209,458	242,544	109,353	1,169,484	18,163	3,193	52,607
1954	2,964,639	1,499,579	370,126	204,087	969,781	23,688	2,719	58,853
1955	3,229,743	1,503,074	401,225	242,526	934,731	29,055	1,934	55,902
1956	3,455,283	1,163,160	376,873	206,205	1,004,272	21,155	2,032	49,459
1957	3,422,231	1,300,954	437,170	564,324	950,662	27,243	1,871	42,935
1958	3,799,844	1,422,164	470,449	614,845	1,462,218	32,485	1,783	47,015
1960	3,908,070	1,555,312	431,309	619,867	1,357,272	33,052	810	54,591
1961	3,625,530	1,011,398	395,669	479,751	1,234,743	27,476	864	54,198
1962	3,643,615	1,031,743	429,495	509,137	1,092,562	41,175	729	64,458

Chief Crops for United States 1930-1962—Cont.

Year	Flaxseed	Cotton		Tobacco	Hay	Sorghums for forage	Sorghums for silage	Beans dry edible
		Lint	Seed					
	1,000 bushels	1,000 bales	1,000 tons	1,000 pounds	1,000 tons	1,000 tons	1,000 tons	1,000 bags
1930	21,673	13,932	6,028	1,648,037	74,527	6,326	572	14,341
1935	14,914	10,638	4,634	1,302,041	90,364	12,052	3,133	14,335
1940	30,924	12,566	5,286	1,460,441	96,050	16,110	6,217	16,945
1944	21,665	12,230	4,902	1,950,940	102,889	11,552	5,644	16,147
1945	34,557	9,015	3,664	1,991,108	107,438	9,543	3,570	13,091
1946	22,588	8,640	3,513	2,314,807	99,518	8,181	3,587	15,840
1947	40,618	11,857	4,681	2,107,160	100,576	5,666	3,338	17,268
1948	54,803	14,877	5,945	1,979,581	96,172	3,633	4,318	20,816
1949	42,976	16,128	6,559	1,969,100	95,055	5,729	3,626	21,379
1950	40,236	10,012	4,105	2,030,645	102,340	6,592	4,926	16,886
1951	33,802	15,290	6,186	2,282,386	108,351	6,410	5,622	17,446
1952	30,174	15,139	6,109	2,254,271	104,345	4,358	3,821	16,235
1953	36,668	16,465	6,748	2,055,370	105,530	6,191	5,912	18,171
1954	41,534	13,569	5,568	2,200,134	104,380	6,431	6,890	18,899
1955	41,243	14,721	6,043	2,192,852	112,736	6,877	9,402	16,649
1956	48,009	13,310	5,407	2,175,556	108,680	4,613	8,843	17,218
1957	25,919	10,964	4,609	1,667,544	120,977	7,508	15,157	15,626
1958	39,543	11,512	4,798	1,736,204	121,924	4,936	12,268	18,981
1960	30,402	14,272	5,886	1,944,175	118,236	3,859	12,547	17,917
1961	22,178	14,318	5,978	2,061,392	116,819	3,413	12,996	20,287
1962	31,952	14,723	6,140	2,309,055	121,034	4,019	12,443	18,827

Year	Peas dry field	Peanuts picked and threshed	Soybeans	Potatoes	Sugar cane		Sugar beets	Oranges and Tangerines
					Sugar and seed	Sirup		
	1,000 bags	1,000 pounds	1,000 bushels	1,000 bushels	1,000 tons	1,000 gallons	1,000 tons	1,000 boxes
1930	2,114	697,350	13,929	343,817	3,153	16,602	9,199	55,060
1935	3,385	1,152,795	48,901	378,895	4,954	24,509	7,908	52,073
1940	2,192	1,766,590	78,045	376,920	4,218	13,360	12,194	85,510
1944	8,894	2,080,825	192,121	383,926	6,144	19,897	6,718	113,210
1945	5,915	2,042,235	193,167	419,399	6,707	28,251	8,616	104,350
1946	6,679	2,038,005	203,395	487,315	5,962	23,335	10,560	118,540
1947	6,322	2,181,695	186,451	388,985	5,289	18,545	12,503	114,510
1948	3,640	2,335,840	227,217	449,895	6,768	11,245	9,424	104,120
1949	3,212	1,864,780	234,194	402,353	6,541	9,745	10,196	108,465
1950	3,206	2,021,730	299,279	429,896	6,944	9,230	13,535	121,610
1951	3,763	1,595,025	280,512	325,708	5,601	5,140	10,584	122,900
1952	2,610	1,366,225	298,052	349,098	7,605	6,005	10,169	125,080
1953	3,350	1,366,225	268,528	380,075	7,619	5,575	12,084	130,930
1954	3,484	1,043,560	342,795	355,099	6,940	4,795	14,027	141,475
1955	2,525	1,548,010	373,522	227,046	7,248	4,910	12,228	137,015
1956	4,639	1,607,810	449,446	243,716	6,483	3,895	12,993	136,705
1957	3,326	1,435,945	483,715	239,539	6,750	3,225	15,530	111,155
1958	2,475	1,864,725	574,413	265,729	6,681	3,770	15,183	130,620
1960	3,241	1,786,266	555,307	257,435	16,456	3,558	16,421	121,535
1961	3,543	1,742,960	679,566	293,594	19,737	3,425	17,704	138,095
1962	4,947	1,811,330	675,197	266,703	20,092	2,716	18,240	104,155

Year	Grapefruit	Lemons	Apples	Peaches	Pears	Grapes	Cranberries	Strawberries
	1,000 boxes	1,000 boxes	1,000 bushels	1,000 bushels	1,000 bushels	1,000 tons	1,000 barrels	1,000 crates
1930	18,690	7,950	.....	56,392	27,167	2,458	584	9,143
1935	18,347	7,787	140,398	55,440	25,943	2,477	516	10,811
1940	42,883	17,236	111,436	57,832	29,590	2,466	570	12,319
1944	52,180	12,550	121,266	78,191	31,337	2,712	376	4,366
1945	63,450	14,450	66,796	81,548	33,042	2,781	656	5,201
1946	59,520	13,800	119,410	86,643	34,447	3,160	856	7,004
1947	61,630	12,870	113,041	82,270	35,312	3,036	790	8,895
1948	45,530	10,010	88,407	65,352	26,334	3,078	968	10,224
1949	36,500	11,360	133,742	74,818	36,404	2,650	840	8,795
1950	46,580	13,400	123,126	53,485	31,140	2,707	984	11,295
1951	40,400	12,900	112,935	70,265	32,687	3,281	932	11,846
1952	38,360	12,590	92,489	62,560	30,947	3,164	804	11,794
1953	48,370	16,130	93,307	64,473	29,081	2,700	1,203	12,435
1954	46,120	14,600	103,773	60,794	30,077	2,607	1,012	11,874
1955	45,380	13,250	107,157	51,852	29,622	3,241	1,026	223*
1956	44,790	16,200	100,852	70,079	32,322	2,912	970	275*
1957	39,780	16,900	118,548	61,518	31,676	2,599	1,050	277*
1958	43,500	17,000	126,610	71,069	28,890	3,026	1,166	267*
1960	43,300	14,340	108,515	74,315	25,621	2,997	1,341	233*
1961	42,910	16,740	126,565	77,895	27,080	3,092	1,236	255*
1962	34,830	12,000	125,425	75,789	29,294	3,210	1,324	258*

*Thousand tons.

HORTICULTURE

Originally the term horticulture meant the cultivation of a garden. It now includes the art and science of vegetable growing or *olericulture*, fruit growing or *pomology*, flower growing or *floriculture*, and landscape gardening. Horticulture, therefore, might justly be called applied botany, and it bears much the same relationship to botany as do any of the branches of engineering to mathematics and physics.

In a new and undeveloped country, horticulture, as a branch of agriculture, usually receives comparatively little attention. But it increases rapidly in importance as the primary problems of producing a sufficient supply of grain, potatoes, and live stock are gradually solved. The phenomenal development of horticulture in America is shown by the great and increasing number of horticultural publications, by the extent to which the subject is taught in the schools, by the obvious importance of the canning and preserving industries, greenhouses, nurseries, and seed raising, and by the accompanying tables. Factories devoted to the manufacture of boxes, baskets, barrels, glass jars, and tin cans depend for their existence largely on the success of horticultural enterprises.

Robert Squibbs's *Garden Kalendar*, published at Charleston, South Carolina, 1787, was probably the first separate book on horticulture printed in America. Since that time, more than 1400 books have been published and more than 500 horticultural journals started, of which about 65 are still in circulation. In the United States and Canada, there are approximately 30 national or sectional horticultural societies, together with numerous local organizations.

Elementary instruction in horticulture is usually given in the primary schools of the cities, as well as in the rural districts. Wherever possible, theory is coupled with practice in the school garden. This training is given not only to teach horticulture, but because it has been found one of the best methods of developing a growing mind. Advanced courses in horticulture are given by 67 colleges and universities located in every state and territory except Alaska. Similar courses are given by 6 universities and various colleges of Canada.

Vegetables. The chief sources of vegetables are: market gardens and greenhouses located near large cities, where, by intensive cultivation, $1000 to $2000 worth of crops may be taken from a single acre; farms devoted to raising green vegetables for commercial canning; and home gardens. The importance of the home garden was recognized during World War I, when many people learned by experience that a piece of ground no larger than 25 by 50 feet can be made to produce all of the vegetables required by a family of five.

Modern transportation facilities and refrigeration have made possible large-scale truck farming at a distance from cities. For some time the South and West have specialized in supplying the North with out-of-season vegetables. A great deal of the marketing is done co-operatively, shipments in carload lots being made up with the produce of a number of growers, who might separately have difficulties in filling a freight car as their crops are harvested.

COMMERCIAL TRUCK CROPS

Crop	Acreage		Production (tons)		Value ($1,000)	
	1962*	States Leading	1962*	States Leading	1961	1962
Artichoke	8,000	Calif.	22,000	Calif.	4,539	4,197
Asparagus	146,220	Calif., N.J.	186,250	Calif., N.J.	47,881	50,181
Beans, lima	108,130	Calif., Del.	118,470	Calif., Del.	20,344	20,010
Beans, snap	298,790	Fla., N.Y.	669,170	Oreg., N.Y.	89,464	86,974
Beets	22,020	Wisc., N.Y.	230,240	N.Y., Wisc.	4,640	5,156
Broccoli	37,450	Calif., Oreg.	97,000	Calif., Oreg.	18,987	16,040
Brussells sprouts	6,000	Calif., N.Y.	34,400	Calif., N.Y.	6,099	6,071
Cabbage	122,920	Tex., N.Y.	139,350	N.Y., Fla.	38,144	54,548
Cantaloupes	132,050	Calif., Ariz.	677,800	Calif., Ariz.	64,503	56,600
Carrots	83,400	Texas, Calif.	848,600	Calif., Texas	47,322	46,738
Cauliflower	27,230	Calif., N.Y.	125,900	Calif., N.Y.	16,510	18,065
Celery	30,760	Calif., Fla.	700,150	Calif., Fla.	47,757	65,677
Corn, sweet	651,560	Wisc., Minn.	461,050	Wisc., Minn.	85,277	87,264
Cucumbers	154,420	Mich., N.C.	616,030	Mich., Calif.	47,461	45,975
Eggplant	3,600	Fla., N.J.	27,550	Fla., N.J.	2,831	2,984
Escarole	7,950	Fla., N.J.	48,750	Fla., N.J.	4,483	5,995
Garlic	2,700	Calif.	12,150	Calif.	2,523	2,595
Honeydew melons	9,450	Calif., Texas	58,200	Calif., Tex.	7,550	5,446
Kale	1,700	Va.	5,500	Va.	751	676
Lettuce	196,970	Calif., Ariz.	852,500	Calif., Ariz.	124,850	159,823
Mint for oil	63,300	Wash., Oreg.	1,712	Wash., Oreg.	17,942	14,816
Onions	96,230	Texas, N.Y.	299,600	N.Y., Calif.	89,860	64,419
Peas, green	412,390	Wisc., Wash.	531,620	Wisc., Wash.	46,317	47,138
Peppers, green	44,660	Fla., N.J.	187,500	Fla., Calif.	29,891	31,001
Shallots	1,000	La.	1,300	La.	188	174
Spinach	45,000	Calif., Texas	177,290	Calif., Texas	13,771	12,902
Strawberries	94,970	Oreg., Calif.	257,726	Calif., Oreg.	88,997	92,199
Tomatoes	475,080	Calif., Fla.	338,250	Calif., Ohio	280,292	294,099
Watermelons	311,990	Texas, Fla.	452,000	Fla., Texas	44,504	37,496

* Preliminary. Source: *Department of Agriculture, Statistical Reporting Service; annual report, Agriculture Statistics*

Fruits and Nuts. In the production of fruit, North America leads the world, and, of all fruits, the apple comes first both in quantity and in value. The raising of oranges, lemons, and grapefruit has become the most highly organized branch of the orchard industries. The annual crop of nuts is increasing rapidly, English walnuts, pecans, and almonds, in the order named, being the most important.

Flowers. In the commercial production of flowers the rose takes first place, the carnation second, and the violet third. An important branch of this industry is the forcing of bulbs and plants in order to produce potted flowers for sale at Christmas and Easter. Although it has been demonstrated that bulbs of first quality can be produced in America, they are practically all imported, chiefly from Holland, Japan, Formosa, and Bermuda.

Landscape gardening consists in the arrangement of growing trees, shrubs, and other ornamental plants in connection with walks, drives, and other features of the landscape, so that together they form an artistic and pleasing view.

THREE LEADING FIELD CROPS OF EACH PROVINCE IN CANADA, 1959

Province and Crop		Yield	Value
CANADA			
Wheat	bu.	413,520,000	$457,111,000
Tame Hay	tons	20,246,000	307,069,000
Oats	bu.	417,933,000	233,850,000
ALBERTA			
Wheat	bu.	107,000,000	110,210,000
Barley	bu.	110,000,000	78,100,000
Oats	bu.	108,000,000	50,760,000
BRITISH COLUMBIA			
Tame Hay	tons	823,000	17,900,000
Potatoes	cwt.	2,104,000	6,102,000
Oats	bu.	4,400,000	2,288,000
MANITOBA			
Wheat	bu.	60,000,000	69,600,000
Oats	bu.	61,000,000	29,280,000
Barley	bu.	35,000,000	26,600,000
NEW BRUNSWICK			
Potatoes	cwt.	7,325,000	13,551,000
Tame Hay	tons	667,000	9,605,000
Oats	bu.	4,625,000	3,515,000
NOVA SCOTIA			
Tame Hay	tons	633,000	9,495,000
Potatoes	cwt.	1,144,000	3,260,000
Oats	bu.	1,600,000	1,440,000
ONTARIO			
Tame Hay	tons	6,630,000	91,894,000
Oats	bu.	93,391,000	61,638,000
Wheat	bu.	12,464,000	19,383,000
PRINCE EDWARD ISLAND			
Potatoes	cwt.	6,132,000	13,122,000
Tame Hay	tons	324,000	4,212,000
Oats	bu.	4,400,000	3,080,000
QUEBEC			
Tame Hay	tons	5,999,000	91,485,000
Oats	bu.	46,517,000	38,609,000
Potatoes	cwt.	8,168,000	20,012,000
SASKATCHEWAN			
Wheat	bu.	232,000,000	255,200,000
Barley	bu.	74,000,000	52,540,000
Oats	bu.	94,000,000	43,240,000

DRAINAGE AND RECLAMATION

In agricultural practice the term drainage generally refers to the removal of excess water from the soil by means of ditches or by tunnels formed of porous tile, in which the water collects and is carried away under the action of gravity. When the ground is so low that the water collected by the system must be removed with pumps, the process is usually termed reclamation.

Drainage was used to a certain extent by the Romans, and during the 17th century attention was occasionally called to its advantages; but the methods practiced by James Smith, of Perthshire, England, about 1823, are generally considered to have introduced the modern systems of farm drainage. In America, John Johnson imported tiles from Scotland in 1835 and placed them in the wet ground of his farm near Geneva, New York. The improvement in his crops was so noticeable that the advantages of draining were quickly appreciated.

The most simple way of draining wet soil is to dig ditches from 3 to 5 feet deep, and connect these with a main ditch that is somewhat deeper. Because this method cuts up the surface of the ground, 3-inch porous tile pipes are generally placed at the bottom of the ditches, which are then refilled. The ground waters filter through the tile and then flow through the pipe to six-, eight-, or ten-inch mains and thence to the outlet.

The advantages of such drainage are many. The texture of the soil is improved, and the ground becomes more fertile. Drained ground is usually ten to fourteen degrees warmer than that which is full of water; consequently, it freezes later and thaws earlier, thus giving a longer growing season. A drained region is much more healthful than one where the earth contains stagnant water. Moreover, when drainage is completed, the vegetation is stronger, the plants root more deeply, and the additional crops more than pay for the expense of installation. Drainage is frequently an efficient method of removing the soluble salts from alkaline land.

Drainage in the United States. In the United States 9 per cent of all farmland had drainage in 1940. The number of acres in crop land so served was 16 per cent of all crop land. But since a large part of the drainage in the country operates in land not now being employed as farms or for the raising of crops, the above figures give a very inadequate picture of drainage enterprises.

In order to drain a farm, in many cases an entire district must be embraced in a drainage undertaking, known officially as an enterprise. Such enterprises are organized under state laws and may be undertaken by state governments, counties, or townships. If undertaken and operated by organizations having their own executive officers, enterprises are known as drainage districts. Others are individually owned, being constructed for the purpose of developing and subdividing land for future sale.

Thirty-eight states make provision for drainage enterprises. These include all except Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island,

LEADING AGRICULTURAL PRODUCTS OF CANADA

By Provinces on Basis of Value, 1959

Province	Wheat	Oats	Barley	Rye	Tame Hay	Potatoes	Corn for Husking	Turnips
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Alberta	110,210,000	50,760,000	78,100,000	1,445,000	46,200,000	3,420,000	.....	.....
British Columbia	1,398,000	2,288,000	1,129,000	32,000	17,900,000	6,102,000	364,000	.....
Manitoba	69,600,000	29,280,000	26,600,000	1,511,000	21,000,000	2,300,000	1,022,000	.....
New Brunswick	105,000	3,515,000	131,000	.....	9,605,000	13,551,000	.....	456,000
Nova Scotia	25,000	1,440,000	47,000	.....	9,495,000	3,260,000	.....	720,000
Ontario	19,923,000	61,638,000	3,931,000	1,580,000	91,894,000	16,235,000	13,421,000	2,964,000
Prince Edward Island	154,000	3,080,000	27,000	.....	4,212,000	13,122,000	.....	1,224,000
Quebec	496,000	38,609,000	732,000	191,000	91,485,000	20,012,000	3,881,000	1,150,000
Saskatchewan	255,200,000	43,240,000	52,540,000	2,640,000	15,278,000	2,819,000	105,000	.....
Canada	457,111,000	233,850,000	163,237,000	7,399,000	307,069,000	80,821,000	18,793,000	6,514,000

Vermont, and West Virginia. Within the other 38 states, drainage enterprises embrace a total of over 146,000 miles of ditches, 55,700 miles of tile drains, and 6,800 miles of dikes and levees. About 87,000,000 acres are covered by the enterprises, which amounts to nearly 5 per cent of the total land area of the 38 states.

Nearly two-thirds of the lands in drainage enterprises are located north of the Ohio and Missouri rivers. These are usually small enterprises and, with the exception of those draining swampy areas in Wisconsin and northern Michigan, they were undertaken to improve farm land already under cultivation.

The enterprises along the lower Mississippi and in the plains along the southern Atlantic and Gulf of Mexico coast lines are, in the main, large scale undertakings. They have been instrumental in draining huge swamps and making them fit for cultivation.

Drainage enterprises in the arid southwestern states are practically all located on irrigated land. Their purpose is to prevent damage from seepage of water and to carry off harmful alkali dissolved from the soil. Frequently, the water drained off is collected in drainage wells and is pumped from them to be used again for irrigation.

The largest swamp-draining enterprise in the United States is that organized for reclaiming the Everglades in Florida. Some 4.5 million acres are included in that area. Nearly one-eighth has been improved, and about 5 per cent is in occupied farms.

Old World Projects. The Fens on the east coast of England, the valley of the Po, in Italy, the south of France, and Egypt have all benefited by extensive reclamation projects. These are only less famous than those of the Netherlands, where, by an elaborate system of dikes and canals, many marshes have been changed to fertile regions known as "polders." In the Haarlem Meer, 44,724 acres which had been covered with 13 feet of water were surrounded by a dike, and, after 39 months of pumping, the water was removed. Even this project is dwarfed by the reclamation of the Zuider Zee, a branch of the North Sea which was formed in 1170 when a terrific storm broke down the sand dunes on the coast. An 18-mile dike was completed in 1932, which cut off the inland water. The pumping out of this water provides 523,000 acres of reclaimed land, leaving a lake named Ijsselmeer.

DRAINAGE OF FARMS IN THE UNITED STATES

State	No. of Acres Provided with Drainage	Capital Invested in Drainage Enterprises
	Number	Dollars
Arizona	298,633	1,119,242
Arkansas	4,592,738	39,450,754
California	2,667,194	70,144,044
Colorado	468,322	4,890,317
Connecticut†	17,037	.....
Delaware	395,014	454,883
Dist. of Columbia†	251	.....
Florida	5,699,022	43,356,692
Georgia	84,374	2,064,840
Idaho	659,136	7,567,032
Illinois	5,091,364	72,567,174
Indiana	10,121,952	47,540,385
Iowa	6,164,344	75,374,497
Kansas	258,113	3,733,919
Kentucky	465,270	4,947,994
Louisiana	4,219,624	23,361,758
Maine†	10,068	.....
Maryland	183,337	43,914
Massachusetts†	20,741	.....
Michigan	8,978,386	40,412,251
Minnesota	10,990,409	65,576,077
Mississippi	2,890,618	23,259,677
Missouri	3,087,063	49,050,414
Montana	372,661	2,827,839
Nebraska	916,181	7,578,999
Nevada	153,373	1,337,647
New Hampshire†	5,412	.....
New Jersey†	89,896	.....
New Mexico	305,885	5,722,121
New York†	743,823	.....
North Carolina	825,576	5,467,906
North Dakota	1,376,041	3,673,336
Ohio	7,729,267	35,215,586
Oklahoma	197,646	1,971,350
Oregon	348,825	5,482,012
Pennsylvania†	170,419	.....
Rhode Island†	1,043	.....
South Carolina	204,366	1,241,300
South Dakota	676,472	5,078,771
Tennessee	601,592	6,501,750
Texas	4,218,850	14,047,181
Utah	202,058	4,869,273
Vermont†	20,530	.....
Virginia	43,759	611,300
Washington	405,709	5,332,842
West Virginia†	23,276	.....
Wisconsin	761,203	4,254,586
Wyoming	312,662	5,594,856
United States‡	86,967,039	691,724,519

†For 1930; these states were omitted in 1940 census. ‡For 38 states in 1940. In 1950 the total land in drainage enterprise was 102,688,331 acres.

IRRIGATION

The practice of supplying water to the fields by artificial means has been known for thousands of years. The ancient Egyptians, the Babylonians, the Chinese, and the natives of India—all made use of irrigation. In the western hemisphere, the Incas of Peru, the Aztecs of Mexico, and the Pueblo Indians of New Mexico employed artificial methods of watering very similar to those of the Old World.

In many parts of the earth, the soil is extremely fertile, but vegetation is scanty because the annual rainfall either is less than 20 inches or is concentrated in a relatively short season and followed by a long period of drought. In such regions, the ability to obtain water and distribute it to the fields when needed means the difference between a comparative desert and a rich region capable of supporting a large population.

Water is usually obtained from a river having its source in a more humid country, and today, along the banks of the Nile or the rivers of southern China, natives may be seen drawing up water from the river and pouring it into distributing channels just as their ancestors did 3000 years ago. Lakes, wells, and springs also may serve as a source of water, and in India during the rainy season many small reservoirs, called tanks, become filled by the floods.

Irrigation is practiced more extensively in India than in any other country, but in Egypt and in China, as also in Italy, Spain, and France, where irrigation was first introduced by the Romans, millions of acres are artificially supplied with water, and the present extensive systems are being enlarged under governmental direction.

Methods of Irrigation. More than 90 per cent of all irrigated lands receive their moisture from rivers and streams. During the season of flood, these streams usually carry far more water than can be used, while later in the year their volume is much less than is needed by the surrounding country. By means of a dam equipped with control gates, a reservoir can be created which may be filled when the river is high and gradually emptied when the river would otherwise be too low.

Most of the great dams of the world, of which that at Assuan, Egypt, is a notable example, have been constructed as the most important feature of some irrigation project. The force of the falling waters is frequently sufficient to generate electric

UNITED STATES GOVERNMENT IRRIGATED LAND ENTERPRISES

Statistics from Census Bureau, 1950 and U.S. Census of Agriculture, 1959

	Area Irrigated			Capital Invested		
	1939 Acres	1949 Acres	1959 Acres	1950 Dollars	1959 Dollars (000 omitted)	Increase 1950–59 Percent
Arizona	653,263	979,014	644,000	137,575,193	168,000	60.1
Arkansas	161,601	418,644	N.A.	14,365,151	N.A.	N.A.
California	5,069,568	6,618,595	4,184,000	640,061,505	898,000	123.2
Colorado	3,220,685	2,940,502	2,670,000	161,396,063	204,000	41.1
Florida	132,362	362,909	N.A.	19,489,139	N.A.	N.A.
Idaho	2,277,857	2,168,323	2,299,000	129,973,554	148,000	19.9
Kansas	99,980	140,992	69,000	5,882,265	43,000	6,149.6
Louisiana	447,095	598,056	186,000	21,857,050	11,000	23.4
Montana	1,711,409	1,809,908	1,347,000	82,000,490	96,000	33.7
Nebraska	610,379	887,505	706,000	56,458,781	56,000	33.0
Nevada	739,863	722,896	263,000	20,249,426	17,000	6.6
New Mexico	554,039	691,429	366,000	61,586,909	59,000	30.1
North Dakota	21,615	35,759	40,000	2,957,763	3,000	21.5
Oklahoma	4,160	44,189	37,000	13,076,010	N.A.	N.A.
Oregon	1,049,176	1,338,226	846,000	74,360,976	71,000	15.7
South Dakota	60,198	84,356	84,000	6,617,914	10,000	66.0
Texas	1,045,224	3,148,115	941,000	144,545,556	88,000	23.6
Utah	1,176,116	1,166,659	1,110,000	56,539,436	92,000	72.1
Washington	615,013	617,362	848,000	178,476,464	369,000	119.0
Wyoming	1,486,498	1,475,069	1,058,000	59,600,358	79,000	58.7
Total	21,136,101	26,248,508	17,698,000	1,887,070,003	2,411,000	75.7

Source: *U.S. Census of Agriculture, 1959.*

	Diversion Dams number	Reservoirs number	Reservoirs with capacity reported: Reservoirs number	Reservoirs with capacity reported: Total Capacity acre-feet	Canals miles	Pipe Lines miles	Wells number: Flowing	Wells number: Pumped
Arizona	562	269	237	3,625,629	4,898	316	245	4,361
Arkansas	108	86	74	40,431	684	19	27	3,662
California	4,706	1,687	1,507	8,711,658	20,188	10,091	572	72,163
Colorado	7,713	1,182	1,105	2,021,343	18,833	251	1,451	4,988
Florida	355	180	168	3,343	692	485	4,181	3,381
Idaho	5,108	366	313	5,124,969	15,321	437	490	887
Kansas	127	52	42	25,505	546	14	12	1,340
Louisiana	319	61	56	31,249	3,675	61	844	7,590
Montana	8,134	629	577	1,598,898	15,498	109	100	142
Nebraska	488	117	96	133,934	4,628	90	100	7,176
Nevada	4,046	202	176	687,179	3,390	124	293	254
New Mexico	1,286	476	448	3,186,401	5,769	167	106	3,832
North Dakota	15	11	6	1,101	92	7	—	4
Oklahoma	20	29	27	148,945	355	20	—	160
Oregon	6,218	528	470	2,369,138	8,395	573	148	2,770
South Dakota	281	100	94	204,693	968	7	14	27
Texas	439	570	508	1,402,689	9,892	758	163	15,065
Utah	3,080	511	474	2,424,093	9,622	299	1,920	565
Washington	1,859	224	205	6,436,541	3,977	1,515	87	2,098
Wyoming	5,237	458	415	4,370,844	9,724	59	225	248
Total	50,101	7,738	6,998	45,548,583	137,147	15,402	10,978	130,713

power, which is especially valuable in irrigated regions where fuel is generally very scarce. The water is usually distributed from the river by main canals, from which branch ditches carry it to the fields. Irrigation is accomplished by running the water in shallow channels until it is absorbed by the earth, or by flooding the entire field.

Irrigation in America. In the United States, irrigation was at first carried on by private enterprise, but the capital required was so great and the payments were necessarily spread over such a long period that the work on many projects was finally undertaken by the government. By the terms of the National Reclamation act, which was passed in 1902, a large part of the money received from the sale of public lands in sixteen Western states was to be used for the construction of reclamation projects under the direction of the department of the interior. But, when the equipment has been paid for, the control passes to the owners of the irrigated land.

Alfalfa is the most important field crop raised in the Western irrigated districts. Fruits and vegetables rank highest in total value, being especially important in the Yakima irrigated area in Washington, in the Salt River region in Arizona, and in Grand Valley, Colorado. Cereals amount to only about 10 per cent of the total crops and are produced chiefly because of the expense of transporting grain from the corn and wheat producing states farther east. The Salt River project, Arizona, on which the waters are stored by means of the famous Roosevelt dam, produces important crops of cotton. The true economic value of these investments in irrigation can be best appreciated when it is noticed that, in some instances, the value of the crops for but one year exceeds the total cost of construction. These projects often serve also for flood control and the development of hydroelectric power.

The Arrowrock dam on the Boise project in Idaho built in 1915 was long the highest in the world (350 feet), but the Hoover (Boulder) dam finished in 1936 is more than twice as high (726), and a dozen or more other dams also outrank Arrowrock. Many of these, in addition to irrigation, are used for flood control, power production, and river regulation. The total area of irrigated land in the United States is over 20 million acres. For details, see tables on *United States Government Irrigated Land Enterprises* on the opposite page.

In Canada, the St. Mary River system in Alberta is by far the most important irrigation project. When completed, it will serve approximately 510,000 acres. Construction of the St. Mary dam, key structure of the project, was completed in 1951. It is 195 feet high, 2536 feet wide, and capable of storing 320,000 acre-feet of water.

Old World Irrigation. As already stated, India is the most extensively irrigated country in the world, the total area of projects being approximately 50 million acres, which is about 20 per cent of the total area cropped. The Sukkur barrage in the Sind province is designed to irrigate 5,500,000 acres. It is part of a larger plan for impounding the waters of the Indus river by works estimated to cost 250 million dollars. The annual value of crops on irrigated land in India approximates an average of 1½ times the total cost of the works.

The area in Egypt which can be cultivated is about 7,300,000 acres, all of which is dependent for its fertility on the Nile floods or irrigation. The Assuan dam, constructed in 1902 and more than doubled in storing capacity in 1912, is credited with having saved Egypt from famine and economic disaster in the low-flood year of 1913. Russia and Japan rank ahead of Egypt, however, in the total area of their irrigated soil. France, Italy, and Spain follow in the order named. China has a large area of irrigated land, but no authentic statistics are available by which its extent may be determined.

FORESTRY

Forestry is the art and the science of the economical management of existing communities of trees, and the development of new forests upon land unsuited to agriculture.

Value of Forests. Forests supply fuel and timber; they break the force of strong winds; they are warmer in winter and cooler in summer than open country; they afford parks for amusement; and they protect game for the hunter. Finally, forests exert a very noticeable influence upon the flow and character of neighboring streams. This effect has three principal causes: First, the trees break the direct force of the rainfall so that the earth on wooded hillsides is not cut up and washed into the valley. Second, water accumulates in the porous bed of a forest, and escapes to the stream gradually, thus tending to produce a continuous flow rather than a series of sudden, disastrous floods. Third, trees draw from swampy ground a large amount of water, which is evaporated through their leaves, thereby substantially decreasing the volume to be drained off by streams.

The purpose of forestry is to secure the greatest possible utilization of forests and forest products for the present, and, at the same time, to provide new growth for the future. To attain these results, existing forests must be protected from their chief enemies, fire and insects; lumbering operations must be performed with a minimum of waste; and cut-over areas must be replanted. Replanting may be done by allowing seed trees to remain standing, by artificial distribution of seed, or by setting out young trees which have been raised in nurseries.

Forestry has been practiced in Europe for several centuries, especially by the Germans and the French. England depended largely upon her commercial organizations to provide a supply of timber from foreign lands, but for a time during the World War she could obtain only that wood which France was able to spare. Because of this experience, England, shortly after the war, planned to plant one million acres of forest within forty years, and appropriated 17 million dollars to be used for this purpose within a period of ten years.

Forestry in the United States. During the early days of American history, the entire country, with the exception of the treeless plains of the mid-continent, was heavily wooded. Forestry, therefore, received little attention. Today, it is estimated that 80 per cent of the standing timber which remains is controlled by private owners, and that, if no precautions are taken, all this will have been destroyed within a century.

In recognition of the pressing need for conservation of a dwindling national asset, Congress, in 1891, empowered the president to create forest reserves. Yellowstone Park Timberland reserve, the first to be established under the new law, was created by President Harrison. There are now about 140 national forests, with a total area of approximately 163 million acres, distributed over 34 states and territories. These are under the control of the forest service of the department of agriculture. They are chiefly located in the Western states.

Within the national forests, cutting of mature trees and replanting of new crops is continually going on. Fuel and fencing may be obtained free by local settlers, but most of the timber is sold. Grazing of live stock within the areas of the national forests is a practice of great importance. About one-seventh of the cattle and one-half of the sheep slaughtered annually are fed in the forests during some part of the year.

Possibly the most important function of the national forests is to safeguard the streams which supply water for the famous Western irrigation projects. Without water there can be no irrigation, and without the forests the supply of water would be irregular and uncertain. Forty-two per cent of the power resources of the West are within the national forests.

UNITED STATES NATIONAL FORESTS

State or Dependency and Forest	Net Area Acres
Alabama:	
Black Warrior	177,529
Conecuh	70,684
Talladega	349,592
Total for State	597,805
Alaska:	
Chugach	4,814,218
Tongass	16,049,561
Total for Terr.	20,863,779
Arizona:	
Apache*	679,432
Coconino	1,741,649
Coronado*	1,317,289
Crook	1,422,777
Kaibab	1,773,221
Prescott	1,265,500
Sitgreaves	802,534
Tonto	2,410,610
Total for State	11,413,012
Arkansas:	
Ouachita*	1,333,419
Ozark	820,390
Total for State	2,153,809
California:	
Angeles	643,865
Cleveland	379,632
Eldorado*	600,126
Inyo*	1,521,470
Klamath*	1,503,109
Lassen	927,568
Los Padres	1,777,251
Mendocino	829,494
Modoc	1,541,155
Mono*	796,758
Plumas	1,175,895
Rogue River*	47,401
San Bernardino	594,468
Sequoia	1,110,700
Shasta	1,195,651
Sierra	1,336,514
Siskiyou*	339,051
Stanislaus	852,020
Tahoe*	589,781
Trinity	1,430,430
Total for State	19,192,339
Colorado:	
Arapaho	967,754
Cochetopa	1,175,717
Grand Mesa	653,170
Gunnison	1,284,544
Holy Cross	1,089,765
La Sal*	26,631
Montezuma	757,311
Pike	1,076,164
Rio Grande	1,289,400
Roosevelt	788,140
Routt	984,547
San Isabel	618,007
San Juan	1,256,697
Uncompahgre	786,265
White River	895,339
Total for State	13,649,451
Florida:	
Apalachicola	509,739
Ocala	323,106
Osceola	156,934
Total for State	989,779
Georgia:	
Chattahoochee	629,129
Idaho:	
Bitterroot*	828,663
Boise	1,288,600
Cache*	382,094
Caribou*	838,827
Challis	2,447,080
Clearwater	1,043,045
Coeur d'Alene	704,226
Idaho	1,715,987
Kaniksu*	850,977
Kootenai*	48,851
Lolo*	398,046
Minidoka*	521,970
Nezperce	1,931,124
Payette	1,312,423
St. Joe	789,458
Salmon	2,048,737
Sawtooth	1,204,735
Targhee*	1,022,146
Weiser	583,737
Total for State	19,960,726
Illinois:	
Bellevue-Savannah	10,710
Shawnee	186,627
Total for State	197,337
Kentucky:	
Cumberland	425,632
Louisiana:	
Kisatchie	509,621
Maine:	
White Mountain*	40,590
Michigan:	
Hiawatha	421,449
Huron	377,175
Manistee	255,049
Marquette	252,530
Ottawa	659,201
Total for State	1,965,404
Minnesota:	
Chippewa	579,048
Superior	1,790,683
Total for State	2,369,731
Mississippi:	
Bienville	175,417
De Soto	466,806
Holly Springs	117,933
Homochitto	189,219
Total for State	949,375
Missouri:	
Clark	824,118
Mark Twain	391,702
Total for State	1,215,820
Montana:	
Absaroka	1,005,102
Beaverhead	1,958,125
Bitterroot*	1,072,151
Cabinet	1,114,003
Custer*	1,127,649
Deerlodge	1,125,068
Flathead	2,223,854
Gallatin	864,817
Helena	891,074
Kaniksu*	12,699
Kootenai*	1,751,931
Lewis and Clark	1,812,613
Lolo*	1,294,346
Total for State	16,253,432
Nebraska:	
Nebraska	206,026
Nevada:	
Eldorado*	400
Humboldt	1,059,700
Inyo*	60,576
Mono*	466,015
Nevada	1,234,921
Tahoe*	16,373
Toiyabe	2,152,236
Total for State	4,990,221
New Hampshire:	
White Mountain*	663,606
New Mexico:	
Apache*	889,658
Carson	1,128,913
Cibola	1,641,832
Coronado*	124,988
Gila	2,393,732
Lincoln	1,145,883
Santa Fe	1,233,989
Total for State	8,558,995
North Carolina:	
Cherokee*	327
Croatan	125,211
Nantahala	350,002
Pisgah	464,958
Total for State	940,498
Oklahoma:	
Ouachita*	158,399
Oregon:	
Deschutes	1,474,037
Fremont	1,123,809
Klamath*	8,723
Malheur	1,114,857
Mount Hood	1,103,625
Ochoco	791,626
Rogue River*	858,794
Siskiyou*	1,040,428
Siuslaw	528,489
Umatilla*	989,849
Umpqua	984,753
Wallowa	973,092
Whitman	1,454,942
Willamette	1,648,397
Total for State	14,095,421
Pennsylvania:	
Allegheny	444,456
Puerto Rico:	
Caribbean	21,499
South Carolina:	
Francis Marion	243,536
Sumter	315,338
Total for State	558,874
South Dakota:	
Black Hills*	494,975
Custer*	73,668
Harney*	535,471
Total for State	1,104,114
Tennessee:	
Cherokee*	547,162
Texas:	
Angelina	139,917
Davy Crockett	161,109
Sabine	184,368
Sam Houston	159,543
Total for State	644,937
Utah:	
Ashley*	1,052,664
Cache*	330,796
Dixie	798,378
Fishlake	1,414,430
La Sal*	507,668
Manti	727,904
Minidoka*	70,998
Powell	1,032,510
Uinta	934,437
Wasatch*	835,384
Total for State	7,705,169
Vermont:	
Green Mountain	167,094
Virginia:	
George Washington*	823,811
Jefferson	538,624
Total for State	1,362,435
Washington:	
Chelan	1,813,000
Columbia	1,254,502
Colville	749,586
Kaniksu*	624,022
Mount Baker	1,816,373
Olympic	635,254
Snoqualmie	1,045,815
Umatilla*	313,359
Wenatchee	1,000,061
Total for State	9,251,972
West Virginia:	
George Washington*	96,836
Monongahela	804,726
Total for State	901,562
Wisconsin:	
Chequamegon	796,760
Nicolet	569,224
Total for State	1,365,984
Wyoming:	
Ashley*	23,703
Bighorn	1,113,670
Black Hills*	165,110
Caribou*	6,670
Harney*	3,676
Medicine Bow	1,059,377
Shoshone	1,566,406
Targhee*	343,428
Teton	1,802,903
Wasatch*	9,912
Washakie	863,677
Wyoming	1,699,653
Total for State	8,658,185
Aggregate for the 160 National Forests	175,723,380

*Forest extending into more than one state. Total area of each of these forests will be found on page 1309.

TOTAL AREA OF NATIONAL FORESTS EXTENDING INTO TWO OR MORE STATES

Forest	States*	Net Area Acres
Apache	Arizona and New Mexico	1,569,090
Ashley	Utah and Wyoming	1,076,367
Bitterroot	Idaho and Montana	1,900,814
Black Hills	South Dakota and Wyoming	660,085
Cache	Idaho and Utah	712,890
Caribou	Idaho and Wyoming	845,497
Cherokee	North Carolina and Tennessee	547,489
Coronado	Arizona and New Mexico	1,442,277
Custer	Montana and South Dakota	1,201,317
Eldorado	California and Nevada	600,526
George Washington	Virginia and West Virginia	920,647
Harney	South Dakota and Wyoming	539,147
Inyo	California and Nevada	1,582,046
Kaniksu	Idaho, Montana, and Washington	1,487,698
Klamath	California and Oregon	1,511,832
Kootenai	Idaho and Montana	1,800,782
La Sal	Colorado and Utah	534,299
Lolo	Idaho and Montana	1,692,392
Minidoka	Idaho and Utah	592,968
Mono	California and Nevada	1,262,773
Ouachita	Arkansas and Oklahoma	1,491,818
Rogue River	California and Oregon	906,195
Siskiyou	California and Oregon	1,379,479
Tahoe	California and Nevada	606,154
Targhee	Idaho and Wyoming	1,365,574
Umatilla	Oregon and Washington	1,303,208
Wasatch	Utah and Wyoming	845,296
White Mountain	Maine and New Hampshire	704,196

*Area of that part of forest in each state may be determined by reference to page 1308 under name of state.

In addition to national forests, there are forested tracts totaling about 8 million acres which have been created as reserves by a number of the states. New York State leads with forest reserves in excess of 2 million acres, chiefly in the Adirondack and Catskill parks. Pennsylvania and Washington have about 1.3 million acres of state forest land each. Other states with forest reserves over 500,000 acres are Montana and Michigan.

A third important classification of forest lands consists of woodlands on farms, which total about 137 million acres, or over 12 per cent of the aggregate farm acreage.

According to estimates made by the United States department of agriculture, about one-third of the total land area of continental United States is forested land and amounts to approximately 630 million acres. Of this total, saw-timber areas cover 212,862,000 acres, of which 100,832,000 acres are old growth and 112,030,000 acres are second growth. Cordwood areas and restocking areas cover 100,791,000 and 148,044,000 acres respectively. Noncommercial scrub areas account for an additional 168,461,000 acres.

Progress of Forestry. By the enactment, in 1924, of the Clarke-McNary forestry law, the United States government became committed to a definite national forestry policy, embracing alike the publicly and the privately owned forest lands of the nation. The provisions of this act insure increased protection to immature forests and a larger measure of Federal assistance in fire prevention. Provision is made for the systematic study of the problems of forest taxation with the specific purpose of developing equable laws to encourage timber growing. Appropriations also are authorized for supplying nursery stocks of young forest trees to the farmer and for aiding him in caring for his tree plantations, the latter work to be carried out in co-operation with the agricultural extension service and forestry department of his own state.

The aim of forestry is to make the forest lands a perpetual source of needed supplies of wood. This will be accomplished when the annual growth equals or exceeds the amount of timber cut, and lost through fire, insects, and disease.

Civilian Conservation Corps. A major step in forestry conservation was taken in 1933, when provision was made for a "forest army," or Civilian Conservation Corps (CCC), employed by the Federal government to plant trees, combat fire and tree diseases, and otherwise to add to the value of the forest domain. A project was begun in 1935 for planting a tree shelter belt 100 miles wide from the Texas Panhandle to Canada to check erosion by the wind, the trees being designed to retard the evaporation of moisture from the soil. Trees are planted in strips 70 feet wide, spaced at one-mile intervals.

The Civilian Conservation Corps, discarded during World War II, served a useful purpose during days of unemployment by training and educating youth throughout the country. It was an instrument for preventing delinquency and providing an opportunity for young men to learn a profession. During World War II credit was given to men who had served in the CCC.

Forestry in Canada. Approximately 94.4 per cent of Canada's forested land is publicly owned. The Dominion government administers about 12,000 square miles of forest within national parks. Apart from these areas, there are no national forests in Canada. The other publicly owned forests belong to the provinces, whose governments administer a total of 97,600 square miles of provincial forest reserves and, in addition, about 13,000 square miles of forested lands within the provincial parks.

Forest reserves are intended to supply timber for local use and to protect the watersheds. The export of unmanufactured timber or pulpwood cut from public lands is prohibited in every province except Nova Scotia.

All the provinces provide means of protection against forest fires, including the patrolling of the forest areas, building of roads and telephone lines, and the maintenance of airplane and motor service for reporting or combating fires. Many millions of trees are distributed annually free of charge from governmental nurseries.

PREVENTION OF SOIL EROSION

Agricultural scientists estimate that farming as it has been carried on in the United States has been instrumental in permitting erosion to ruin permanently 50 million once-fertile acres of land. Twice as much more is declared by department of agriculture specialists to be seriously damaged. The fertility of an additional 570 million acres is said to be in earlier stages of impairment.

The reason given is that removal of the forest and matted grass cover of the soil, as incidents to intensive agriculture, has had this triple effect: First, a large proportion of the rain, instead of being held back and absorbed to form a sub-surface reservoir, runs off, forming gullies and carrying top soil into streams and rivers. Secondly, the soil, containing a smaller amount of permanent moisture, is more susceptible to drought. Thirdly, during dry spells, high winds strip off enormous amounts of top soil, carrying it away as dust.

As compared with plowed land, it is estimated that grass-covered soil retains two to three times as much water from a given rainfall and that forests in turn retain twice as much as do pastures.

Prescriptions to retard the damage include:

1. Plowing parallel with the slopes, instead of running furrows up and down hill.
2. Building brush and log dams across gullies and small streams.
3. Retention of woodlots on farms and planting of trees on unproductive land.
4. Rotation of crops, including in the cycle the raising of grasses and soil-enriching plants, such as clover and other legumes.

Partly to encourage this form of conservation, Congress in 1936 passed a Soil Conservation act, under which benefit payments were to be made to farmers for diverting part of their grain, cotton, and tobacco acreage to uses calculated to build fertility and to check erosion.

AGRICULTURAL INDUSTRY IN

State	Electricity*	Electric water pump*	Telephones*	Distance to trading Center most frequently used		
				1 to 4 miles	5 to 9 miles	10 miles and over
Alabama	144,589	31,857	17,442	80,801	56,360	50,501
Arizona	8,062	4,630	4,408	3,421	2,308	3,176
Arkansas	121,916	30,808	19,201	77,044	50,517	34,350
California	124,613	85,194	78,720	64,636	32,625	20,450
Colorado	36,541	18,623	27,048	13,828	11,349	16,298
Connecticut	14,425	11,175	13,081	6,940	4,795	1,835
Delaware	6,112	4,665	4,990	3,263	2,662	491
Dist. of Columbia	18	1	17	1		
Florida	40,535	24,235	10,253	19,220	16,776	13,711
Georgia	149,271	52,916	18,624	73,390	66,754	40,656
Idaho	37,232	25,874	22,264	14,457	12,433	9,832
Illinois	169,645	105,237	127,618	81,116	65,093	31,351
Indiana	152,864	99,299	102,904	68,422	57,180	26,767
Iowa	184,787	116,983	166,380	78,935	73,690	32,858
Kansas	97,668	41,245	89,760	41,610	44,185	32,347
Kentucky	145,246	28,940	45,808	90,410	52,607	41,129
Louisiana	83,191	30,485	14,364	53,779	29,948	20,187
Maine	26,200	14,798	19,467	12,821	8,568	5,370
Maryland	30,302	20,765	19,457	15,749	10,121	6,348
Massachusetts	20,365	10,294	17,319	10,930	5,526	2,306
Michigan	146,902	114,255	83,136	66,687	55,320	22,426
Minnesota	150,755	101,391	107,359	65,896	69,101	33,833
Mississippi	140,695	36,188	16,425	97,035	75,862	55,320
Missouri	159,165	53,461	106,673	91,862	72,121	41,903
Montana	26,335	15,134	9,995	7,353	7,956	17,636
Nebraska	83,309	38,115	69,541	34,285	38,741	24,949
Nevada	2,184	1,457	1,550	949	700	1,056
New Hampshire	12,696	7,904	10,055	5,690	4,150	2,118
New Jersey	23,281	19,427	17,829	10,922	7,567	3,113
New Mexico	14,037	5,595	3,500	6,381	4,500	9,657
New York	117,262	79,735	87,767	55,746	38,471	16,417
North Carolina	219,417	71,021	23,347	111,337	85,498	62,154
North Dakota	44,200	19,812	27,214	15,894	22,791	22,711
Ohio	185,681	118,286	119,721	85,869	65,452	31,115
Oklahoma	93,315	30,512	47,161	45,054	47,291	38,594
Oregon	56,618	37,762	30,104	22,740	16,072	14,970
Pennsylvania	133,919	85,391	77,211	58,291	46,106	28,561
Rhode Island	2,411	1,862	1,998	1,011	746	489
South Carolina	95,025	32,961	11,901	51,902	47,985	29,191
South Dakota	45,898	16,631	37,221	16,690	22,242	23,650
Tennessee	165,541	41,694	43,541	94,713	57,025	45,843
Texas	260,373	89,647	79,080	106,288	100,888	93,197
Utah	21,602	5,448	12,515	8,397	4,574	4,460
Vermont	17,533	7,595	13,267	8,899	5,133	2,591
Virginia	114,273	40,701	35,853	56,202	37,830	38,524
Washington	64,599	42,293	40,166	29,037	19,397	14,287
West Virginia	59,141	13,915	21,724	32,736	19,683	19,003
Wisconsin	156,382	121,229	99,821	71,273	61,036	24,004
Wyoming	9,432	4,716	4,735	2,958	2,284	6,428
Total	4,213,563	2,011,162	2,059,625	2,072,940	1,640,239	1,117,473

* Latest available statistics. Based on reports for sample of farms.

THE UNITED STATES, 1959

Motor Trucks		Tractors		Automobiles		Farms Operated by Full Owners	State
Farms Reporting	Number	Farms Reporting	Number	Farms Reporting	Number		
55,000	63,000	54,000	71,000	67,000	76,000	60,848	Alabama
6,000	17,000	5,000	14,000	6,000	10,000	3,972	Arizona
59,000	73,000	50,000	89,000	52,000	58,000	56,054	Arkansas
70,000	131,000	71,000	161,000	88,000	127,000	68,486	California
29,000	52,000	28,000	66,000	30,000	40,000	15,640	Colorado
6,000	11,000	6,000	14,000	7,000	10,000	5,710	Connecticut
4,000	5,000	4,000	9,000	5,000	6,000	3,197	Delaware
N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	Dist. of Columbia
23,000	36,000	23,000	40,000	33,000	42,000	35,477	Florida
61,000	73,000	63,000	93,000	76,000	88,000	61,717	Georgia
27,000	44,000	29,000	62,000	30,000	38,000	20,118	Idaho
100,000	113,000	138,000	321,000	142,000	173,000	63,769	Illinois
76,000	88,000	110,000	226,000	114,000	140,000	75,713	Indiana
92,000	100,000	159,000	344,000	166,000	205,000	78,977	Iowa
83,000	122,000	92,000	184,000	95,000	119,000	38,392	Kansas
66,000	75,000	81,000	114,000	102,000	117,000	97,668	Kentucky
39,000	47,000	34,000	56,000	48,000	55,000	44,251	Louisiana
12,000	17,000	12,000	20,000	14,000	17,000	13,988	Maine
16,000	21,000	21,000	43,000	22,000	28,000	16,736	Maryland
7,000	12,000	8,000	15,000	9,000	12,000	8,422	Massachusetts
63,000	76,000	102,000	194,000	102,000	131,000	77,189	Michigan
87,000	103,000	134,000	287,000	136,000	171,000	84,918	Minnesota
61,000	71,000	53,000	87,000	73,000	82,000	74,547	Mississippi
95,000	110,000	128,000	218,000	134,000	151,000	106,405	Missouri
26,000	53,000	26,000	65,000	26,000	35,000	11,873	Montana
64,000	83,000	82,000	180,000	85,000	110,000	31,141	Nebraska
2,000	5,000	2,000	5,000	2,000	3,000	1,613	Nevada
5,000	7,000	5,000	8,000	5,000	7,000	4,854	New Hampshire
12,000	21,000	12,000	30,000	3,000	19,000	11,167	New Jersey
12,000	20,000	9,000	18,000	11,000	14,000	8,933	New Mexico
48,000	66,000	73,000	156,000	73,000	93,000	58,081	New York
81,000	91,000	107,000	151,000	134,000	154,000	91,393	North Carolina
48,000	75,000	52,000	125,000	51,000	67,000	20,269	North Dakota
70,000	82,000	120,000	243,000	125,000	162,000	89,198	Ohio
70,000	93,000	67,000	109,000	72,000	83,000	46,180	Oklahoma
30,000	49,000	35,000	71,000	37,000	47,000	31,360	Oregon
58,000	71,000	86,000	169,000	86,000	113,000	73,703	Pennsylvania
1,000	2,000	1,000	2,000	1,000	1,000	960	Rhode Island
32,000	39,000	35,000	51,000	56,000	66,000	38,908	South Carolina
39,000	52,000	51,000	118,000	52,000	67,000	17,841	South Dakota
69,000	77,000	79,000	110,000	101,000	114,000	96,474	Tennessee
150,000	198,000	157,000	278,000	177,000	211,000	116,733	Texas
14,000	19,000	14,000	24,000	16,000	20,000	11,398	Utah
8,000	10,000	10,000	18,000	10,000	13,000	8,212	Vermont
48,000	58,000	56,000	92,000	65,000	78,000	65,137	Virginia
37,000	60,000	43,000	78,000	46,000	61,000	36,274	Washington
21,000	25,000	22,000	32,000	27,000	31,000	36,856	West Virginia
81,000	91,000	122,000	254,000	123,000	153,000	91,256	Wisconsin
9,000	16,000	8,000	22,000	8,000	11,000	4,028	Wyoming
2,174,000	2,829,000	2,681,000	5,141,000	2,947,000	3,635,000	2,118,690	Total

Source: *1959 Census of Agriculture*

FARM INCOME AND GOVERNMENT PAYMENT BY STATES

Source: *Economic Research Service; Department of Agriculture*

State	Cash Receipts from farm marketing (000 omitted)		Government payments by program 1962 (000 omitted)				
	1960	1962	Conservation	Sugar Act	Wool Act	Soil Bank	Total*
Alabama	$ 532,598	$ 567,350	$ 6,706	$ . . .	$ 28	$ 4,773	$ 22,679
Arizona	435,554	494,204	1,615	. . .	611	58	5,325
Arkansas	679,012	747,898	5,366	. . .	38	6,590	16,490
California	3,164,865	3,328,175	5,849	9,429	3,805	2,333	31,444
Colorado	638,706	669,596	3,421	6,030	3,373	8,744	40,230
Connecticut	157,876	141,600	476	. . .	6	78	641
Delaware	115,807	109,600	319	. . .	3	280	2,211
Florida	760,820	835,934	2,908	1,713	3	2,073	9,926
Georgia	770,275	827,623	8,005	. . .	19	11,664	33,658
Idaho	432,171	429,009	2,389	6,526	2,548	3,222	23,122
Illinois	1,967,053	2,197,473	9,927	76	848	7,052	109,251
Indiana	1,129,744	1,200,099	6,621	. . .	662	8,374	73,943
Iowa	2,480,573	2,600,844	12,446	49	2,088	10,422	148,228
Kansas	1,218,895	1,327,719	6,153	378	945	16,142	105,362
Kentucky	559,812	622,878	8,419	. . .	675	5,968	35,123
Louisiana	371,251	432,257	4,552	9,106	52	2,802	19,615
Maine	208,967	189,508	978	. . .	45	1,364	2,374
Maryland	278,163	287,261	1,387	. . .	37	1,165	6,148
Massachusetts	163,198	150,874	607	. . .	15	47	682
Michigan	728,912	744,838	5,935	2,631	695	8,583	45,913
Minnesota	1,422,840	1,457,740	6,567	2,918	1,452	18,634	90,499
Mississippi	599,513	696,693	5,993	. . .	52	3,738	18,132
Missouri	1,106,634	1,142,293	8,598	18	999	10,884	102,849
Montana	405,550	399,975	3,813	2,639	3,498	5,242	26,199
Nebraska	1,182,983	1,268,521	6,862	2,649	801	9,763	101,364
Nevada	50,983	45,275	421	1	512	. . .	963
New Hampshire	56,062	55,063	561	. . .	6	152	719
New Jersey	304,967	279,703	708	. . .	14	786	4,261
New Mexico	236,006	270,136	1,862	5	2,008	6,247	14,956
New York	854,697	861,065	4,525	. . .	221	5,739	21,123
North Carolina	1,085,513	1,158,686	7,219	. . .	63	3,914	39,467
North Dakota	516,934	637,237	5,366	1,410	1,234	24,623	72,884
Ohio	1,003,775	1,038,822	6,140	704	1,716	8,181	59,520
Oklahoma	693,769	660,569	8,434	122	265	14,211	56,350
Oregon	415,492	435,764	2,689	1,244	1,480	2,938	15,120
Pennsylvania	799,470	789,281	4,460	. . .	373	5,157	20,206
Rhode Island	21,080	20,382	93	. . .	2	1	98
South Carolina	366,791	407,378	3,779	. . .	6	7,873	21,208
South Dakota	600,800	671,385	4,341	244	3,250	16,953	53,343
Tennessee	510,858	531,807	5,703	. . .	266	7,121	29,982
Texas	2,277,014	2,437,726	21,731	79	10,515	31,310	148,461
Utah	158,649	165,885	1,830	1,082	2,376	1,863	8,888
Vermont	123,404	126,217	976	. . .	12	418	1,456
Virginia	469,889	501,179	5,006	. . .	465	1,648	17,231
Washington	574,174	574,951	2,371	2,632	575	4,029	21,552
West Virginia	107,668	103,476	1,660	. . .	392	830	3,770
Wisconsin	1,108,988	1,117,294	6,172	152	357	9,214	42,499
Wyoming	164,911	161,921	2,056	1,837	4,498	958	10,681
Total	$34,013,666	$35,921,164	$224,015	$53,674	$53,904	$304,114	$1,736,147

* Total includes—Great Plains Conservation $6,447,000.

Above New type equipment at work in the cotton fields.

Upper left For easier hauling and storing of hay, this new hay baler gives greater uniformity to both bale shape and density. It bales up to 14 tons per hour.

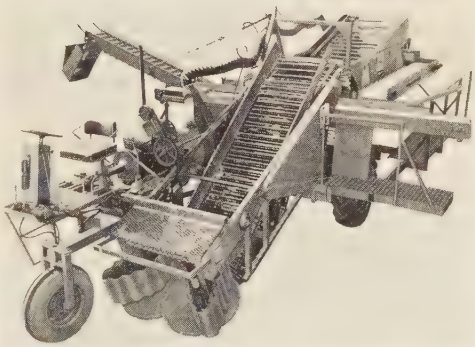
Left Green Peas and Lima Beans are harvested automatically with this tractor-drawn machine. Vines, which have been placed in windrows in the field, are picked up and threshed from the pods. The product is discharged clean from the machine for additional handling.

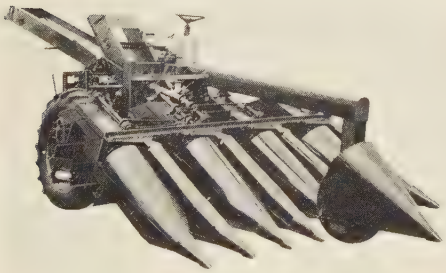
AGRICULTURAL COMBINES

Right Tomato harvesting is accomplished with this machine. Vines are cut beneath the ground and both the vines and fruit are gathered into the harvester for separation. The machine is self-propelled.

Lower right This modern 6-row planter covers a strip 21 feet wide and plants up to one hundred acres per day of such crops as corn, cotton, beans, peanuts, peas, sorghums, and many vegetable crops.

Below This Sweet Corn harvester picks four rows of corn, any size ear, and loads it into truck or wagon for hauling directly to unloading sheds at the canning company.





MECHANIZED WORK UNITS

Used mainly for spraying orchards, applications from this Speed Sprayer are much more efficient and thorough than methods formerly employed. Result—larger and better crops.

For roadside weed and brush control, highway departments today employ equipment which, at the same time, gives American thoroughfares a "manicured" look.

These cattle seem to enjoy their "shower bath" from a modern sprayer. Rigid inspection is necessary to insure quality dairy and meat products for today's market. This important program begins on the farm.

Today's farmer makes quick work of setting new fence posts. The whirling auger on the tractor-mounted post hole drill can dig up to 600 holes in one day. It can also dig holes for planting trees and shrubs.

Ditch digging and backfilling is a speedy operation with this kind of equipment. The backhoe unit at the rear can dig to 14 feet in depth, while the loader unit in the foreground backfills the ditch after the tile or pipe is in position.

POULTRY AND EGG PRODUCTION IN THE UNITED STATES, 1962

Source: Department of Agriculture, Statistical Reporting Service; annual report, *Agricultural Statistics.*

State	Eggs Produced on Farms (Millions)	Chickens Raised on Farms	Commercial Broilers Produced	Turkeys Raised	Chicks Hatched by Commercial Hatcheries
Alabama	1,666	9,820	214,933	238	225,292
Alaska	6	. . .	22	. . .	. . . .
Arizona	160	1,119	. . . .	180	2,316
Arkansas	1,522	7,346	242,850	2,478	248,229
California	6,907	34,022	60,400	17,963	134,800
Colorado	284	1,268	692	1,632	2,429
Connecticut	714	4,049	13,976	217	32,651
Delaware	128	992	91,306	136	79,315
Florida	1,225	10,988	30,243	238	36,028
Georgia	2,583	14,603	353,600	663	417,908
Hawaii	159	811	1,335	. . .	2,562
Idaho	258	1,606	4,441	**	5,966
Illinois	2,283	9,071	3,204	1,076	27,249
Indiana	2,284	12,464	32,499	3,367	71,384
Iowa	4,432	20,670	2,975	7,792	40,750
Kansas	1,106	6,946	1,532	834	10,026
Kentucky	853	5,583	15,670	805	8,595
Louisiana	511	4,039	24,029	50	24,234
Maine	805	6,026	61,989	29	67,588
Maryland	270	1,827	118,686	233	134,271
Massachusetts	592	3,360	7,106	356	16,081
Michigan	1,326	5,458	2,950	1,097	17,340
Minnesota	3,282	15,023	12,414	15,125	39,303
Mississippi	1,506	8,261	139,605	163	156,638
Missouri	1,741	9,108	37,100	4,103	80,058
Montana	198	1,533	. . . .	281	1,247
Nebraska	1,623	7,516	1,003	1,151	14,697
Nevada	12	89	. . . .	1	. . . .
New Hampshire	330	2,291	5,616	74	16,106
New Jersey	1,864	7,229	3,500	156	15,200
New Mexico	157	730	. . .	27	78
New York	1,780	7,026	6,606	603	20,490
North Carolina	2,304	13,644	203,126	2,345	220,889
North Dakota	424	2,688	. . . .	973	2,385
Ohio	2,465	9,469	10,764	3,452	35,340
Oklahoma	560	3,132	7,681	1,284	10,805
Oregon	571	2,955	9,661	1,490	16,405
Pennsylvania	3,202	15,685	37,795	1,368	77,972
Rhode Island	78	463	1,251	43	2,785
South Carolina	948	7,026	20,755	632	28,289
South Dakota	1,587	7,080	. . . .	830	10,537
Tennessee	927	5,141	33,337	114	52,545
Texas	2,562	14,148	125,706	4,083	157,267
Utah	299	1,342	1,809	3,508	3,674
Vermont	163	956	525	25	479
Virginia	1,108	6,604	48,668	4,045	79,281
Washington	1,054	4,359	15,426	522	26,450
West Virginia	342	1,796	20,582	1,023	5,382
Wisconsin	1,933	6,090	17,390	5,527	19,821
Wyoming	57	250	. . . .	4	112
Total*	63,151	318,181	2,026,348	92,336	2,699,249

* Includes Alaska and Hawaii except for turkeys raised.
** Included with Montana.

PRODUCTION OF FARM CROPS AND MEAT OF LEADING COUNTRIES, 1961

Source: Statistical Abstract, 1963.

In Thousands of Short Tons

Country	Wheat	Cotton	Rice	Corn	Potatoes	Sugar	Meat
Argentina	5,622	154	209	5,754	1,306	773	2,674
Australia	7,389	.....	149	169	527	1,511	1,673
Austria	785	.....	.....	218	3,742	235	452
Belgium	814	.....	.....	.....	1,972	496	486
Brazil	855	676	5,857	9,920	1,192	3,697	2,064
Canada	8,502	.....	.....	818	2,201	137	1,252
Chile	1,080	.....	91	176	913	65	202
China	34,496	2,657	93,696	23,634	.....	1,323	.....
Colombia	160	86	491	812	607	400	320
Cuba	.....	.....	408	234	.....	7,459	.....
Denmark	478	.....	.....	.....	1,441	247	837
Ecuador	.....	.....	186	176	220	.....	.....
Egypt (UAR)	1,583	333	1,259	1,782	432	402	228
Finland	508	.....	.....	.....	1,165	75	144
France	10,554	.....	148	2,727	15,797	2,411	3,226
Germany, Fed. Rep.	4,451	.....	.....	.....	23,717	1,690	2,986
Greece	1,757	108	94	298	514	.....	139
Hungary	2,134	.....	42	2,993	1,797	520	433
India	12,117	882	56,464	4,480	3,028	3,402	.....
Indonesia	.....	.....	14,121	2,624	.....	691	267
Iran	3,090	117	661	.....	.....	105	.....
Iraq	945	10	75	.....	.....	.....	.....
Ireland	517	.....	.....	.....	2,364	161	272
Italy	9,140	6	743	4,343	4,334	1,082	1,002
Japan	1,963	.....	17,112	128	4,242	220	390
Korea, Rep. of	188	10	4,085	.....	384	.....	73
Mexico	1,513	493	473	6,130	333	1,640	491
Netherlands	531	.....	.....	.....	4,114	689	643
New Zealand	258	.....	.....	.....	254	.....	823
Norway	30	.....	.....	.....	1,348	.....	132
Pakistan	4,241	360	17,767	546	534	133	374
Paraguay	.....	12	.....	121	.....	34	.....
Peru	192	144	340	409	1,262	881	.....
Philippines	.....	.....	4,309	1,316	.....	1,687	228
Poland	3,078	.....	.....	36	49,828	1,807	1,791
Portugal	474	.....	195	697	993	18	179
Rumania	4,398	.....	.....	6,327	.....	506	.....
South Africa	918	7	.....	6,164	360	1,178	593
Spain	3,790	117	434	1,176	5,421	581	586
Sweden	895	.....	.....	.....	1,719	328	373
Switzerland	343	.....	.....	.....	1,400	40	271
Syria (UAR)	833	137	2	.....	15	13	44
Turkey	7,865	220	257	1,121	1,554	644	180
U.S.S.R.	73,036	1,719	206	26,524	92,594	7,308	8,733
United Kingdom	2,881	.....	.....	.....	6,949	1,119	2,058
United States	37,041	3,436	2,682	101,480	14,679	3,175	14,291
Uruguay	413	.....	68	164	.....	47	357
Venezuela	.....	9	89	463	82	257	131
Yugoslavia	3,499	.....	22	5,016	2,965	276	524
World Total	260,700	60,400	267,100	235,100	308,600	60,400	69,600

ANIMAL INDUSTRY

During the early period of man's development, wild animals were a valuable source of food and of clothing. Later, certain of the larger animals were tamed and used as beasts of burden. Fine furs are still taken chiefly from wild animals; but, as the population of the earth increased in numbers and advanced in the arts of civilization, man learned that better meat, more comfortable clothing, and superior types of motive power could be obtained from domestic animals. By careful selection and breeding, he gradually developed these animals to suit his needs.

Nevertheless, the number of species used by man is very small. Swine, cattle, sheep and goats, horses, mules, and asses comprise more than 99 per cent of all live stock exclusive of poultry. These animals are extensively distributed throughout the temperate zones, the type or species most suitable to any locality depending almost entirely on the climate and on the condition of the soil.

Swine. The total number of swine is less than that of either cattle or sheep. Nevertheless, because of its rapid growth and great rate of reproduction, the hog is the chief meat producing animal of the world. Hogs cannot live upon grass, but require a more concentrated food. They are found, therefore, wherever grain is raised, because the feeding of grain to hogs usually results in a more valuable food product. More than one-quarter of the American corn crop goes to market as pork. In fact, the corn belt is the center of the hog raising industry. According to the purpose for which they are raised, modern breeds of swine are divided chiefly into lard hogs and bacon hogs. The Poland-China, Duroc-Jersey, and Chester White hogs are of the first class, and, when fattened on corn, may yield as much as 50 per cent of their live weight in lard. The Tamworth and the Yorkshire are typical bacon producing breeds. In number of swine produced, China is first, followed by the United States, Germany, Russia, and Spain.

Sheep. Just as pork is the principal meat of grain producing countries, so mutton and wool are the chief animal products of all dry, rough, and thinly settled, grass-growing regions. Tunis, Algeria, and Morocco are known as the "sheep countries," and for centuries the shepherd has been representative of one of the most important industries of Syria, Palestine, and the great dry steppes of southern Russia and the Crimea. The semiarid regions of western United States and the high plateaus of Mexico are largely devoted to sheep raising. Australia leads all countries in number of sheep, Russia is second, United States third, and Argentina fourth. The number of sheep in the United States reached its maximum in 1903.

Draft Animals. The horse is the most important and the most valuable of all draft animals; nevertheless, for this purpose, it is exceeded in numbers, even at the present time, by the ox. In the production of horses, Russia is first, followed by the United States, Argentina, Brazil, China, Germany, and Canada. In Canada, horse raising is of unusual importance, as is shown by the fact that the number of horses sometimes exceeds that of sheep and is almost equal to that of swine.

The United States produces more than half of the world's supply of mules. The greatest horse and mule market in the world is at East Saint Louis, Illinois.

The Percheron, which is considered by many to be the finest type of draft horse, was developed by French breeders in the south of Normandy. The English Shires are the largest of all horses. The breeding of thoroughbreds—horses whose pedigree shows unbroken descent from pure Arabian and Barbary ancestors—is most extensive in Great Britain. A thoroughbred racer has sold for more than $200,000.

As a beast of burden, the camel is especially well adapted to traveling in the desert, the reindeer to the plains of the arctic regions, and the yak to cold places of high altitude, such as Tibet. The llama performs in the Andes the same services as does the yak in the Himalayas. The elephant is extensively used in India as a draft animal, and his great power is utilized by almost every traveling circus. The dog is the least important of general draft animals. However, it is very useful for drawing sleds in the snow regions of North America, and is commonly used for hauling wagons in the densely populated sections of northwestern Europe.

Cattle. India, the United States, Russia, Argentina, Brazil, Germany, and China are the chief cattle producing countries of the world; but the chief beef exporting nations are Argentina and Australia. The cattle of India consist largely of the humped Brahman variety, and of the water buffalo. They are not used to any great extent for food. Cattle raising is quite generally divided into the production of beef cattle of the Shorthorn and Hereford types, and of milk producing breeds, such as the Jersey and the Holstein. In a new, level, thinly settled country, well covered with rich grass, beef cattle are raised on a large scale for the export of meat, hides, and tallow. Fresh beef can be shipped to any part of the world, because of modern methods of artificial refrigeration. But, as the population increases, cattle ranges give place to farms, and the type of cattle gradually changes from beef producers to dairy animals. In order to produce more beef from fewer animals, the tendency of modern breeding is towards early maturing cattle. In Europe, where extensive pastures are no longer available, practically all cattle are stall-fed. Denmark is first as an exporter of butter, with Russia normally second, and Australia and New Zealand third.

Poultry. Poultry raising is the most universal form of animal industry. All countries raise poultry, chiefly chickens. China leads in the production of eggs, with Russia second. In the United States there is an average of only about 72 chickens to each reporting farm, yet the annual production of eggs amounts to some 2,391 million dozens. Turkeys, ducks, geese, and guinea fowls amount to about 4 per cent by value of all poultry in the United States. This total normally exceeds 350 million, and in Canada is about 50 million.

Of about 100 standard varieties of domestic chickens, the best-known fall into three classes: the Asiatic, meat producing type, such as the Brahmas, Cochins, and Langshans; the Mediterranean, egg laying type, which includes Leghorns, Minorcas, and Anconas; and the American, general utility type, represented by the Plymouth Rocks, Wyandottes, and Rhode Island Reds.

Silk Culture. The annual production of silk amounts to about 88 million pounds, of which Japan, China, and Italy together produce over 90 per cent. Silk raising requires, not only a plentiful supply of mulberry leaves, but also a large amount of inexpensive labor. The industry is, therefore, carried on chiefly by the women living on small farms. The annual importation of silk into the United States normally exceeds 400 million dollars in value.

Bees. The production of honey is an industry which depends upon the food-storing instinct of the honeybee, and upon a supply of growing flowers to provide the nectar. The total production of honey in the United States is over 65 million pounds annually. Of even greater value is the service performed by bees in fertilizing flowers of fruit trees and other useful plants.

Farm Animals in U. S. In 1940, each of the 6.1 million farms of the United States had on the average seven swine, ten cattle, seven sheep, two horses or mules, and 55 chickens, valued in all at $740.49. These animals produced, besides what was con-

DOMESTIC ANIMALS ON FARMS, 1963

	Horses and Mules 1959	All Cattle		Milk Cows		Sheep and Lambs 1963	Hogs and Pigs 1963
		1959	1963	1959	1963		
Alabama	93,000	1,526,000	1,723,000	208,000	249,000	18,000	933,000
Alaska	N.A.	6,000	8,000	2,000	3,000	15,000	1,000
Arizona	51,000	1,003,000	1,133,000	44,000	54,000	526,000	29,000
Arkansas	77,000	1,280,000	1,401,000	204,000	222,000	40,000	325,000
California	77,000	3,683,000	4,663,000	754,000	881,000	1,909,000	305,000
Colorado	65,000	2,197,000	2,562,000	118,000	124,000	1,911,000	225,000
Connecticut	4,000	140,000	139,000	83,000	89,000	8,000	16,000
Delaware	3,000	50,000	53,000	24,000	28,000	5,000	37,000
Florida	27,000	1,502,000	1,709,000	180,000	188,000	7,000	354,000
Georgia	71,000	1,353,000	1,496,000	196,000	221,000	14,000	1,519,000
Hawaii	7,000	209,000	216,000	14,000	16,000	.....	58,000
Idaho	50,000	1,380,000	1,500,000	194,000	217,000	1,113,000	117,000
Illinois	74,000	3,790,000	4,055,000	542,000	585,000	665,000	7,894,000
Indiana	53,000	1,974,000	2,145,000	411,000	449,000	456,000	5,246,000
Iowa	81,000	6,480,000	7,053,000	831,000	888,000	1,361,000	13,318,000
Kansas	68,000	4,324,000	5,222,000	316,000	355,000	752,000	1,393,000
Kentucky	145,000	1,947,000	2,354,000	266,000	544,000	296,000	1,414,000
Louisiana	87,000	1,656,000	1,800,000	205,000	263,000	79,000	197,000
Maine	8,000	186,000	192,000	89,000	104,000	38,000	20,000
Maryland	15,000	476,000	488,000	198,000	228,000	31,000	191,000
Massachusetts	5,000	143,000	151,000	89,000	99,000	12,000	108,000
Michigan	36,000	1,610,000	1,752,000	612,000	701,000	363,000	792,000
Minnesota	58,000	3,598,000	4,386,000	1,216,000	1,406,000	940,000	3,696,000
Mississippi	141,000	2,006,000	2,086,000	335,000	350,000	45,000	536,000
Missouri	102,000	3,833,000	4,306,000	613,000	673,000	627,000	4,207,000
Montana	86,000	2,483,000	2,304,000	73,000	76,000	1,610,000	152,000
Nebraska	68,000	4,982,000	5,773,000	319,000	315,000	698,000	2,727,000
Nevada	19,000	531,000	526,000	14,000	17,000	304,000	9,000
New Hampshire	4,000	91,000	100,000	48,000	58,000	8,000	13,000
New Jersey	7,000	186,000	190,000	120,000	132,000	15,000	160,000
New Mexico	43,000	1,081,000	1,209,000	39,000	41,000	1,145,000	52,000
New York	47,000	2,023,000	2,131,000	1,173,000	1,379,000	144,000	95,000
Nortu Carolina	145,000	834,000	907,000	243,000	278,000	43,000	1,343,000
North Dakota	57,000	1,841,000	2,011,000	264,000	290,000	654,000	267,000
Ohio	74,000	2,200,000	2,249,000	641,000	720,000	879,000	2,757,000
Oklahoma	90,000	3,239,000	3,764,000	238,000	240,000	239,000	424,000
Oregon	44,000	1,354,000	1,435,000	152,000	162,000	777,000	158,000
Pennsylvania	58,000	1,810,000	1,951,000	827,000	978,000	219,000	497,000
Rhode Island	1,000	20,000	19,000	14,000	14,000	2,000	10,000
South Carolina	68,000	497,000	553,000	100,000	111,000	9,000	420,000
South Dakota	61,000	3,222,000	3,738,000	242,000	256,000	1,774,000	1,548,000
Tennessee	139,000	1,743,000	2,051,000	456,000	526,000	156,000	1,256,000
Texas	237,000	8,508,000	10,240,000	507,000	598,000	5,651,000	985,000
Utah	30,000	698,000	705,000	88,000	105,000	1,274,000	64,000
Vermont	9,000	406,000	427,000	248,000	285,000	11,000	11,000
Virginia	84,000	1,316,000	1,450,000	308,000	363,000	277,000	673,000
Washington	38,000	1,152,000	1,384,000	218,000	268,000	340,000	136,000
West Virginia	38,000	515,000	514,000	121,000	126,000	246,000	84,000
Wisconsin	59,000	4,100,000	4,382,000	2,095,000	2,426,000	245,000	1,898,000
Wyoming	49,000	1,253,000	1,148,000	29,000	29,000	2,219,000	25,000
Total	2,953,000	92,437,000	103,754,000	16,521,000	18,730,000	30,170,000	58,695,000

Source: *1959 data, 1959 Census of Agriculture; 1963 data, Dept. of Agriculture, Statistical Reporting Service.*

PUREBRED BEEF AND DUAL-PURPOSE CATTLE

Source: *Breeder's Gazette, March 1964*

Number of new registrations each year, as reported by breed associations, United States

Year	Aberdeen Angus	Devon	Hereford	Polled Hereford	Red Poll	Shorthorn	Brahman
1936	15,023	208	124,278	8,000	1,382	36,521	.....
1937	17,278	236	134,679	6,732	1,418	34,424	.....
1938	19,248	214	135,454	7,946	1,624	33,575	.....
1939	25,308	259	159,408	8,717	2,350	41,025	.....
1940	40,778	285	191,405	10,848	2,876	41,431	4,409
1941	38,737	336	207,517	15,244	2,724	50,120	4,132
1942	46,820	338	250,527	17,372	2,522	54,471	[1]
1943	52,432	398	288,675	17,034	3,155	52,845	8,536
1944	57,717	443	298,421	18,881	4,267	60,504	7,054
1945	66,020	401	316,081	31,863	3,958	63,988	10,954
1946	71,968	397	336,193	24,200	4,088	69,418	10,623
1947	81,992	403	356,530	33,000	4,366	80,853	14,928
1948	84,548	365	352,888	37,121	4,296	58,538	15,145
1949	87,722	...	370,015	37,179	4,689	73,986	17,220
1950	110,442	601	426,971	44,263	4,782	76,965	19,177
1951	138,896	511	506,061	61,513	5,093	108,565	20,610
1952	164,329	500	548,418	71,580	5,011	47,938	24,013
1953	160,754	710	560,794	78,152	4,225	47,674	17,873
1954	213,410	534	552,554	80,020	3,834	48,487	17,010
1955	186,316	560	522,639	101,084	3,443	48,963	16,564
1963	345,576	5,308	513,076	174,575	2,135	38,294	13,791

[1]No report of registration received.

PUREBRED DAIRY CATTLE

Number of new registrations, by breeds, United States

Breed	1948	1949	1950	1951	1952	1953	1954	1955	1963
Ayrshire:									
Bulls	4,175	3,904	3,412	3,458	2,604	2,357	2,178	2,018	*
Cows	21,938	22,413	20,824	22,005	20,604	22,013	20,815	21,017	*
Total	26,113	26,317	24,236	25,463	23,208	24,370	22,993	23,035	14,605
Brown Swiss:									
Bulls	6,295	5,637	5,759	5,827	*				
Cows	16,330	15,678	16,962	19,936	*				
Total	22,625	21,315	22,721	25,763	23,385	21,854	22,854	21,667	16,854
Guernsey:									
Bulls	18,939	17,227	16,013	14,181	13,669	9,622	7,882	7,589	*
Cows	77,956	72,679	78,888	79,448	100,240	79,986	73,663	73,977	*
Total	96,895	89,906	94,901	93,629	113,909	89,608	81,545	81,566	55,670
Holstein-Friesian:									
Bulls	35,576	36,329	36,662	36,629	32,424	25,752	23,539	23,469	*
Cows	132,762	141,596	147,584	155,009	157,266	163,810	172,424	174,139	*
Total	168,338	177,925	184,246	191,638	189,690	189,572	195,963	197,608	258,568
Jersey:									
Bulls	12,152	11,273	10,654	9,145	7,934	7,841	6,041	5,777	*
Cows	56,974	54,701	58,325	59,506	62,924	79,741	54,555	54,483	*
Total	69,126	65,974	68,979	68,651	70,858	87,582	60,596	60,260	43,363

*Individual figures not available.

sumed on the farms, 399 dozen eggs, 49 pounds of wool, and 1916 gallons of milk, including that sold for making butter and cheese. The farm value of these products amounted to an average of $275.77 for each farm. The inhabitants of the United States are the greatest meat eaters in the world with an average total consumption estimated at about 130 for each person. In 1900 the average was 215.9 pounds.

The most important breeding grounds of beef cattle in the United States are the western portion of the Corn Belt, the Great Plains, the valleys and high plateaus of the Far West, and the Gulf coast from Georgia to Texas. Many animals are shipped from the ranges to the corn belt to be fattened.

Milk. The insuring of an adequate daily supply of fresh milk of standard quality in the large centers of population necessitates elaborate organization, specialized transportation, and rigid inspection. Most milk offered for sale is pasteurized, that is, heated to 60–63° C. for 20 to 30 minutes. Many municipalities have insisted on a unified system of grading milk as A, B, and C. Grade A, either raw or pasteurized, must have not more than 10,000 bacteria per cubic centimeter; grades B and C, not more than 50,000. Grade B must be pasteurized under official supervision; grade C is pasteurized, but not under official supervision. By the Babcock test, devised in 1890 by S. M. Babcock, the proportion of fat in milk is readily determined. This normally varies from 3 to 6%. Large amounts of milk are concentrated and shipped in air-tight tins for use in the home or food factories. Wisconsin and New York are the leading states in milk production.

Serums and Vaccines (*văk'sĭn*; *-sēn*). Employment of animals for the preparation of serums and of vaccine used in the treatment and prevention of diseases is a small but exceedingly important branch of animal industry. For example, diphtheria antitoxic serum is developed within the blood of healthy horses, while the vaccine used for preventing smallpox is generally obtained from calves. Production of these invaluable substances in the United States is carried on under rigid governmental inspection.

There is a marked difference between antitoxin and vaccine. Diphtheria antitoxin, as its name implies, contains substances which, when injected into the blood of a person suffering from diphtheria, neutralize the poisons already produced in the blood by the active germs of that disease. A vaccine is the exact opposite of an antitoxin. Smallpox vaccine, for example, contains, in a greatly diluted or weakened form, the virus which tends to produce smallpox, or, rather, cowpox. When, by the process of vaccination, a minute quantity of vaccine is allowed to enter the system, the blood soon proceeds to develop within itself quantities of antitoxin which neutralize the virus. As the result of this reaction, the system builds up a more or less permanent resistance to further attacks of the specific disease.

In the preparation of diphtheria antitoxin, a very small amount of the poison produced by growing diphtheria germs is injected into a healthy horse. The horse develops a very mild fever, which soon disappears. Successively larger doses are administered at intervals until the horse receives without injury an amount of the toxin many hundreds of times that which would kill an ordinary animal.

Smallpox vaccine is obtained by vaccinating healthy young calves with smallpox or cowpox virus. The virus is applied in long narrow scratches, which, in about a week, develop the characteristic swelling that contains vaccine lymph. The virus produced in these lesions is collected, purified, diluted with glycerin, and quickly distributed. The vaccine is prepared under most rigidly sanitary conditions. Wherever it is consistently used, smallpox becomes practically unknown.

Insulin. This extract, secured chiefly from the pancreas of cattle and hogs, is used extensively in the treatment of diabetic patients. It occurs in certain interior portions of the pancreas, known as the "islands (Latin—*insulæ*) of Langerhans"; hence its name. Diabetes is due to a failure of the liver to act normally in transforming sugar into glycogen, and as a result the blood becomes surcharged with unassimilated sugar. Insulin, when injected into the blood, temporarily enables the liver to take this sugar from the blood and, if persistently administered, serves to prolong the life of the patient. F. G. Banting and J. J. R. MacLeod of the University of Toronto received jointly a Nobel prize in 1923 for their discovery of insulin and its use.

ANIMAL INDUSTRY IN CANADA

Farm Live Stock, Dairy Products, and Poultry, by Provinces, 1960

Province	Horses		Cattle			Sheep	
	Number	Value Per head	Number	Value Per head	Dairy Products Value	Number	Value Per head
Alberta	115,000	$ 99	2,665,000	$129	$ 49,336,000	555,000	$15
British Columbia	22,500	112	427,000	134	38,086,000	97,000	18
Manitoba	56,000	109	911,000	135	33,455,000	84,000	14
New Brunswick	12,800	163	158,000	114	14,970,000	62,000	15
Nova Scotia	12,100	142	160,000	122	14,985,000	73,000	14
Ontario	95,000	158	3,048,000	158	203,086,000	385,000	19
Prince Edward Is.	9,100	124	112,000	118	6,344,000	34,000	15
Quebec	129,000	199	2,087,000	129	198,042,000	266,000	13
Saskatchewan	120,000	92	1,933,000	129	40,518,000	217,000	14
Canada	571,500	134	11,501,000	137	598,822,000	1,773,000	16

Swine		Poultry		Fur-Bearing Animals		Rank of Province by Value	Province
Number	Value Per head	Number	Value	Pelts	Value		
1,385,000	$22	9,939,000	$ 8,662,000	1,661,388	$ 4,766,217	3	Alberta
51,000	25	5,177,000	6,407,000	767,646	4,938,540	5	British Columbia
380,000	23	7,390,000	6,598,000	675,807	5,180,127	6	Manitoba
59,000	26	1,098,000	1,388,000	35,430	200,155	7	New Brunswick
52,000	25	2,272,000	2,738,000	67,083	593,025	8	Nova Scotia
1,880,000	28	30,039,000	32,364,000	928,640	7,974,547	1	Ontario
48,000	25	705,000	744,000	3,542	54,151	9	Prince Edward Is.
1,043,000	25	10,951,000	12,421,000	396,648	2,672,147	2	Quebec
585,000	21	8,078,000	6,831,000	987,837	3,263,349	4	Saskatchewan
5,483,000	25	75,649,000	78,153,000	6,000,298	31,203,451		Canada

The native home of the Hereford is Herefordshire, England. Henry Clay of Lexington, Ky., made the first importation in 1817. Herefords are noted for distinctiveness in color. They are red with white faces. Breast, crest of neck, underline, and switch of tail are pure white. Herefords are low set, blocky, have well-sprung ribs, wide loin, long rump, and uniform and abundant depth. The carcass is unusually thick fleshed and evenly covered. Ability to convert grass, roughage, and grain into quality beef with efficiency and in minimum time is the basis of the breed's popularity. There are more Herefords, commercial and purebred, marketed every year in the United States than all other beef breeds combined.

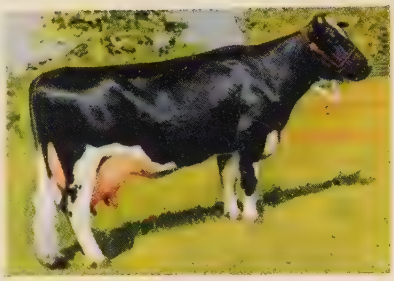
The Aberdeen-Angus breed originated in Scotland. The name came from two adjacent shires of Aberdeen and Angus. Hugh Watson was the first great improver of the Aberdeen-Angus breed. He began his operations in 1818. The first breeding herd in the United States was established by Anderson and Findlay, Lake Forest, Illinois. The color should be entirely black. White spots on the underline behind the navel or on the udder are permissible; but white on any other part of the body disqualifies an animal for show and registry. The typical animal of the breed is broad, deep, low set, symmetrical, and has a compact well-rounded body. The percentage of carcass to offal is very high. The meat is fine of grain, the marbling is excellent. and the quality of flesh is unsurpassed.

AMERICAN BEEF CATTLE

The Shorthorn breed is native to northeastern England. Breed progress began about 1780 under the direction of Colling Brothers, Thomas Booth and sons Richard and John, and Thomas Bates. Shorthorns were first imported into the United States in 1783, when a few were brought into Virginia. In color, Shorthorns may be pure red, red and white, pure white, or roan. They produce a beef carcass that is wide and thick in the loin, wide, long and thick in the hind quarters, the sections where the high-priced cuts are found. The Shorthorn was the pioneer beef breed in the United States.

Warren Gammon & Son, Des Moines, Iowa, bred the first Polled Herefords. They were developed by mating the offspring of horned Herefords that were born without horns. Mr. Gammon located 4 polled bulls and 10 cows by sending a letter of inquiry to 2500 Hereford breeders. He was able to purchase the 4 bulls and 7 of the cows. The first calves from this mating came in 1902. From 75 to 100 per cent of the cal es were polled. When a Polled Hereford was mated to a Horned Hereford, from 50 to 75 per cent of the calves were polled. Polled Hereford type and conformation are essentially the same as Horned Herefords. Both are registered in the same herdbook of the American Hereford Association. Polled Herefords are increasing very rapidly in number and popularity.

The Holstein-Friesian breed originated in the province of Friesland in northern Germany. The first importations of Holsteins into the United States were made in 1795. The Holsteins are the largest of the dairy breeds. The color is black and white, with the colors sharply defined rather than blended. Cattle qualify for registration that are nearly all white or black, but no solid-color animal can be registered. A Holstein herd test of upwards of 100,000 cows shows an average annual production of 11,208 lbs. of milk with a fat test of 3.44% and a total average production of 385 lbs. of butterfat. Official records show that scores of Holstein cows have produced in excess of 30,000 lbs. of milk in a year.

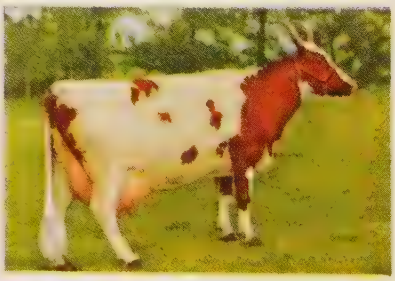


The Guernsey breed originated in the Channel Islands, near the north coast of France. The first cattle brought to the United States were called Alderneys. Gradually the cattle on the islands of Alderney, Sark, and Guernsey became known as the Guernsey breed. The color of the Guernseys is fawn and white, with fawn predominating. A light cherry red with white is not unusual. The horns are of moderate size and amber in color. The skin is yellow. In a recent American Guernsey Cattle Club herd improvement registry covering several thousand cows on annual test the average production was 8688.5 pounds of milk and 425 pounds of butterfat.

The Jersey breed originated on the island of Jersey, one of the Channel Islands. In 1789 a law was passed prohibiting the importation of cattle into Jersey Island except for immediate slaughter. The first importation of Jerseys into the United States was made in 1850. Jerseys are more evenly distributed in the United States than any other breed. The color is usually some shade of fawn or cream, though different shades of mouse color, gray and brown are common. Some individuals are almost black. They may be a solid color of any of these shades, or spotted with white. The muzzles and tongues are usually black or lead colored, and around the muzzle is a white or mealy ring. Jerseys surpass all other breeds in the production of butterfat. Several cows have produced in excess of 1000 lbs. of butterfat in a year.

The Brown Swiss breed is one of the oldest in existence and was developed in Switzerland over a period of many centuries. The first importation of Brown Swiss into the United States was made by Henry M. Clark of Belmont, Massachusetts. It included 1 bull and 8 heifers. The bull, named William Tell, became number one in the herdbook of the Brown Swiss Cattle Breeders' Association. The color varies from dark to light brown. There is usually a light stripe of gray along the back. The nose, switch, tongue, and horn tips are always black, and there is usually a light or mealy ring around the muzzle. The cows have made good at the milk bucket. Well-culled, well-fed farmer herds average 10,000 pounds of 4% milk year after year.

The Ayrshire breed originated in southwestern Scotland, in the county of Ayr. The first importations into the United States occurred in 1822. The color varies from almost pure white to mainly all cherry red or brown, with any combination of these colors. The horns turn gracefully, giving a distinctive appearance to the breed. Ayrshire cows have more of the beef type conformation than most other dairy breeds. They produce milk that tests around 4% butterfat. In order for a bull to meet Approved Sire Plan standard by the Ayrshire Breeders' Association, 70% of all tested daughters must produce 8,500 pounds of milk or 340 pounds of butterfat in a 305-day lactation period.



AMERICAN DAIRY CATTLE

DAIRYING

This term embraces the production of milk and the manufacture of milk products. While goats, sheep, camels, reindeer, mares, and the Asiatic buffalo are sometimes used as a source of milk, the cow alone is bred for the purpose and supports a huge dairy industry. The dairy industry was revolutionized in the late 19th century by the introduction of the centrifugal cream separator and of the Babcock test for determining the fat content of milk. The latter, invented in 1890, made possible the purchase of milk, for manufacture and distribution, on the basis of quality and powerfully stimulated the improvement of herds.

The same period saw the rise of education in dairy management. A school of agriculture was opened in 1873 at Copenhagen, Denmark, which country has shown the most marked improvement in the quality of its milch cows. In 1890, at Madison, Wis., the first American school for dairying was opened, under the direction of W. A. Henry. Since that time numerous schools for dairying, experimental stations, and co-operative cow-testing associations have come into existence in the United States, Canada, and other countries. Australia, New Zealand, Argentina, Russia, and Switzerland are also large producers of milk and milk products.

Dairying in North America. In 1954 the number of dairy cows in the United States was about 24 million, and the average amount of milk produced per cow was 4500 pounds. A United States gallon of milk weighs about 8.6 pounds; the Canadian gallon, about 10.3 pounds. Each person in the United States annually consumes about 8.7 pounds of butter, 8.2 pounds of margarine, 7.7 pounds of cheese, and 16.3 pounds of ice cream. The popular consumption of margarine has risen markedly during recent years.

The chief dairying states are Wisconsin, New York, Iowa, Minnesota, Texas, and Illinois. Wisconsin produces the greatest amount of butter, cheese, and condensed milk; New York, the most milk for market. The dairy production of the United States is valued at about 1200 million dollars—$9.11 *per capita*; that of Canada, about 290 million dollars—$25.48 *per capita*. Among the Canadian provinces, Ontario leads in the production of cheese and butter, Quebec ranking second.

Cheese and Other Milk Products. Cheese was a common article of diet at least as early as 1400 B. C. It is made from milk by separating the curd, or casein, portions of the fat, and other constituents from the whey, shaping the mass into different forms, and usually curing it. The separation is ordinarily effected by rennet, prepared from the stomachs of young calves, puppies, or pigs. Upward of 150 kinds of cheese are made in Europe and America, the differences being dependent on the kind and condition of milk used, the manufacture, the seasoning, and especially the curing.

Milk is preserved either in the form of powder; as a sweet, slow-flowing liquid; or as an unsweetened, creamlike liquid. In these forms, which were first made about 1855, milk is now susceptible of much wider use than was formerly the case. It has become an important article of international commerce, and its use by bakers has resulted in a marked improvement in the quality of factory-made bread.

When used for ice cream, milk is generally *homogenized*, the fat globules being thereby rendered so small that they do not rise in the form of cream.

Casein obtained from milk is used in the manufacture of glue and also, in a plastic form, as a strong, elastic, noninflammable product resembling celluloid. Its uses include electric insulation and ornamental objects.

See *Butter*, page 1360; *Milk*, page 1318; *Cattle*, page 1315; also, for dairy production in the United States and Canada, tables on animal industry, pages 1316, 1317, and 1318.

FISHERIES

The three greatest commercial fishing grounds of the world are located near the coasts of northwestern Europe, northeastern North America, and northeastern Asia. In these places, where the ocean is comparatively shallow, enormous "schools" of valuable food fishes congregate in order to obtain the food that they find near the bottom. A second important type of fisheries takes advantage of the spawning habits of certain fish, which, at the spawning season, travel up rivers or to the shores, where they are easily caught. The cod and haddock are chief examples of bottom feeders, while salmon and shad are the most valuable of the second group.

The rank of various nations in order of the value of their fisheries is approximately: Japan, United States, China, Russia, Great Britain, Canada, France, Siam, and Norway. Although the United States is near the top of the list, the fishing industry is of less relative importance there than in any other of the countries named. The total annual products of the fisheries in the United States are about 3.3 billion pounds, valued at $110,000,000. In Newfoundland and Norway, fishing is the chief industry, while in Japan the fisheries supply almost the only animal food of the entire population. The world's fish production averages over 2 million dollars a day in value. London is the greatest fish market of the world and the herring is the most important fish. Whaling is carried on mainly in the Antarctic Ocean. It is largely in the hands of Norwegians, who operate in ships equipped like factories for processing the animals when captured. The oil is sold chiefly for making soap.

The development of a process of rapid freezing, which has the effect of preserving the original flavor, has greatly expanded the consumption of fresh fish.

Fisheries of the United States. Because of its great extent, the United States affords almost all kinds of fishing, from seals in Alaska to sponges in Florida. The oyster is the most valuable product of the country's fisheries, with salmon second, menhaden third, cod fourth, and halibut fifth. The menhaden is used chiefly for its oil. Of the fish taken from the Great Lakes, the most valuable are the ciscoes, lake trout, whitefish, and pike-perch.

Salmon is canned chiefly in the northwestern coastal states and in Alaska. The salmon pack of Alaska exceeds in value any other product of the territory. Tuna packing is a comparatively recent industry of southern California. Sardines are canned in Maine, where young herring are used, and in California, where the pilchard or true sardine is extensively taken. Canned crab meat is largely imported from Japan. Lobsters, which are taken on the Atlantic Coast from Delaware to Labrador, are most abundant off Maine and Nova Scotia.

Canadian Fisheries. The salmon of British Columbia is the most valuable product of Canadian fisheries, with lobster second, cod third, halibut fourth, and herring fifth. In order of production, British Columbia leads the provinces, and is followed by Nova Scotia, New Brunswick, Ontario, and Quebec. Government bounties are paid to encourage the industries and interior bodies of water are stocked with fish fry.

Secondary Products. In addition to food, there are many other uses for fishery products. From the whale are obtained the ordinary whale oil and whalebone, and also sperm oil, spermaceti wax, and ambergris, which is highly valued for use in fine perfumes. True caviar is prepared from the roe of the sturgeon, and the swimming bladder of the same fish is the source of the finest isinglass. Liquid glue is prepared from fishskins and offal, while crushed oyster, clam, and other shells are used for poultry grit, for surfacing roads, and for making lime. Sealskin, pearls, and corals are among the luxury products of the fisheries. Fish scales enter into *essence d'orient*, used in making artificial pearls.

MINING AND MINERAL PRODUCTION

Mining includes all the methods and processes involved in obtaining useful materials from the earth. The further processes by which metals are obtained from their ores are included in the science of metallurgy.

Mining is purely an extractive process. For this reason it is the most destructive of the primary industries by which man satisfies his wants. A ruined forest may be replaced, if necessary, within a few generations; even the number of fish in the sea may be greatly increased by artificial propagation. But, when a ton of coal or of iron ore has once been mined, the store available to future generations has been decreased by just so much. There can be no replacement.

Importance. In the United States, the combined crops of corn and wheat greatly exceed in value all mineral products, so that on this basis of comparison mining might at first seem of secondary importance. Nevertheless, the distinctive character of modern commerce, industry, and civilization is due largely to the extensive employment of the products of the mine. Consider, for example, modern methods of transportation as represented by the railroads. Engines and cars are built largely of metal, and travel on metal rails; the fuel used to generate the power necessary to run the trains comes from the mines; and the terminal buildings are composed chiefly of products of the quarry. Finally, 65 per cent of the freight hauled by American railroads consists of mining products. Similarly, nearly all essential parts of the automobile have the same source; the fuel and the lubricating oil, the glass of the wind shield, and even the acid in the battery are prepared from mineral products. The rubber tires, while they may seem to be an exception, could not be used were it not for the sulphur with which they are vulcanized.

Historical. In the development of the human race, the acquirement of a knowledge of mining and of the metallurgical arts marks the change from savagery to barbarism. This change has not been made by all races at the same time. Copper was obtained from the mines of Sinai by the Egyptians 5000 or more years ago, although this stage was not reached in Europe until about 2000 B. C. Gold and meteoric iron, which are found as free metals, were utilized at even earlier periods. Similarly, the savages of North America employed native copper which they found in the region of Lake Superior.

Copper was the first metal to be reduced from its ore. The Phœnicians, about 1000 B. C., were accustomed to obtain the red metal from Cyprus and from Spain. They obtained also great quantities of silver from Spain, and, for the tin necessary to alloy with copper in making bronze, they sailed north to the "tin islands," which we now call Great Britain. The Romans had extensive iron mines on the island of Elba. During the 16th century it was the quest for gold that sent the Spanish adventurers to South America and to Mexico. They found gold in enormous quantities, although the Aztecs, whom they despoiled of their treasure, still employed weapons and tools of bronze. The value attached to iron and other metal products by ancient peoples is suggested by the fact that the Greek god Hephæstus, the Roman god Vulcan, and Thor, the Norse deity, were all workers at the forge.

Mining Products. These important substances may be roughly classified as metals, fuels, and the products of the quarry. The first group supplies the materials from which practically all tools and machines are constructed; the second group yields energy, without which most of our machinery would be useless; while from the third group are produced cement, limestone, granite, marble, and other products, so necessary for permanent building.

Types of Mines. Heavy minerals, of which gold is the most important, are frequently found disseminated throughout an alluvial or a glacial deposit. A mineral-bearing bed of this type is known as a placer, from the Spanish word *placel*, meaning sand bank. The simplest form of placer mining consists in shaking the gold-bearing earth in a pan of water with such a motion that the heavier particles sink to the bottom while much of the lighter material can be thrown over the side.

In *sluicing*, an operation which depends on the same principle, a stream of water flows through a wooden trough or other form of channel provided with corrugations, or riffles, on the bottom. Mercury is placed in the riffles. When placer dirt is shoveled into the sluice, the current carries away the lighter substance while the gold settles into the riffles, where it amalgamates with the mercury and is retained. The amalgam is collected and heated in a retort, from which the mercury distills, leaving the gold.

Hydraulicking is placer mining on a large scale. In this process the gravel bank is washed down into sluices by means of a stream of water under a pressure of 250 to 400 pounds per square inch. Huge dredges are also used on placer deposits, the buckets dropping the sand on screens, from which the fine particles pass to sluices, where the gold is recovered.

Where bodies of ore are to be found comparatively near the surface, *open-pit* mining is frequently most satisfactory. By this process the overburden of useless earth is removed so that the ore may be taken up by steam shovels and dropped directly into railroad cars. This is the principal method used in Minnesota for obtaining iron ore. It is also employed elsewhere on copper ores and, to some extent, on coal. In 1914, Hibbing, Minnesota, a town of 10,000 people, was moved to a new location in order that a valuable body of ore might be available for open-pit operation.

Drilled wells are used chiefly to obtain petroleum, natural gas, salt, and sulphur.

Underground mines are reached by tunnels entering the side of a hill or mountain, by shafts sloping gradually, or by vertical shafts. When the veins of mineral are reached, various systems of cutting away the ore are used so as to obtain as much of the valuable material as possible, consistent with economy, safety, and ease of working. Some of these methods are known as *stoping*, *room-and-pillar* mining, the *longwall* method, *milling*, and *caving*. Removal of the coal or ore may be accomplished by pick-and-shovel methods or by machines.

Explosives are nearly always used in mining; in fact, three-quarters of all explosives ordinarily manufactured in the United States are discharged in the mines. High explosives are employed where a hard ore is being mined, but for coal "permissible explosives" are preferred. These cause less shattering than does dynamite, and have a short, low-temperature flame, in order to eliminate, as far as possible, the danger of igniting any explosive gases that may have collected in the mine. The use of permissible explosives has reduced the accident mortality in coal mines from 3.39 per 10,000 in 1903 to much less than 1 per 10,000 at present.

Prospecting. The search for valuable bodies of minerals in the earth is known as prospecting. An oily spot on the surface of the ground, an outcropping vein, rusty places, or a strip of unusually rich or poor vegetation may call attention to a useful deposit. Modern methods of prospecting are generally carried out by large companies in the light of geological knowledge supplied by scientific experts. Any region that gives indication of mineral wealth may be tested by means of core drills which bring up a section of the material through which they pass Careful geological and chemical examination of the core forms a basis for a fairly accurate estimate of the amount and the quality of ore that may be expected.

Development. Having established a promising location, shafts must be sunk, the ore blocked out by further drilling, and provision made for drainage and ventilation of the tunnels. If early indications are confirmed, the necessary machinery is installed, a mill or a cleaning house is constructed, and the mine is placed in operation. The proper operation of a mine is a great problem of economics, because commercial success often depends on the utilization of products which in earlier times were considered of no value.

Ore Dressing. Ore as taken from the mine is usually contaminated with various impurities of no value. Mechanical methods of concentrating the valuable minerals and of separating one ore from another, as zinc sulphide from lead sulphide, are known as *ore dressing*. Ore from the mine is usually discharged upon bar screens called *grizzlies*, where large lumps of impurities can be rejected by hand. The remainder passes through crushing, grinding, and pulverizing machinery, washers, screens, settling tanks, and other devices—all acting to produce a concentrated ore for the smelter.

Technical Processes. Magnetic ores are frequently separated from nonmagnetic substances by passing the powdered material through a magnetic field. A similar separation of conducting and nonconducting minerals may be produced by means of on electrostatic field. The use of the amalgamation process in placer mining has already been explained. Gold-bearing ore taken from the lodes of underground mines usually consists chiefly of quartz. This hard material is reduced to powder by stamp mills or by other types of machinery and is then passed over copper plates coated with mercury. Much of the gold is retained by these plates. The remainder of the metal may be obtained by treating the powder with chlorine gas, which forms a soluble chloride of gold, or with weak cyanide solution, which dissolves gold and silver. The precious metal is precipitated from the cyanide solution by means of zinc dust or shavings; heat is sufficient to decompose the salt formed by chlorination.

In separating diamonds from other minerals, the final concentrates are passed in a stream of water over greased plates, which retain only the diamonds. A similar physical, selective action is utilized in the important concentrating process known as *flotation*. This consists in causing one of the constituents of a finely ground ore to float at or above the surface of a mixture of the ore with water and, usually, oil. As generally practiced, the ore is mixed with pine oil,—wood and tar oils and petroleum are also used,—and passed through a flotation machine in a rising current of water. Minerals having an adamantine, a resinous, or a metallic luster are carried to the surface with the oil so that a separation is readily effected. Other flotation processes make use of bubbles of gas rather than of particles of oil to accomplish the same result.

Mining in Canada. Minerals were first discovered in Canada in 1604 by Master Simon, a French mining engineer. Coal is the most valuable product of the Canadian mines, but to the world at large the nickel mines are most important. The mines at Sudbury, Ontario, produce 85 per cent or more of the world's supply of this valuable metal, for which no satisfactory substitute is known. Canada produces notable quantities of gold, silver, and copper. The Hollinger mine, in the Porcupine district, is the largest gold mine in the world. The geological formation which, in Ontario, yields the gold of Porcupine, the silver of Cobalt, and the nickel of Sudbury passes into northern Quebec, where, because of the undeveloped condition of the country, the mineral wealth is still unknown.

Production in the United States. The United States, because of the great variety and abundance of its natural resources, is the center of the mineral industry of the world. It produces each year more than one-third of the total value of all mineral products, and ranks first in output of approximately half of the 30 most important mineral commodities. It is also first, not only in absolute value of mineral products, but in the ratio of production to population. Most of the copper used in Europe comes from America.

The value of the annual production of minerals in the United States averages about 5 billion dollars. Of the total for 1930, petroleum and natural gas contributed 30.3 per cent, bituminous coal 16.9 per cent, and anthracite 7.3 per cent—a total of 54.5 per cent for fuel. Pig iron was valued at 10.6 per cent of the total, copper 3.8 per cent, lead and zinc 2.2 per cent, gold and silver 1.4 per cent, and limestone 2.1 per cent. Thus limestone alone was worth more than all the gold and silver. The value of cement production constituted 4.8 per cent of the total.

More than one million persons, or 2.9 per cent of all male workers, were engaged in the mineral industry. Of these, more than 70 per cent were engaged in the production of coal. A train of a length sufficient to carry the annual products of the coal mines of the United States would stretch six times around the earth.

Bureau of Mines. This branch of the department of the interior was established by an act of Congress which became effective July 1, 1910.

It is the duty of the bureau to conduct scientific investigations having for their object the improvement of technical processes and conditions of labor involved in the production and the use of mineral wealth. One of the most valuable results of this work has been a great reduction in the number of explosions and other accidents in mines.

The headquarters of the bureau are at Washington, D. C., where an analytical laboratory is maintained for testing the quality of the fuel used by the navy, the army, the Panama Canal zone, and the Federal buildings. The central laboratory is established at Pittsburgh, with other stations devoted to special investigations located in various parts of the United States including Alaska.

Economic Significance. Among the scores of minerals which the world produces, certain ones stand out as pre-eminently important by reason of their utility in our civilization. Among them are coal, petroleum, iron, and gold.

Coal and petroleum are the basic fuels for the production of power, on which industrial civilization rests. Coal is of primary importance for industrial power, and petroleum for motive power in transportation by sea, highway, and air. Hence the possession of large reserves of these minerals confers on any nation an advantage of the first order. The exploitation of coal in Great Britain was a primary factor in its early industrial development. The United States is favored by even larger supplies of coal, and its petroleum resources, added to these, have placed it in a decisive position of economic leadership. Since gasoline, however, may be made by the Bergius process from low-grade coal, lack of petroleum may be offset by the possession of coal and lignite.

Iron is by far the most essential metal in the machine age. When iron deposits are found in close proximity to coal deposits, the material elements are present for building up an economic empire. These conditions account to a large extent for the industrial growth of the United States, Great Britain, western Europe, Russia, and the Japanese power in Manchukuo.

Gold is placed among the premier minerals because of its unique value as a promoter of trade and commerce. By its acceptance as an international standard of value and a basis of credit, it has, as it were, fertilized the wealth-creating activities of every nation.

MINERAL PRODUCTS OF THE UNITED STATES, 1962

Mineral	Quantity	Value
Metallic		
Antimony ore . . . tons	631	. . . . .
Bauxite . . . . long tons	1,369,007	$15,609,000
Chromite . . . long tons	82,000	2,939,000
Copper . . . . . pounds	1,228,421	756,707,000
Ferro-alloys . . long tons	1,954	. . . . .
Gold . . . 1,000 troy oz.	1,542,511	53,990,000
Ilmenite . . short tons	809,037	13,974,000
Iron: Ore . 1,000 long tons	69,969	618,242,000
Pig	65,641	. . . . .
Zinc . . . . tons	505,491	116,413,000
Lead, refined . . . . tons	236,956	43,602,000
Manganese ore . . . tons	24,758	. . . . .
Manganiferous ore . . tons	338,501	. . . . .
Mercury (quicksilver) flasks 76 pounds net	26,277	5,024,000
Nickel . . . . . tons	13,110	. . . . .
Silver . . . 1,000 troy oz.	36,798	39,929,000
Tungsten ore . . . . tons	8,429	11,639,000
Uranium ore . short tons	7,052,870	138,294,000
Nonmetallic		
Aplite . . . . . tons	125,156	912,000
Asbestos . . . short tons	53,190	4,677,000
Asphalt . . . . short tons	1,647,063	14,601,000
Barite . . . . short tons	860,312	9,820,000
Boron minerals . short tons	646,613	49,336,000
Bromine . . 1,000 pounds	190,747	46,617,000
Cement:		
Portland . . 1,000 bbls.	325,476	1,070,371,000
Masonry . . 1,000 bbls.	19,998	57,405,000
Natural . . 1,000 bbls.	402	1,611,000
Clays . . 1,000 short tons	47,797	163,012,000
Coal:		
Bituminous . . . . 1,000 short tons	422,149	1,891,553,000
Pa. Anthracite . . . . 1,000 short tons	16,894	134,094,000
Emery . . . . short tons	4,316	71,000
Feldspar . . . . . tons	492,476	5,076,000
Fluorspar . . . short tons	206,026	9,166,000
Garnet, abrasive short tons	14,166	1,172,000
Gypsum . 1,000 short tons	9,969	36,343,000
Lime . . 1,000 short tons	13,752	186,754,000
Magnesite . . short tons	492,471	2,287,000
Magnesium compounds from sea water and brine . . . . . short tons	408,129	28,742,000
Mica: Scrap . . short tons	107,702	2,639,000
Sheet . . . pounds	360,958	1,277,000
Natural gas liquids . . . . . 1,000 gal.	6,244,522	444,817,000
Petroleum . . . 1,000 42-gal. bbls.	2,676,185	7,768,822,000
Phosphate Rock . . . . 1,000 long tons	19,382	134,304,000
Potassium salts . . . . 1,000 short tons	2,452	94,859,000
Pumice . 1,000 short tons	2,247	6,262,000
Pyrites . 1,000 long tons	916	6,809,000
Salt . . 1,000 short tons	28,807	174,841,000
Sand and gravel . . . . 1,000 short tons	776,701	794,725,000
Sodium carbonate (natural) . . . . 1,000 short tons	977,584	24,330,000
Sodium sulphate (natural) . . . . 1,000 short tons	457,881	9,092,000
Stone . . 1,000 short tons	656,954	1,025,697,000
Sulphur . 1,000 long tons	155,467	108,508,000
Talc and soapstone . tons	771,728	5,278,000
Vermiculite 1,000 short tons	205	3,293,000
Summary		
Total value of all metallic products . .		1,937,000,000
Total value of nonmetallic products . .		16,897,000,000
Grand total, approximate, of all mineral products		18,834,000,000

VALUE OF MINERAL PRODUCTION IN THE U. S., BY STATES, 1962

Source: Bureau of Mines

State	Value	Rank	Percent of total
Alabama . . .	$219,837,000	20	1.17
Alaska	54,196,000	39	.29
Arizona . . .	474,142,000	11	2.52
Arkansas . . .	153,785,000	26	.82
California . . .	1,467,295,000	3	7.79
Colorado . . .	308,115,000	17	1.64
Connecticut . .	19,754,000	45	.10
Delaware . . .	1,531,000	50	.01
Dist. of Col. . .	74,000	. .	(1)
Florida	185,697,000	24	.99
Georgia	107,705,000	29	.57
Hawaii	14,844,000	47	.08
Idaho	82,575,000	33	.44
Illinois	588,335,000	8	3.12
Indiana	202,330,000	22	1.07
Iowa	96,561,000	30	.51
Kansas	501,076,000	9	2.66
Kentucky . . .	399,518,000	15	2.12
Louisiana . . .	2,445,329,000	2	12.98
Maine	14,947,000	46	.08
Maryland . . .	66,629,000	36	.35
Massachusetts .	30,035,000	43	.16
Michigan . . .	446,520,000	12	2.37
Minnesota . .	428,936,000	13	2.28
Mississippi . .	209,428,000	21	1.11
Missouri . . .	153,307,000	27	.81
Montana . . .	190,656,000	23	1.01
Nebraska . . .	108,249,000	28	.57
Nevada	83,733,000	32	.44
New Hampshire	6,010,000	48	03
New Jersey . .	65,686,000	37	.35
New Mexico . .	674,064,000	7	3.58
New York . . .	241,892,000	18	1.28
North Carolina .	54,597,000	38	.29
North Dakota .	90,572,000	31	.48
Ohio	393,671,000	16	2.09
Oklahoma . . .	843,272,000	4	4.48
Oregon	52,458,000	40	.28
Pennsylvania .	823,152,000	5	4.38
Rhode Island .	2,994,000	49	.02
South Carolina	33,901,000	42	.18
South Dakota .	45,789,000	41	.24
Tennessee . . .	154,030,000	25	.82
Texas	4,300,000,000	1	22.84
Utah	410,412,000	14	2.18
Vermont . . .	25,130,000	44	.13
Virginia	222,494,000	19	1.18
Washington . .	68,474,000	34	.36
West Virginia .	714,964,000	6	3.80
Wisconsin . . .	68,289,000	35	.36
Wyoming . . .	485,777,000	10	2.60
Total	18,834,000,000	. .	100.00

[1]Less than 0.005 per cent.

TOTAL VALUE OF MINERAL PRODUCTS OF THE U. S.

Year	Metallic Value Dollars	Nonmetallic* Value Dollars	Total Value Dollars
1880-1923	28,447,660,000	51,773,099,000	80,220,759,000
1924	1,233,370,000	4,072,430,000	5,305,800,000
1925	1,382,155,000	4,295,475,000	5,677,630,000
1926	1,405,345,000	4,808,255,000	6,213,600,000
1927	1,220,633,000	4,309,367,000	5,530,000,000
1928	1,288,290,000	4,096,910,000	5,385,200,000
1929	1,480,390,000	4,407,210,000	5,887,600,000
1930	985,790,000	3,779,010,000	4,764,800 000
1931	569,790,000	2,596,810,000	3,166,600,000
1932	285,875,000	2,175,825,000	2,461,700,000
1933	417,065,000	2,138,035,000	2,555,100,000
1934	548,934 000	2,776,466,000	3,325,400,000
1935	733,130,000	2,916,870,000	3,650,000,000
1936	1,081,600,000	3,475,200,000	4,556,800,000
1937	1,468,200,000	3,945,200,000	5,413,400,000
1938	892,600,000	3,470,600,000	4,363,200,000
1940	1,677,700,000	3,904,800,000	5,582,500,000
1948	15,670,000,000	12,160,000,000	27,830,000,000
1950	1,351,000,000	10,511,000,000	11,855,000,000
1955	2,055,000,000	13,856,000,000	15,792,000,000
1956	2,358,000,000	15,132,000,000	17,365,000,000
1957	2,134,000,000	16,096,000,000	18,109,000,000
1958	1,597,000,000	15,055,000,000	16,526,000,000
1962	1,937,000,000	16,897,000,000	18,834,000,000

*Includes fuels—coal, natural gas, natural gasoline, petroleum.

PRIMITIVE man became safely established in his supremacy over the lower animals when he invented the bow and arrow. Since that prehistoric time, millions of inventions have been made, each adding a part to the total sum of knowledge by which mankind is gradually achieving mastery of space and control of the forces of nature. Some inventions are of trifling importance; others are so fundamental that their development affects the lives of all civilized people. The history of human progress has been marked by a series of epoch-making inventions.

At Ghent, in Flanders, on December 14, 1814, a treaty was signed which formally declared at an end the War of 1812 between England and the United States. Nevertheless, fighting was still going on in Louisiana 59 *days* later, because news of the treaty had not yet arrived. Few examples could more strikingly illustrate the progress of invention during the last century. Today, an event of similar importance could be known throughout the country in less than 59 *minutes*.

An invention is considered to be any new and useful machine, art, manufacture, or composition of matter, or any new and useful improvement thereon. All civilized nations recognize the right of an inventor to his product, and, when all requirements have been fulfilled, will issue a written contract or *patent*, guaranteeing to him the exclusive right to the use of his invention for a definite period of time. The life of a United States patent is 17 years. Approximately two million patents have been issued by the United States patent office. Comparatively few have shown themselves to be valuable.

SOME NOTED INVENTIONS OF MODERN TIMES

Certain inventions have proved to be of special importance because of their marked influence upon the welfare and the progress of mankind. Talking machines, telephones, and motion pictures, for example, are so much a part of our daily life that the wonderful principles governing their operation usually receive but little attention. Some of the more noteworthy of these inventions are given special treatment in the articles that follow.

Air Brake. A device, invented by George Westinghouse, Jr. in 1869, for applying the brakes to the cars of a railroad train by means of compressed air. Although the original system has been greatly improved in many ways by Westinghouse and others, the following description applies to the mechanism common both to passenger and to freight trains.

Each car is equipped with a *brake cylinder*, in which there is a piston connected to the brake shoes by a rod; an *auxiliary reservoir* to hold compressed air; a *triple valve*; and a train pipe with flexible couplings at each end. On the locomotive, in addition to its own brakes, are a steam driven *air compressor* which supplies air to the whole system, a *main air reservoir*, and the *control valve* operated by the engineer.

Under normal conditions, equal pressures of about 70 pounds are maintained in the train pipe and in the auxiliary reservoirs, and this condition of equal pressure holds the triple valve in a position closing the brake cylinder. To *set* the brakes, the engineer allows air to *escape* from the train pipe, thus reducing the pressure below that of the auxiliary reservoir. The triple valve then changes so that air enters the brake cylinder and forces the brake shoes against the wheels.

To *release* the brakes, the engineer allows air from the main reservoir, which has about 110 pounds pressure, to enter the train pipe until it again has a pressure equal to that in the auxiliary reservoir. The triple valve then resumes its normal position and the pressure is removed from the brakes. It is obvious that, if the coupling of a car becomes detached or broken, the train pipe pressure is lowered and the brakes are immediately applied.

This system has been of great importance in the development of the railroads because it allows the engineer to have complete control of his train, and permits of quick stops at high speed, either in an emergency or under ordinary running conditions.

Airplane, or **Aeroplane.** A heavier-than-air flying machine that flies because of the lifting effect of *moving* air upon a surface inclined to the wind at a small angle. The necessary movement of the air is relative to that of the airplane. For example; a speed of about 35 miles per hour *with respect to the air* is generally required before a flying machine can leave the ground. If the air is still, the machine will have to travel along the ground at 35 miles per hour, but, if a 20-mile wind is blowing, the machine can rise when moving into the wind at only 15 miles per hour.

Airplanes are usually classified, according to the number of their supporting surfaces, as *monoplanes* or *biplanes;* the latter type is becoming less common. The planes are not flat, but are curved upward, with the greatest curve near the front edge. A two or three bladed propeller at the front is driven by a gasoline motor. The larger military and cargo planes have two or four engines.

Among notable attempts to solve the problem of artificial flight was the work of Lilienthal and Chanute, with gliders; and of Ader, Maxim, and Langley, who, with the aid of their respective governments, built power driven machines which were usually destroyed by accidents at the first trial.

Orville and Wilbur Wright, bicycle manufacturers of Dayton, Ohio, were interested in aviation, and they found after many tests that the current theories were partly correct and partly guesswork. The Wrights devoted their attention chiefly toward a means of securing stability of a machine when in the air. They succeeded in developing a system of maintaining balance and control by bending or warping the ends of the planes, and using an elevating rudder in front. On December 17, 1903, they achieved flights of from 12 to 59 seconds, Wilbur being the first to fly successfully in a heavier-than-air machine. Reports of this work traveled to Europe and encouraged the French school of enthusiasts to continue their efforts. Alberto Santos-Dumont was the first of these to succeed, when in 1906 he made flights of several hundred feet. The French airplanes differed from the Wright type in having a tail, which was not adopted by the Wrights until about seven years later. Glenn H. Curtiss, in America, developed a type of biplane, and in 1911 and 1912 he developed the hydro-airplane and flying boat, capable of rising from and landing on the water.

From 1908 the development of the airplane was very rapid, especially in France and Germany. Improved engines also supplied greater power although they weighed much less. Of these, the rotary engines are most peculiar because the cylinders are placed like the spokes of a wheel, and revolve around a fixed crank shaft. The motors commonly used average two pounds in weight per horse power; some racing motors are as light as .8 pounds per horse power.

In World War I airplanes carried machine guns and even small cannon. These guns were often geared to fire between the revolving blades of the propeller. In World War II the armament was greatly increased. Bombing planes can carry bombs weighing up to 4000 pounds. Photographic equipment is used for reconnaissance and for checking the damage done by bombing. Radio keeps the aviator in communication with other planes. By the use of gliders, engineless planes towed by another plane, an entire army may be transported by air and set down behind the enemy's lines. Since World War II the

development of jet-propelled planes, particularly the propellerless jet and the turbo-propeller jet, has given military planes supersonic speed. In September 1948 the U. S. Air Force F-86 made 670 m.p.h., while in July 1949 a naval jet reached 710 m.p.h.

Noteworthy aerial achievements include the first non-stop flight across the Atlantic Ocean, 1930 miles from Newfoundland to Ireland, in 16 hours, 12 minutes, made in 1919 by English aviators, Alcock and Brown; a discontinuous flight of 26,103 miles around the world in 365 hours, 11 minutes, of flying time, made in 1924 by U. S. Army Air Service planes; and an altitude record of 310,000 feet by Major Robert M. White, an American, in 1962.

The first American passenger air line service was begun on November 1, 1920, between Key West and Habana.

Various types of airplanes have been built for vertical ascent. The most successful is the autogiro, invented in 1923 by De la Cierva, a Spaniard. It differs from all other heavier-than-air craft in the source of its lifting power. This lift is given, not by wings, but by four rotating blades hinged to a nearly vertical spindle and moving in a horizontal plane. They rotate by wind pressure, and are not driven by the engine, the sole function of which is to propel the machine. The autogiro can climb steeply and descend almost vertically at a speed less than a man with a parachute, thereby eliminating the hazards of landing which attend the usual type of airplane. Moreover, it is proof against falling into a spin, and can maintain itself in the air at a forward speed as slow as 25 miles an hour. See *Aeronautics*, *Transportation by Air*.

Airship. A dirigible balloon as distinguished from an airplane. Ordinary balloons were invented by the Montgolfier brothers in 1783, and in the same year Pilâtre de Rozier made the first ascension. Attempts were made, almost from the beginning, to control the direction of flight. However, the first successful dirigible was not built until 1852 when Henri Giffard propelled a balloon at six miles per hour by means of a three horse power steam engine. Alberto Santos-Dumont constructed 14 dirigibles. As all of the earlier airships were handicapped by lack of light, powerful motors, it remained for the Lebaudy brothers, Major Parseval, and Count Ferdinand von Zeppelin to develop dirigibles capable of fulfilling the requirements for military use.

Dirigible balloons may be classified as rigid, semirigid, and nonrigid. The rigid type has a strong skeleton or framework inside the envelope; the semirigid is held by a network of wires and rods; the nonrigid is merely a large bag of gas. Successful development of the rigid type is due largely to Zeppelin, whose airships were all rigid.

The zeppelin was developed commercially for mail and passengers before World War I and in that war was used for bombing expeditions. The United States tried dirigibles, but gave them less attention after several accidents. They proved of great value, however, in World War II in combating submarines. Captive balloons were used for observation during World War I, and, in World War II, to support cables and nets for air raid protection. Blimps are non-rigid airships. A U. S. Navy blimp set a world record in 1954 by staying aloft more than 8 days.

The lifting power of airships has customarily been provided by the use of hydrogen, although in recent years helium has been increasingly employed. The buoyancy of helium is somewhat less and the cost is higher, but it has the merit of not being inflammable. This advantage of helium received a tragic confirmation in 1937, when the German zeppelin *Hindenburg* was destroyed by flames, with most of its passengers, its hydrogen having ignited from an unknown cause as the craft was mooring at Lakehurst, N. J. See *Airship Transportation*.

Amplifier. This is a general term applied to devices for magnifying variations in electric currents. The commonest form is the three-electrode vacuum tube. It has made possible such recent achievements as transatlantic radiotelephony, phototelegraphy, television, speaking motion pictures, a radically improved type of phonograph, and the "loud speaker."

The idea is already familiar that the sound variations constituting speech or music can be rendered as equivalent grooves on the record of a phonograph and then reconverted into sound. It is equally true that a modulated electric current can be produced which will represent such sound variations. The current may also represent light variations, through the agency of the photoelectric cell, the action of which is explained under *Phototelegraphy*. The amplifier is used to magnify the modulated electrical current to such a degree that when this is converted to equivalent sound or light variations, the results will be easily heard or seen.

In speaking motion pictures, sound is converted to an equivalent band of light and shade, which is placed so accurately beside the pictures on the film that, on reconversion to sound, it produces an effect remarkably close to real life. The amplifier is essential to the process. Phonographs also owe much to the amplifier, both in improving the quality, and in enlarging the volume, of the sound reproduced.

Automobile. A self-propelled, four-wheeled vehicle designed to travel on highways. As steam and electric automobiles comprise less than 2 per cent of the total number, the term refers, when used without qualification, to a motor vehicle propelled by a gasoline engine. In Great Britain, gasoline is commonly called *petrol*; in Germany, *benzin*; and, in France, *essence de pétrole*, or simply *essence*.

Most standard automobiles of today consist essentially of a steel frame, attached through springs and axles to four pneumatic tired wheels. A four-cycle gasoline engine is mounted at the front, just behind a radiator through which water for cooling the engine is pumped. By means of a *clutch* operated by a left-foot pedal, the flywheel may be connected with the *transmission gears* which transmit the power through a driving shaft to bevel and differential gears attached to the middle of the rear axle.

Speed of the car is varied by shifting from one to another of the transmission gears, and by changing the amount of fuel supplied to the engine. The *differential gear* permits the rear wheels to revolve at different rates when the car rounds a curve and the outside wheel must move faster than that on the inside. The engine is started by means of an electric motor which receives power from a storage battery and is geared to the flywheel. When the engine is running, the battery is charged by a generator driven by the fan belt.

The front axle does not turn, but the wheels are attached to it by movable joints which are connected by a bar called a tie rod. The bottom of the post on which the steering wheel is mounted is fitted with a screw thread which causes a vertical *steering arm* to move forward or backward. This movement is transmitted to the *steering knuckle* by a rod.

The engine usually has from 4 to 12 cylinders, runs at from 800 to 4000 revolutions per minute, and weighs from 5 to 15 pounds per horse power. Some of the speed records which have been made are: 1 mile in 17.7 sec.; 10 miles in 4 min. 9.31 sec.; 50 miles in 26 min. 23.4 sec.; 100 miles in 54 min. 17.8 sec.; and 500 miles in 5 hr. 7 min. 26 sec.

It is probable that Siegfried Markus, a German, should be called the inventor of the gasoline automobile, for in 1875 he built a crude machine which carried him about the streets. Gottlieb Daimler is often called the "father of the automobile" because of the great improvement which he made in the gasoline engine, about 1884. In 1885 both Daimler and Karl Benz used gasoline engines to propel bicycles and tricycles. The first commercially manufactured car, made by Panhard and Levassor in 1891, used the Daimler engine. But the first automobile imported into the United States was a Benz, taken to the Chicago World's Fair in 1893.

The first successful American automobile was built by Charles E. and J. Frank Duryea in 1892. Henry Ford built a car in 1893, and Elwood Haynes in 1894. In 1896 these three cars and the imported Benz were the only ones in the United States; in 1948 there were 33¼ million passenger cars alone. The first public auto race was run in 1894 from Paris to Rouen; the first in the United States took place in 1895 from Chicago to Waukegan. The commercial history of gasoline automobiles in the United States may be said to date from 1898, when a Winton was the first car sold. The first commercially successful Ford was sold in 1903.

In 1879, George B. Selden, of Rochester, N. Y., applied for a fundamental patent on a road vehicle driven by a gasoline motor. The application was kept active, by perfectly legitimate methods, for 16 years, when a patent was taken out in 1895. Because of this patent, many of the leading manufacturers were forced to pay royalties of from .8 to 1.25 per cent of the retail price. Others refused to pay and, led by Henry Ford, carried the question to the United States circuit court of appeals which in 1911 decided in their favor and freed the industry of this burden. See *Internal Combustion Engine.*

Colorscope. This is an electrical device for matching colors. Each of two colors to be matched is placed before a photoelectric cell, which generates an electric current proportional in intensity to the light waves received by the cell. When the colors are exactly matched, the two currents are equal and register zero on a galvanometer. The instrument was invented by Dr. H. H. Sheldon and exhibited first in 1930.

Compass. A device designed to hold a certain definite direction, from which a ship or airplane may establish and maintain a true course. Prior to the 20th century, the only compass known was the magnetic, or *mariner's*, compass. This acted imperfectly in the presence of magnetized iron on ships, and the gyrocompass was devised to overcome this difficulty. The development of aeronautics demanded a different type. Several have been invented, of which the earth inductor compass is best known.

Magnetic Compass.—The action of this kind of compass depends on the magnetic force of the earth. The earth is a huge magnet, one pole being approximately at 70° N. lat. and 97° W. long. and the other at 72° S. lat. and 153° E. long.

One or more magnets, or needles, are mounted to move in a horizontal plane within a circular framework, the flat upper side of which is called the compass card. The magnet sets itself in line with the earth's "lines of force," thereby pointing in the general direction of the earth's magnetic poles. In order that motion may be as free as possible, the needle with its framework may be floated on a nonfreezing liquid within the compass bowl. This is the so-called liquid compass. In the dry compass, the entire weight of the needle and framework rests on a pivot within the bowl.

Since the compass needle points to the magnetic poles of the earth, not the geographic poles, it shows, for most places, a variation, or declination, from the true north and south. This angle of variation is known as the compass error. To enable navigators to make necessary corrections for declination, magnetic charts are prepared. They are revised periodically, since the location of the magnetic poles varies slightly from time to time.

Gyrocompass.—In the construction of this nonmagnetic compass, use is made of the fact that the axis of a freely suspended gyroscope wheel will tend to turn parallel to the earth's axis of rotation.

The most successful type of gyrocompass is that known as the *Sperry compass*, perfected about 1910 by Elmer A. Sperry.

The instrument consists essentially of a gyro wheel mounted so as to be free to spin, free to tilt about a horizontal axis, and free to turn about a vertical axis. The gyro wheel is about 9 inches in diameter and weighs 50 pounds. It revolves in a vacuum inside a metallic casing at a speed of about 8500 revolutions per minute.

Upon starting the gyro wheel in motion, it gradually assumes a position parallel to the earth's axis. In the course of a few hours it establishes a north and south direction, which is maintained with marked accuracy so long as the wheel is kept rotating at the right speed. As usually mounted, the instrument carries a compass card similar to that of the magnetic compass. See *Gyroscope*; also *Magnetism*, page 945.

Earth Inductor Compass.—This instrument was invented by scientists in the United States bureau of standards. It consists of a generator, a direction controller, and a steering indicator. The generator is pivoted on a vertical axis. It contains two pairs of brushes, which are revolved in the magnetic field of the earth at the rate of 1400 revolutions per minute. Each pair of brushes collects a direct current.

When the generator is oriented properly, the currents are equal and register zero on a galvanometer, known as the steering indicator. If the generator is oriented at an angle to this position, one current is stronger than the other and deflects the steering indicator to the right or left. The direction controller is a crank for orienting the generator by reference to a compass card.

If the aviator wishes to change his direction, he moves the direction controller to the compass point indicating the desired direction. This changes the current strengths and deflects the steering indicator to the left or right until the plane is headed in the direction for which the control crank is set. To continue in this direction the aviator must steer so that the steering indicator remains at zero.

Boxing the Compass.—Around the outer edge of the circular compass card the degrees are marked from 0 to 360, beginning at north and numbering in the same direction as the hands of a clock move. Besides being marked in degrees, the compass card is marked also in points (11¼°), half points, and quarter points. The four primary directions—north, south, east, and west—are called the *cardinal* points. The points intermediate between these—northeast, southeast, southwest, and northwest—are called *intercardinal*. The point halfway between north and northeast is north-northeast, that between northeast and east is east-northeast, and so on for like subdivisions. Other points are named north by east, northeast by north, and similarly, according to the following table.

COMPASS CARD

N.	E.	S.	W.
N. by E.	E. by S.	S. by W.	W. by N.
N. N. E.	E. S. E.	S. S. W.	W. N. W.
N. E. by N.	S. E. by E.	S. W. by S.	N. W. by W.
N. E.	S. E.	S. W.	N. W.
N. E. by E.	S. E. by S.	S. W. by W.	N. W. by N.
E. N. E.	S. S. E.	W. S. W.	N. N. W.
E. by N.	S. by E.	W. by S.	N. by W.

Composing Machine. A machine which sets either type or type molds and arranges them in lines of the proper order and length for printing. The true typesetting machine has been almost entirely supplanted by those which set type molds from which castings are automatically produced. Of this second class, the linotype and monotype are best known, and, because of their extensive use in printing, are of greatest economic importance.

The linotype was invented in 1885 by Ottmar Mergenthaler, a German living in Baltimore. It is operated similarly to a typewriter, from a keyboard having 90 or more keys. When a key is pressed, the corresponding brass matrix is released from its compartment in a magazine and falls on a moving belt which carries it to a collector. At the end of each word a wedge-shaped spacer is inserted. When

the molds for one line of type are assembled they are carried to a casting wheel and placed in front of a slot.

At this time the wedge-shaped spacers are pushed up between the matrices so that the words are spread until they exactly fill one line. A pump then forces molten type metal into the slot and against the matrices. The metal cools rapidly, so that the molds may be almost instantly removed and redistributed into the proper section of the magazine. The slug of metal is trimmed to exact size between knives and placed with others to form a column of type. Should any error be discovered, a whole line must be reset. Linotype machines may be operated electrically by the so-called teletypesetter, first used in 1928. This device makes use of ticker tape perforations transmitted by telegraph. These, corresponding to words, are fed into the teletypesetter, which depresses the proper keys of the linotype keyboard so as to reproduce the words of the message.

The monotype, as indicated by its name, casts each letter separately. It also differs from the linotype in that the composing and the type casting are done on different machines. The composing mechanism has a keyboard of 225 keys which cause holes corresponding to the proper letter to be punched in a moving strip of paper. When words have been set almost to fill a line, an automatic indicator shows the operator what size space is required to *justify*, or exactly fill the line. When this ribbon is passed through the casting machine, each type is cast separately and delivered in proper order of lines.

Dynamo and Electric Motor. The dynamo, sometimes called a generator, is a machine for producing electric current. It is driven by mechanical power, usually steam or water power. The same machine, when reversed in action, is an electric motor. Driven by an electric current, it is capable of performing work, such as driving machinery or providing traction for cars. The dynamo and motor are sometimes referred to under the single term dynamo-electric machine.

Michael Faraday in England discovered, in 1831, the principle on which the dynamo is based, namely, that, if the lines of force between the poles of a magnet are cut by an electric conductor moving across them, an electric current is induced in the conductor. The dynamo consists essentially of one or more coils of insulated copper wire about a ring of soft iron, which revolves rapidly on its diameter between the poles of a magnet. The revolving part is called the *armature*. The ends of the wire lead to metal *collecting rings*, from which two metal brushes, connected through an external circuit, pick up the current. In this simple form, at each complete revolution of the armature, the current flows first in one direction and then in the opposite direction. The change from one point of maximum intensity in one direction to the next in the same direction is called a cycle. By adding two or more rings to the armature, a so-called two or many-phase current is produced, in which, for every revolution of the armature, there are two or more points of maximum current intensity in each direction.

If the collecting rings are replaced by a *commutator*, that is, by insulated ring segments placed opposite each other, a one-direction, or direct, current may be produced. It will fall to zero once during each revolution of the armature, but this pulsation may be virtually eliminated by increasing the number of armature rings and coils.

The magnets used for the early dynamos were permanent magnets, but later the electromagnet was substituted. For alternating currents, this is actuated by a separate circuit, but, with direct current machines, the current produced by the dynamo may be used in whole or part to actuate, and regulate the strength of, the magnet.

Designs of modern dynamos differ widely. One or many magnets may be used and either the magnets or the armature may revolve, the other remaining stationary. Motors have been adapted to innumerable uses, including electric railways, elevators, machine shops, and household appliances.

For long distance transmission, the alternating current is almost exclusively used in America, since this current may be readily transformed to a high potential and so transmitted over a much smaller copper or aluminum conductor than would otherwise be necessary. At the point of use, the current is "stepped down" by transformers and distributed to the users. It is common practice to transmit in this way currents of 220,000 volts over hundreds of miles.

When the peak requirements for electricity at different using centers occur at different times, economies can be effected by connecting many generating stations and consuming centers, thereby making available the surplus from any station for the center needing it. To such systems the term *superpower* has been applied.

Electric power is generated most economically where coal, natural gas, oil, or water power are readily available. The chief generating centers or regions in the United States include Niagara Falls; New York City; Chicago; Los Angeles; San Francisco; Pittsburgh; Muscle Shoals, Ala.; Butte, Mont.; and the North Pacific states. The electric power produced and used in the United States is over 800 billion kilowatt hours and the number of customers exceeds 15 million. Each customer uses, on the average, over 42 incandescent lamps.

Electron Tube. A vacuum tube very similar in appearance to an incandescent electric lamp, but generally containing, in addition to the filament, a flat metallic plate and an irregularly shaped grid. When the filament is heated to glowing by means of an electric current, it emits *electrons* or negative charges of electricity, which ordinarily would return to the wire. If, however, a battery is connected to the filament and to the plate so that the plate is *positively* charged, the electrons will be attracted to the plate and a current of electricity will flow through the vacuum and around the circuit. If the plate is negatively charged, no current will flow; consequently, when connected with an alternating current, the tube acts as a valve which allows the electricity to pass through in one direction only, thus producing a direct current.

The grid is placed between the filament and the plate, so that, if a charge of varying strength is applied to the grid, corresponding changes will also be imposed on the current flowing through the tube. A weak current is thus enabled to control one that is much stronger. Because of these properties, electron tubes are used as relays, which make long-distance telephony possible; as converters, by which direct current may be obtained from an alternating source; as detectors, which amplify weak radio telegraph or telephone signals and make them audible; and as transmitters, which can be used to send out a continuous train of ether waves of almost any desired frequency.

The first patent for a simple electron tube was issued to J. A. Fleming in 1904. Notable improvements were made later by DeForest and Langmuir. Transistors are replacing vacuum tubes.

Fathometer. An instrument for measuring the depth of water in the process of echo sounding. An electric oscillator on a ship makes a characteristic sound which is transmitted to the water. The instrument clocks the time of its production and the time when the echo, reflected from the floor of the ocean, returns to the instrument. Since sound travels about 4700 feet a second in water, the depth is calculated from the lapse of time, an indicator showing the result. By thus making possible the almost instantaneous recording of the contour of the sea floor, the instrument multiplies the speed and the economy with which the ocean bed can be mapped.

Gyroscope. A mechanical device invented early in the 19th century, and at first used chiefly to illustrate certain laws of rotating bodies. It consists

essentially of a wheel with a heavy rim, mounted on an axis which is pivoted at both ends within a light circular framework. Instruments of this type are frequently sold as toys under the name *gyro-top*. The more scientific form of gyroscope is so mounted that it is free to revolve about three mutually perpendicular axes, whose common center is the center of gravity of the spinning wheel.

When the wheel of a gyro-top is made to rotate rapidly,—usually by pulling away a string coiled about the axis,—two characteristics are noticeable. First, any attempt to change the direction of the axis meets with a surprising amount of resistance. Second, this resistance is so great that, if the gyroscope is turned on its side and supported at only one end, it will not fall, but will move in a horizontal circle about its point of support, apparently in contradiction of the laws of gravity. This circling movement, known as *precession*, takes place in the direction opposite to that in which the wheel is rotating.

A gyroscope resists any force which tends to change the direction of its axis for the same reason that the passengers on a moving train are jerked forward when the brakes are suddenly applied; that is, because of inertia The amount of inertia depends upon the speed of the wheel, its mass, and the average distance of the mass from the axis.

The act of precession is explained by the fact that a body moving under the influence of two forces must respond to both. The wheel which is rotating on one axis is also pulled downward because of gravitational attraction. The gyroscope then tends to place its axis parallel to a third, intermediate axis, and, as a result, moves backward. As the third axis also changes its position at the same time, precession continues as long as the inertia of the wheel is sufficient to prevent falling.

The earth acts as a huge gyroscope, spinning on an axis which points toward the polestar, and also rotating around the sun. As these two axes of rotation do not coincide, the earth, like the top, is forced to precess, thus causing the pole to move west in a small circle which is completed once in 25,900 years. For this reason, the star which indicated true north when the Egyptians built the pyramids is not the polestar of today.

The tendency of a gyroscope to rotate in one plane has been utilized for many purposes. By means of a gyroscope, Léon Foucault, about 1852, was able to demonstrate the rotation of the earth.

Gyroscopes are no longer scientific toys. The *Brennan monorail car* is capable of retaining perfect equilibrium upon a single rail, because of two heavy, motor-driven gyroscopes, which spin in opposite directions. Somewhat similar devices are used upon ships to prevent rolling, while, for ice-breaking vessels, the gyroscope is fastened so as to cause the vessel to roll. Torpedoes are held to their course by means of a controlling gyroscope which begins to spin when the torpedo is released. Gyroscopic apparatus for stabilizing airplanes is also in use. This stabilizing influence becomes more comprehensible in the light of Newton's third law of motion—to every action there is an equal and opposite reaction. Probably the most important application of the gyroscope is the gyrocompass which indicates true north regardless of any change in the magnetic field. See *Gyrocompass*.

Internal Combustion Engine. A heat engine which performs work because of the expansive energy of hot gases formed within a closed chamber. The fuel used may be a natural or an artificial gas, a volatile liquid such as gasoline or alcohol, a poorly volatile liquid such as kerosene, or heavy oils and tars. An engine is usually named for the fuel to which it is best adapted.

In order that such engines may operate continuously it is necessary that the fuel, together with the proper amount of air, be placed in the cylinder, compressed, burned, and allowed to expand, after which the spent gases must be removed and the series of operations repeated. When these processes are performed during four strokes of the piston the machine is called a *four-cycle* engine.

The action of a four-cycle gas or gasoline engine is as follows: At the first, or *intake stroke*, with the exhaust valve closed and the intake valve open, the piston moves away from the closed end of the cylinder, and fuel is sucked into the chamber. With both valves closed, the piston then returns on the *compression stroke* which forces the confined gas into a small space. The compressed gas is then ignited by means of an electric spark, and the chemical action of burning raises the temperature so that the gases expand and force the piston outward. After this *power stroke*, the exhaust valve opens and the piston returns on the *exhaust stroke*, forcing out the burned gas.

In a *four-cycle* engine there is one power stroke during two revolutions of the flywheel. In a *two-cycle* engine the same operations are performed during two strokes of the piston, so that there is an explosion at each revolution of the crank shaft. This is usually effected by making the crank case gas-tight and filling this space with the proper mixture of gas and air. At the end of the power stroke, two valves or ports are uncovered. One opens to the exhaust and the other to the crank case, which is under slight pressure, so that the burned gas flows out and fresh fuel is forced into the cylinder. As the piston returns, it covers the valve openings and compresses the gas, which is then ignited and the series repeated.

It is obvious that power thus imparted by a blow on the piston at every second or fourth stroke will be jerky. In order to prevent excessive vibrations a single-cylinder engine usually has a heavy flywheel, while larger engines have several cylinder, connected to one crank shaft and firing in rotation so that the pressure is more continuous. For automobile and aircraft engines, four and six vertical cylinders in a straight line, or eight and twelve cylinders in two equal rows inclined so as to form a V, have been most generally satisfactory. In some aircraft engines vibration is almost eliminated by having the cylinders rotate like a flywheel about a fixed crank shaft.

In gas engines the proper amounts of gas and air are easily adjusted in a mixing chamber; in the gasoline engine a jet of the volatile liquid is sprayed into a current of air as it is drawn through a *carburetor* into the cylinder. With kerosene or other less volatile fuels, a hot bulb or other form of heating device is often necessary. Ignition is almost universally caused by means of an electric spark produced by an induction coil or a high tension magneto.

The *Diesel* type of engine, which operates with heavy hydrocarbons such as tar oil, usually requires no ignition system when once in operation. Instead, air is drawn into the cylinder and highly compressed. The great pressure raises the temperature of the air to such a degree that, when the fuel is forced into the cylinder by means of a pump, spontaneous combustion occurs. The great advantage of the Diesel engine due to the low cost of fuel is partly offset by the heavier construction necessary to provide for the great pressure.

A theoretical plan for the four-cycle engine was originated by Beau de Rochas in 1862. The same plan was independently invented by Nicholas A. Otto, of Cologne, and was developed into a practical machine in 1877.

The power which a four-cycle engine will deliver is generally calculated by means of the formula,

$$\text{DHP} = \frac{\text{D}^2 \times \text{S} \times \text{RPM}}{18{,}000}$$

For example: the *delivered horse power* (DHP) of an engine having a 3-inch bore (D), a 4-inch stroke (S), and running at 1000 *revolutions per minute* (RPM) equals $3 \times 3 \times 4 \times 1000 = 36{,}000 \div 18{,}000$ or 2 horse power. The power of a two-cycle engine is obtained by dividing by 13,500 instead of 18,000.

For multicylinder engines the result is multiplied by the number of cylinders.

Microscope. An optical instrument consisting of a lens or combination of lenses, used to obtain a magnified image of minute objects. A *simple microscope* consists of a single convex lens composed of one or more parts, and is often called a magnifying glass. Instruments of this class have been known and used for centuries.

A *compound microscope* is composed of two lenses,—the objective and the eyepiece, or ocular,—mounted in opposite ends of a metal tube. The objective, being of short focus, is placed close to the object, of which it produces a magnified image within the tube. The eyepiece, which is generally of low power, magnifies this image a second time.

The first instrument of this type seems to have been made, about 1590, by Zacharias Janssen, a native of Holland. The magnifying power of a compound microscope depends on the power of the objective, the power of the eyepiece, and the distance between the two. It would thus seem possible to produce images of any magnification, but greatly enlarged images lack detail and sharpness, so that a power of 2000 diameters is seldom exceeded for visual work. It should be remembered that, as area increases with the square of the diameter, 2000 diameters means 4,000,000 times the area of the object.

The usual form of compound microscope consists of the lenses in an adjustable tube fastened above a platform having an opening in the center, across which the object is to be placed. Beneath the platform is a mirror which reflects rays of light from some source of illumination upward through a condenser. This, as its name indicates, concentrates the light from the mirror into a small bundle of rays which pass up through the stage, object, and lenses. For opaque objects the lighting must be from above.

Eyepieces which magnify from 4 to 20 diameters are generally used with objectives having a focal length of ⅔, ⅙, or 1/12 inch and a corresponding power of about 10, 44, and 90 diameters. A 1/12 inch objective with a 10-power ocular would therefore produce a magnification of 900 diameters. To prevent loss of light when using objectives of very short focus, a drop of cedar oil or similar fluid is placed so that it touches both the object and the lens. Objectives constructed to operate under such conditions are called *oil-immersion* lenses.

No microscope can show directly the true form of any object smaller than one-half the wave length of light by which it is seen. Much smaller objects, however, may be observed indirectly by means of two devices—the *ultramicroscope* and the *electron microscope.*

The ultramicroscope consists of an arrangement by which minute objects may be made visible as spots of light against a dark field. Light is sent across the field instead of up through it, so that any ultramicroscopic particles reflect light and are seen like dust in the air of a dark room through which a ray of sunshine is passing. In this way particles about six-millionths of an inch have been detected.

The electron microscope, invented in 1938, is a revolutionary contribution to microscopy. It employs the principle that electrons are, like light, reflected from what they strike. The electrons are focused, by a magnetic field within a cylindrical coil of electric wires, upon a glass plate treated chemically so as to become fluorescent where the electrons converge. The fluorescence reproduces the pattern of the minute object scanned.

The instrument is steel, about five feet high, with glass windows. Its interior is a vacuum. Within the vacuum a cathode-ray tube sends out a stream of electrons which strike the object to be scanned. Those reflected by the object are picked up by the magnetic field created by the coil of electric wire and are converged upon the chemically treated glass. The image may be projected in enlarged form on a phosphorescent screen.

Motion Pictures. A series of separate pictures projected upon a screen, and changed so rapidly that the eye receives the effect of continuous motion. This effect is due to a physiological property of the eye called *persistence of vision,* which causes an image to remain apparent for about 1/5 second after it has really disappeared. Standard pictures are projected at the rate of 16 per second. Each picture is shown perfectly still for 5/96 second, and the screen is dark for 1/96 second three times in the period during which one picture passes before the source of illumination.

After the invention and the development of photography, many investigators worked over the problem of picturing motion. Edward Muybridge, using methods devised by John D. Isaacs about 1872-73, studied the movements of a trotting horse by means of a row of 24 cameras, exposed in order as the horse passed before them. The photographs were projected in such a way as to simulate movement, but his apparatus was necessarily clumsy as he had only glass plates. A light, flexible, continuous film was needed as a substitute for the glass, and this was invented by Goodwin and produced by Eastman.

In 1894, Edison placed on the market his kinetoscope, which successfully depicts motion by means of photographs printed on an endless strip of celluloid film. But the pictures in this machine can be viewed by only one person at a time. In 1895, Thomas Armat of Washington was the first to produce motion pictures by modern methods. The essential point in the improvement made by Armat, with whom C. F. Jenkins was for a while associated as experimenter, was a device by which the film moved intermittently, having periods of rest and illumination largely in excess of the period of movement from image to image. Other projectors were made and exhibited in 1896. From 1897 to 1907 a violent war of litigation over patents disturbed the industry.

Motion picture film is so standardized that pictures made by one company may be exhibited on any machine in the world. It is usually prepared in strips 200 feet long by 1⅜ inches wide. On each side there is a margin of 3/16 inch in which perforations are cut. There are 16 photographs and 64 perforations to the foot. Each picture is thus 1 x ¾ inches. One thousand feet is the standard length to fill one reel.

The motion picture camera is equipped with a very fast, high grade lens of 2 to 3 inch focus. The shutter is a revolving, perforated disk driven by a crank which the operator usually turns at the rate of two revolutions per second. Eight exposures are made at each turn of the handle. Within the box the film passes from the original coil over several rolls. It is carried behind the lens, over other rolls which preserve an even tension and prevent tearing, and finally is rewound on a second reel. A delicate mechanism, catching in the perforated edges, holds the film firmly while the shutter is open and jerks it forward just ¾ inch when the shutter closes.

The exposed film is wound spirally on racks and is developed in huge tanks in a dark room. From the negative, any number of positives may be printed at the rate of from 5 to 8 pictures per second. These are made on similar strips of film coated with an emulsion which is not so sensitive but which gives greater contrast.

In the projecting machine, an electric arc is the usual source of illumination. The light passes first through heat filters and condensing lenses, and then through the film and the projecting lenses to the screen, where the picture is enlarged about 10,000 times. Most films are made of celluloid and are consequently highly inflammable. Non-inflammable films may be produced from cellulose acetate, but even these are melted by the heat from the arc if they are held too long between the lenses. The used and the unused reels of film are therefore held in asbestos lined boxes, and a safety shutter is

provided, which automatically protects the picture from the light if the machine accidentally stops. The mechanism for moving the film is similar to that used in the camera, but the shutter disk which revolves once for each picture has two large openings instead of a single small one.

Animated cartoons are made by photographing a great number of single drawings each showing a different stage of the action. Colored "movies" are made by exposing through a series of color screens and projecting through similar screens in reverse order—the technicolor process. These pictures must usually be shown at about twice the normal speed. "Talking movies" depend for their success on the exact timing of picture and voice. This problem was solved by the use of the photoelectric cell and the amplifier. See *Amplifier*, *Photoelectric Cell*.

The motion picture industry as organized today has three principal divisions: production, distribution, and exhibition. Forty-five years after its birth, in about 1895, the industry in the United States had grown to such proportions that it employed nearly 300,000 people. Nearly one-fifth of the total of the world's motion picture theaters, approximating 100,000, are in the United States. Russia is credited with the largest number, about 30,000. It is estimated that one-eighth of the world's population attend motion picture theaters each week.

The first studio for making motion pictures was a little, black, paper covered shanty built by Edison near his factory in New Jersey. Today a whole community in California is given over to the staging and filming of picture stories. This community, Hollywood, in Los Angeles, produces over two-thirds of the world's output.

Phonograph. An instrument which records and reproduces sound by means of a moving diaphragm that is caused to vibrate by sound waves in the air. A stylus or chisel-like needle connected with the diaphragm is allowed to trace or engrave a spiral line upon a revolving cylinder or disk. The slightest movement of the diaphragm is thus recorded on the path of the needle. To reproduce the sound, the record is again revolved at the same speed and a smooth needle attached to a second diaphragm is allowed to travel over the engraved line. The irregular motion of the needle then forces the diaphragm to vibrate and produce sound waves similar to those first recorded.

The first phonograph, or "talking machine," was invented by Thomas A. Edison in 1877. It consisted of a cylinder having a spiral groove cut on its surface, and mounted on a screw passing through its center. A smooth layer of tin foil was placed on the cylinder, which was then revolved so that the groove was always under the point attached to the diaphragm. The movements of the diaphragm thus produced irregular indentations in the tin foil, which would impart similar vibrations when the stylus was again allowed to travel over the cylinder.

The *graphophone*, invented in 1885 by Chichester Bell and Charles Tainter, improved on the phonograph by substituting a wax tube for the tin foil. The *gramophone*, invented by Emile Berliner in 1887, differed fundamentally from the first two, in producing a tracing of the sound waves as a zigzag line of even depth, rather than an up-and-down engraving. This system was found more satisfactory on disks than on cylinders. Modern practice tends toward the use of wax cylinders for temporary records, such as those used for commercial dictation, and of hard disks for all permanent records. Some machines employ reproducing needles which are used but once, while others have a permanent diamond or sapphire point.

In preparing commercial records the original is recorded directly upon a wax tablet. This is carefully covered with graphite in order that it may conduct electricity, and is then electroplated with copper. The copper shell is stripped from the wax and then nickel-plated in order to harden it. From this *master record*, a second, mother record is prepared in the same way, and from the mother record several matrices are made which are used for molding the familiar commercial disks. These are generally composed of shellac, together with charcoal, barium sulphate, and other substances.

In the *auxetophone*, an ordinary record is used to control the action of a delicate valve which impresses the proper vibrations on a stream of air generated by an air compressor. The recorded sound is thus *reproduced* without the aid of a vibrating diaphragm.

Great progress has been made within the past few years in the recording and transmission of sound. A new accuracy and realism has been achieved by the introduction of high-fidelity (hi-fi) equipment, which reproduces sound with an amazing degree of faithfulness to the original. This has been accomplished largely by eliminating sound distortion caused by electronic deficiencies in the making of a record and in the transmitting equipment. Its popularity, especially among lovers of music, has proved a stimulus to the industry.

Photoelectric Cell. This device, often called the electric eye, is used for translating variations in the intensity of light into variations in intensity of an electric current. Since the electric current, properly amplified by electron tubes, can be made to perform innumerable operations, the photoelectric cell makes it possible to produce these results by changes in the light which falls on the cell. Possible applications are almost innumerable.

The effect of light on an electric current was first noted by Heinrich Hertz in 1887. Julius Elster and Hans Geitel constructed in 1890 the first photoelectric cell. In modern practice, this cell consists essentially of a glass bulb or tube, either evacuated of air or filled with an inert gas, such as argon or neon, having an anode of platinum or some other suitable metal. The cathode is usually a very thin coating of an alkali metal, such as potassium or cæsium, which has been found to emit particles of negative electricity, or electrons, when exposed to light. When an electric current is passed from the anode to the cathode, this current is decreased by the action of light on the cathode. This effect varies with the amount and the wave length (color) of the light, which is admitted through a small window. The current used is necessarily of extremely low voltage and must be magnified enormously by an amplifier before being put to effective use in the production of sound or the operation of mechanical devices. Another type of cell utilizes a property of selenium, which is a very poor conductor of electricity when in the dark but, when exposed to light, conducts an electric current much more readily.

Photoelectric cells differ in their sensitivity to light of different colors or wave lengths. Some are adapted to respond to infra-red light rays, which are invisible to the human eye. Such cells can "see" in the dark, and the resulting current fluctuations can be made to produce visible photographs of invisible objects.

The first important application of the photoelectric cell was in the production of audible motion pictures. It is the basic element in phototelegraphy and television. It may be used also for mechanically counting objects passing before its "eye," for sorting objects by their color, for analyzing and matching colors, for measuring illumination and ultra-violet radiation, for transforming the printed page into intelligible sound, and for picking up obscure or invisible light signals and performing operations in accordance with the signals. All these operations it can perform better than the human eye. With the development of television, it promises to enable man to see in the dark or through fogs.

Photography. The process of forming and fixing images of objects upon a sensitized surface by means of the physical and chemical properties of light. The question "Who invented photog-

raphy?" is often asked, but cannot be definitely answered because modern photographic methods have been developed by contributions from many minds.

J. H. Schultz, in 1727, made the first photographic copy of writing. In 1802, Thomas Wedgwood copied pictures by the action of light. Joseph Nicéphore Niepce produced the first permanent pictures in 1814. Louis Jacques Daguerre, in 1839, made public the details of his *daguerreotype* process of sensitizing a silver plate with iodine, and developing, with vapors of mercury, the image produced on exposure. The next year Professor John W. Draper of New York university made by this method the first photograph of a human face. William H. F. Talbot, in 1841, presented his calotype process, which permitted many copies to be made from one paper negative.

In 1851, Scott Archer introduced the process in which sensitive silver salts are produced in a film of *collodion* supported on a glass plate. The gelatin-silver bromide emulsion, which is the basis of modern dry plates, was discovered in 1871 by Dr. R. L. Maddox. In 1884, George Eastman patented a successful roll film of paper, and, in 1887, Rev. Hannibal Goodwin applied for a patent on a transparent, sensitive, celluloid-like pellicle which was the basis of the modern roll and cut film. Both films and glass plates are coated with a creamy yellow emulsion of gelatin containing the bromide and iodide of silver.

Modern photographic apparatus usually consists of a light-tight box or camera, equipped with a lens which focuses an image upon the sensitive surface of a plate or film when the shutter is opened. No change can be seen on the exposed plate until it is *developed* by immersion in an alkaline, oxygen-absorbing solution of pyrogallol, metol, or similar reducing agent. In this solution the plate gradually darkens and the image appears. But, as the parts of any object which reflect the most light cause the greatest change in the silver salts, a reversed image, called a *negative*, is produced, in which the high lights of the object appear dark, and the shadows, light. Developing is done in the dark or in a red light, which does not affect ordinary plates. The negative is next *fixed* with a solution of sodium thiosulphate, commonly called *hypo*, which dissolves all *unchanged* silver salts. After further washing in fresh water, the negative is dried. Satisfactory negatives are produced almost mechanically by the system of *tank development*, in which the exposed plates are treated with a developer of known strength, for a definite time at a fixed temperature.

The final step consists in making a positive *print* by placing sensitized paper behind the negative and exposing these to the light. The dark parts of the negative hold back more light than the lighter shadows, so that the resulting image has the same light values as the original object. The principal kinds of photographic paper are: those which are printed by artificial light, developed, and fixed in the same way as the negative; and ordinary *printing out paper*, which is exposed to the sun until the image appears, and is then fixed, washed, and often given further treatment to improve the color. Other types of photographic paper are the gum bichromate, platinum, and blue print.

Photographs in natural colors are generally produced by means of screens or filters which separate light into its red, green, and violet components. The finished photograph must usually be viewed through similar screens. The processes of Ives, Joly, Wood, and the Lumière brothers are best known. On the Lumière autochrome plate a permanent screen is formed by a layer of starch particles colored red, green, and violet and mixed in the proper proportions.

By use of highly sensitized film, photography will produce results which far outdistance the capacity of the human eye. Rays, for instance, invisible to the eye may nevertheless produce pictures from objects which appear to be completely in the dark. In astronomical work, by long exposure, stars are photographed which are completely invisible to the human eye. In warfare, photographs made from airplanes will reveal changes in enemy forces which camouflage conceals from the eye. X-ray photography is one of the most valuable aids to surgery. Another important use is the photographing of documents or pages of books. The pictures are produced on a very small scale in a non-inflammable film, from which they may be projected by a lantern on a screen. The so-called candid camera depends on the use of very sensitive films and high speed exposure.

Phototelegraphy. A process for sending photographs by telegraph or telephone, perfected in the Bell Telephone laboratories, New York City, about 1925. The apparatus consists of a transmitter and a receiver, which may be used at the ends of any telephone line. A positive film of the photograph to be transmitted is rolled into cylindrical form and inserted in the transmitter. This film is revolved, at the same time moving forward very gradually with a screwlike motion. A small intense ray of light is focused on the film and shines through it with intensities varying according to the lightness or shade of the portion traversed. The varying currents thus set up control a similar cell and a beam of light directed upon an unexposed photographic film at the receiving end which is geared to rotate synchronously with the film at the transmitting end.

Radar. This term means "radio direction and ranging," operating on the principle of high tension radio impulses sent out in a straight line and reflected directly back to the sending instrument. The time of travel gives the distance. This was the device used by the Allies to detect the approach of enemy aircraft and ships in World War II and to determine the distance (range) to enemy forces. A joint Army-Navy release proclaimed the existence of Radar April 25, 1943. The system operates with ultra-high-frequency radio waves and was discovered in September, 1922, by Dr. A. H. Taylor and Leo C. Young of the U. S. Naval Aircraft Radio laboratory. The battleship *New York*, in 1938, was the first ship to be equipped for its use, and British "locators" during the Blitz of 1943–45 operated on the same principle as Radar.

Radio. This term is used to describe the transmission and reception of signals by means of radiated electromagnetic rays (radio waves).

The utilization of radio waves for sending messages by code is known as radiotelegraphy or wireless telegraphy. It may be accomplished by a series of interrupted waves to indicate dots and dashes, as in wire telegraphy. To transmit the tones of the voice or music, a continuous wave is required. To produce such radiations, an alternating current of very high frequency is necessary. This is supplied by electron tubes or transistors. Communication of this type is known as radiotelephony, or more often simply as radio. See *Radio Broadcasting*.

The basis of modern systems of wireless or radiotelegraphy was laid down in 1864 when Clerk-Maxwell, by mathematical reasoning, predicted the existence of electromagnetic waves in the ether. In 1887 Professor H. Hertz proved by experiments that such waves existed, and later Edouard Branly and Sir Oliver Lodge each developed an instrument called a coherer, by which these waves could be detected. Hertz found that they could be produced in the ether by the discharge of an electric spark. The shortest of these waves is many times longer than the longest light wave, but they travel at the same speed, 186,284 miles per second.

Guglielmo Marconi, in 1895, was the first to combine the discoveries of earlier scientists into a practical method of signaling. In 1901 he signalled the letter S across the Atlantic. This achievement was surprising, since it meant that the waves must have changed their direction with the curvature of the earth. Professor Kennelly in the United States

and Dr. Heaviside in England later proved that the Hertzian waves were reflected by a layer of ionized atoms produced about 50 to 100 miles above the earth's surface by ultra-violet rays from the sun. The existence of this celestial mirror, the so-called ionosphere, makes possible long distance communication by radio.

Marconi produced his signals by means of sparks formed by an induction coil and condenser. One side of the electric discharge was connected with the earth; the other, with a series of aerial wires or antennæ supported from tall poles. The current producing the spark was controlled by a telegraph key, so that long and short trains of waves, corresponding to the dashes and dots of the telegraph code, were radiated from the antennæ. At the receiving station, similar aerial wires conducted the incoming waves to a coherer which under their influence operated a local telegraphic circuit.

The coherer was soon replaced by electrolytic detectors and by crystals of carborundum, silicon, galena, and other minerals which, when used with telephone receivers, were much more sensitive. These in turn have been largely superseded by electron tubes and transistors which are used both for receiving and for transmitting.

A message sent out is radiated in every direction. To insure that the receiving station obtain only that message intended for it, the so-called wave antenna is employed, having a length approximately that of the wave used and pointed in the direction of expected messages. The antenna is not sensitive to waves coming crosswise. The large transatlantic stations are able to transmit two and receive six messages simultaneously. This result is possible partly through the use of different wave lengths and partly through the so-called barrage receiver, by which interfering waves from near-by stations are neutralized and the desired waves are amplified. In the short-wave "beam" system, reflectors are used at the sending and receiving ends, thereby greatly increasing the energy of the waves received.

The development of wireless telegraphy has been rapid. Three large systems are those of the Marconi and Telefunken companies, and of the Radio Corporation of America. In 1902 the first transatlantic message was sent, and later the value of the wireless telegraph on shipboard was proved by incidents such as the rescue of the survivors of the *Titanic* in 1912. Commercial service is regularly carried on throughout all parts of the world. All ships except the smallest are required to carry the necessary sending and receiving equipment.

Radio Broadcasting. Although all transmission by radio is broadcast in all directions, as distinguished from wire telegraphy and telephony, the term radio broadcasting is not applied to radiotelegraphy but only to wireless transmission by high frequency electromagnetic waves, or radiotelephony. These waves with their modulations corresponding to different sounds are produced through the medium of electron tubes or transistors in the sending instruments. Receiving instruments, also by means of electron tubes or transistors reconvert the modulations into air vibrations recognized by the ear as sounds.

The waves used in transmission differ in length according to the instruments producing them. If messages are sent out over waves having the same or not greatly different lengths the messages will "interfere." Consequently, to avoid "interference" no two or more stations within range of each other may be allowed to transmit over approximately the same length at the same time. For this reason, sending stations are licensed to broadcast with waves of a definite length and to broadcast at certain hours. Licensing is done by governments according to rules agreed on at international conventions. A high-power receiving station near Grand Island, Nebr., checks on American broadcasting stations to see that they observe the terms of their license.

Ordinary radio waves have lengths varying from 30,000 to 10 meters. "Short" radio waves have lengths from 10 meters down to lengths of microscopic proportions. The term *frequency*, measured in *kilocycles*, as applied to radio waves is the inverse of wave length. If a wave length is doubled, the frequency is halved. See *Spectrum of Rays*.

Short-wave broadcasts have the advantage of being more readily reflected along the ionosphere. A system known as the national "hook up" is accomplished by the transmission of programs by wire to distant points where they are broadcast on long waves. Static refers to static electricity causing imperfect reception.

On September 29, 1915, the same year in which the first transcontinental telephone line was completed, a conversation over the wireless telephone occurred between New York and San Francisco and was heard in Panama and Honolulu. A regular transatlantic radiotelephone service was inaugurated in 1927. See *Electron Tube, Radio*.

Frequency Modulation. (F.M.) A circuit designed by Major E. H. Armstrong. The practical effect is to do away with static and man-made noises and interferences, also to permit a large number of stations to use a wave length.

Television. The method of broadcasting both sound and pictorial effects simultaneously. Transmission by wire or wireless of scenes or moving pictures by conversion of light rays to electrical waves, which are reconverted to reproduce the original image.

Refrigeration. While ice has been used at least as early as the Christian era to chill foods, and the addition of salt has been known for centuries to add to its effectiveness, the invention of a device to lower temperatures by mechanical means opened an entirely new chapter in refrigeration.

The first patent for a refrigerating machine was granted to Dr. John Gorie, Apalachicola, Fla., in 1851, and the first refrigeration plant to be operated commercially was opened in New Orleans in 1866.

Refrigerating machines are based on the principles (1) that a liquid absorbs heat ("produces cold") when it turns into a gas and (2) that a gas tends to turn into a liquid when the pressure upon it is increased and to return to a gaseous state when the pressure is lowered. These principles are applied as follows:

A gas is chosen as a "refrigerant" which will liquefy at a pressure not far above that of the atmosphere. Pressure is increased upon the gas, thus liquefying it. The liquid is led into pipes not subject to the higher pressure. The liquid becomes a gas, absorbing heat from the walls of the pipes and their surroundings, thereby cooling the surroundings. The gas is returned to the compression chamber, where it is again liquefied and the cycle repeats itself.

Gases commonly used as refrigerants include sulphur dioxide, ammonia, and carbon dioxide. They are usually compressed by a pump driven by an electric motor, although an alternative method is to heat a solution of ammonia gas in a closed boiler, the gas driven off increasing the pressure. Refrigerating machines are ordinarily automatic. This requirement involves (1) use of a thermostat to start the application of power when the temperature of the commodities to be chilled rises above a certain point and to stop the power when the temperature falls below another point and (2) valves which permit the flow of the refrigerant from the compression chamber to the cooling tubes and on to the compression chamber again when certain temperature conditions prevail.

Refrigeration machinery was first used in breweries and later was applied to the manufacture of ice. Its employment for the direct cooling of food storage chambers has had an influence on the diet of the world's population which is difficult to exaggerate. It has made possible, for instance, the storage and long-distance shipping of meat, fruits, and vegetables. The process of very rapid freezing of fresh

fruits and fish has been found to preserve the original flavor without change.

One of the most important applications of refrigeration is so-called air conditioning, which usually involves the cooling of air and regulation of its humidity. The process involves sending air through a water spray chamber, the water ordinarily being cooled by refrigeration equipment.

For certain purposes, refrigeration is applied through the medium of solidified carbon dioxide, or "dry ice." The dry ice is produced under high pressure by refrigeration machinery, its temperature being about 110° F. below zero. In view of its low temperature, a much smaller bulk is required for a given amount of cooling than would be required if ordinary ice were used. As heat is absorbed, the dry ice turns into gas, leaving no liquid residue. The resulting carbon dioxide gas, being heavier than air, forms a protecting blanket around the solid, thus decreasing loss of heat to the surrounding air.

Sewing Machines. Modern sewing machines may be divided into two classes, chain stitch and lock stitch. The great majority of domestic machines make the lock stitch because the chain stitch is liable to ravel. Both types use a needle having the eye near the point, and usually a groove along the side so that the thread will not bind.

In making the chain stitch the needle plunges through the cloth and returns to its first position, leaving a loop of thread on the underside of the cloth. The material is advanced automatically, and the needle descends through the first loop, which is tightened while another loop is left. Through this the needle passes on the next stitch. The upper side of chain stitching appears as a straight line; the lower side forms a series of chainlike links. A second type of chain stitch machine employs a rotating hook to make a twisted loop.

Two threads are necessary to form the lock stitch. One passes from the spool, over various guides, and through the eye of the needle. The other is wound upon a bobbin that is attached beneath the sewing table to a vibrating shuttle or at the center of a rotating hook. When the needle descends, it throws out a loop, through which the shuttle or the hook passes with the second thread, thus locking the stitch. With a properly adjusted tension on the thread, the end of the loop is drawn to the middle of the cloth, so that both sides of the stitching present the same appearance.

An important device used on all domestic machines is the four-motion feed plate which lies under the material and moves it forward between stitches. The surface of this plate is covered with forward-pointing teeth which engage the cloth and with the first motion pull it toward the needle. The plate next drops down from the cloth, moves backward, then upward, and again travels forward for the length of the stitch.

Several hundred different types of sewing machines are used for commercial purposes. There are machines which sew on buttons, others which make the buttonholes, and delicate machines, having from four to a dozen needles, for sewing gloves. Carpet-sewing machines travel along the seam, because the material is too large and heavy to be moved to the needle. Sewing machines have had a predominating influence upon the garment making industry. The McKay stitching machine, invented by Lyman Blake, and the Goodyear welt-sewing machine have revolutionized shoemaking. By the Goodyear method, the insole of a shoe is fastened to the upper, and a narrow strip, called the welt, is sewed around the edge of the insole. The sole is then sewed to the welt.

The first sewing machine was invented in 1790 by Thomas Saint, an Englishman. Saint probably never built a machine, but a model constructed from his plans has been shown to be entirely practicable. In 1830, Barthelemy Thimonnier, a French tailor, produced a machine which was used for sewing uniforms for the French army. It was Thimonnier's factory that was destroyed by a mob. Later improvements of the sewing machine were made almost entirely by Americans.

About 1832–34, Walter Hunt, a machinist, first combined an eye-pointed needle with a lock stitch machine. He sold his interest in his invention to a blacksmith, who refused to apply for a patent. In 1853, Hunt himself applied, but the courts held that in waiting so long he had abandoned his rights to protection.

Elias Howe, in September 1846, received a patent for a sewing machine on which he had been working for three years. Howe's machines were the first to become a real competitor of hand labor. As the courts sustained the fundamental principles of Howe's patent, he is generally considered to be the inventor of the modern sewing machine. Howe was also the first to patent a lock stitch machine. He used in it an eye-pointed, grooved needle that moved horizontally.

In 1849, John Bachelder produced the first machine having a horizontal sewing table and a continuous feed. This feed consisted of an endless leather belt studded with pins.

Isaac Merritt Singer, in 1851, received patents for the first machine with a rigid, overhanging arm and a vertical needle. His machine made the lock stitch and was operated by a foot treadle.

The four-motion feed was invented in 1850 by Allen B. Wilson, a cabinetmaker. In 1857, A. E. Gibbs, a Virginia farmer, invented a rotary hook for making a chain stitch. As the fundamental patents have gradually expired, the most satisfactory features of the older machines have been adopted by all modern sewing machine manufacturers.

Steam Engine. A machine by which the expansive power of steam is transferred into mechanical energy and useful work.

The use of steam as a driving force is not new, for, in the first century A. D., Hero of Alexandria described a toy which revolved because of escaping steam. During the 17th century, steam appliances were used for pumping water, and, in 1705, Newcomen built for the same purpose the first practicable engine in which pressure was applied to a piston. In 1765, James Watt invented the separate condenser, and later made many other improvements of the greatest importance.

Modern steam engines may be divided into two types: the *reciprocating engine* and the *steam turbine*. In the first and more common type, steam acts alternately on either side of a *piston* which is forced back and forth within a hollow cylinder.

The piston is attached by a *piston rod* to a *crosshead*, which is in turn connected with the *flywheel* by a *connecting rod*. Through the action of valves, the steam is admitted behind the piston, while that part of the cylinder in front is connected with the exhaust. The piston moves toward the opposite end, and at the proper moment the steam is cut off, the piston finishes its stroke, and the valves automatically change so that the action is reversed. In a noncondensing engine the exhaust steam is forced out into the air against the atmospheric pressure of 14.7 pounds per square inch. In a *condensing engine* the exhaust steam is drawn off into a vacuum and condensed. By thus avoiding back pressure, more power is developed. In *expansion* engines the exhaust steam is forced into a second, larger cylinder, where it expands further and does more work. Marine engines are frequently of the *triple expansion* and even *quadruple expansion* type in which the steam, before it is exhausted, is allowed to expand into a third and a fourth cylinder, each larger than that preceding.

In spite of the great commercial importance of the reciprocating engine, it is very far from being efficient. In the best engines only about 12½% of the energy in the fuel is delivered as mechanical

energy. The largest single units of this type are of about 10,000 horse power.

In the steam turbine, steam flows from an opening against vanes attached to a *rotor*, which revolves under the pressure of the moving steam. As the steam leaves the moving vanes, it strikes stationary blades, which again deflect it against another row of the vanes. The turbine is the most nearly perfect of all steam engines. It operates at very high speed and is especially effective in driving dynamos and in propelling ships. Turbine generators may attain a capacity of 160,000 kilowatts, or 251,000 horse power. The first vessel driven by turbines developed a speed of 34 ½ knots, so that large vessels were soon equipped with the new engines which give greater power and require much less space.

A further development in ship propulsion which provided greatly increased power with much greater economy in space was the introduction of atomic reactors, as in the pioneer U.S. ship *Nautilus* (See *Submarine Warfare*). The record of this vessel for long cruises submerged was enhanced when she made history, in 1958, by passing the North Pole under Arctic ice. Power plants similar to the one successfully demonstrated by the *Nautilus* are now standard for the U.S. submarine fleet.

The steam necessary for turbines is produced by heating water in a boiler. *Saturated steam* is in such a condition that any lowering of its temperature or increase of pressure will cause part of it to condense to water. One pound of such steam normally occupies 26.36 cubic feet. Saturated steam holding in suspension less than 3 per cent of water is called *dry steam*. Steam at a temperature higher than its normal condensing point is known as *superheated steam*. By its use and through improvements in design and fueling, boilers have been constructed to operate at a pressure of 3375 pounds to the square inch. Variant types of boilers include those which employ electricity for heating or which use mercury vapor instead of steam.

Telegraph. In its simplest form the telegraph is composed of a *line* of wire, usually galvanized iron; a key for sending; a sounder to make the signals audible; and some source of current such as a battery or dynamo. All are connected so that the current must pass through each one. Only one wire is generally used because the earth serves as a return wire to complete the circuit.

The *key* is merely a lever held in place by a spring. It has an insulated knob on one end, and carries a contact point underneath. The *sounder* consists of two electromagnets with a piece of iron mounted close to their ends. The iron armature is attached to a pivoted arm which strikes a brass anvil when it moves either up or down. When the key is *open*, no current can flow, but, when the knob is depressed, a contact is made which closes the circuit. The current then flows through the magnets, which pull the iron toward them, causing a click when the arm strikes the anvil. When the key is raised, the arm springs away from the magnets with another click.

The signals depend upon the time between the sounds of an up and a down click. A short period corresponds to a dot, a longer period to a dash, with a definite arrangement of dots and dashes for each letter. The Morse code, which is used in the United States and Canada, also makes use of a space in order to simplify the combinations. To avoid errors, the Continental Morse code using only dots and dashes is generally employed in Europe, and also in radiotelegraphy.

A commercial Morse telegraph key is equipped with a switch which is closed when the instrument is not in use. A current thus flows continually through all the instruments on a line until some operator wishes to send a message. He then opens his switch and sends the signals which are repeated in every office connected with the line. As the current flowing over a long line is usually too weak to operate a sounder, the main line is connected with a *relay*, which operates in the same way but is much more sensitive. The moving arm of the relay acts as a key to close a local circuit and operate a sounder. Very long lines, such as those from New York to Chicago, are generally divided into sections by *repeaters* which act as a reversible relay to repeat the signals with a stronger current.

By using currents differing in strength or direction, or both, it is possible by the *duplex* system to send a message in both directions at the same time. In 1873, Edison invented the *quadruplex* system whereby two messages may be sent in both directions at the same time. The *synchronous multiplex* system permits six operators to send over the same wire. Machines, such as the Wheatstone automatic telegraph, which use a perforated tape, are capable of transmitting 300 to 400 words per minute as compared with 25 to 40 by a good operator. With the multiplex *printing telegraph* system, messages are sent by pressing keys on a machine resembling a typewriter, and are automatically printed on telegraph blanks at the receiving end. Most telegrams are now sent in this way. Facsimile telegrams may be sent by phototelegraphic instruments. (See *Phototelegraphy*.)

The supreme court of the United States has decided that Samuel F. B. Morse was the inventor of the electromagnetic telegraph. Other famous scientists who worked on the same problem were the Englishmen, Wheatstone and Cook, whose five-wire system was the first to be tried commercially, and Professor Joseph Henry, an American, who in 1831 operated the first sounding electric telegraph. Steinheil of Munich also developed a similar system about 1837. Morse began his work in 1832. His first commercial line was constructed with government aid. It extended between Washington and Baltimore and was opened to the public April 1, 1844.

Morse Code. A·— B—··· C—·—· D—·· E· F··—· G——· H···· I·· J·——· K—·— L·—·· M—— N—· O——— P·——·· Q——·— R·—· S··· T— U··— V···— W·—— X—··— Y—·—— Z——··

Continental Code. A·— B—··· C—·—· D—·· E· F··—· G——· H···· I·· J·——— K—·— L·—·· M—— N—· O——— P·——· Q——·— R·—· S··· T— U··— V···— W·—— X—··— Y—·—— Z——··

Telephone. An instrument used for the purpose indicated by its name, which means a "voice from afar." Many inventors worked on the problem of an electric telephone. On February 14, 1876, Alexander Graham Bell applied for a patent, granted on the following March 7, which is fundamental for this method of transmitting speech by means of electricity.

Although it follows the basic principles of Bell's telephone, today's set possesses far better sending and receiving qualities. The telephone consists of two basic parts: 1) the handset which contains a receiver and transmitter, and 2) the base housing a ringer, an electrical network, a switch, and often a dial.

When the handset is lifted off the base, an electrical circuit is established through the telephone instrument. In the transmitter, this circuit passes through carbon granules in a chamber located immediately behind the diaphragm. Sound waves cause the diaphragm to vibrate, which in turn exerts pressure upon the granules, compressing them in varying densities. The varying resistance of the granules regulates the current flow. An electrical pattern of the voice is sent through a switching center to the other telephone.

In the receiver of the other telephone, a permanent magnet, surrounded by an electromagnet, exerts force on an iron-rimmed fabric diaphragm. As current passes through the electromagnet (coil),

the magnet's attraction on the iron rim and attached diaphragm varies and the diaphragm moves accordingly. The surges of current dispatched from the transmitter set the pattern of vibration. This vibration sets sound waves in motion which the listener hears.

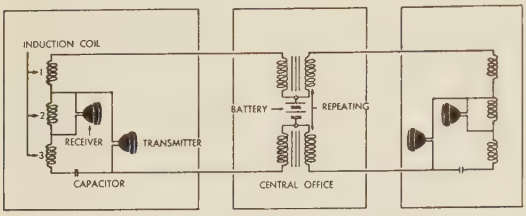


Diagram of a Telephone Circuit

One telephone is connected to another automatically (dial) or by hand in the switching center, called a central office. Today almost 90 per cent of all Bell telephones are dial operated. Three main types of dial apparatus are in use. Step-by-step, a switching system which connects a call in stages as each figure is dialed, is used mostly in smaller communities. In larger cities, or where switching requirements are complicated, "panel" and "crossbar" systems are most often found. Panel equipment has largely been replaced by "crossbar" for new installations. Unlike step equipment, crossbar switching of a call does not begin until the number is completely dialed. Then the entire operation is completed almost instantaneously. In conjunction with automatic accounting equipment, crossbar systems have opened the way for such modern, time-saving arrangements as operator long distance dialing and customer dialing to distant points. In 144 cities, in mid-1956, approximately 1,500,000 customers could dial long distance calls on a nationwide basis. Telephone connections now span the Atlantic and Pacific oceans.

Telephone conversations are carried over various types of voice highways. *Wire* transmission, the best known, basically depends on a pair of wires, providing metallic circuit. Two pairs form a quad and, when suitably arranged, can carry three conversations simultaneously. Telephone cables are made up of quads and pairs of various sizes. "*Carrier*" systems are today the principal method of long distance transmission. "Carrier" is the term given to a method by which a pair of wires, or other transmission medium, can be adapted to carry many simultaneous conversations. Conversations are put on different frequency bands. Filters at the receiving end sort out and "demodulate" (restore) the frequencies to those of the original voice band.

"Coaxial" cable is one of the transmission media used for long distance carrier systems. Such cables usually have eight tubes. Tubes and a copper wire within have a common axis, or are coaxial. Voice signals are sent through the tubes on different frequency bands at speeds approaching light. With today's equipment, 1860 separate conversations or 660 conversations plus TV signals in each direction can be carried on a pair of tubes. Since two tubes are kept for emergencies, a coaxial cable thus can carry a maximum of 5580 separate simultaneous conversations. *Radio Relay*, a narrow beam radio system of super high frequencies (microwave), is another carrier communications system. The principal Bell Company radio relay systems can handle as many as six broad band communications paths in each direction. Two such highways in opposite directions can carry up to 600 conversations or two television programs. *V.H.F.(Very High Frequency) Radio* is used for communicating to and from moving vehicles, while *high frequency radio* is used for many overseas calls. In 1956, the first two major transoceanic telephone cable systems were laid—one between North America and Great Britain and the other between Alaska and the United States. The Trans-Pacific cable between U.S. and Japan was completed in 1964.

Over 84,000,000 telephones are in use in the United States—more than 50 per cent of the world's total. They are operated by Bell Companies and approximately 13,289,000 independent concerns.

Television. This term is applied to the reproduction, transmission, and reception, through the medium of electromagnetic rays, of a series of rapidly succeeding photographic pictures which give the impression of a scene from life. The word means "seeing from a distance."

The central element in the process is a specialized form of electron tube known in different forms as an iconoscope or an image dissector. It contains a screen consisting of numerous minute light-sensitive cells. A photographic image is focused on the light-sensitive cells. The screen is scanned by an electronic beam, which has the effect of setting up in the cells currents proportional to the amount of light received. The currents on transmission to a receiving instrument are used to reconstruct the light pattern in the original image. A standard picture calls for the electronic beam passing across the image 440 times and making 30 complete pictures in a second.

Transmission requires the simultaneous use of numerous telephonic channels, a requirement which is met by the coaxial cable for wire transmission and short wave bands for wireless transmission.

Thermostat. An instrument for automatically regulating the temperature produced by heating apparatus. When the temperature to be regulated rises to a certain point it causes an element of the thermostat, either a fluid or a metal bar, to expand and touch off a control which closes a draft or the fuel feed supplying the heat. Then when the temperature falls to a certain point, the sensitive element of the thermostat contracts and the control is actuated in such a way as to cause more heat to be supplied.

Thermostats in household use are ordinarily placed in a living room. The control actuated by the expanding or contracting element is connected electrically with a device for regulating the furnace. In a hot air furnace, if coal is burned, the device closes or opens the drafts; if oil or gas is used, the device partially cuts off the feed. In hot water furnaces, the action of the thermostat is to cut off or turn on an electric current operating a pump which, when in action, causes the hot water to circulate. A second thermostat regulates the temperature of the water.

Typewriter. An instrument for writing in characters similar to those used for printing. Christopher Latham Sholes is generally considered to be the inventor of the modern typewriter. On his first machine, completed in September 1867, many letters were written and sent to friends. One of these letters induced James Densmore, of Meadville, Pa., to take a large financial interest in the new invention, which was patented in 1868. Six months later, when Densmore first saw the typewriter, he decided that it was absolutely impracticable.

Under the constructive criticism of Densmore, Sholes proceeded to build model after model, until, after five years of work, a satisfactory machine was produced.

A famous firm of gunmakers, E. Remington and Sons, was then persuaded to manufacture the machine, which, in 1874, appeared on the market as the Remington typewriter.

Most of the standard modern typewriters are operated by 42 keys arranged in what has been found to be the most convenient order. This arrangement is known as the *universal keyboard*. Scores of other arrangements are used for writing in foreign languages, or for the use of special characters. Each key controls a steel type bar which carries two characters near the free end.

Selection of the desired character is obtained by means of a shift key.

The type bars are hinged in a basket-like group, so that each one may strike on a common center when the proper key is depressed. The paper is placed upon a rubber cylinder, which is mounted on a carriage moving from right to left. Under the control of a pawl and ratchet, the carriage moves one space to the left after each letter is printed or when the space bar is used. At the end of a line the carriage is pushed to the right by the operator. This pressure also serves to advance the paper for a new line.

Just before the type bar reaches the cylinder, an inked ribbon is raised into place so that the key strikes the ribbon and leaves a sharp impression upon the paper. Key and ribbon then drop back so that the writing is always visible. The ribbon, which is usually about 25 feet long, is stretched between two spools and moves at the same speed as the carriage. When most of the ribbon has been wound upon one spool, the direction of winding is automatically reversed.

The average operator writes about sixty words per minute, which is about three times as fast as the ordinary penman. Special typewriters are in use for bookkeeping and similar operations.

Outstanding among typewriter improvements was the early introduction of the warning bell which tells the typist the end of the line is approaching, the coming of the noiseless machine in 1909, and the advent of the electric typewriter about 1935. The portable typewriter, which is small and light and easily carried in a hand case, has proved a boon to newspapermen, students, and others who work outside offices.

The teletype or teletypewriter records messages by electrical transmission, as does also the machine known as the stock market ticker. See *page 1209*.

MODERN INVENTIONS

Invention, Inventor, and Country	Date
Adding machine; Blaise Pascal; France	1642
Recording; Burroughs; United States	1888
Air brake; George Westinghouse, Jr.; United States	1869
Airplane; Orville and Wilbur Wright; United States	1903
Airplane compass; Mendenhall and Williamson; United States	1917
Air pump; Otto von Guericke; Germany	1654
Airship; Henri Giffard; France	1852
Aluminum, Hall process of making; Charles M. Hall; United States	1886
Aniline dyes; W. H. Perkin; England	1856
Autogiro; J. de la Cierva	1920
Automobile, gas engine; Siegfried Markus; Germany	1875
First commercial; Levassor; France	1891
Babbitt metal; Isaac Babbitt; United States	1839
Bakelite; L. H. Baekeland; Belgium-United States	1907
Balloon; J. E. and J. M. Montgolfier; France	1783
Barbed wire machine; Glidden and Vaughan; United States	1874
Barometer; Torricelli; Italy	1643
Bicycle; Macmillan; Scotland	1840
Modern type; James Starley; England	1884
Bifocal lens; Benjamin Franklin; United States	1780
Calcium carbide, commercial production of; Thomas L. Willson; United States	1892
Carborundum; E. G. Acheson; United States	1891
Car coupler, automatic; E. H. Janney; United States	1873
Carding machine; Whittemore; United States	1797
Cartridge, metallic; Houiller; France	1847
Cash register; J. Ritty; United States	1879
Caterpillar tractor; Benjamin Holt; United States	1900
Caustic soda, Castner process; Hamilton Y. Castner; United States	1890
Cellophane; J. E. Brandenberger; France	1912
Celluloid; J. W. and Isaac Hyatt; United States	1869
Chrome tanning; Schultz; United States	1884
Clock, pendulum; Huygens; Netherlands	1657
Coach, steam; Richard Trevithick; England	1801
Coal, liquefaction of, for producing gasoline; Friedrich Bergius; Germany	1914
Coherer, for detecting "wireless" waves; E. Branly; France	1892
Color photography; F. E. Ives; United States	1892
Ruled screen process; John Joly; Ireland	1894
Autochrome process; A. and L. Lumiére; France	1906
Cotton gin; Eli Whitney; United States	1793
Cream separator, centrifugal; De Laval; Sweden	1880
Cultivator, rotary disc; Mallon; United States	1878
Cyanide process for gold and silver ore; Forrest and MacArthur; Scotland	1890
Dental plate, rubber; Charles Goodyear, Jr.; United States	1855
Depth bomb; Unge; Sweden	1903
Improved; Godfrey Tait; United States	1916
Diesel engine; Rudolf Diesel; Germany	1893
Dynamite; A. Nobel; Sweden	1866
Dynamo-electric machine, first; Michael Faraday; England	1831
Drum wound armature; Werner Siemens; Germany	1854
Separately excited field; H. Wilde; England	1863
Electric arc lighting, practicable system; C. F. Brush; United States	1878
Electric battery, primary; Alessandro Volta; Italy	1799
Electric battery, storage; Gaston Plante; France	1859
Nickel-iron type; Thomas A. Edison; United States	1903
Electric furnace, arc type; Pichou and Johnson; France and England	1853
Resistance type; W. Borchers; Germany	1880
Electric lamp, carbon filament; Joseph W. Swan; England	1860
Improved carbon filament; Thomas A. Edison; United States	1879
Ductile tungsten filament; W. D. Coolidge; United States	1910
Electric motor, split phase; Tesla; United States	1887
Alternate current; Tesla; United States	1892
Electric welding, resistance process; Elihu Thompson; United States	1886
Electrocast blocks; G. S. Fulcher; United States	1927
Electromagnet; Wm. Sturgeon; England	1824
Electron tube, practical; J. A. Fleming; England	1904
Three-electrode; Lee De Forest; United States	1906
Electroplating; Luigi Brugnatelli; Italy	1805
Electrotyping; Moritz H. von Jacobi (Germany) and Thomas Spencer (England)	1838
Elevator, power; Elisha G. Otis; United States	1852
Flotation process, ore refining; Elmore; United States	1899
Food preservation, canning process; Appert; France	1810
Fourdrinier paper-making machine; Louis Robert; France	1798
Galvanometer; Sweigger; Germany	1820
Gas engine, electric ignition; Barsonti and Matteucci; Italy	1857
Four-cycle; Nicholas August Otto; Germany	1877
Successful; Gottlieb Daimler; Germany	1884
Gaslighting system; Wm. Murdock; England	1792
Gas mantle, incandescent; von Welsbach; Austria	1885
Gas meter, wet; S. Clegg; England	1815
Dry, modern; Wm. Richards; United States	1843
Gatling gun; R. J. Gatling; United States	1861
Gauge, steam pressure; Bourdon; France	1849
Gramophone; Emile Berliner; United States	1887
Graphophone; Bell and Tainter; United States	1885
Guncotton; Schönbein; Germany	1846
Gyrocompass; H. Anschutz-Kampfe; Germany	1906
Improved; Elmer A. Sperry; United States	1910
Gyroscope; Foucants; France	1852
Harvester and thresher, combined; S. C. Matteson; United States	1888
Hydraulic press; Joseph Bramah; England	1795
Hydrogenation, catalytic; Sabatier and Senderens; France	1902
Hydroplane; Glenn H. Curtiss; United States	1911
Ice machine, compressor system; Jacob Perkins; United States	1834
Absorption system; F. P. E. Carré; France	1860
Induction coil, modern; Ruhmkorff; Germany	1851
Injector, steam, for boilers; Henri Giffard; France	1858
Iron, galvanizing process; Henry Craufurd; England	1837
Knitting machine; William Lee; England	1589
Circular; M. I. Brunel; England	1816
Latch needle; Townsend and Moulding; England	1858
Kodak, roll-film hand camera; Eastman and Walker; United States	1888
Lacquer, synthetic—nitrocellulose; W. P. Field; United States	1890
Cellulose acetate; C. F. Cross, E. J. Bevan; England	1892
Lathe, turret; Stephen Fitch; United States	1845
Lawn mower; A. M. Hills; United States	1868
Lewis gun; I. N. Lewis; United States	1912
Leyden jar, modern; John Bevis; England	1746
Lightning conductor; Benjamin Franklin; United States	1752
Linotype; Ottmar Mergenthaler; United States	1885
Lithography; Alois Senefelder; Bohemia	1798

MODERN INVENTIONS—Con.

Invention, Inventor, and Country	Date
Locomotive, steam, on rails; Richard Trevithick; England	1804
First successful; George Stephenson; England	1829
Loom, pattern; M. J. Jacquard; France	1801
Power; Edmund Cartwright; England	1785
Locomotive, electric; Vail; United States	1851
Machine rifle; John M. Browning; United States	1916
Matches, friction; John Walker; England	1827
Safety; Lundstrom; Sweden	1855
Mercerized cotton; John Mercer; England	1844
Mercury vapor lamp; Peter Cooper Hewitt; United States	1900
Microphone; Emile Berliner; United States	1877
Microscope, compound; Zacharias Janssen; Netherlands	1590
Electron; E. Ruska, B. von Boris; Germany	1938
Monotype; Talbert Lanston; United States	1887
Motion picture machine; Thomas Armat; United States	1895
Mowing machine; Manning; United States	1831
With differential gear; Eickemeyer; United States	1876
Multiplying machine; G. W. Leibnitz; Germany	1671
Nails, machine cut; Ezekiel Reed; United States	1786
Naval telescope gun sight; Bradley A. Fiske; United States	1891
Nernst lamp; Walter Nernst; Germany	1897
Nitrogen fixation electric arc; C. Birkeland; Norway	1903
Catalytic process; Haber and Bosch; Germany	1911
Cyanamid process; Caro and Franke; Germany	1908
Nylon; E. I. du Pont de Nemours & Co., U. S.	1937
Oleomargarine; H. Mege-Mouries; France	1869
Opthalmoscope; Helmholtz; Germany	1851
Optophone, by which blind can read type; E. E. Fournier d'Albe; England	1914
Pen, steel; Samuel Harrison; England	1780
First successful fountain; L. E. Waterman; U. S.	1884
Percussion cap; Shaw; United States	1816
Phonograph; Thomas A. Edison; United States	1877
Photoelectric cell; J. Elster and H. Geitel; Germany	1895
Photography, daguerreotype process; L. Daguerre; France	1839
Bichromate process; Mungo Ponton; Scotland	1839
Use of hypo; John Herschel; England	1839
Collodion process; Scott Archer; England	1851
Gelatin-silver bromide emulsion; R. L. Maddox; England	1871
Roll-film, modern; Hannibal Goodwin; United States	1887
Phototelegraphy; Bell Telephone Laboratories; United States	1925
Piano; Bartollomeo Cristofori; Italy	1709
Piano player, first pneumatic; M. Fourneaux; France	1863
Pin-making machine; L. W. Wright; United States	1824
Plow, cast-iron, modern shape; Jethro Wood; United States	1819
Disk; Hardy; United States	1896
Pneumatic tire; R. W. Thompson; England	1845
Independently by John B. Dunlop, Ireland	1888
Pneumatic tool; George Law; England	1865
Portland cement; Joseph Aspdin; England	1824
Printing from movable type; J. Gutenberg; Germany	1450
Printing press, cylinder; F. Konig; Germany	1811
Double cylinder; R. Hoe & Co., United States	1845
Rotary; Thomas Nelson; England	1850
Gordon; George P. Gordon; United States	1850
Pulmotor; Alexander B. Dräger; Germany	1911
Radar; Dr. A. Hoyt Taylor and Leo C. Young of the Naval Aircraft Radio laboratory; United States	1922
Radiotelegraph; G. Marconi; Italy	1895
Radiotelephone; Lee DeForest; United States	1906
Long-distance; American Tel. & Tel. Co.; United States	1915
Rail, flanged; T. R. L. Stevens; United States	1831
Rayon; H. de Chardonnet; France	1889
Reaper, McCormick; Cyrus H. McCormick; United States	1831
Refrigerating machine; John Gorie; United States	1851
Revolver; Samuel Colt; United States	1835
Rifle, spiral grooves; Koster; England	1620
Breech-loading, successful; John M. Hall; United States	1810
Bolt action, military; Dreyse; Germany	1839
Repeating; Henry; United States	1860
Rock drill, percussion; J. J. Couch; United States	1849
Diamond bit; Herman; United States	1854
Safety lamp, miner's; Sir Humphry Davy; England	1815
Saw, band, wood; William Newbery; England	1808
Circular, wood; Samuel Miller; England	1777
Screw propeller, successful application; John Ericsson; Sweden	1841
Self-binding reaper, twine; J. F. Appleby; United States	1875
Sewing machine; Elias Howe; United States	1846
Four-motion feed; Allen B. Wilson; United States	1854
Shoe-sewing machine, McKay; Lyman Blake; United States	1858
Welt-sewing; Charles Goodyear, Jr.; United States	1871
Shotgun, practical breech-loading; Casimir Lefaucheux; France	1836
Hammerless, ejecting; J. Needham; England	1874
Silencer for firearms; Hiram P. Maxim; United States	1909
Smokeless powder; J. F. E. Schultze; Germany	1867
Spectroscope; Kirchhoff and Bunsen; Germany	1859
Spinning machine, jenny; James Hargreaves; England	1767
Roll-drawing; Richard Arkwright; England	1769
Mule-jenny; Samuel Crompton; England	1779
Ring spinner; John Thorp; United States	1828
Stainless steel; Brearley; England	1914
Steamboat, successful; Robert Fulton; United States	1807
Steam engine, atmospheric; Thomas Newcomen; England	1705
With separate condenser; James Watt; Scotland	1765
Double action, use of expanding steam; James Watt; Scotland	1782
Compound; Jonathan C. Hornblower; England	1781
High-pressure; Oliver Evans; United States	1799
Steam hammer; James Nasmyth; Scotland	1839
Steam turbine; Charles A. Parsons; England	1884
Steel, Bessemer process; William Kelly; United States	1847
Independently by Henry Bessemer; England	1855
Crucible process; Robert Huntsman; England	1740
Open-hearth process; Siemens and Martin; England	1866
High speed; F. W. Taylor and M. White; United States	1900
Manganese; Hadfield; England	1884
Stereoscope, lenticular; Sir David Brewster; England	1849
Stereotyping; William Ged; Scotland	1725
Stethoscope; Laënnec; France	1819
Submarine boat, first successful; John P. Holland; United States	1900
Submarine detector; Max Mason; United States	1917
Tack machine; Blanchard; United States	1806
Tank, military; Gen. E. D. Swinton; England	1914
Telegraph; S. F. B. Morse; United States	1837
Duplex system; J. B. Stearns; United States	1872
Quadruplex system; Thomas A. Edison; United States	1873
Submarine, siphon recorder; Wm. Thompson; England	1874
Telephone; A. G. Bell; United States	1876
Automatic; A. B. Strowger; United States	1889
Long-distance, by loading coils; Michael I. Pupin; United States	1900
Telephone transmitter, microphone; Emile Berliner and Thomas A. Edison, United States	1877
Telescope; Jan Lippershey; Netherlands	1608
Teletypesetter; Morkrum-Kleinschmidt Corporation; United States	1928
Television; J. L. Baird; England	1925
Independently by C. F. Jenkins; United States	1925
Thermit mixtures; H. Goldschmidt; Germany	1897
Thermometer; Galileo; Italy	1593
Threshing machine; Andrew Meikle; Scotland	1786
Torpedo, self-propelled; Whitehead; England	1868
Radio controlled; Bradley A. Fiske; United States	1897
Transistor; John Bardeen, Wm. B. Shockley, Walter H. Brattain, United States	1948
Trolley car, practical system; F. J. Sprague; U.S.	1888
Tunnel shield; M. I. Brunel; England	1818
Turbine, hydraulic; J. B. Francis; United States	1849
Turret, revolving, for floating battery; Theodore Timby; United States	1862
Typewriter, first practicable; C. L. Sholes; U.S.	1868
Vacuum bottle; James Dewar; England	1892
Valve gear, Stephenson link; William Howe; England	1843
Walshaert gear; Egide Walshaert; Sweden	1844
Vulcanized rubber; Charles Goodyear; United States	1844
Watches, machine-made; Dennison and Howard; United States	1850
Water gas, modern process; T. S. C. Lowe; United States	1873
Wood pulp, for paper, mechanical process; Keller and Voelter; Germany	1844
Sulphite process; B. C. Tilghmann; United States	1867
Sulphate process; Dahl; Sweden	1883

ENGINEERING AND BUILDING

An engineer directs the natural forces of nature to the uses of mankind. He must therefore be a scientist; for mathematics, physics, and chemistry are the foundation of most engineering training. Nevertheless, the pioneer of science who devotes his energies to solving the problems of physics or chemistry is not an engineer. To qualify as such, he must apply the knowledge obtained by research and testing, to the design, construction, and operation of works, machines, or processes.

The mathematician studies the mutual relations between the sides and the angles of a triangle; the engineer uses the knowledge thus obtained to measure the distance across a river or to the top of a distant peak. The physicist studies the laws of centrifugal force; the engineer applies these laws when he raises the outer rail at a curve, to prevent a train from leaving the track. The chemist discovers that starch can easily be changed into glucose; the engineer then designs and operates a factory where table sirups are made from corn or potatoes. Because of this practical side of his work, an engineer has been described as one who can accomplish with one dollar what an untrained worker can do, indifferently, with two.

The practice of engineering is not new, for the pyramids of Egypt with their perfectly placed masses of stone compare well with the greatest of modern structures; and some of the bridges and aqueducts constructed by the Romans are still in use. The earliest engineers were chiefly surveyors. Later, engineering became largely a military profession, because the chief demand of the time was for men who could plan strong fortifications and construct tunnels and the engines of war necessary to reduce opposing forts.

With the advance of civilization and the development of commerce, engineering projects, such as bridges and harbors, dams, roads, and canals, were required even more for civil than for military purposes. As a result, men capable of filling this need gradually developed the profession of *civil engineering*, which is now generally recognized as the first and largest division of engineering practice. Next, the rapid increase in the application of power to mechanical operations caused men to specialize in the design and the use of machines. Thus developed the second great branch of the engineering field—that of *mechanical engineering*.

Branches of Engineering. Civil and mechanical engineering represent the fundamental divisions of engineering practice. Mining, electrical, chemical, and sanitary engineering are specialized branches, each applying general engineering principles in connection with a particular division of science. The electrical engineer is probably the most highly specialized, but that each branch is closely related to every other is shown by the training given to students of engineering in the great technical schools. For the first two or three years of their work, students of electrical, mechanical, or chemical engineering study almost the same subjects; later they are permitted to specialize.

More than a hundred well recognized subdivisions might also be named, such as heat, hydraulic or water power, railway, locomotive, automotive, ventilation, highway, telephone, and aeronautical engineering.

Civil Engineering. The civil engineer may be compared to a general at war with the elements, for he strives to bring the land and the sea under his control. He is a builder, in order that commerce and industry may be more easily carried on. He designs, locates, and builds highways and railroads, and, if these are interrupted by a deep gorge or by wide rivers, bridges and tunnels are constructed under his direction. He deepens harbors, protects them from the open waters by means of breakwaters, places lighthouses to guide ships to safety, and builds docks at which cargoes can easily be handled.

Construction of canals and the development of inland waterways, the building of dams for purposes of irrigation and water power, the erection of a single skyscraper or the building of an entire city and of aqueducts to supply the city with water—all come directly within the province of the civil engineer.

Mechanical Engineering. The division of engineering which is concerned with the design, construction, and operation of machines. A civil engineer may plan and lay out a railroad, and a naval architect may design a fast and beautiful steamship, but it is the mechanical engineer who designs the locomotive that hauls the trains and the boilers and engines that drive the vessel. While an architect designs, and a civil engineer constructs, a mighty office building, the mechanical engineer provides for a suitable power plant, pumps, elevators, hot water, ventilation, heat, and often a system of refrigeration. A steel mill, with its enormous power plant and giant engines for handling and shaping iron and steel products, is one of the most impressive examples of mechanical engineering.

When a new type of machine is required for some special purpose, it must be designed by a mechanical engineer. However, standardized machines for many purposes are already on the market, so that in factory operation the mechanical engineer must frequently select and arrange the proper machines to produce a certain result in the most economical manner. The design and the improvement of automobiles have become so important that specialists in this branch of mechanical work are called *automotive engineers*.

Another important duty of the mechanical engineer is the testing of structural materials. The builder of a bridge knows that it will carry its load because a mechanical engineer has designed machines capable of testing steel beams by the application of enormous forces. In this age of machinery, no engineering problem of any considerable importance can be carried through without the aid of the mechanical expert.

Mining Engineering. A branch of engineering devoted to the surveying, testing, and evaluation of mineral deposits, and the planning and execution of the methods by which the mineral is obtained and treated. The mining engineer must decide on the methods to be used in removing the ore, in strengthening tunnel walls to prevent accidents, in providing drainage and ventilation for the mine, and in quickly and efficiently hoisting the mineral to the surface. He must, therefore, be especially trained in civil and mechanical engineering, and in chemistry, geology, and mineralogy.

Electrical Engineering. Engineering principles applied to the designing, building, and operating of dynamos and batteries, electric light and power systems, electric railways, motors, heating apparatus varying in type from a toaster to a giant furnace, telegraph and telephone systems including radio transmission, and various other types of electrical apparatus.

In co-operation with the mechanical engineer, the electrical engineer has done important work in providing mechanical equipment with electrical control. And, in co-operation with the chemical engineer, he has developed the important division of *electrochemical* engineering, which deals with the use of electricity in chemical processes. The products of the electrochemical industries include some of the most indispensable materials employed in manufacture, such as ferro-alloys, aluminum, electrolytic copper, caustic soda, chlorine, hydrogen, oxygen, carborundum, cyanamid, and calcium carbide.

SOME NOTED BRIDGES AND VIADUCTS OF THE WORLD*

Kind and Name	Location	Completed	Length Feet	Main Span Feet	Height Feet	Approximate Cost
Bascule [(1) one leaf; (2) two leaf]:						
Canadian Pacific Ry. (2)	Sault Ste. Marie canal (U. S.)	1914	426	336		$ 250,000
Michigan Ave. (2)	Chicago R., Chicago, Ill.	1920	300	256	16.5	
Wells St. (1)	Chicago R., Chicago, Ill.	1921		268		
Outer-Drive (2)	Chicago R., Chicago, Ill.	1937		264	24	1,800,000
St. Charles Air Lane (1)	Chicago R., Chicago, Ill.	1931	277	219.3	20	705,000
Arlington Memorial (2)	Potomac R., Washington, D. C.	1932	2,163	216	35	7,360,000
Tower (2)	Thames R., London, Eng.	1894	2,980	200	30	5,000,000
Cantilever:						
Quebec	St. Lawrence R., Quebec	1917	3,240	1,800	150	9,000,000
Forth	Firth of Forth, Scotland	1890	8,095	1,700	150	16,000,000
Rip Van Winkle	Hudson R., Catskill, N. Y.	1935	5,040	1,600	142	2,165,000
Victoria	St. Lawrence R., Montreal	1898	8,440	1,250	150	6,000,000
Longview	Columbia R., Wash.	1930	3,740	1,200	196	5,800,000
Queensboro	East R , New York City.	1909	7,449	1,182	135	13,000,000
Carquinez	Carquinez Str., Cal.	1927	4,482	1,100	158	7,800,000
South Shore	St. Lawrence R., Montreal	1929	9,137	1,097	162	18,639,000
Cooper River	Charleston, S. C.	1929	14,313	1,050	160	6,000,000
Bluewater	St. Clair R., Port Huron.	1938	6,539	871	210	3,250,000
Baton Rouge	Mississippi R., La.	1939	15,840	850	90	8,500,000
Concrete Arch:						
Plougastel-Brest	Elorn R., France	1930	2,625	612	118	440,000
Westinghouse Memorial	Turtle Creek Valley, East Pittsburgh	1931	1,560	460	200	1,480,000
Pont de la Caille	Cruseilles, France			458.5		
Cappelen Memorial	Mississippi R., Minneapolis	1923	1,032	435	88	900,000
Pierre du Vauvray	Seine R., Ande, France	1924		432		
Royal Tweed	Tweed R., Edinburgh, Scot.	1928	1,400	361.5	45	800,000
Resorgimento	Tiber R., Rome, Italy	1911	492	328	47	238,000
Grafton	Auckland, N. Z.	1909	973	320	147	170,000
Masonry Arch:						
Plauen	White Elster R., Germany	1903	492	295.2	58	125,000
Sidi Rached	Constantine, Algeria	1915	1,468	227	300	366,000
Cabin John	Cabin John Creek, Washington, D. C.	1864	420	220	101	237,000
London	Thames R., England	1831	928	152	56	7,241,500
Steel Arch:						
Kill van Kull	Staten Is.—Bayonne, N. J.	1931	5,780	1,652	150	18,000,000
Sydney Harbor	Sydney, Australia	1932	3,770	1,650	170	35,000,000
Birchenough	Sabi R., Southern Rhodesia	1935	1,080	1,080		500,000
Glen Canyon	No. Central Arizona	1964	1,271	1,028	700	
Hell Gate	East R., New York City.	1917	17,868	977.5	135	15,000,000
Rainbow	Niagara R., Niagara Falls	1941	1,240	950	189	3,760,000
Henry Hudson	Harlem R., New York City	1936	2,000	800	142.5	1,137,876
McKees Rocks	Ohio R., near Pittsburgh	1930	3,600	750	100	6,000,000
West End	Ohio R., Pittsburgh	1931	1,889	780	73	
Suspension:						
Verrazano-Narrows	Brooklyn-Staten Island	1965	13,700	4,260	228	
Golden Gate	San Francisco Bay, Cal.	1937	8,500	4,200	220	32,815,000
Mackinac	Straits of Mackinac, Michigan	1957	26,444	3,800	148	96,400,000
Washington Memorial	Hudson R., New York City	1931	8,243	3,500	213	60,000,000
Transbay	San Francisco Bay, Cal.	1936	22,720	2,310†	200	77,600,000
Delaware Memorial	Delaware R. near Wilmington	1951	10,750	2,150	442	44,000,000
Ambassador	Detroit R., Detroit, Mich.	1929	8,000	1,850	152	22,500,000
Delaware River	Camden-Philadelphia	1926	9,570	1,750	135	24,600,000
Bear Mountain	Hudson R.	1924	2,257	1,632	155	5,000,000
Williamsburg	East R., New York City.	1903	7,308	1,600	135	15,000,000
Brooklyn	East R., New York City.	1883	7,580	1,595.5	135	18,000,000
Lions Gate	Vancouver Harbor, Vancouver, B. C.	1938	5,820	1,550	200	6,000,000
Mid-Hudson	Hudson R., Poughkeepsie, N. Y.	1930	4,200	1,500	135	5,622,700
Manhattan	East R., New York City.	1909	6,855	1,470	135	17,000,000
Triborough‡	East and Harlem Rs., N.Y.C.	1936	4,318	1,380	135	42,000,000
Truss [(s) simple; (c) continuous]:						
Metropolis (s)	Ohio R., Ill.	1917	5,700	720	53	3,000,000
Paducah (s)	Ohio R., Ohio	1929	9,000	716	100	
St. Louis (c)	Mississippi R., Mo.	1930	5,350	700	55	
Tanana River (s)	Alaska	1923	700	700		1,370,000
Cincinnati (c)	Ohio R., Ohio	1929	1,575	675	104	1,750,000
Cape Girardeau (c)	Mississippi R., Mo.	1930	2,339	671	99	
St. Louis Municipal (s)	St. Louis, Mo.	1913	668	668		
Vertical Lift:						
Buzzards Bay	Cape Cod Canal, Mass.	1936	806	544	139	2,000,000
Marine Park	Jamaica Bay Channel, N. Y.	1937	4,802	540	55	3,800,000
Burlington-Bristol	Delaware R., N. J.—Pa.	1931	3,027	534	61	1,300,000
Kansas City	Missouri R., Kans.—Mo.	1912	5,340	428	65	2,200,000
Boonville, Mo., M.K.T.R.R	Missouri R.	1932	1,638	408	27	1,000,000
Hackensack River	P.R.R. near Jersey City	1930	2,950	331.5	40	
Suisun Bay	California	1930	5,603.5	328	70	12,000,000
San Mateo	San Francisco Bay	1929	7.1 mi.	303	125	7,500,000

*The bridges in this table are divided according to the type of their main span. In each division, the bridges are arranged in the order of the length of the main span.

†Two joined spans of 2310 feet each; also a main cantilever span of 1400 feet.

‡Suspension span over East River; vertical lift span, 310 feet long, over Harlem River.

Many bridges which are not remarkable for their main spans are nevertheless noteworthy on account of their lengths or their heights. Among the longest bridges in the world are the following:

Chesapeake Bay Bridge-Tunnel, length 17.6 miles, from Cape Charles to Chesapeake Beach, Va.

Transbay, 8 miles long.

Great Salt Lake cutoff, a railroad trestle 20 miles long.

San Mateo bridge across San Francisco bay, 7.1 miles.

Lake Pontchartrain railroad bridge, Louisiana, 7 miles.

James River Highway bridge, near Newport News, Va., with approaches, 6 miles; without approaches, 4½ miles.

Lake Pontchartrain highway bridge, Louisiana, 5 miles.

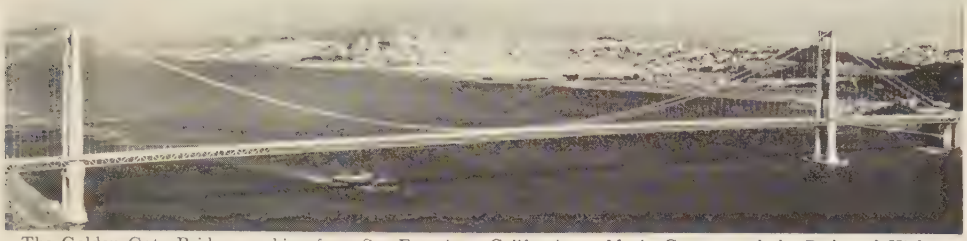
Huey Long cantilever bridge over Mississippi at New Orleans, completed 1935, totaling 4½ miles.

Rainbow Bridge, Niagara River, is the longest hingeless arch span in the world.

Among the highest bridges are the following:

Royal Gorge, a suspension bridge over the Arkansas River at Canon City, Colo., 1050 feet high; steel arch bridge over the Colorado River at Glen Canyon Dam, Arizona, 700 feet high; Snake River cantilever bridge near Twin Falls, Idaho, 502 feet high; Marble Canyon, a steel arch bridge over the Colorado River at Lee's Ferry, Arizona, 467 feet high.

NOTABLE BRIDGES

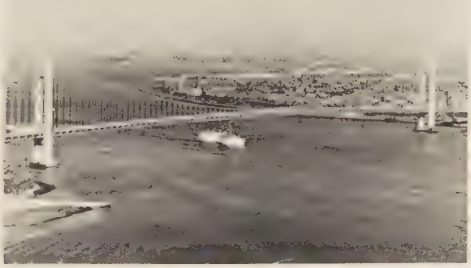


The Golden Gate Bridge reaching from San Francisco, California, to Marin County and the Redwood Highway. It was completed in 1937 at a cost of more than $32 million.

The multiple arched Atchafalaya Bridge stretches across the Atchafalaya River at Morgan City, Louisiana. This bridge is said to have the largest set of piles of any bridge in the world.

Completed in 1964, the Chesapeake Bay Bridge-Tunnel is the longest in the world, with an over-water length of 17.6 miles. It connects Wise Point, Va. with the Chesapeake Beach area of Virginia Beach, Va. Pictured here are the approaches (2 man-made islands) to one of the two 24-ft. tunnels. Total cost was $140 million.

The steel arched Bayonne Bridge crosses the Kill van Kull from Bayonne, New Jersey, to Port Richmond on Staten Island. Length of the main structure is 5780 feet, the arch span is 1652 feet.

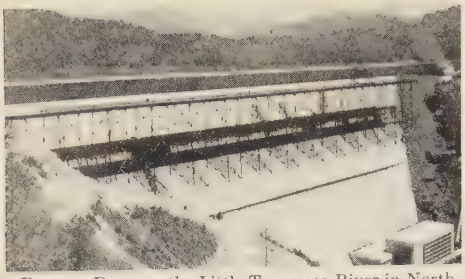


The Verrazano-Narrows bridge, with the world's longest center span of 4260 feet, unites Staten Island with Brooklyn, N.Y.

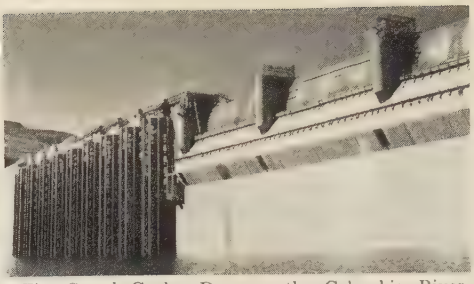
UPI

Mackinac Bridge, five miles long and having a 3800-foot center span, carries a four-lane highway.

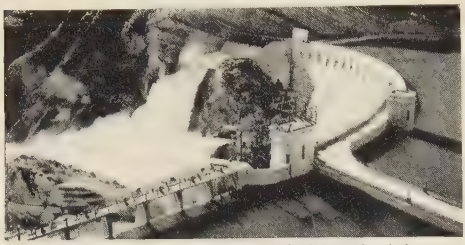
Photo by H. D. Ellis



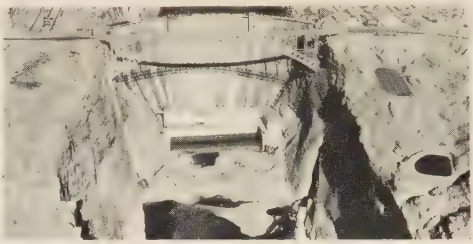
Fontana Dam, on the Little Tennessee River in North Carolina's Great Smoky Mountains, is 480 feet high. The average rainfall in this area is 84 inches. The dam assures flood control and electric power for the T. V. A. system.



The Grand Coulee Dam on the Columbia River, Washington, is 553 feet high and creates a lake of 127 square miles. This water will be used to irrigate land to provide a living for about 350,000 people.

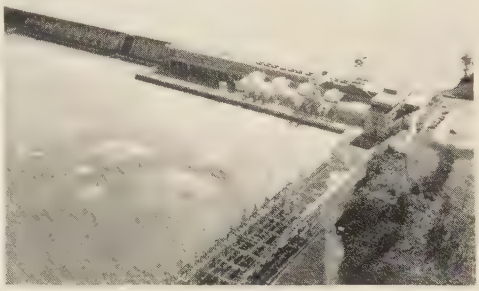


The Roosevelt Dam is on the Salt River in Arizona. It is 1125 feet long, 280 feet high and provides water for the irrigation of the arid country below it. It also assures flood control and provides electric power.



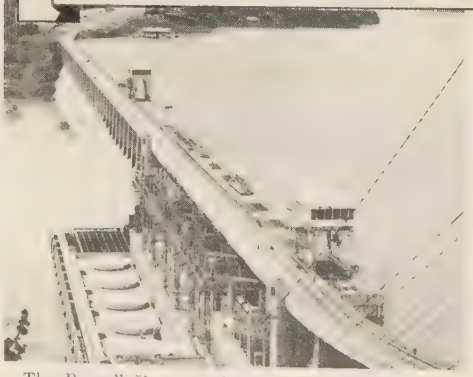
Harnessing the waters of the Colorado River just south of the Utah-Arizona border, Glen Canyon Dam has among its primary purposes power generation, flood control, river regulation, and silt retention.

The Norris Dam is on the Clinch River, near Knoxville, Tennessee. It is 265 feet high, and creates a reservoir of 837 million gallons of water. It is valuable in flood control and provides electric power for the area.

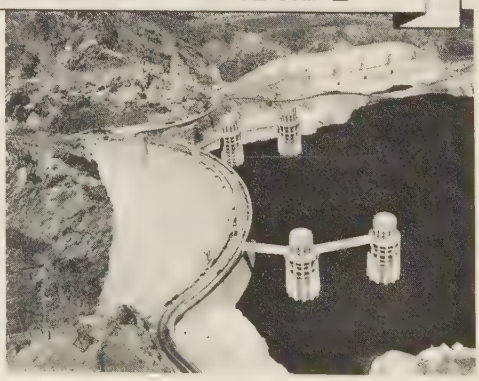


Wheeler Dam, on the Tennessee River in Alabama, was completed in 1936. It provides flood control and electric power, and improves navigation. Power generators may be seen at right of picture.

GREAT AMERICAN DAMS



The Bagnell Dam on the Osage River in Missouri creates the Lake of the Ozarks. Its maximum height is 148 feet and its volume is 551,000 cubic yards. The dam powerhouses generate the electricity used by the area.



Majestic in its clean graceful lines, Hoover Dam stands with one shoulder against the Nevada wall and the other against the Arizona wall of Black Canyon, controlling the mighty Colorado River.

Chemical Engineering. A chemical engineer designs and operates the process and special equipment necessary for commercial preparation of chemical substances. His field includes the production of acids and alkalies, dyes, fertilizers, gases, explosives, synthetic drugs and perfumes, and also of many products, such as leather, paper, soap, starch, glucose, and sugar, which frequently do not suggest the chemical methods by which they are prepared.

Sanitary Engineering. A branch of civil engineering which deals with problems such as providing a community with pure water, and disposing of sewage, garbage, and other refuse, in such a manner as to avoid danger to the public health. In addition to the fundamental civil engineering, a sanitary engineer must, therefore, have special training in biology, bacteriology, and chemistry.

Military Engineering. This consists in the application of engineering principles to military problems. The military engineer is essentially a civil engineer who has specialized in the design and construction of permanent forts, military bridges, roads, railroads, barracks, and camps. The plans for dugouts, trenches, tunnels, barbed wire entanglements, and the placing of mines and big guns are all under the direction of the military branch called, in the United States army, the Corps of Engineers. On graduation at West Point, the cadets ranking at the head of their class are usually assigned to this corps, which, in addition to purely military duties, has charge of navigable rivers and harbors, and also of the bridges and roads in Crater Lake and Yellowstone national parks.

The mechanical engineering involved in the production of guns and ammunition for the United States army is done under the direction of the department of ordnance. The magnitude of the work may be best appreciated after considering the size of one of the 16-inch guns guarding the Panama canal. It weighs 130 tons and is 49¼ feet long, tapering from a diameter of 28 inches at the muzzle to 5 feet at the breech. The projectile weighs 2400 pounds, and, when driven by a full charge of 667 pounds of powder, leaves the bore at the rate of about half a mile per second. When the gun is fired, the gas pressure on the base of the shell equals 19 tons to the square inch, or about 180 times the pressure on the foundations of a great skyscraper. If the tallest known building were placed on top of the earth's highest mountain, ten miles away from this gun, the engineers in charge could fire a shell over the obstacle with a fair chance of striking a target 21 miles distant.

Graduates of the United States Naval Academy are all trained as mechanical engineers. Those wishing to specialize in the designing of warships are given advanced courses in *naval architecture*; those who are to have control of a ship's engines, are given special courses in *naval engineering*. It is these specialists who decide upon the number and size of the guns, the type and size of the power plant, and the thickness of armor plate on a battleship; the size and equipment of submarines; the design of torpedoes, mines, depth bombs; and similar engineering problems relating to the navy.

Aqueduct (Latin, *aqua*, "water"; *ducere*, "to lead"). An artificial channel or system of conduits through which a large volume of water may flow for a long distance under the action of gravity. Aqueducts are generally used when a city is unable to obtain a near-by supply of water. And, because water is absolutely necessary, aqueducts were used by some of the most ancient cities of which there is any record.

The earliest aqueducts were tunnels, but the Romans developed the use of masonry conduits carried across the country on tall, arched piers. It is this type of structure which is generally associated with the name aqueduct. Modern engineers are returning more and more to the use of tunnels, preferring siphons—which are U-shaped tunnels—instead of bridges, for carrying the water across a river or a low level.

Rome was supplied with water by eleven aqueducts, constructed between 312 B. C. and 226 A. D. The longest of these, the *Anio Novus*, had a length of 62 miles. The *Aqua Virgo*, or *Aqua Vergine* as it is called in the modern Italian language, was restored by the popes Nicholas V and Pius IV and now supplies water for several fountains in Rome. Among the many aqueducts built throughout the Roman Empire, that at Segovia, Spain, and the Pont du Gard at Nimes, France, are probably most famous.

There are many modern aqueducts of great length. In England, Liverpool has a 68-mile aqueduct and Manchester one of 96 miles. Vienna, Austria, obtains water through a conduit 114 miles in length. Longest of all is the Pugliese aqueduct, which supplies 536 Italian towns with water, and has a total length of 1175 miles. The city of Winnipeg, Canada, has a 100-mile aqueduct, and Denver, Colorado, brings a part of its water a distance of 20 miles through large wooden pipes.

The Catskill aqueduct, built to supply New York City with an additional 600 million gallons of water per day, was completed in 1917 at a total cost of 177 million dollars. The water, obtained from the Esopus and Schoharie watersheds, is first stored in the Ashokan reservoir, which has sufficient capacity to cover all of Manhattan island to a depth of 30 feet. The aqueduct proper, 92 miles long, is composed of 55 miles of cut-and-cover conduit, 31 miles of tunnel, and 6 miles of steel pressure tubing. The cut-and-cover sections are made by excavating a channel, in which a 17-foot concrete conduit is built and then covered with earth. The water is carried under the Hudson river at Storm King, about 4 miles above West Point, by means of a siphon consisting of a tunnel 3022 feet long, bored through solid rock at a depth of 1100 feet below sea level. The aqueduct ends at Hill View reservoir, and the water is distributed to the city from a pressure tunnel 18 miles long, which passes the length of Manhattan island and into Brooklyn at a depth of 200 to 700 feet below the streets.

The Los Angeles aqueduct, built between 1908 and 1913, begins at the Owens river, which, with about 35 contributing streams, drains an area of 2800 square miles in the Sierra Nevada. The total length of the aqueduct is about 233 miles. For 60 miles the water is carried in open canal to the Haiwee reservoir. From the end of the reservoir, which is 3760 feet above sea level, the water flows to its destination through 98 miles of covered conduit, 43 miles of tunnel, and 12 miles of steel siphon. As Los Angeles has an elevation of only 275 feet, the water, in coming from the reservoir, has a total drop of almost 3500 feet and thus serves as a source of electrical energy capable of producing 120,000 horse power. The aqueduct is designed to carry 260 million gallons of water per day, and, as there is not yet need for so great an amount, the excess is used for irrigation purposes. The total cost of the aqueduct was about 24 million dollars.

The great Hetch Hetchy project for supplying water for the city of San Francisco involves the construction of an aqueduct 170 miles long.

Bridge. The first artificial bridges were probably tree trunks or strong vines used by primitive man to cross some narrow gorge or stream. Simple bridges, consisting of logs of wood or slabs of stone supported at each end, were used by the earliest known groups of mankind.

The arch bridge was probably first used by the Chinese. Simple brick arches have been discovered among Egyptian ruins, but whether or not the Egyptians used arch bridges is unknown. Bridges are not mentioned in the Bible, but according to other records a brick arch was erected across the Euphrates river within the city of Babylon. *Pontoon*

bridges, which are carried on boats or other floating supports, were used for military purposes by Cyrus and other Persian kings as early as the 6th century B. C.

The stone arch was developed by the Romans, who used it especially for strong monumental bridges, some of which are still standing. Smaller Roman bridges usually consisted of wooden beams resting either on stone or on timber foundations. In the 16th century Leonardo da Vinci and Palladio invented the wooden truss and used it in constructing bridges. The first metal arch bridge was made of cast iron and erected at Coalbrookdale, over the Severn river, in 1776. Cast iron was displaced by wrought iron after the investigation carried out for Robert Stevenson when planning the famous tubular bridge across Menai Strait. Later, steel displaced wrought iron, and now ordinary steel is gradually giving way to special alloy steels. At the present time the principal structural materials for bridges are steel, concrete, and masonry.

Bridges may be classified, according to the methods used for supporting the weight, as girder or truss, suspension, arch, and cantilever.

A modern *girder bridge* rests upon strong beams or girders of steel or re-enforced concrete, supported by firm foundations at either end. The girders may be single steel I-beams for small crossings, or *plate girders* built up from steel plates carefully riveted together. Plate girder bridges are the standard type for distances of 20 to 100 feet. The longest plate girder is 130½ feet; another, of 122½ feet, is heavier, weighing 170 tons.

A *truss bridge* may be considered as one composed of enormous girders from which all excess material has been cut away, leaving only a network of braces and connecting members. The ribs of a truss are always arranged to form triangles, because triangular bracing gives the most rigid structure obtainable. Simple truss bridges have been built with spans up to 720 feet in length.

A *suspension bridge* is carried by ropes, chains, or cables, fastened at both ends. This type of bridge has frequently been used by primitive people; it is occasionally used for military purposes; and it has been employed for some of the most famous bridges in the world, notably those of New York City, San Francisco, Philadelphia, and Detroit. Of these, the Oakland Bay bridge at San Francisco, completed in 1936, has the longest span, 4620 feet. The weight of the cables supporting the Delaware River bridge connecting Philadelphia and Camden is 7000 tons. They contain a total of 25,100 miles of wire, a length exceeding the circumference of the earth. The oldest suspension bridge in the United States is the 1057 foot suspension bridge connecting Cincinnati, Ohio, with Covington, Kentucky, completed in 1867.

Arch bridges are so constructed that the load imparts an outward thrust which must be carried at each end by heavy structures, called abutments. In building a bridge of this type, false work or centering of some sort is necessary to carry the load until the arch is completed. It is interesting to note that the first masonry arch across the river Tiber—the Pons Æmilius—was begun about 179 B. C., and in 1911 the longest re-enforced concrete arch then built—the Risorgimento arch, with a span of 328 feet, 1 inch—was completed over the same river. One of the largest arch bridges in America is that over Hell Gate, New York City. It is made of steel, with a hinge at each end to relieve excessive strains. When the foundations for one of the abutments were being sunk, it was discovered that there was a wide crack in the rock, which had been thought to be solid. In order to prevent any settling, a concrete arch was built across the gap, so that the Hell Gate bridge is partially supported by another bridge that is buried 90 feet underground. The Kill van Kull bridge, New York, has the longest steel arch in the world, 1652 feet.

Cantilever bridges consist of trusses arranged like a bracket on a wall, that is, they are supported at one end, while the free arm reaches out over the space to be bridged. In practice, the heavy columns which are to carry the weight are usually erected on strong foundations, with an arm extending in opposite directions so as to give a balanced structure. The shore arm is then fastened to heavy anchor foundations. By placing a cantilever on opposite sides of a river, panel after panel can be added to the free arms until they meet at the center. The greatest bridge in the world of this type crosses the St. Lawrence river at Quebec, with a distance of more than one-third of a mile between the central piers. Construction was begun in 1903. In 1907, when the south cantilever was almost finished, one of the main supporting members gave way and the structure fell into the river. In the new bridge, begun in 1911, an opening of 640 feet was left between the arms. The truss to fill this span was constructed on the shore, floated out under the bridge, and lifted by means of hydraulic jacks. When about 15 feet above the water, the connections at one corner slipped, and the truss, weighing 5000 tons, collapsed and fell into the water. The following year, a second span was successfully raised into place. Seventy-four men were killed at the first accident, and eleven at the second.

The ordinary *bascule* or *jackknife bridge* is a girder or truss, hinged at one end and counterbalanced by weights so that it may be swung up like the blade of a pocketknife.

A *rolling lift bridge* is a bascule which turns up on the rounded ends of its own base instead of on a hinge.

A *vertical lift bridge* usually consists of a truss placed between two towers. Cables or levers connect the truss to counterbalancing weights, so that the power of a comparatively small motor is sufficient to raise the bridge straight up.

A *swing bridge*, erected on a turntable at its center, is sometimes preferred because it gives two channels, one on either side of the open bridge. When closed, a swing bridge is usually a simple truss, but the open bridge is a cantilever.

Viaducts, in the ordinary use of the term, are bridges carried across a valley or other low level, on towers. The towers may be high or low, and the spans are usually comparatively short.

A girder or truss bridge pushes down on its foundation piers, a suspension bridge pulls inward, and an arch pushes outward. A cantilever pushes down on its main pier, but may pull up on the anchorage. In addition to the *dead load* or weight of the bridge itself, the engineer must include in his calculations the *live load* which it is to carry, together with the added strain due to starting and stopping of trains, and a possible wind pressure of 30 or more pounds on each square foot of surface.

Canal Locks. Among the most important structures connected with a canal are the locks. These act as a step or as an elevator to raise or to lower a vessel from one water level to another. They are used where there is a change in the elevation of a canal.

An ordinary lock consists of a rectangular basin provided with heavy, water-tight gates at both ends. The sides of the lock and the top of the gates extend above the highest part of the canal. When the gates at one end are open, those at the other end must be closed in order to hold back the water.

When a vessel, traveling upstream, enters a lock, the gates are tightly closed behind it. Water is then admitted to the lock chamber, and the boat gradually rises until it reaches the upper level of the canal. The gates in front are then swung open, and the way is clear. To lower a vessel, the process is reversed, and the water flows from the lock until the lower level is reached.

Locks are occasionally constructed so that the entire chamber is raised or lowered. Sometimes two such chambers are connected and balanced so that

one is raised when the other is lowered. In such cases only sufficient water is transferred to make the upper chamber slightly heavier than the other, so that the change in position is caused by gravity.

Dam. Any barrier used to stop the flow of a liquid is called a dam. In engineering, however, the term refers to a structure built across a watercourse, and provided with a spillway over which the water confined behind the wall can flow when it rises to the proper level.

By means of a dam, the depth of a shallow stream may be increased until it is sufficient for the passage of boats and barges; water can be stored for the use of municipalities, for manufacturing, or for irrigation; and power can be generated.

The design and construction of large dams requires a high degree of engineering skill because of the enormous pressure exerted by the water. This pressure depends not on the volume, but on the height, of the water held behind the dam. Each vertical foot of water imparts a pressure of .433 pounds on every square inch of surface, so that at the bottom of a dam where the water is 100 feet deep there is a pressure of 3.1 tons per square foot.

Few dams are more famous than that across the Nile river at Aswan. Since the dawn of civilization, the years of rich harvests and the periods of famine in the Nile valley have depended on the height to which the river would rise during the annual flood. The average rise has been about 25 feet; 30 feet meant destruction and ruin, while 18 feet meant poor crops and starvation. But now the reservoir behind the dam not only affords control of the river's flow, but supplies enough water to irrigate 6 million acres that formerly were desert.

Dams are built of timber, earth, concrete, masonry, and occasionally of steel. Earth dams frequently have a thin core of concrete, which prevents the water from trickling through the earth and ruining the dam. The center of the Gatun dam was pumped into place by hydraulic dredges which took up the mud from the river bottom and deposited it between walls of stone. The water drained away, leaving a very firm structure.

Automatic dams are frequently used on canals where it is desired to keep the water level as high as possible. Movable dams of the "bear-trap" type

SOME IMPORTANT DAMS OF THE WORLD

Name	Location	Completed	Type	Height Feet	Length on Top Feet	Width in Feet	
						Top	Base
Arrowhead	California	1909	Earth *	222	850	20	950
Arrowrock	Boise R., Idaho	1916	Concrete (a)	349	1,100	15½	238
Ashti	Ashti R., India	1878	Earth	58	12,709	6	182
Aswan	Nile R., Egypt	1934	Masonry	174	6,970	36	92
Barossa	South Australia	1903	Concrete (a)	112	472	4½	42
Bartlett	Verde R., Ariz.	1939	Multiple arch	287	750	20	1,700
Belle Fourche	South Dakota	1909	Earth	122	6,493	19	650
Bonneville	Columbia R., Wash., Ore.	1937	Concrete	170	1,282	40	180
Camarasa	Spanish Pyrenees	1920	Concrete	333	460	21	250
Cataract	Sydney N. S. W.	1908	Concrete (a)	192	811	16½	158
Cheoah	Little Tennessee R.	1918	Concrete	225	725	12	175
Cobble Mountain	Little R.,Springfield, Mass.	1930	Earth	245	700	50	1,505
Columbia	Susquehanna R., Pa.	1875	Timber	11	6,847	16	30
Conowingo	Susquehanna R.	1928	Concrete	105	4,700	22	105
Coolidge	Gila R., Arizona	1928	Multiple dome	251	550	4	20
Dalles, The	Columbia R., Oreg.-Wash.	†	Concrete-Earth	260	8,875	..	...
Diablo	Skagit R., Rockport, Wash.	1930	Concrete arch	446	1,180	16	140
Dix River	Kentucky	1925	Rock-fill	278	1,020	20	650
Dnieprostroy‡	Dnieper R., Ukraine, Russia	1932	Arch gravity	200	5,000	73	140
Don Pedro	Tuolumne R , Cal.	1923	Concrete	280	1,040	16	177
El Azucar	San Juan R., Mexico	1945	Earth	138	19,360	26	1,661
Elephant Butte	Rio Grande R., New Mex.	1916	Concrete (a)	305	1,310	18	215
Fort Peck	Missouri R., Mont.	1939	Earth *	242	20,000	13	2,875
Gatun	Panama	1913	Earth	105	7,800	400	2,600
Gilboa	Schoharie Creek, N. Y.	1926	Concrete, earth	160	2,300	15	158
Glen Canyon	Colorado R., Ariz.	1964	Concrete	710	1,550	25	340
Grand Coulee	Columbia R., Wash.	1942	Concrete	553	4,200	30	490
Grimsel	Central Switzerland	1930	Concrete gravity	373	656	15	224
Hetch Hetchy	Tuolumne R., Cal.	1922	Concrete	427	600	15	298
Hoover	Colorado R., Ariz. Nev.	1935	Concrete gravity	727	1,244	45	660
Kensico	White Plains, N. Y.	1917	Masonry	307	1,843	28	235
Keokuk	Miss. R., Keokuk, Ia.	1913	Concrete	53	4,649	29	42
Lake Cheesman	S. Platte R., Colo.	1904	Masonry	236	700	18	176
Morena	San Diego, Cal.	1909	Rock-fill	278	520	16	357
Norris	Clinch R., Tenn.	1936	Concrete	265	1,872	30	405
Necaxa No. 2	Necaxa R., Mex.	1911	Earth	190	1,220	54	975
New Croton	Croton R., N. Y.	1906	Masonry	297	1,168	18	206
Oahe	South Dakota	1958	Earth	242	9,360	..	...
Olive Bridge(Ashokan)	Esopus Creek, N. Y.	1913	Masonry	252	1,000	26	200
Owyhee	Owyhee R., Oregon	1932	Concrete	417	1,010	30	265
Pacoima	San Fernando, Cal.	1928	Concrete	372	640	10.4	100
Pardee	Mokelumne R., Cal.	1929	Concrete arch	358	1,337	..	241
Poona	India	1872	Masonry	108	5,136	14	61
Roosevelt	Salt R., Ariz.	1911	Masonry	280	1,125	16	158
Salt Spring	Mokelumne R.,Cal.	1932	Rock-fill	332	1,300	15	900
Saluda R.	S. Carolina	1930	Earth	208	7,838	25	1,150
Sautet	France	1934	Concrete arch	414	263	..	...
Seminoe	North Platte R.,Wyo.	1939	Concrete arch	261	560	15	85
Sennar	Nile R., Upper Egypt.	1926	Masonry	130	9,915	15	50
Shasta	Sacramento R., Cal.	1945	Concrete gravity	602	3,500	..	...
Shoshone	Shoshone R., Wyo.	1910	Masonry	328	200	10	108
Sukkur	Indus R., India	1932	Masonry	185	4,725	..	...
Tansa	India	1891	Masonry	118	8,800	12	100
Tieton	Yakima project, Wash.	1925	Earth *	232	900	25	1,200
Wachusett	Nashua R., Mass.	1906	Masonry	228	1,476	25	187
Wilson Dam	Muscle Shoals, Ala.	1925	Concrete	137	4,860	..	105

*With concrete core. ‡Destroyed by Russian army in 1941 to prevent use by invading Germans and later rebuilt.
(a) Called also cyclopean masonry, because, where possible, enormous boulders are set in the concrete.

are equipped at the top with hinged, floating leaves, which rise and fall with the water level so that the depth of flow over the dam is always about the same. On small structures the water usually flows directly over the top, but, in large dams, the excess water passes through control gates and over a spillway. The highest dam in the world is the Hoover dam at Black canyon in the Colorado river, which rises 727 feet above the river bed.

The multiple arch, hollow, concrete dam is a form of structure which is coming into extensive use. The ability of this type to withstand great water pressure depends on the strength of comparatively thin, concrete arches, rather than on the weight of massive walls. The same principle is involved in the multiple dome dam, consisting of concrete forms facing upstream, each one shaped like one quarter of an egg shell cut axially.

Cofferdams are water-tight enclosures open at the top and used where it is necessary to work in places that would ordinarily be covered with water. In order to examine the sunken battleship *Maine*, which lay in Habana harbor at a depth of about 37 feet, an oval cofferdam was built around the vessel so that the water could be pumped away.

Embankments placed parallel to the course of a stream so as to prevent the flooding of the surrounding country are known as *levees*.

The term *dike* originally referred to an artificial ditch or canal. Later, it was also applied to the mound of earth thrown up beside the excavation, and eventually to any embankment or wall, especially one used to prevent floods.

Jetties are dikes built, usually at the mouth of a river or harbor, to direct the flow of the tide or the river current in such a way as to scour out a deeper channel. One of the most important uses of jetties has been to make navigable the mouth of the Mississippi river. The longest jetty in the world, 42¾ miles in length, was built to preserve a channel at the mouth of the Columbia river.

Locomotive. The first locomotive used commercially in the United States was called the *Stourbridge Lion*. It was built in England and was put into service in 1829. The first to be built in America for commercial purposes was the *Best Friend*, which was manufactured for the Baltimore and Ohio railroad in 1830. It was destroyed by an explosion after about seven months of service. In 1831, the *De Witt Clinton* was put into operation. On its first run from Albany to Schenectady, a stretch of 17 miles, it covered the distance in 1 hour and 45 minutes, but the return trip was accomplished in 38 minutes. Its weight was 12,098 pounds, or less than that of a single pair of driving wheels on a standard Pacific type engine of today.

The chief improvements in the locomotive have been devices to secure greater pulling power and more efficiency. These purposes have been effected partly by the use of stronger boilers and *greater steam pressure*. Some locomotives now operate at a boiler pressure of 250 pounds per square inch. Certain ones in Germany have been constructed to use a pressure of 750 pounds. A second improvement has resulted from *superheating the steam*. Superheated steam acts as a gas under pressure and can do a certain amount of work without condensing. A third improvement has been the introduction of *compound cylinders*, by which the engine is changed from the simple to the expansion type. See *Steam Engine*.

Among the largest and most powerful steam locomotives in the world is one built for the Northern Pacific railroad in 1928. It is 175 feet long, weighs 500 tons, generates 6000 horse power and is capable of hauling on the level a train over two miles long. It is driven by two pairs of cylinders, each connected with eight drive wheels. Electric locomotives weighing 600 tons and having a length of 150 feet are not unusual. The greatest speed attained by a locomotive, is 112 miles per hour, which was made in 1893 by the New York Central engine number 999 while hauling the Empire State Express.

In 1937, there were about 47,000 locomotives operating in the United States. This represents a decrease from the maximum of 65,358 in 1924 and indicates a trend toward fewer and more powerful locomotives, but since 1944 there has been a great upsurge in the use of Diesel-electric motive power. In 1952 it handled 65.5 per cent of freight traffic, compared with 32.6 per cent for steam locomotives and 1.9 per cent for other locomotives. The same advance has been made in passenger traffic, with Diesels hauling 71.5 per cent of the traffic in 1952.

In recent years, there has been a conspicuous trend toward the electrification of railroads. In a test made at Erie, Pa., an electric locomotive was pitted against two large steam locomotives of the New York Central railway in a pushing contest. It was found that the electric locomotive was able, not only to stop the two steam locomotives, which had been allowed first to develop a high speed, but forced them backward against the full force of their driving power.

The ordinary electric locomotive takes its power from an electrified line. Some locomotives, however, develop their own electric power either from Diesel engines or from a steam turbine engine.

Locomotives designed for high speed are usually streamlined to reduce air resistance. The necessity of providing for locomotives and cars a level track over or through natural obstacles has set for civil engineers many of the most difficult problems they have had to solve. Most of the great bridges and tunnels of the world have been built for railways and have been among the greatest triumphs of civil engineering.

The following table shows the standard types of American steam locomotives:

Symbol*	Type	Special Use
0–6–0	6-wheel switcher	Switching
2–8–0	Consolidated . .	General freight
2–8–2	Mikado	General freight—sharp curves
2–10–0	Decapod	Heavy freight
2–10–2	Santa Fe	Heavy freight—sharp curves
2–10–10–2	Mallet articulated†	Heavy freight
2–8–8–8–2	Mallet articulated triplex†. . . .	Heavy freight
4–4–0	American . . .	Passenger and freight
4–6–0	Ten-wheeler . .	Passenger, fast freight
2–6–2	Prairie	Heavy passenger, fast freight
4–4–2	Atlantic	High speed passenger
4–6–2	Pacific	Fast heavy passenger, fast freight
4–8–2	Mountain	Heavy passenger

* The first figure in each entry indicates the number of smaller wheels under the front; the last figure denotes the number of trailing wheels under the rear; the intermediate figures indicate the number and the grouping of the driving wheels.

† In this type, the frame is jointed, or articulated, to facilitate the passing of curves.

Skyscraper. The first requirement of a modern skyscraper, and one of the most important, is a firm foundation. If possible, the foundation should rest on bed rock, but, where a heavy structure must be located over sand, soft clay, or peat, the difficulties of obtaining a solid foundation are often very great.

One of the most satisfactory methods is to drive piles through the soft earth until they reach solid rock. Or, if the ground is comparatively firm, a great number of piles may be driven until the total resistance of the earth to further settling of the piles is sufficient to carry the weight of the building. The Illinois Central Railway passenger station in Chicago is thus supported on about 1700 wooden piles, driven to a depth of from 40 to 60 feet by means of one-ton to two-ton drop hammers. In 1920, when an American firm received a contract to build modern steel office buildings in Japan, 13,000 piles of Oregon pine were shipped across the Pacific to form foundations in the city of Tokyo.

HIGH BUILDINGS AND TOWERS

Name and Location	Height in feet
Television Tower, Roswell, N. M. inc. antenna	1610
Empire State, New York, N. Y.	1248
Chrysler, New York, N. Y.	1046
Eiffel Tower, Paris, France	984
Cities Service (Sixty Wall Tower), New York, N.Y.	950
Bank of the Manhattan, New York, N. Y.	927
R.C.A. Tower, Rockefeller Center, New York, N.Y.	850
Pan Am Building, New York, N. Y.	792
Woolworth, New York, N. Y.	792
City Bank-Farmers Trust, New York, N. Y.	759
Terminal Tower, Cleveland, Ohio	708
Metropolitan Tower, New York, N. Y.	700
500 Fifth Avenue	697
Chanin Tower, New York, N. Y.	680
Lincoln, New York, N. Y.	678
Penobscot, Detroit, Mich.	658
American Exchange-Irving Trust, New York, N. Y.	646
Waldorf-Astoria, New York, N. Y.	626
Sherry-Netherland Hotel, New York, N. Y.	620
Mercantile, New York, N. Y.	620
General Electric, New York, N. Y.	616
Singer, New York, N. Y.	612
New York Life Insurance, New York, N. Y.	610
Board of Trade, Chicago, Ill.	605
Prudential Building, Chicago, Ill.	601
U. S. Court House, New York, N. Y.	590
Gulf, Pittsburgh, Pa.	582
Municipal, New York, N. Y.	580
Carew Tower, Cincinnati, Ohio	574
Civic Opera Building, Chicago, Ill.	571
New York Central, New York, N. Y.	565
Continental Bank, New York, N. Y.	562
Pittsfield, Chicago, Ill.	557
Temple, Chicago, Ill.	556
Le Veque Lincoln Tower, Columbus, O.	555
Washington Monument	555
City Hall, Philadelphia, Pa.	548
Equitable Trust, New York, N. Y.	542
Transportation Bldg., New York, N. Y.	542
Ritz Tower, New York, N. Y.	540
Bankers Trust Co., New York, N. Y.	539
Field Estate, Chicago, Ill.	535
Ulm Cathedral, Germany	529
Cathedral of Learning, University of Pittsburgh	523
Cologne Cathedral, Germany	512
Pyramid of Cheops, Egypt	481

Piles may be of wood, concrete, or steel. One of the most effective types consists of a hollow steel tube, driven with a pile driver. Earth and stones are blown out of the cylinder by compressed air, and the interior is filled with concrete.

When the piles are all in place, the tops are cut off at exactly the same height, and care must be taken that wooden piles are entirely below water level, because, when covered with water, wood is preserved almost indefinitely. The platform type of foundation usually consists of steel beams piled in layers to form a pyramid. Each layer is placed at right angles to that below, and all are covered with concrete.

To support the enormous weight of the skyscrapers of New York City, the foundations are sunk to bed rock by means of open cofferdams or closed pneumatic caissons. The caisson may be a huge timber box or steel cylinder, open at the bottom, but closed at a height of 8 or 10 feet so as to form a working chamber. Above the working chamber the caisson is filled with concrete, which is pierced by vertical shafts for the passage of men and materials. The top of each shaft is closed by an air lock, for, as the earth is removed at the bottom and the structure gradually sinks, the pressure of the air must be raised to prevent the surrounding water from flowing into the working chamber. A depth of 100 feet is about the limit to which the pneumatic caisson can be used, because of the difficulty of working under an air pressure of over 45 to 50 pounds. At these pressures a total of 90 minutes in the caisson is considered a full day's work. When the edges of the caisson reach rock, the working chamber and shafts are filled with concrete, thus forming a solid pillar.

After the foundations have been completed, the steel skeleton is rapidly placed in position. First the massive columns are erected and bolted temporarily to the crossbeams that form the floor Each piece can be placed quickly in its proper position because at the steel mill, where it was rolled into shape and punched or drilled with rivet holes, it was marked with a number corresponding to the blue-printed plans. Bolts are soon replaced by red-hot rivets which are fixed in place by means of noisy pneumatic hammers.

At each floor the girders extend beyond the wall columns in order to form a short shelf, on which the wall for that floor is carried. Because of this arrangement by which each floor supports its own wall, it frequently happens that offices on one floor of a large building are occupied before the walls either above or below are placed in position. Floors are formed by brick or hollow tile arches, or by concrete slabs, placed between or over the beams. All of the steel skeleton is carefully painted to prevent rust, and, wherever possible, is covered with concrete, plaster blocks, or terra cotta, as protection against fire. The columns especially require this protection because, if they should warp or bend under the action of an intense fire, the entire building would probably be ruined.

Tunnel. An underground passage which may be used for such purposes as railroad, foot, and ordinary vehicular traffic; for conducting water, sewage, and gas; or for pipes and cables. The term tunnel, as generally used, refers to an artificial passageway, horizontal or nearly so, open at both ends, and constructed without removing the surface soil.

Tunnels cut through solid rock with the aid of simple hand tools were built by many of the ancient civilized nations, including the Egyptians, Assyrians, Greeks, Aztecs, Peruvians, and the natives of India. The oldest known tunnels were used as the entrance to a royal tomb or for religious purposes, but by 500 B. C. the Greeks were using tunnels for mining.

The Romans, who surpassed all previous nations as engineers, built tunnels for use as roads, aqueducts, sewers, and mine galleries, not only at Rome, but in what is now France, Switzerland, Spain, Portugal, Algeria, and Turkey. In order to drain Lake Fucinus, the emperor Claudius, about 52 A.D., completed a three-mile tunnel, 9 feet wide and 19 feet high. The Romans understood *fire setting*, which consists in first heating a rock surface by means of fires and then cooling it suddenly with water in order to produce cracks.

During the middle ages every castle had a secret tunnel, serving chiefly as a means of escape in case of defeat. Most of the famous modern tunnels have been built to supply the need for a better and a quicker means of railroad or automobile transportation. But inspection of the table, *Some Important Tunnels of the World*, shows that the longest tunnels are used as aqueducts for the transportation of water and for draining water from mines.

In the construction of large rock tunnels, small sections are first drilled and blasted out. These openings are then gradually enlarged to full diameter. If the first cutting is at the top of the tunnel, it is called a *heading;* if at the bottom, a *drift.* In building the Rogers pass, later named the Connaught tunnel, great speed was required. A small pioneer tunnel, parallel to the main boring, was therefore constructed first, so that, by cutting cross passages, work could be carried on in several sections at the same time. Of an entirely different type are those of which the earliest important example was the railroad tunnel under the river between Detroit, Michigan, and Windsor, Ontario. This tunnel, consisting of two parallel tubes, was built on land, in twenty sections having the form of enormous, hollow, steel cylinders. Each section, 23½ feet in diameter and about 262 feet long, was closed at both ends, floated into position, and then sunk to foundations which had been dredged on the river bed. The sections were joined, covered with concrete, and also given a concrete lining. The Detroit-Windsor vehicular tunnel and the Oakland-Alameda tube are later examples of this type.

The first of the great transalpine tunnels, the Mont Cenis, was driven from both ends. The work was so accurate that, when the borings met after 13 years of labor, there was a difference in alignment of only one inch. During the construction of the St. Gotthard tunnel, conditions were so severe that 800 of the workers died. The Simplon tunnel, which now consists of two parallel tunnels 16½ feet in diameter, was most difficult of all. This tunnel passes through the mountains at a depth of 5000 to 7000 feet below the peaks. The pressure was so great that in places great steel beams were necessary to hold the rock walls in place. Cold springs at times poured as much as 17,000 gallons of water a minute into the first tunnel, and, near the center, hot springs were encountered which raised the temperature of the air to such a degree that it was necessary to spray the walls with cold water. The second tube was completed in 1921.

The many miles of tunnel under New York City represent one of the greatest achievements of engineering skill. The New York City extension of the Pennsylvania railroad, which crosses from New Jersey, under the Hudson river to the Pennsylvania terminal, and then under East river to Long Island, has a total length of only 13.68 miles. Yet the average cost of this short extension was almost 6 million dollars a mile. One of the chief engineering problems in the construction of the Holland vehicular tunnel was to provide proper ventilation. Powerful fans change the air completely 42 times each hour.

Construction of tunnels, such as the Pennsylvania and the Hudson and Manhattan tubes, through clay and silt, under a river bed, is much more difficult and dangerous than blasting through solid rock. The use of compressed air is often necessary in the head of the tunnel to balance the pressure of the surrounding water.

One of the greatest aids in soft ground tunneling is the *shield*, which is a short, hollow cylinder slightly larger in diameter than the tunnel. The forward end is closed and is provided with several strong doors through which the workman may pass to excavate, if the nature of the ground permits. The shield is pushed forward by hydraulic rams, and the cast-iron or concrete lining of the tunnel which is thus formed is constructed under the protection of the rear walls of the cylinder. Various unusual expedients are sometimes necessary. In tunneling through soft clay, huge torches have been used to bake the ground hard. In order to drive an opening through wet quicksand, the earth has been frozen by artificial refrigeration.

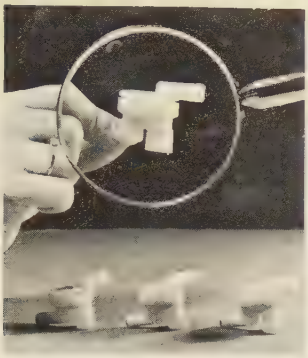
The largest tunnel in the world is the Rove, which forms a part of the canal between the Rhone river and Marseille, France. It is 4½ miles long and, with a height of 40 feet and a width of 72 feet, it is almost six times as large in cross section as an ordinary railroad tunnel.

The first transportation tunnel in the United States was a part of the Schuylkill Navigation canal, opened in 1821. The first railway tunneli in the United States was 901 feet long. It was constructed in Pennsylvania, between 1831 and 1833, for the Allegheny Portage railroad. Neither tunnel is now in existence.

SOME IMPORTANT TUNNELS OF THE WORLD

Name	Location and Use	Length Miles	Years in Construction	Approximate Cost
Appenine	Italy; Florence Bologna R. R.	11.5	1923 1928	$24,735,000
Arlberg	Austrian Alps; R. R.	6.23	1880–1884	7,500,000
Arthur's Pass	South Island, N. Z.; R. R.	5.38	1908–1912	3,000,000
Brooklyn-Battery	Brooklyn-Manhattan; under East R.; vehicular	1.72	1940 -1950	80,000,000
Caldera	Peru, S. A.; R. R.	1.75	–1893	
Cascade	Cascade Mts., Wash.; Gt. N. R. R.	2.6	1897–1900	1,250,000
Cascade, New	Berne-Scenic, Wash.; R. R.	7.78	1925–1928	10,000,000
Choacella	Part of 240-mile Colorado River—Los Angeles aqueduct, costing $230,000,000	18.3	1933–1936	
City No. 1	New York City; Aqueduct	18.11	1911–1914	26,400,000
City No. 2	New York City; Aqueduct	20.0	1928–1932	42.700,000
Connaught	Selkirk Mts., B. C.; Can. Pac. R. R.	5.0	1913–1916	6,500,000
Detroit River	Detroit, Mich.—Windsor, Ont.; R. R.	1.6	1906–1910	10,000,000
Detroit International	Detroit, Mich.—Windsor, Ont.; vehicular	.95	1928–1930	10,000,000
Elizabeth Lake	Los Angeles Aqueduct, Cal.	5.1	1907–1911	1,088,000
Florence Lake	Southern Cal.; Aqueduct	12.8	1920–1925	17,000,000
Gravehals	Oslo—Bergen, Norw.; R. R.	3.3	1904–1909	
Great St. Bernard	Italy-Switzerland	3.6	–1964	15,000,000
Grenchenberg	Jura Mts., Switz.; R. R.	5.3	1912–1915	3,500,000
Gunnison	Montrose, Colo.; Aqueduct	5.8	1905–1909	2,170,000
Hetch Hetchy	San Francisco Aqueduct, Calif.	18.0	1920–1923	
Holland	New York—New Jersey; under Hudson R.; vehicular	1.75	1920–1927	48,400,000
Hoosac	Hoosac Mts., Mass.; R. R.	4.31	1856–1873	11,000,000
Hudson & Manhattan	New York City—New Jersey	8.50	1875–1911	75,000,000
Jungfrau	Swiss Alps; R. R.	4.47	1897–1912	1,375,000
Khojak Pass	Quetta-Chaman, India; R. R.	2.44	1889–1891	
Loetschberg	Bern-Brig, Swiss Alps; R. R.	9.05	1906–1913	10,000,000
Mersey	Liverpool-Birkenhead; vehicular	2.16	1925–1934	40,000,000
Moffat	James Peak., near Denver, Colo.; R.R.; water system	6.1	1922–1927	14,500,000
Mont Blanc	France-Italy	7.25	1959 -1965	
Mont Cenis	France—Italy; R. R.	7.97	1857–1872	15,000,000
Mont d' Or	Jura Mts., France—Switz.; R. R.	3.8	1910–1915	4,060,000
Mt. Royal	Montreal, Can.; Can. North. R. R.	3.22	1910–1916	
Newhouse	Idaho Springs, Colo.; drainage and transportation	4.17	1893 1910	
N. Y. City Extension	New Jersey—Long Island; Penn. R. R.	11.7	1905–1910	100,000,000
Pirahy River	Rio de Janeiro, Brazil; Aqueduct	5.25	1911–1913	
Posey (Oakland-Alameda)	San Francisco bay; vehicular, trolley	.67	1926 1928	4,500,000
Ricken	Swiss Alps	5.35	1904–1910	2,500,000
Rothschönberg	Freiberg, Sax.; mine drainage	18.0	1844–1887	
Rove	On Rhone canal, France	4.5	1901–1927	27.000,000
Saint Gotthard	Switzerland -Italy; R. R.	9.33	1872–1882	11,500,000
Severn	England—Wales	4.36	1873–1886	
Shandaken	Gilboa—Allaben, N. Y.; Aqueduct	18.0	1919–1923	12,138,000
Simplon	Switzerland—Italy (Second tunnel built 1912-1921)	12.45	1898 -1906	21,000,000
Sutro	Virginia City, Nev.; drain mines	3.79	1869–1878	
Tanna	Japan; under mountains for Tokkaido R. R.	4.85	1918–1932	
Tauern	Austrian Alps; R. R.	5.31	1901–1909	6,062,500
Tequixquiac	Drains City of Mexico	6.25	1880–1898	6,760,000
Transandine	Chile—Argentina	5.0	–1911	

THE AGE OF PLASTICS

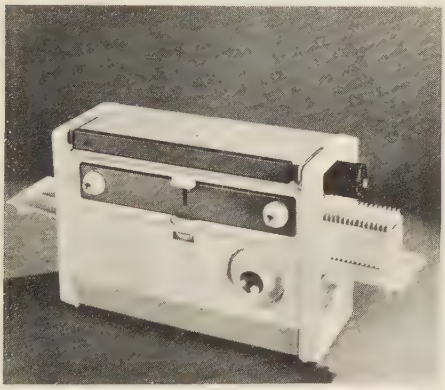


This tiny but powerful plastic fuel pump is for use in gasoline engines found in lawn mowers, chain saws, and many other small home, marine, and industrial gasoline engines. Exceptional priming performance is an outstanding feature of the design.

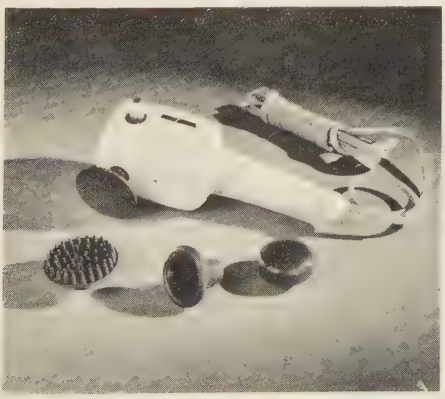
To save time in looking for telephone numbers and the exasperation of dialing the wrong ones, this automatic card dialer stores often-called numbers on plastic cards—then dials them instantly . . . and correctly.

Courtesy *Bell Telephone Laboratories*

These plastic parts from 1963 automobile models include instrument clusters, console, arm rests, garnish molding, heater ducting, knobs, facing plates, and dashboard panel components.



In today's home are found many appliances and household articles made of plastic. Shown here, above, is a slide projector and, below, a vibrator massager, both molded from urea-formaldehyde molding compound.



Right It's like having a cow in the refrigerator. A new-type polyethylene bag is shown being filled with milk at the dairy. Completely sanitary, this new container seals in 6 or 10 quarts of milk and locks out air and odor pickup from other foods in the refrigerator. The bag is protected by an attractive corrugated container and placed in a tray for dispensing. In areas where this is used, there has been a noticeable increase in milk consumption by families.

Photo courtesy *Container Corp. of America*

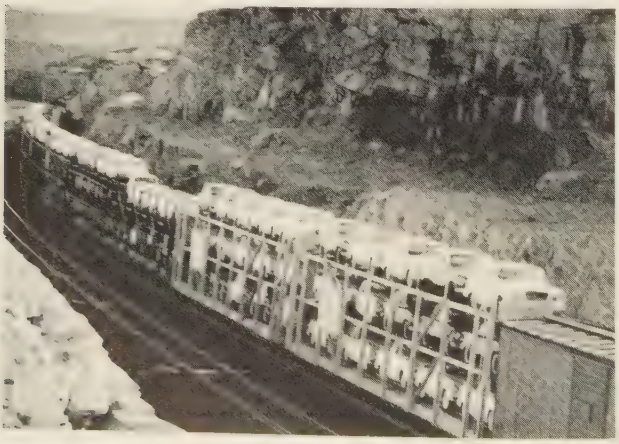
Rapid, large-scale production of daily newspapers is made possible by equipment such as this in the Chicago Tribune pressroom.

In the aluminum industry, molten metal is siphoned from melting pots and poured into pig molds.
Photo Courtesy Aluminum Co. of America

GLIMPSES OF AMERICAN BUSINESS

The sensitive pulse of American business is felt in the rise and fall of security values at the New York Stock Exchange.

At Du Pont's Seaford, Delaware, plant, where the fiber was made, nylon spools are assembled for making more than 700 million pairs of stockings.



Association of Western Railways

Along with truck-rail combinations and other adaptations of their service to modern conditions, the railroads have introduced some special equipment such as the tri-level auto carrier shown at the left

MANUFACTURING

THE word manufacture is derived from the Latin *manus*, "hand," and *facere*, "to make." Literally, it means "made by hand." However, in modern usage, the term no longer imparts its intrinsic meaning, but almost invariably refers to the making of articles by power driven machinery rather than by hand-operated tools. This change in language is representative of far greater and more important changes in social and economic conditions, which were consequent to the Industrial Revolution that originated in England during the latter part of the 18th century.

For proper appreciation of the extraordinary effects of the Industrial Revolution, it is first necessary to consider the systems of manufacturing and the social conditions which this revolution displaced.

The Domestic System. Primitive manufacturing consists of the elemental processes involved in the preparation, for individual or family use, of food, shelter, clothing, ornaments, weapons, and tools. Manufacturing in the home, of products intended solely for domestic consumption, was customary in the earliest times of which there is any record. It was equally characteristic of the pioneers who settled the American West, and is always to be found where individual families must depend upon their own resources. The first advance in manufacturing practice came when some member of a household was able to produce a surplus of meal, cloth, leather, or other commodity, which could be sold outside of the home.

Origin of Handicrafts. Later, with the rise and development of large communities, specialization became possible. Men who were unusually skillful in building, weaving, metal working, or other handicraft were enabled to devote all their energies to their chosen occupations. Thus originated the numerous trades, such as those of carpenter, wheelwright, coppersmith, weaver, fuller, tanner, butcher, and baker. Eventually, the expert workers learned to combine for mutual benefit according to their distinctive handicrafts. Such combinations, which in Europe were known as craft guilds, gradually became very powerful and were able to exercise strict control over the individual members and their products.

As a rule, a master craftsman labored at home or in a shop connected with his dwelling place, carrying on his trade with the aid of apprentices and the help of journeymen who formed the intermediate grade of workers. His products were made to suit the demands of his customers, or were offered for sale to the public under regulations prescribed by the guild to which he belonged. The master generally owned his shop and tools, purchased his raw materials, changed them into the finished product, and disposed of the goods himself.

The Outwork System. The next step in the organization of manufacturing came with the growth of the outwork system. By this arrangement, raw materials owned by a merchant were distributed or "put out" among home workers, who made and returned the finished product and received payment for their labor. Under these conditions, the buying of raw materials and the selling of completed goods were controlled by the merchant. The workman, however, owned the tools required for production and was, to a certain extent, master of his time. He usually owned his home and a piece of ground, so that a shortage of work at his craft allowed him to give more time to his farm.

Hand Power and Machines. All of the foregoing systems of domestic production are still in existence. Bread is baked and clothing is made in many homes. And, frequently, a woman who has acquired unusual skill as a cook or as a seamstress devotes her spare time to preparing food or clothes for her neighbors. In almost every town, carpenters, cabinetmakers, tinsmiths, blacksmiths, tailors, and many other skilled craftsmen are to be found working with their own tools and in their own workshops in order to fill custom orders. Panama hats, Turkish rugs, Navajo blankets, and the fine laces of Switzerland, Italy, and Ireland are still prepared by the painstaking action of skilled fingers. Nor has the outwork system been entirely discarded. In a modified form it is still the basis of modern, successful, merchandising concerns which sell knitting machines and yarn to home workers, and buy, for resale, all of the hosiery which they are able to produce. Nevertheless, all of the foregoing examples are exceptions to the general rule that, today, manufacturing is done in factories equipped with complicated, power driven machinery. This change from handwork to the factory system of production was the outstanding feature of the Industrial Revolution.

Manufacturing before 1780. In the chapter on the history of commerce, it has been shown that manufacturing, transportation, and commerce are interdependent and have developed together from the earliest historical times. When, by 1750, England had become the chief commercial nation of the world, the most important products of her industries were woolen textiles, fabricated to a large extent from the fleece of domestic sheep.

Cloth making was a domestic industry in which the wool was washed, carded, and spun into yarn by women. The processes in use differed from those employed in the days of ancient Greece only because the spinning wheel had been substituted for the distaff and spindle sometime during the 15th century. Almost every cottage contained a loom, on which the yarn was woven into cloth by the master of the house. The methods of weaving, like those of spinning, had changed very little for centuries, although in 1733 John Kay invented the "fly shuttle," which made the process much more easy and rapid.

As several spinners were required to keep a weaver supplied with yarn, the weavers were usually glad to make cloth from yarn "put out" by a merchant. In this way the workers were able to keep continuously occupied, while the merchant insured a steady supply of cloth with which to meet the increasing demands of commerce. Fulling and finishing of woolen fabrics were generally done in a fulling mill located on the banks of a stream.

Practically all other operations were performed in the homes, although occasionally a merchant would erect and equip a weaving shed wherein a considerable number of hired weavers could work together under his supervision. Production of cotton cloth was small, the finest cotton goods being imported from India.

In the iron industry, charcoal furnaces were still extensively used, although the practice of smelting with coke, as introduced by Abraham Darby about 1735, was gradually spreading. This new demand for coke stimulated production of coal. In operating the coal mines, Newcomen's engine was found to be valuable for pumping out water which accumulated in the tunnels and galleries. Power for the operation of slitting mills and for producing the air blast for furnaces was obtained by water wheels. For this reason, ironworks were usually located beside streams.

Economic Conditions. A review of the general economic conditions existing in England about 1763 shows that commerce was actively increasing, transportation was being facilitated by the construction of turnpikes and canals, capital was accumulating, and industrial production, while very important in the aggregate, represented the contributions from farm homes and from many small shops or works, quite widely dispersed throughout the land. The country as a whole was fundamentally agricultural.

Living conditions were comparatively stable, because, if unable to obtain employment at his trade, a skilled worker could generally depend upon his small farm for the necessities of life.

At home, England possessed what seemed to be an adequate supply of coal, iron ore, and wool; her colonies were capable of producing large quantities of cotton, sugar, and natural dyes. All of these raw materials are adapted to large scale operations, and, as the demands for commercial products continued to increase, the need for machinery and improved methods of production was commonly recognized.

Epoch-making Inventions. In 1767, James Hargreaves invented his spinning jenny, capable of spinning eight threads of cotton instead of one. Arkwright, a barber by trade, followed, in 1769, with the roll-drawing spinner, which operated by water power, and therefore became known as the water frame. This machine produced thread strong enough to be used for the warp of cotton cloth, but insufficiently fine for the higher grades of muslin.

Ten years later, Samuel Crompton combined the best features of the jenny and the roll-spinner in a new power machine which, because of its hybrid origin, he called a "mule." The mule established the muslin industry in England. It also made it possible to spin cotton thread faster than the weavers could change it into cloth on the hand looms.

Improvements in the speed of weaving began in 1785 when Edmund Cartwright, a clergyman, obtained a patent for a power loom. This machine at first was far from successful; in fact, a practicable power loom did not come into use until about 1803. The great demand for cotton, caused by the application of the power loom, could not have been supplied at a reasonable cost had not Eli Whitney, in 1793, invented his cotton gin, whereby cotton fiber could be quickly separated from the seeds. It is interesting to note that these great inventions were all concerned with the manufacture of cotton, rather than of woolen fabrics. The use of power for spinning and weaving wool did not become general for several years after the beginning of the 19th century.

Water Power and Steam. In order to use the new textile machinery, many cotton mills were erected in the northern parts of England, where water power was most available. But the necessity of locating beside a waterfall was removed by Watt's condensing engine, invented in 1765 and greatly improved in succeeding years. Steam boilers heated by coal fires became a source of unlimited power. As the cost of transporting coal was greater than that of moving textiles or other finished commodities, the coal fields gradually became the center of manufacturing industries.

The iron trade also was greatly stimulated by the use of coal and of steam power. For example, the annual production of iron was doubled within eight years after the substitution of the steam engine for water power as a source of the air blast required in smelting. In 1783, Henry Cort invented the grooved rolling mill, and, in the following year, introduced the puddling process for making wrought iron from pig iron.

Thus, in response to the demands of commerce for large quantities of cheap textiles, we find that, in the last half of the 18th century, machines were invented which permitted of an increased volume of production. Steam engines were developed to drive the machinery. Cort's inventions made possible a more extensive application of iron, and from the improved iron many new types of machines and more efficient engines were constructed.

Effects of the New Inventions. Manufacturing by machinery, in buildings especially designed for that purpose, required a far greater outlay of capital than was necessary to provide the simple tools used by manual laborers. Nevertheless, costs of production were so greatly reduced by this method that a development of the factory system was inevitable. The widespread domestic system practically disappeared, because necessity forced the workers to leave their rural homes and to concentrate near the factories. The laboring population was gradually transplanted from the land to the cities. Master craftsmen, skilled in all branches of their trade, were no longer needed. For the factory system of production depends upon the use of labor-saving machinery wherever possible, and upon a systematic division of any complete manufacturing process into the proper number of parts. Each succeeding step is then performed by a worker who is able to acquire a high degree of skill in the accomplishment of a single operation. Under this system, production increased enormously, old industries expanded, and new ones came into existence.

Automation. Industrial development since World War II has been marked by the rapid progress made by automation, a new word meaning the use of machinery or mechanical devices instead of men in a production system. By the use of electronic equipment, the flow and quality of production can be regulated and co-ordinated. Production principles found effective in speeding the output of war materials are now used in civilian industries. Machines can operate continuously at higher speeds and more efficiently than men, and they do not tire as men do.

New models of specialized automatic labor-saving machines are constantly being introduced into industrial plants engaged in the mass production of standardized products. Development of mechanical ways of moving and handling materials has likewise contributed to the reduction of labor engaged in these operations. By the wider use of automatic controls, or the control of machines by other machines, many industries are becoming self-regulated. Not only does automation save labor, but it makes possible a better quality product. High-speed electronic computers and data-processing machines have helped to cut down the large clerical forces formerly required for the important work of handling information.

Whether automation presents an opportunity for labor or is a threat to it remains to be seen. If our economy continues to expand, the new machines may, through increased production, create more jobs than they eliminate. It seems inevitable that some readjustments will be necessary, but, as Norbert Wiener remarked, automation wisely applied holds promise of "more human use of human beings."

Industrial Advantages. Europe became the workshop of the world, and, until 1894, England surpassed all other nations in manufacturing. The advantages which caused her superiority are worthy of note because they are those which, today, will insure the success of any properly directed manufacturing concern. England controlled a plentiful supply of cheap *raw materials*. Her *workers* were skillful and adaptable. Her methods of *production*, because of the many great inventions and the early adoption of the factory system, were the most efficient known. She had, in her colonies and also in continental Europe, a ready *market* for her finished goods. And, as a means of *distribution*, her highly skilled commercial organization was second to none.

British Industrial Centers. Textiles are, as they always have been, the chief product of British manufacture. Before the advent of machinery, wool was the principal fiber used, but, early in the 19th century, cotton took the lead. Cotton was first imported into England in 1298 for use in making candlewicks. By 1801, England produced more cotton goods than did all of continental Europe. Manchester became the cotton manufacturing center of the world. Leeds is now the center of the

British woolen industry, of the manufacture of ready-made clothing, and of leather. Leicester is renowned for the production of woolen hosiery, as Nottingham is for cotton hosiery and for machine-made net. Silk weaving and dyeing is located chiefly in Derbyshire.

The iron and steel industry in England is second in importance only to that of textiles. Blast furnaces and rolling mills are concentrated at Middlesbrough, Newport, and Barrow, while Birmingham and Sheffield have become world famous for their manufactures of fine steel and of steel products. An example of extreme specialization is Redditch, whence a large part of the world is supplied with needles and fishhooks. The greatest shipbuilding district in the world is located along the banks of the Clyde river. The heart of the British ceramic industry is at Burslem in north Staffordshire.

INDUSTRIAL GERMANY

Germany's industrial revolution did not begin until the formation of the empire in 1871. But, when once begun, the transformation from an agricultural to an industrial basis was the most rapid and complete ever known. In 1845 Germany mined less coal than either France or Belgium. In 1880, Spain had more steam tonnage than Germany. Even as late as 1882, more than one-fourth of the German textile workers operated under the domestic system. But, by 1895, over 90 per cent were employed in factories. In 1871, about 64 per cent of the population of Germany was rural, while 36 per cent lived in cities. During the succeeding 40 years the intensive development of manufacturing caused towns to grow rapidly while the rural population remained stationary. In 1910, 60 per cent of the people lived in cities.

Fuel and Iron. Germany possessed or controlled abundant supplies of iron and coal. Nevertheless, her iron ore, derived chiefly from Lorraine and Luxemburg, contained a high proportion of phosphorus and was thereby rendered unsuitable for the production of Bessemer steel. This difficulty was removed in 1878 when Thomas and Gilchrist invented their basic method of making steel, by which phosphorus is removed from the molten metal and retained in the slag. When finely ground, "Thomas slag" becomes valuable as a fertilizer, so that the invention stimulated both manufacturing and agriculture, and was of fundamental importance to Germany.

Chemical and Other Industries. The German dye and fine-chemical industry, although depending primarily on the by-products from the coke ovens, is quite widely distributed, with the chief factories located on waterways at Ludwigshafen, Leverkusen (near Cologne), Frankfort, Hochst, and Berlin. The heavy-chemical industry is centered about the potash beds of Stassfurt. The largest salt works in the country is at Schonebeck.

Most of Germany's electrical machinery is made at Berlin and Nuremberg. Porcelain is produced chiefly at Meissen, Zwickau, and Berlin. Crefeld rivals Lyon as a center of the silk industry. Shipbuilding is important at Stettin, Hamburg, Kiel, and Lubeck. Textile factories tend to concentrate near the coal fields, but the industry as a whole is scattered over the entire country. Chemnitz is called the Saxon Manchester. As a nation devoted to manufacturing, Germany's policy has been to produce highly finished goods in which the greatest proportion of the cost is due to the application of skilled labor.

OTHER EUROPEAN NATIONS

France. In France the innovations which had so quickly transformed industrial conditions in England were adopted with much less haste. In 1848, factory methods of production were not yet customary, and typical French manufacturing was done in private workshops or in small establishments. One of the chief reasons why steam power was not more quickly applied in France was an insufficient supply of coal.

The famous French steelworks at Le Creusot were founded by royal charter in 1782, but this enterprise was not financially successful until the management was taken over by the Schneider family in 1836.

Production of textiles and of clothing is the most important branch of French manufacturing. Roubaix, Tourcoing, Fourmies, Reims, and Amiens are the chief centers of the wool industry. Mulhausen, in Alsace, and Rouen lead in the production of cotton fabrics. Paris has become the center of the production of jewelry, perfumes, gloves, shoes, and porcelain. Lyon is at the heart of the great French silk trade. Saint Etienne is known for the production of silk ribbons; Troyes, for hosiery; and Grenoble, for kid gloves. Lille is the largest manufacturing city of the North.

Switzerland. Switzerland, with very little coal or iron, is distinctly a manufacturing country which is forced, by a shortage of raw materials, to produce highly finished articles, such as silks, fine shoes, watches, and intricate machinery. The famous Geneva watches are so named because Geneva is the commercial center of the watch trade. They are made chiefly in the towns of Le Locle, La Chaux de Fonds, Bienne, Saint Imier, and Porrentruy. A shoe factory at Schonenwerd, near Olten, is said to be the largest in Europe. Saint Gallen is noted for the production of embroidered linen. Zurich and Basel are centers of the silk industry. Electricity generated by water power is extensively employed, notably in the production of aluminum at Rheinfelden.

Belgium. This country, where both coal and iron are available, was the only section of Europe which was able to follow the industrial pace set by England during the first half of the 19th century. Liege is one of the most successful metallurgical and manufacturing cities in Europe. It is famous for the production of all types of steel products, especially firearms. The production of textiles is even more important than that of steel and machinery. Cotton manufacturing is centered at Ghent, the making of linen at Ghent and Tournay, and the spinning and weaving of wool at Verviers.

Scandinavia. Sweden and Norway are noted for the production of wood pulp, matches, and paper, and for their electrochemical industries. In Norway electricity is used to manufacture large amounts of nitrogenous fertilizer at Odde, Notodden, and Sarpsborg. Stockholm, Goteborg, and Norrkoping are the chief industrial towns of Sweden. Perhaps the most famous manufactured product is the pure Swedish iron, reduced from domestic ore with charcoal from the extensive forests.

Czechoslovakia. This nation possesses a better supply of coal than of iron. Bohemia, however, is noted for its iron industry and especially for the manufacture of fine glassware, of which Eger is the center of production. Small articles of glass, such as buttons, beads, and imitation jewels are produced in enormous quantities at Gablonz.

Western Europe was the most important manufacturing district in the world. In 1880, the United Kingdom led all the other nations in this branch of industry, but by 1894 the United States assumed first place.

The highly developed production in Czechoslovakia far exceeds its domestic needs, and agricultural products, led by sugar, provide raw materials of great importance to its industry. The beer industry is world famous as are the spirits. malt and foodstuff industries. Metallurgical industry thrives here because of the abundant supply of iron ore and coal. Output of steel in 1946 was approximately 1,850,000 short tons; of pig iron, 1,050,000 short tons. The Skoda steel works at Pilsen are the largest in Europe. Other industries are glass, porcelain, pottery making, timber, paper and cellulose industries.

MANUFACTURING STATISTICS BY STATES, 1962

Source: Bureau of the Census.

States	All employees		Production workers			Value added by manufacture million dollars
	Number (average for the year) 000 omitted	Salaries and wages, total million dollars	Number 000 omitted	Man-hours, total millions	Wages total million dollars	
Alabama	235	1,067	192	372	776	2,075
Alaska*	5	35	4	8	27	91
Arizona	51	317	34	71	194	502
Arkansas	114	427	96	191	319	885
California	1,359	8,979	890	1,799	4,925	15,886
Colorado	99	619	69	142	402	1,155
Connecticut	421	2,469	300	610	1,534	4,230
Delaware	58	380	30	58	147	554
Dist. of Columbia	23	142	11	21	59	246
Florida	200	1,046	136	264	595	2,085
Georgia	328	1,349	271	547	957	2,860
Hawaii	23	94	16	29	57	208
Idaho	29	148	23	45	109	296
Indiana	596	3,589	452	938	2,472	7,150
Illinois	1,195	7,186	838	1,698	4,440	13,670
Iowa	173	978	126	252	636	2,086
Kansas	118	682	86	174	446	1,410
Kentucky	174	892	132	265	593	2,167
Louisiana	130	677	98	203	461	1,636
Maine	101	426	86	173	329	767
Maryland	244	1,389	178	348	868	2,806
Massachusetts	726	3,764	528	1,043	2,319	6,589
Michigan	935	6,274	673	1,397	4,120	11,956
Minnesota	238	1,387	162	326	814	2,656
Mississippi	120	428	101	197	321	849
Missouri	382	2,062	272	534	1,275	4,145
Montana	19	102	15	30	76	229
Nebraska*	63	331	45	93	218	688
Nevada*	5	34	4	8	24	99
New Hampshire	81	359	66	130	255	610
New Jersey	801	4,756	563	1,119	2,908	9,432
New Mexico*	14	72	9	19	43	136
New York	1,910	10,919	1,283	2,499	6,004	19,140
North Carolina	510	1,919	432	860	1,427	4,253
North Dakota*	6	27	4	9	17	55
Ohio	1,223	7,678	879	1,768	4,998	14,576
Oklahoma	92	486	59	117	263	826
Oregon	144	786	117	225	588	1,471
Pennsylvania	1,407	7,726	1,039	2,017	4,951	13,103
Rhode Island	119	550	93	185	372	1,031
South Carolina	253	971	215	442	740	1,974
South Dakota*	14	68	11	20	47	138
Tennessee	320	1,417	251	502	956	3,023
Texas	495	2,664	350	727	1,631	6,362
Utah	50	303	31	62	163	685
Vermont	36	176	28	57	118	325
Virginia	296	1,343	237	474	941	2,850
Washington	232	1,493	160	306	872	2,823
West Virginia	109	636	86	167	458	1,597
Wisconsin	469	2,713	344	698	1,785	5,098
Wyoming*	8	41	6	11	25	79
Total	16,778	94,398	12,139	24,307	59,177	179,323

* Estimates

SUMMARY OF MANUFACTURES FOR MAJOR INDUSTRY GROUPS, 1962

Source: *Bureau of the Census*

Industry	Production workers			Value added by manufacture (millions)
	Number (average for the year)	Man-hours, total (millions)	Wages, total (millions)	
Food and kindred products	1,119,139	2,282	5,054	$ 20,902
Tobacco manufactures	67,212	134	265	1,642
Textile mill products	783,870	1,585	2,715	6,079
Apparel and related products	1,082,686	1,949	3,213	7,092
Lumber & products, exc. furniture	494,921	966	1,762	3,603
Furniture and fixtures	305,857	629	1,199	2,828
Paper and allied products	463,868	978	2,444	7,063
Printing and publishing industries	565,843	1,084	3,097	9,952
Chemical and allied products	471,092	954	2,650	16,064
Petroleum and coal products	110,023	221	726	3,454
Rubber products	313,590	636	1,583	4,314
Leather and leather products	307,847	569	1,000	2,097
Stone, clay and glass products	464,619	944	2,282	6,601
Primary metal industries	921,619	1,805	5,677	13,847
Fabricated metal products	834,090	1,724	4,287	11,115
Machinery, except electrical	1,037,892	2,110	5,831	16,117
Electrical machinery	1,022,566	2,083	5,136	15,566
Transportation equipment	1,123,709	2,360	7,187	20,899
Instruments and related products	228,430	461	1,196	4,311
Miscellaneous manufactures	419,167	831	1,869	5,761
All industries, total	12,138,768	24,307	59,177	$179,323

PROFITS OF MANUFACTURING CORPORATIONS BY INDUSTRY GROUPS

(Amounts estimated, in millions of dollars)

Source: *Federal Trade Commission and Securities and Exchange Commission.*

Industry Group	Profits before Taxes			Profits after Taxes		
		Percent of Sales			Percent of Sales	
	1963	1962	1963	1963	1962	1963
Food	2,905	4.6	4.7	1,449	2.3	2.4
Tobacco	675	11.9	12.1	327	5.7	5.9
Textile mill products	721	5.0	4.8	354	2.4	2.3
Apparel and finished textiles	414	3.1	3.0	189	1.6	1.4
Lumber and wood products	387	4.1	5.1	246	2.5	3.3
Furniture and wood products	259	4.8	4.9	126	2.3	2.4
Paper and allied products	1,215	8.8	8.6	634	4.6	4.5
Printing and publishing	653	6.5	6.5	316	3.4	3.2
Chemicals	4,539	13.9	14.0	2,427	7.4	7.5
Petroleum refining and related industries	4,419	10.0	12.1	3,860	9.6	10.6
Petroleum refining	4,362	11.0	12.3	3,831	9.7	10.8
Rubber	714	6.9	6.9	373	3.7	3.6
Leather	169	3.7	3.7	82	1.8	1.8
Stone, clay and glass	1,115	10.5	10.0	593	5.6	5.3
Primary nonferrous metals	910	8.8	8.6	563	5.5	5.3
Primary iron and steel	1,761	7.4	9.1	938	3.9	4.8
Fabricated metal	1,322	6.3	6.4	668	3.1	3.2
Machinery (excl. elec.)	2,891	9.1	9.5	1,432	4.5	4.7
Electrical machinery	2,568	7.5	7.4	1,299	3.7	3.8
Transportation equipment (excl. auto.)	6,090	10.5	10.8	3,006	5.3	5.3
Motor vehicles and parts	5,226	13.9	14.0	2,562	6.9	6.9
Instruments, etc.	777	11.7	12.0	390	5.9	6.0
Miscellaneous	424	7.1	6.7	209	3.4	3.3
All manufacturing	34,924	8.2	8.5	19,483	4.5	4.7

MANUFACTURING IN THE UNITED STATES

The development of successful manufacturing requires, among other things, an adequate supply of capital and of labor, a steady market for the finished products, and regular means of transportation. None of these was available in the American colonies during the early period of their existence. Furthermore, almost all of the colonies were founded as commercial enterprises which were expected to serve their promoters and the homeland by becoming a source of raw materials and a market for manufactured goods.

First Colonial Manufactures. In the early colonial days of America, each home was of necessity self-sufficient. Grain was ground, wool was spun and woven, and hides were tanned only in order to supply the needs of the family. However, as the population increased and towns developed, these industries were divided among the members of each community. Each settlement was soon furnished with mills for grinding grain, for sawing lumber, and for the fulling and finishing of woolen cloth. Tanneries, also, were erected in many communities. The first sawmill was built at Dorchester (Mass.) in 1628. The first New England tannery was located at Lynn in 1629, and the manufacture of shoes was begun there in 1635.

Expansion of New England Industry. The American colonies as a group were essentially agricultural. But, in New England, where the land was not well adapted to farming, a large proportion of the settlers were forced to gain a livelihood by other means. Fishing, which, from the first, was an industry of primary importance, gave rise to a demand for ships. The finest materials with which to construct ships were available in the forests, and shipbuilding soon became one of the chief industries.

From fishing and shipbuilding, the New Englanders quite naturally advanced to maritime trade, which was carried on at first chiefly with the West Indies. These islands were glad to exchange their surplus sugar and molasses for salt fish and lumber. Thus, in addition to purely local manufacturing industries which sprang up in all of the settlements, New England developed others which were based on the necessity of equipping the ships, supplying food for the sailors, providing cargoes for export, and utilizing the commodities that were imported.

A ropewalk to supply vessels with cordage was erected in Boston in 1641, and, at many places along the coast, salt for the preservation of meat and fish was prepared by evaporating sea water over wood fires. Bakers found employment in shops devoted to the production of sea biscuit, or hard-tack. Rum was so extensively used on shipboard that the expense for liquor issued regularly to sailors was generally as great as the cost of their bread, and the production of rum by fermenting and distilling the West Indian molasses became a thriving New England industry. Since practically all commercial commodities, whether liquid or solid, were packed and shipped in barrels, the manufacture of barrels and barrel staves, buckets, and similar forms of cooperage from the white oak of New England became exceedingly profitable.

Ironworks. Iron was sorely needed in the colonies, not only to provide ships with anchors, bells, cannon, and shot, but also to supply the population with nails, hardware, cooking utensils, iron barrel hoops, and similar products. The earliest successful attempt to meet the demand was made at Lynn, Massachusetts, where a company organized by the son of Governor Winthrop erected a blast furnace in 1644. The first product from the furnace was a cast-iron kettle of about one quart capacity, made in 1645. In 1648 a refining forge was added to the equipment, so that refined iron products then became available. The making of nails, hammered from rods of iron obtained from slitting mills, was a domestic industry almost as widespread as the production of textiles

Growth of Manufacturing. The colonial population, which in 1640 numbered 25,000, increased to one million during the succeeding century, and amounted to 2¼ million in 1775. Manufacturing developed at a corresponding rate. Iron furnaces and refining forges became almost as common as sawmills, gristmills, and fulling mills. The abiilty of the colonial foundrymen is shown by the fact that in 1753 they melted and recast the bell for the Pennsylvania statehouse, which afterward became famous as the Liberty Bell. Four of the signers of the Declaration of Independence were financially interested in the iron industry. The Washington family owned a one-twelfth interest in the Principio ironworks of Maryland.

England encouraged the manufacture of pig iron, but passed laws against the production of steel and steel products, as well as that of other articles which competed with British industry. Although these prohibitory laws checked the growth of manufacturing industries, enforcement of them was found to be almost impossible except in the vicinity of the larger cities where the crown officers were stationed.

The Revolutionary War greatly stimulated American manufacturing, because raw materials accumulated and the supply of English products, on which the country had largely depended, was cut off. Necessity caused the growth of various industries. But, when peace was concluded, English manufacturers flooded the country with their products at prices so low that many American concerns were ruined.

Textiles. Competition of American made cloth with that of British manufacture was especially difficult, because the colonies were at first unable to utilize the newly invented textile machinery. England not only prohibited the exportation of designs or models of the machines, but even endeavored to prevent the emigration of mechanics skilled in the industry. However, in 1789, Samuel Slater, who had been employed in Arkwright's factory, came to America. He went first to Philadelphia, where a comparatively large amount of cotton spinning was carried on. Failing to interest the manufacturers in that city, he went to New York and then to Rhode Island, where, in 1790, on the falls of the Pawtucket river, he built for Moses Brown the first power driven cotton spinning mill in the United States. Andrew Jackson called Slater the "father of American manufacturers."

In 1805, there were only four cotton mills in America. But the passing of the Embargo act of 1807, followed by the Nonintercourse act and the War of 1812, prevented foreign commerce and again stimulated manufacturing. Twelve new spinning mills were opened in 1808; in 1811, spindles to the number of 80,000 were in use, and 10,000 bales of cotton were spun; in 1815, the spindles numbered 500,000. In 1814, Francis Cabot Lowell devised a power loom similar to those which he had seen while visiting England, and erected at Waltham, Massachusetts, the first complete cotton factory in the world. Practically all power mills were located on waterfalls, although steam engines came into use as a source of power after 1810. Most of the early mills obtained their cotton from the West Indies, because the Southern states marketed their product in Liverpool.

Tariffs and Railroads. At the close of the War of 1812, British manufactures were for a second time thrown on the American market at prices which brought disaster to many growing industries. After 1816, these industries received protection through a series of tariff acts, and manufacturing again expanded.

Even more important than the tariff, however, in its influence upon manufactures, was the development of railroads. The iron industry was directly affected, because the railroads proved to be

the greatest consumers of iron products. Iron T rails were first rolled in 1844, in Maryland. Bessemer steel was first made on a commercial scale in 1864; in the following year, the Chicago Rolling Mills produced the first American Bessemer steel rails. Besides thus stimulating iron and steel manufactures, through enlarging the market for their products, the railroads promoted many types of industry by furnishing the necessary means for the interchange of goods between manufacturing centers and distant agricultural regions. The cotton growing South and the rapidly expanding agricultural regions of the West afforded rich markets where the demand for manufactured products seemed unlimited. By 1860 the annual production of agricultural implements alone amounted to 17.8 million dollars.

Inventions and Industrial Progress. While the development of such agricultural machinery as the McCormick reaper added greatly to the farmers' ability to raise grain on a large scale, many other great inventions opened the way for new forms of manufacturing. (See table of *Modern Inventions.*) To choose a single example, the invention of the sewing machine laid the foundation for the great modern clothes making industries, and, when the machine was developed, it revolutionized the process of making shoes.

Manufacturing after the Civil War. During the Civil War, the lack of the customary supply of raw material from the Southern states checked the production of cotton goods, although other branches of manufacturing were unusually active. The coming of peace introduced an era of industrial progress in which large scale production was developed to a degree never before attained, and the United States advanced steadily to first rank among manufacturing nations. In 1820, America produced only 2 per cent of the world's pig iron; a century later the proportion had increased to 54 per cent.

America's Chief Manufactures. Fourteen groups of related industries, each of which has an annual production in excess of $1 billion, account for over 96 per cent of all American manufactures. In the following list, the principal groups are ranked in order of importance as shown by reports of Department of Commerce, U.S. Census of Manufactures covering 1962.

GREAT MANUFACTURING INDUSTRIES

Group and Important Divisions	Value
Food and kindred products	$20,271,000,000
Meat products	2,777,000,000
Flour and other grain-mill products	2,075,000,000
Dairy products	3,324,000,000
Bakery products	2,872,000,000
Canned and frozen foods	2,476,000,000
Confectionery	871,000,000
Transportation equipment	17,585,000,000
Motor vehicles	8,968,000,000
Aircraft	6,995,000,000
Ships and boats	1,062,000,000
Railroad equipment	323,000,000
Chemicals and allied products	14,768,000,000
Petroleum refining	2,915,000,000
Chemicals	5,238,000,000
Drugs and medicines	2,440,000,000
Paints and varnishes	913,000,000
Soap and related products	2,368,000,000
Fertilizers	501,000,000
Gum and wood chemicals	100,000,000
Machinery (except electrical)	14,148,000,000
Tractors and farm machinery	1,061,000,000
Metalworking machinery	2,493,000,000
Construction and mining machinery	2,165,000,000
Machinery, electrical	13,759,000,000
Industrial apparatus	1,722,000,000
Communication equipment	3,491,000,000
Household appliances	1,647,000,000
Metal Industries	12,834,000,000
Blast furnace and steel mills	7,267,000,000
Iron and steel foundries	1,510,000,000
Printing and Publishing	9,492,000,000
Newspapers	2,989,000,000
Books	1,179,000,000
Commercial printing	2,683,000,000
Periodicals	1,188,000,000
Stone, clay, and glass products	6,336,000,000
Glass	2,128,000,000
Concrete and plaster	1,778,000,000
Cement, hydraulic	747,000,000
Clay	545,000,000
Forest products	5,938,000,000
Lumber and basic products	3,395,000,000
Furniture, Household	1,674,000,000
Millwork	968,000,000
Textiles and their products	5,613,000,000
Broad woven fabrics	1,279,000,000
Woolen and worsted goods	367,000,000
Knitting mills	1,253,000,000
Women's clothing	1,168,000,000
Men's clothing	1,009,000,000
Miscellaneous industries	5,065,000,000
Toys and sporting goods	908,000,000
Jewelry and silverware	383,000,000
Musical instruments	158,000,000
Rubber products	3,929,000 000
Tires and inner tubes	1,263,000,000
Leather and leather goods	2,042,000,000
Footwear	112,000,000
Tanning and finishing	267,000,000
Tobacco manufactures	1,596,000,000

Distribution of Manufacturing. As the preceding table shows what manufactures in the United States have the greatest annual value, the next point of interest is, "Where are these industries chiefly located?" Inspection of the table, *Manufacturing Statistics by States*, shows that 31 states each had in 1962 an annual production exceeding $1 billion in value. To these states is to be credited over 95 per cent of all national manufactures. New York led with manufactured commodities valued in excess of $19 billion, followed by California, Ohio, Illinois, and Pennsylvania with more than $13 billion each. Michigan produced over $11 billion, New Jersey exceeded $9 billion, and Indiana, Massachusetts, and Texas passed the $6 billion mark.

According to the Bureau of the Census, the first census of manufactures covered the year 1809, and was then taken at ten-year intervals up to 1899. From 1904 to 1919 it was taken every five years, and from 1921 to 1939 every other year. The 1947 census of manufactures was the first since 1939. Present legislation provides for a complete census covering 1953 and every fifth year thereafter. An annual survey is part of this program.

Localization of Manufacturing. Economic factors such as raw materials, supply of power and labor, markets, and distribution facilities usually determine the location of manufacturing industries. Cotton and woolen mills require a moist atmosphere, while other industries depend on skilled labor or raw material supply. Water power and access to cheap coal were formerly major factors in attracting industry. Due to electric power today and its easy transmission, power requirements no longer force industries into certain areas. The West Coast today, with only 4 per cent of American industry, promises a future because of climate, availability of hydroelectric power, and future market demands.

Westward Movement of Industry. As the center of American population has moved westward, it has been followed, although with less speed, by the center of manufacturing. The early settler in the "West" obtained his ax, spade, and kettles from New England. Today the Western farmer obtains his plow or thresher from Illinois. The center of production of flour and gristmill products has moved from New York to Minnesota. Here the mills are close to the great wheat producing areas, power is available, and markets are easily accessible. Slaughtering and meat packing, which, as a separate industry, originated in Cincinnati about 1818, is now centered in Chicago. Kansas City, Kansas, ranks second in this industry, with Omaha, Nebraska, third. In these locations, the industry is close to the Western cattle raising area, its source of raw material.

Manufacturing in the South. One of the most notable developments connected with American manufacturing progress has been that of the production of cotton goods in the Southern states. North Carolina and South Carolina both rank in value of cotton manufactures above Massachusetts, which in 1920 was easily the leader. In 1880, North Carolina, South Carolina, and Georgia, together produced only 6.2 per cent of American cotton products. In 1910, their combined output equaled 29.7 per cent, and, in 1939, 58.8 per cent, of the total. In the production of iron and steel also the South is advancing steadily. A new process by which paper may be made from slash pine grown in the South is the basis of an expanding industry. Large increases in chemical and other industries requiring cheap power are taking place as the result of the development of the Tennessee Valley begun in 1933 under government initiative.

While easy access to raw materials has been the leading cause of the migration of certain industries to the South, the hope of obtaining labor at low wages has been an important motive. Recent governmental studies have shown, however, that wages have tended to level out between the regions and that differences within single states are considerably larger than between averages for North and South.

Distribution of Industry. The following table shows, for each of a number of important industries, which state ranks first in value of goods produced. When figures are given, they indicate the relation which the industry within a state bears to that of the entire country. The name of a city in parenthesis indicates the municipality which leads all others in a given industry.

CENTERS OF INDUSTRIAL PRODUCTION*

Industry or Product	Leading State	Per Cent of Total
Agricultural implements	Illinois	49.5
Aircraft and parts	California	32.0
Automobiles and trucks	Michigan (Detroit)	56.6
Buttons	New York	37.6
Canned and dried fruits and vegetables	California	29.2
Carbon paper and typewriter ribbons	New York	48.3
Cement	Pennsylvania	19.4
Chemicals	New Jersey	22.9
Cigars	Pennsylvania	35.4
Cigarettes	North Carolina	51.3
Clocks and watches	Illinois	24.5
Clothing, Men's	New York (New York)	29.9
Clothing, Women's (outer)	New York (New York)	67.0
Condensed and evaporated milk	Wisconsin	26.0
Cotton goods	North Carolina	27.8
Cutlery and edge tools	New York	23.4
Electrical machinery	Pennsylvania	20.8
Electrical appliances	Ohio	30.2
Fertilizer	Virginia	10.4
Firearms	Connecticut	54.8
Flour and grain mill products	Kansas	10.7
Furniture, household	New York	11.5
Furs	New York	90.0
Glass	Pennsylvania	13.6
Glue and gelatin	Massachusetts	24.8
Iron and steel	Pennsylvania	29.7
Jewelry	New York	35.1
Leather	Massachusetts	19.9
Linoleum	New Jersey	25.6
Lumber	Washington	16.7
Marble and stone	Vermont	14.6
Meat packing	Illinois (Chicago)	18.1
Motor cycles and bicycles	Ohio	42.8
Paints, varnishes, and lacquers	Illinois	16.4
Paper and paperboard	New York	11.6
Petroleum refining	Texas	28.4
Pianos	New York	33.7
Pins, needles, hooks and eyes, other fasteners	Connecticut	30.0
Printing and publishing	New York	20.8
Printing presses	New York	30.3
Radios and phonographs	Illinois	27.1
Rayon and allied products	Tennessee	24.2
Rubber boots and shoes	Massachusetts	38.6
Rubber tires and inner tubes	Ohio (Akron)	46.1
Sewing machines	Illinois	22.4
Shoemaking	Massachusetts	19.3
Soap and glycerin	New York	9.8
Steam and electric railroad cars	Pennsylvania	24.1
Sugar, Beet	California	27.1
Sugar refining	New York	20.5
Tanning materials and natural dyestuffs	New Jersey	29.3
Textile machinery	Massachusetts	38.4
Turpentine and resin	Georgia	58.8
Wood pulp	Washington	16.4
Wool textiles	Massachusetts (Lawrence)	27.2

*Based on U. S. Census of Manufactures.

GROWTH AND SPECIALIZATION OF INDUSTRY

The 20th century witnessed a remarkable increase in specialization and an extraordinary rise in industrial efficiency. These were largely the result of the application of inventive genius and scientific research to the problems of production. Of chief importance was the exploitation of the possibilities in electricity as a means of transmitting power.

The Electrical Age. Power in the form of electricity can be used *when* and *where* it is wanted far more readily than power delivered directly from steam engine or water wheel. It facilitates the ready and precise control of machine processes, thereby making possible an increasing use of automatic machinery. In the first quarter of the 20th century electrification in American industry rose from 4 per cent to 70 per cent. It later became almost universal. Electricity used in factories but developed in central stations increased from 182,562 horse power in 1899 to 15,868,828 horse power in 1925—87 fold. The result has been a pronounced growth in production accomplished by a decreasing number of workmen. Wages have risen, yet many manufactured articles have become cheaper. At the same time, by making power available at long distances from its generating source, electricity has obviated the need for locating industries in centers of congested population. New industrial communities may be semirural in character, with marked improvement in living conditions.

The marked advance in the field of electric energy production in the United States is shown by the fact that the total production in 1940 was 141,837,010,000 kilowatt hours, while in 1950 it had risen to 329,141,343,000. Production by the type of prime mover used in 1950 was hydro 95,938,317 kwh, steam 229,543,366, and internal combustion 3,659,660,000. Fuel consumed in the production was coal 91,877,770 tons, oil 75,420,490 barrels, and gas 628,918,834,000 cubic feet. By far the greater proportion of this energy was supplied by privately-owned public utilities. The total number of power-generating plants in 1950 was 3,867, of which 1,458 were hydro, 1,051 steam, and 1,358 internal combustion.

Specialization and Mass Production. The automobile industry and possibly the assembly line methods of shipbuilding and plane construction in World War II are the best examples of specialization and mass production. Operations are analyzed into their simplest constituent parts and each of these is performed by a worker, with or without a special machine. His work is confined, mechanical, and highly specialized.

New Industries and Research. Through the expenditure of many millions of dollars on organized scientific research, industrial firms have evolved or perfected many important new materials and new products which have become the basis of new industries. Examples are the camera, synthetic lacquer, the radio, and a cheap method of producing aluminum. The electrical, rubber, and automobile industries have risen in the 20th century from very small beginnings to gigantic proportions, automobiles reaching the first place among American industries in 1925. Synthetic nitrates, rayon, and airplanes have likewise forged ahead under the powerful stimulus of well-directed research.

Manufacturing and Agriculture. In 1899, one out of every 16 persons in the United States, or 6.2 per cent of the population, was employed in manufacturing. The proportion increased moderately thereafter whereas the proportion of persons engaged in agriculture steadily declined. Not only, therefore, is manufacturing becoming more important because of the largely enhanced value of its product, but it produces a growing proportion of the total output of the country's industries, and it employs an increasing percentage of the working population. This condition became almost inevitable when the last of the rich American agricultural lands were settled. Fear is frequently expressed that manufacturing is making progress at the expense of agriculture. For any given locality this may at times be true, but, considered more broadly, manufacturing and agriculture must develop together. The great industrial cities could not exist for more than a day, or at most a week, if their incoming supply of food should be cut off, while the agriculturist, who finds his chief market in the industrial centers, would be unable to produce and distribute his crops if he did not have the advantages afforded by countless factory products.

The situation has been further affected by the recent enormous increase in the population of the United States, which between the 1950 and 1960 censuses increased nearly 28 millions, the greatest rise in the nation's history.

MANUFACTURES—STATISTICS FOR STANDARD METROPOLITAN AREAS WITH 40,000 OR MORE MANUFACTURING EMPLOYEES, 1962

Source: *Bureau of the Census; 1962 Annual Survey of Manufactures*

STANDARD METROPOLITAN STATISTICAL AREA*	Rank	Establishments	All employees[1]		Value added by Manufacture[2] $1,000	Capital Expenditure new[3] $1,000
			Number	Payroll $1,000		
Akron (Ohio)	34	698	79,000	538,000	877,000	65,000
Albany-Schenectady-Troy (N.Y.)	43	744	64,000	390,000	649,000	30,000
Allentown-Bethlehem-Easton (Pa.)	35	1,005	97,000	518,000	821,000	41,000
Atlanta (Ga.)	31	1,317	89,000	482,000	975,000	59,000
Baltimore (Md.)	12	2,112	186,000	1,128,000	2,248,000	163,000
Binghamton, (N.Y.)	67	302	39,000	216,000	280,000	16,000
Birmingham (Ala.)	46	660	59,000	344,000	593,000	36,000
Boston (Mass.)	7	5,665	322,000	1,791,000	3,144,000	137,000
Bridgeport (Conn.)	40	784	70,000	416,000	706,000	22,000
Buffalo (N.Y.)	14	1,820	163,000	1,067,000	1,929,000	122,000
Canton (Ohio)	47	469	51,000	325,000	593,000	33,000
Chattanooga (Tenn.)	59	428	38,000	180,000	415,000	19,000
Chicago (Ill.)	2	13,508	852,000	5,237,000	9,660,000	454,000
Cincinnati (Ohio)	15	1,776	147,000	902,000	1,863,000	71,000
Cleveland (Ohio)	6	3,898	271,000	1,772,000	3,188,000	190,000
Columbus (Ohio)	37	835	75,000	465,000	782,000	27,000
Dallas (Texas)	26	1,756	107,000	577,000	1,165,000	49,000
Dayton (Ohio)	25	930	100,000	663,000	1,234,000	68,000
Denver (Colo.)	32	1,286	75,000	483,000	891,000	56,000
Detroit (Mich.)	4	6,468	470,000	3,381,000	5,983,000	241,000
Flint (Mich.)	30	278	68,000	506,000	1,052,000	53,000
Fort Worth (Texas)	50	784	52,000	297,000	538,000	18,000
Gary-Hammond-East Chicago (Ind.)	20	444	102,000	708,000	1,476,000	111,000
Grand Rapids (Mich.)	45	841	52,000	313,000	601,000	32,000[4]
Greensboro-High Point (N.C.)	58	577	45,000	177,000	421,000	14,000
Hartford (Conn.)	33	905	86,000	547,000	887,000	49,000
Houston (Texas)	24	1,750	92,000	572,000	1,367,000	169,000
Indianapolis (Ind.)	28	1,101	100,000	637,000	1,111,000	44,000

For footnotes, see page 1354.

MANUFACTURES—STATISTICS FOR STANDARD METROPOLITAN AREAS WITH 40,000 OR MORE MANUFACTURING EMPLOYEES ,1962—Con.

Source: *Bureau of Census; 1962 Annual Survay of Manufactures*

STANDARD METROPOLITAN STATISTICAL AREA*	Rank	Establishments	All employees[1]		Value added by Manufacture[2] $1,000	Capital Expenditure new[3] $1,000
			Number	Payroll $1,000		
Jersey City (N.J.)	22	2,400	116,000	676,000	1,431,000	53,000
Kansas City (Mo.)	18	1,625	108,000	640,000	1,562,000	78,000
Lancaster (Pa.)	52	632	46,000	238,000	482,000	18,000
Lawrence-Haverhill (Mass.)	65	n.a.	44,000	222,000	356,000	18,000
Los Angeles-Long Beach (Calif.)	3	16,910	818,000	5,455,000	9,363,000	409,000
Louisville (Ky.)	23	872	90;000	531,000	1,416,000	71,000
Memphis (Tenn.)	51	708	44,000	218,000	537,000	24,000
Miami (Fla.)	66	n.a.	42,000	176,000	332,000	26,000
Milwaukee (Wis.)	13	2,298	193,000	1,239,000	2,107,000	87,000
Minneapolis-St. Paul (Minn.)	17	2,433	162,000	986,000	1,810,000	86,000
Nashville (Tenn.)	56	n.a.	41,000	203,000	430,000	18,000
Newark (N.J.)	8	4,425	247,000	1,504,000	2,943,000	161,000
New Haven (Conn.)	62	722	41,000	238,000	383,000	29,000
New Orleans (La.)	54	901	44,000	214,000	472,000	24,000
New York (N.Y.)	1	39,396	1,183,000	6,588,000	11,393,000	331,000
Paterson-Clifton-Passaic (N.J.)	16	3,332	161,000	927,000	1,820,000	66,000
Philadelphia (Pa.)	5	8,124	552,000	3,245,000	5,675,000	316,000
Pittsburgh (Pa.)	10	2,479	279,000	1,852,000	2,686,000	204,000
Portland (Oreg.)	39	1,758	64,000	374,000	730,000	48,000
Providence (R.I.)	27	2,913	131,000	607,000	1,138,000	46,000
Reading (Pa.)	57	697	53,000	246,000	425,000	24,000
Richmond (Va.)	49	492	46,000	234,000	544,000	38,000
Rochester (N.Y.)	21	1,015	108,000	733,000	1,466,000	71,000
Rockford (Ill.)	55	487	40,000	245,000	438,000	16,000
St. Louis (Mo.)	9	3,150	250,000	1,521,000	2,910,000	178,000
San Diego (Calif.)	44	755	72,000	502,000	625,000	20,000[4]
San Francisco-Oakland (Calif.)	11	4,433	197,000	1,297,000	2,536,000	196,000
San Jose (Calif.)	29	773	85,000	627,000	1,064,000	53,000
Seattle (Wash.)	19	1,903	132,000	908,000	1,542,000	64,000
Springfield-Holyoke (Mass.)	42	962	67,000	368,000	661,000	28,000
Syracuse (N.Y.)	36	760	71,000	438,000	796,000	28,000
Toledo (Ohio)	41	742	58,000	378,000	689,000	28,000
Utica-Rome (N.Y.)	60	473	40,000	215,000	419,000	16,000
Washington (D.C.)	61	n.a.	40,000	235,000	400,000	27,000[4]
Wichita (Kans.)	63	446	44,000	282,000	376,000	14,000[4]
Wilkes-Barre–Hazelton (Pa.)	68	696	44,000	153,000	276,000	8,000
Wilmington (Del.)	48	369	54,000	398,000	569,000	63,000
Worcester (Mass.)	53	792	51,000	274,000	472,000	17,000
York (Pa.)	64	608	40,000	188,000	374,000	24,000[4]
Youngstown (Ohio)	38	563	70,000	455,000	778,000	38,000

n.a. Not available.
* A standard metropolitan statistical area is a county or group of counties (except in New England) which contains at least one city of 40,000 inhabitants or more, or "twin cities" with a combined population of at least 40,000. In New England, towns and cities are the units used in defining standard metropolitan statistical areas.
1. Includes central administrative offices or units which serve the manufacturing establishments of a company.
2. Value of shipments less cost of materials, supplies, fuel, electricity, and contract work.
3. Includes expenditures for plants in operation and plants under construction.
4. Standard error in excess of 15 per cent.

MANUFACTURES OF THE UNITED STATES, 1962

By Selected Representative Products

Source: *U.S. Department of Commerce*

Product	Value added by Manufacture	Value of Products Shipped
Asbestos products	$268,174,000	$512,903,000
Aluminum	611,241,000	2,016,613,000
Bags, paper	374,507,000	1,005,935,000
Bags, textile	61,831,000	159,186,000
Ball and roller bearings	623,505,000	962,726,000
Batteries, storage	210,867,000	452,097,000
Beet sugar	166,866,000	456,412,000
Beverages, non-alcoholic	1,135,497,000	2,030,897,000
Biscuits, crackers, and pretzels	618,216,000	1,134,067,000
Book printing	953,859,000	1,529,506,000
Boxes, paperboard	1,851,489,000	4,433,167,000
Boxes, wooden	203,833,000	465,643,000
Bread and other bakery products	2,334,889,000	4,446,345,000
Brick and hollow tile	237,601,000	399,768,000
Brooms and brushes	166,614,000	306,878,000
Candles	21,304,000	39,298,000
Cane sugar refining	233,959,000	1,139,697,000
Canning and frozen foods	2,495,699,000	6,806,250,000
Carbon paper and inked ribbons	73,060,000	165,899,000
Carpets and rugs	129,787,000	328,272,000
Cheese, natural	141,081,000	808,086,000
Chemical products	16,064,005,000	29,371,809,000
Chocolate and cocoa products	174,280,000	461,958,000
Cleaning and toilet goods	2,524,716,000	4,342,332,000
Computing machines	1,025,128,000	1,833,241,000
Concrete products	490,293,000	865,149,000
Confectionery products	603,120,000	1,395,076,000
Corsets and allied products	299,440,000	581,222,000
Cottonseed oil	76,746,000	511,745,000
Cutlery	176,670,000	239,365,000
Dresses	1,101,685,000	2,278,930,000
Earthenware food utensils	34,192,000	48,383,000
Electric household appliances	1,874,696,000	3,808,471,000
Electric lamps	367,055,000	544,880,000
Envelopes	160,247,000	326,643,000
Farm machinery (except tractors)	1,206,595,000	2,483,558,000
Footwear, except rubber	1,280,759,000	2,451,856,000
Footwear, rubber	211,174,000	326,450,000
Frozen foods	422,875,000	1,300,894,000
Furniture:		
Household, wood	896,986,000	1,692,737,000
Household, upholstered	478,161,000	943,936,000
Metal house furniture except upholstered	222,953,000	499,525,000
Office furniture, wood	48,626,000	85,184,000
Office furniture, metal	216,775,000	362,060,000
Glass containers	639,620,000	1,014,781,000
Glass, flat	315,335,000	490,923,000
Greeting cards	192,914,000	331,700,000
Gypsum products	244,938,000	406,356,000
Handbags and purses, leather	134,100,000	263,444,000
Hard-surface floor coverings	110,738,000	191,265,000
Hardware	966,592,000	1,651,811,000
Hosiery, full-fashioned	66,149,000	148,756,000
Hosiery, seamless	454,023,000	923,038,000
Ice cream and ices	432,308,000	1,092,730,000
Iron and steel forgings	450,493,000	918,060,000
Jewelry, costume	136,204,000	253,166,000
Leather tanning and finishing	263,599,000	765,942,000
Lighting fixtures	552,868,000	1,112,781,000
Lime	96,795,000	155,901,000
Lithography	1,090,891,000	1,858,221,000
Locomotives and parts	224,169,000	443,246,000
Luggage	110,051,000	207,899,000
Lumber, planing mill products	1,484,934,000	3,320,675,000
Matches	38,776,000	63,458,000
Mattresses and bedsprings	261,275,000	633,941,000
Men's and boys' suits and coats	741,327,000	1,486,592,000
Metal barrels, drums, and pails	104,419,000	279,535,000
Millinery	104,084,000	175,368,000
Millwork plants	424,720,000	1,094,494,000
Motorcycles, bicycles	74,162,000	172,600,000
Motors and generators	977,003,000	1,660,688,000
Musical instruments	180,039,000	352,310,000
Needles, pins, fasteners	188,004,000	319,005,000
Newspapers	3,015,847,000	4,325,712,000
Optical goods	85,771,000	134,153,000
Paints and varnishes	904,115,000	2,103,625,000
Paper and board mills	244,452,000	447,247,000
Pencils, lead and art goods	57,200,000	107,582,000
Pens and mechanical pencils	109,846,000	180,906,000
Periodicals	1,324,845 000	2,184,468,000
Petroleum refining	2,980,848,000	15,914,594,000
Phonograph records	126,257,000	189,263,000
Photographic equipment	1,099,076,000	1,616,047,000
Pickles and sauces	243,220,000	695,933,000
Plastic products	1,100,825,000	2,372,111,000
Plated ware (*see* Silverware)		
Plumbing fixtures and fittings, metal	775,047,000	1,561,875,000
Plywood plants	491,475,000	1,267,923,000
Printing, commercial	2,844,295,000	4,864,365,000
Pulp mills	180,013,000	453,591,000
Railroad and street cars	276,979,000	665,708,000
Roofing and paving materials	325,113,000	838,826,000
Rubber industries	4,313,590,000	8,516,227,000
Rubber, synthetic	318,415,000	759,036,000
Rubber tires and inner tubes	1,278,829,000	2,884,441,000
Saws	64,884,000	102,702,000
Scales and balances	49,849,000	77,735,000
Scientific instruments	1,114,162,000	1,711,757,000
Seafood, canned	157,354,000	428,906,000
Sewing machines	81,537,000	120,327,000
Shipbuilding and repairs	947,258,000	1,666,175,000
Shortening and cooking oils	290,200,000	1,672,127,000
Signs and advertising display	377,025,000	607,240,000
Silverware and plated ware	130,229,000	235,716,000
Soap and detergents	386,778,000	713,933,000
Soybean oil mills	142,817,000	1,340,803,000
Sporting and athletic goods	359,550,000	699,882,000
Surgical and medical instruments	132,372,000	223,476,000
Surgical appliances and supplies	366,902,000	583,653,000
Telephone and telegraph equipment	1,020,895,000	1,883,602,000
Thread mills	74,096,000	197,410,000
Tin cans and other tinware	772,377,000	2,112,439,000
Tobacco:		
Chewing and smoking	76,221,000	147,125,000
Cigarettes	1,248,402,000	2,548,269,000
Cigars	198,758,000	368,923,000
Toilet preparations	1,015,871,000	1,500,988,000
Tools, edge	361,286,000	590,569,000
Tractors and Industrial Trucks	175,410,000	360,562,000
Transformers	404,927,000	731,263,000
Typewriters	206,883,000	290,685,000
Vacuum cleaners	107,518,000	163,580,000
Venetian blinds	94,659,000	204,600,000
Wallpaper	17,825,000	31,819,000
Watches and clocks	233,914,000	427,266,000
Wire drawing	715,967,000	1,994,705,000
Wire and cable, insulated	364,111,000	848,217,000
Woolen and worsted fabrics		
Women's and children's underwear		
X-ray and therapeutic apparatus	76,229,000	127,101,000
Yarn mills, cotton system	362,391,000	1,036,113,000
Yarn mills, wool, except carpet	113,368,000	409,881,000

LUMBERING

The lumber industry of the United States began in pioneering days in Maine, which held the lead for more than 200 years. With the increase in population and the westward trend of the people, the industry grew rapidly and the center of production shifted, first to New York about 1850, and then to Pennsylvania in 1860. From there it moved to Michigan, Minnesota, and Wisconsin, which from 1870 to 1895 were the principal lumber-producing states. Then the South sprang into the lead, notably Mississippi and Louisiana, but it was overtaken in 1920 by the West, particularly Oregon and Washington, an area which still dominates the industry. Oregon has been the leading lumber state since 1938.

The production of lumber is divided between the coniferous, or softwood, trees and the broadleaf, or hardwood, trees. In a general way, soft woods may be considered as the structural material used by carpenters, while hard woods are more extensively utilized by cabinetmakers. The distinction, however, is not sharp, because some of the so-called "hard woods" are, in fact, softer than certain of the so-called "soft woods."

Total lumber production in 1962 was 33,174,000,000 feet board measure, of which 26,812,000,000 feet was softwood and 6,362,000,000 was hardwood.

Industries depending on forest products are widely distributed throughout the United States. California manufacturing plants use the largest amount, followed by New York, Washington, Illinois, and Michigan.

On the basis of the quantity cut, yellow pine has been for many years the most important timber, although the amount of Douglas fir standing in forests in the United States is greater than that of any other single kind of wood. For the first time, in 1949, more Douglas fir was cut than yellow pine.

In recent years, the lumber industry has come to realize that trees are a crop and it engages in extensive tree planting, even maintaining nurseries to supply the seedlings.

LUMBER PRODUCTION IN THE UNITED STATES

(Millions of Board Feet)

Source: *Bureau of the Census, Industry Division*

Kinds of Wood	1962	1961
EASTERN REGIONS, total	13,294	12,833
Southern Pine	5,733	5,622
Southern Hardwood	3,341	3,230
Appalachian	1,313	1,153
Northern Hemlock and Hardwood	490	489
Northeastern	1,334	1,308
WESTERN REGIONS, total	19,880	19,186
Douglas Fir	8,077	7,793
Western Pine	9,506	9,095
California Redwood	2,225	2,225
Total, U.S.	33,174	32,019

PRODUCTION OF LUMBER IN SELECTED STATES, 1962

(Millions of Board Feet)

Source: *Bureau of the Census, Industry Division*

State	Total Est.	Softwoods	Hardwoods
Alabama	1,074	742	332
Alaska	72	72	. .
Arizona	326	326	. .
Arkansas	1,223	867	356
California	5,002	4,990	*a*
Colorado	208	207	*a*
Connecticut	30	*a*	*a*
Florida	185	176	*a*
Georgia	1,018	733	285
Idaho	1,509	1,508	*a*
Illinois	126	*a*	118
Indiana	131	*a*	124
Kentucky	466	*a*	*a*
Louisiana	783	420	363
Maine	310	291	*a*
Massachusetts	79	*a*	*a*
Michigan	273	42	231
Mississippi	830	421	409
Montana	1,069	1,061	*a*
New Hampshire	160	159	*a*
New Mexico	245	238	*a*
New York	290	*a*	214
North Carolina	1,283	901	382
Ohio	209	*a*	194
Oregon	7,712	7,656	*a*
Pennsylvania	422	*a*	342
South Carolina	557	380	177
Tennessee	601	90	511
Texas	754	545	209
Virginia	1,065	535	530
Washington	3,473	3,415	*a*
West Virginia	334	*a*	312
Wisconsin	217	41	176
Wyoming	103	103	. .
Total U.S.	33,174	26,812	6,362

a Withheld because estmiate did not meet publication standards.

MANUFACTURES OF CANADA

Summary of major groups of manufactures and their gross value, 1959

Product	Gross Value	Product	Gross Value
Food and beverages	$4,673,889,281	Clothing (incl. knitting mills)	955,085,617
Iron and steel products	3,077,628,204	Printing, publishing, etc.	823,631,668
Paper products	2,027,299,168	Textiles	802,517,086
Transportation equipment	2,022,195,705	Non-metallic mineral products	694,237,680
Non-ferrous metal products	1,740,453,053	Rubber products	347,680,280
Wood products	1,425,135,795	Tobacco and tobacco products	324,563,661
Chemicals	1,378,211,030	Leather products	271,175,005
Products of petroleum and coal	1,268,007,449	Miscellaneous industries	432,428,521
Electrical apparatus and supplies	1,047,462,278	Total value all products	$23,311,601,481

Source: *Canada Year Book.*

THE history of civilization is frequently divided into periods distinguished by the materials used among the people then living. Thus a period when only skins of animals were worn for clothing is regarded as more primitive than a period when cloth was woven of wool, cotton, or some other substance.

Judged by such a standard, the present age far excels all previous ones. Materials which were used earlier are now prepared in more efficient ways and are applied to more various purposes. The ancient art of pottery, for example, has been enriched in modern times by many new processes and products. Moreover, many materials have in recent times been discovered, and many others have been created by aid of the science of chemistry. The latter include such substances as aniline dyes, linoleum, and portland cement.

Familiar as are most of these products, their source and the manner of their preparation are practically unknown to the average person. Yet there are few subjects on which information is more interesting and more generally useful.

The almost infinite number of different objects manufactured and the additions to that number which are being made practically from day to day render it quite impossible to give an exhaustive record of these products. Those, however, which are among the best-known and most widely employed have been selected and treated in the following section, where each will be found described in such a way as to show clearly and concisely its source, history, manufacture, and uses.

Arc Lamp. A device producing intense, bluish white light that is much used for illuminating streets, factories, and large, open spaces. Light is produced by the flow of an electric current between the slightly separated ends of two carbon rods. The tips of the rods become white hot and give off carbon vapor, which serves to conduct the current across the gap. This flaming path, in which the temperature is above 6500° F., is curved in the form of an arc, whence the name *arc light*.

The carbons are usually made from petroleum or gas coke. They are gradually burned away and must be renewed after from 100 to 150 hours of service. Should the arc become broken, the upper rod automatically drops against the lower and is again pulled up to the proper distance by means of a magnet. When the carbon rods contain some salt, such as calcium fluoride, the vapor becomes intensely colored and is known as a *flaming arc*.

Because the arc light requires rather frequent cleaning, and renewal of the carbons, it is being replaced in many cases by gas-filled tungsten lamps, which give more light from the same amount of electricity.

Attar, or **Otto, of Roses.** A rare and expensive oily perfume obtained by distilling the petals of several species of roses. It is produced chiefly in India, Bulgaria, Persia, and Turkey. About 40,000 roses are required to yield one ounce of attar, which is so fragrant that the use of one drop is often sufficient in making a gallon of cologne.

Bakelite. An artificial material used in the preparation of varnishes and as a substitute for amber and hard rubber. It is formed by chemical reactions between carbolic acid and formaldehyde, and was discovered by L. H. Baekeland. It is made in two initial forms, distinguished in name by the letters *A* and *B*. *Bakelite A* is soluble and fusible; *bakelite B* is insoluble, but plastic, so that it can easily be molded. Both of these initial forms are changed under the action of heat and pressure to *bakelite C*, which is hard, insoluble, infusible, and possessed of high insulating properties.

Baking Powder. A mixture of chemicals substituted for yeast in order quickly to make light and porous cakes, biscuits, and similar foods. Nearly all such powders are combinations of *baking soda*, or *sodium bicarbonate*, with some acid substance. Starch comprising about 25 per cent of the whole serves to keep the mixture dry. The acid material is usually cream of tartar, a salt of phosphoric acid, or alum. When the powder becomes wet, a chemical reaction takes place which results in the production of carbon dioxide. This gas is also produced when bread is raised by yeast. As the gas cannot escape when generated within a thick dough or batter, it produces a porous, open structure in the cooked product, making it lighter and more easily digestible.

Bell. A hollow, cup-shaped vessel suspended from the closed end and giving forth sound when struck. The materials used in small bells range from glass to steel, but large bells are usually cast by pouring melted *bell metal* into molds of clay. Bell metal is an alloy of copper with various proportions of tin, to which small amounts of other metals may be added. Sometimes several weeks must elapse before the metal is cool enough to allow the removal of the mold without danger to the casting. The characteristic tone by which one bell is distinguished from another depends, not only on its size, shape, and thickness, but also on the proportion in which the constituent metals are alloyed.

The largest bell ever made, the 220-ton Tsar Kolokal of Moscow, was never rung because, before it was finished, an 11-ton piece fell from its side. The first large bell, 6½ tons in weight, was cast in 1400. The largest bell in the Western hemisphere is the Bourdon, weighing 18¼ tons, in the Rockefeller carillon, Riverside church, New York City. One of the most famous is Big Ben, weighing 13 tons, in Westminster palace, London. The Liberty Bell is the most famous of all bells in the United States.

Bells, as known today, were used first during the 4th century as a summons to religious exercises. At present, most of the large and famous bells belong to churches, but the uses of bells, especially for sounding signals, are very numerous. Sound is usually caused by rocking the bell until it strikes a metal clapper. Very large bells remain at rest and are struck by a moving hammer. Many famous clocks have tuned bells that strike the hours, while, on ships, each half hour is indicated by a fixed number of strokes on a bell. Sailors are often warned of dangerous waters by a wave-rocked *bell buoy*. A *curfew* bell was sounded originally in England as a signal that it was time to "cover the fire" with ashes and to retire for the night.

Books. The earliest known records in the form of writing are the inscriptions on tablets of baked clay which were excavated from the ruins of the ancient Chaldean city of Nippur. Such tablets were probably in use about 6000 B. C. Inscriptions cut in stone, wood, or other more or less durable substances continued to be employed for special purposes long after more convenient materials were in general use. One of the earliest of these materials was papyrus, made from a plant that grew chiefly in Egypt. An extant Egyptian papyrus manuscript, called the *Papyrus Prisse*, dates from about 2000 B. C. From 400 B. C. to 600 A. D., the greater part of all writing was done on papyrus. Another material often used in this period was parchment, which was made principally from the skins of sheep, goats, or calves. Scrolls made of papyrus or parchments were prepared in the form of strips, sometimes 120 feet long. For convenience, these long strips were rolled on two sticks. The change from rolls to piles of leaves came with the more general use of parchment. The books of the Christian monasteries were usually written on this material.

Printing on paper by means of engraved blocks was practiced by the Chinese as early as 50 B. C. The name of the first European to print from movable type has been the subject of controversy for several hundred years. According to the Dutch, the

honor belongs to Lourens Janszoon Coster, of Haarlem, Holland; but works printed by Coster have never been identified. In 1450, at Mainz, Germany, Johannes Gutenberg operated a printing shop, where he first experimented with letters carved from wood and later used types carved or cast from metal. Some books may have been printed from movable type at an earlier date, but the first book known to have been so printed is the Gutenberg Bible in Latin, completed about 1455.

The first book printed in English was a history of Troy, probably made at Bruges, Flanders, in 1474, by William Caxton. Early in 1476, Caxton established a press in the almonry of Westminster, London, and the next year brought out *Dictes and Sayings of the Philosophers*, the first book printed in England. The first press in the New World was established at the city of Mexico in 1544; the first one in the territory now embraced by the United States was built at Harvard college in 1639.

The making of a book was at first a comparatively simple process. In modern times, however, it has become a complex and highly specialized form of industry.

Manuscripts and Proofs.—When the author's typewritten manuscript or copy is sent to the printer, it is placed in the hands of the operators of typesetting machines. These machines automatically cast the type and deliver it arranged in a column, face up, on a long narrow tray called a *galley*. An inking roll is passed over the type, and an imprint, or *proof*, is made on sheets of paper. These *galley proofs* are sent to the author, who makes whatever corrections he wishes.

Electrotypes.—The type in the galleys is next made up into pages; titles, headings, and page numbers are inserted; and a final proof is made in order to show how each page will look. If this proof is satisfactory, an electrotype is made of each page. This is done by pressing the type upon a wax-surfaced plate so that each letter leaves its impression on the soft surface. This wax mold is then dusted with graphite so as to conduct electricity. It is then connected with the negative pole of a battery or dynamo and is placed in a plating solution, where it receives a thin coating of copper.

In order to strengthen this thin copper shell, which is an exact duplicate of the type for one page, the wax is removed and the back is filled with electrotype metal, which is composed chiefly of lead.

Sixteen or thirty-two of these electrotyped pages are locked into a large iron frame and placed on the printing press. These *electros*, or plates, are so arranged that when a sheet of paper is printed on both sides and is folded, the pages will be in proper sequence.

Paper.—The paper for printing is selected with careful regard to the kind of printing to be done and to the number of pages in the book. Ordinary type matter may be printed on rough stock, in order to obtain greater bulk for a few pages, or on smooth stock, if a larger number of pages is to be included in the finished volume. The various grades of smooth stock are known in the trade under the names machine finish, supercalendered, thin text, and India bible.

Illustrations.—For general use, these are of two kinds: *line cuts*, which are zinc etchings in coarse line; and *half tones*, or copper etchings in fine screen. Line cuts may be printed in with the text matter on all but the very coarse papers. Finer line cuts and all half tones, whether black or in two or more colors, must be printed on specially surfaced papers.

Folding and Pressing.—As the sheets come from the presses, they are passed to folding machines, which automatically cut them apart and deliver them in folded sections called *signatures*. These signatures consist of 8, 16, 24, 32, or 64 pages, depending upon the thickness of the paper used. Heavy papers are usually folded in 8's and 16's; thinner papers in 32's; and India bible or thin text stocks in 32's and 64's.

After folding, the signatures are compressed in bundles by machinery in order to remove the air and to make each section firm.

Tipping.—At this stage of the process, any specially prepared pages of illustrations and other *inserts* are *tipped*, or pasted, into the sections. This operation is performed by machinery if the illustration is to go on the outside of the section; handwork is necessary if the illustration goes on the inside, in which case the folded section must first be slit open to receive the insert.

While the pasting operation is under way, the white or colored flyleaves for the front and the back of the book are cut and are pasted to the first and the last section. These sections are re-enforced with muslin strips pasted around the binding edges of the first and last sections and the flyleaves. They are strengthened also by *whipstitching*, that is, by stitching through and through the section at the binding fold. These processes impart strength to the leaves which will hold the book in the cover.

Gathering.—Some books must be gathered by hand because of their peculiar size or shape or because they are printed on very thin or very thick paper. For large quantity editions, gathering is performed by machines wherever possible. Each of these machines contains a series of 32 or more *pockets*, or small bins, in which piles of the various sections are arranged in sequence; underneath the bins passes a traveling belt, or *conveyor*. This belt has an intermittent motion, each movement carrying it a distance equal to that from one bin to the next. At each movement, metal arms having fingers, or *grippers*, take from the bottom of each pocket one copy of the section it contains. This copy is dropped automatically on the traveling belt, falling upon a copy of the section carried forward from the preceding bin. In this manner, completely gathered books are delivered upon a table at the end of the moving belt.

Sewing.—Next in sequence is the operation of sewing the assembled sections together. A girl opens each section at its center and hangs it on one of a series of swinging steel arms. The arm carries the section into the sewing machine, the needles of which are curved in form and are preceded by a series of *punches*. The punches pierce the section at the back fold, and the sections are sewed together by a looped stitch, each section being *locked* to the next. As the sections thus sewed together come out of this machine, they are cut apart into separate complete books.

Smashing.—This step consists of compressing the books in powerful machines, not unlike enormous pincers. It removes the impress of the type made in printing and reduces the books to a uniform thickness in order that they may properly fit the covers which are being prepared.

Trimming, Coloring, and Gilding.—Trimming the edges is performed in machines having one or more heavy steel knives operating on the guillotine principle. Any *coloring* or *gilding* of edges is then in order. Plain coloring consists in spraying, sponging, or brushing the top or three edges with a pigment or aniline color while the books are arranged in piles on a table or are in presses. *Sprinkling* is done by spraying or brushing a pigment color over the edges through a coarse screen. *Marbling* is the most difficult and expensive of coloring processes. For this operation, books are carefully *jogged up*, that is, arranged in clamps which hold bundles of books to a thickness of 18 inches. These bundles are dipped into a vat containing a solution of gum tragacanth, upon the surface of which has been sprinkled a variety of water colors. These colors lie on the surface like oil spots upon water. Many different effects, or *patterns*, can be obtained by changing the combination of colors and by *combing* the colors in the vat with huge wooden or wire combs.

Gilding edges is the most delicate and expensive of all edge finishing. The trimmed books are placed in wooden clamps, or presses, horizontally arranged.

Edges are *scraped* with steel tools to obtain perfect smoothness, and a thin *filler* is applied, consisting of paste and a bit of color. After this coating is dry, the gold is applied in thin sheets over a *sizing* of egg albumin. When dry, the gold is burnished by hand with an agate or a bloodstone.

A thin coating of flexible glue is now applied to the backs or binding edges of the books, and superfluous thread ends are trimmed off.

Rounding and Backing.—These operations are performed in a power driven machine, into which the books are fed one at a time, horizontally, back edge first. Rollers convex the back and concave the front edge. Clamps grip the book just forward of the binding edge, compressing it to the depth of the cover thickness to be used, and, at the same time, the machine shapes the *joints* on each side of the back which provide for the fit-up of the cover.

Lining-Up.—This process consists in the reenforcing of the book with one or more thicknesses of coarse crash, or *super*, and with a strong paper on the back. The crashes and paper are applied with flexible glue. Machines do this work quite as efficiently as it can be done by hand, provided the books are not of unusual size or bulk. In order to give a finished appearance to the volumes, *headbands*, or small ornamental pieces of book cloth, striped cotton, mercerized cotton, or silk, are prepared in strips and are affixed by glue or paste to the top and bottom of the book backs.

Casing-In.—The book is now ready for the cover. The operation of combining book and cover is called *casing-in*. This is accomplished by either of two methods: (1) All ordinary cloth books are cased-in by the simple operation of *pasting-off*. First the back leaves and then the front leaves of the book are attached to the cover by paste or glue. The cover is thus left free from the back of the book. (2) Books bound in leather or artificial leather and sometimes cloth schoolbooks and catalogues are often *cased-in-tight-back*. A coating of glue is applied to the backs of such books, so that the covers are affixed only to the backs. Then, after the books have been thoroughly dried, the front and back leaves are pasted-off as in process (1).

Pressing.—After the covers have been thus attached, the books must be *built-in* in presses. The books are held between wooden boards having metal edges which project one-eighth of an inch on each side. These edges fit into the space along the back, or binding edge, between the ridge formed in the rounding and backing operation and the edge of the pulpboard used for stiffening the cover. This process imparts a neatly creased joint, or hinge, which permits the cover to open freely.

After the volumes have dried in the presses from 6 to 24 hours, they are removed, examined for defects, incased in jackets or wrapped individually, and packed in cartons or cases.

Bottle. A hollow vessel with a narrow neck and no handles. In olden times, bottles were made by sewing up the skin of some animal, leaving one natural opening, such as the leg. Today, bottles are usually made of glass, either by hand or by machinery. In the hand process, expert glass blowers collect the proper amount of molten glass on the end of a long tube; blow a bubble of air into the soft mass; drop the material into a hot mold; and, by further blowing, force the glass to the required shape. The blowpipe is then broken off, and, after the rough top of the bottle is smoothed with a special tool, the glass is slowly and carefully cooled. Bottles are now generally made by machines which automatically copy the hand process. Some of these are capable of producing 1200 dozen in one day. Small orders or special types are still made by hand.

Bread. A staple form of baked food, made from the flour or meal of some grain, in such manner that the product has a more or less porous structure. This is the modern *leavened*, or raised, bread. In general, the term bread includes any product made by baking a mixture of flour or crushed cereal and water. Wheat flour, because of its gluten, makes the best bread, although there are many special kinds made from other cereals. The common and standard form in the United States consists of a light-colored loaf made from wheat flour and raised with yeast. It is essentially a starch food as it normally contains a little more than one-half its weight of starchy compounds, about one-tenth of protein, 1.1 per cent of salts, 1 per cent of sugar, and only 1.3 per cent of fat, the remainder being water. Because of its low fat content, bread is usually eaten with butter. Corn bread and hot bread are familiar forms in those Southern states where, because of climatic conditions, the ordinary loaf will keep but a short time.

To understand the well-known process of bread making, it is necessary to know of what flour is composed and why yeast causes the dough to rise. Good wheat flour contains about 75 per cent starch and between 11 and 12 per cent of a nitrogenous material called *gluten*. Starch mixed with water must be heated to form even a weak paste; but wet gluten is very tough and elastic, acting somewhat like soft rubber in binding the flour and water into a dough. A cake of *yeast* contains thousands of microscopic vegetable cells or yeast plants. These will grow rapidly in a dilute solution of sugar if certain salts and substances containing nitrogen are also present.

When yeast is stirred into dough and warmed, it finds conditions exactly suitable for growth and proceeds to develop rapidly. During growth, the yeast produces certain substances which cause the sugar to break down into *alcohol* and *carbon dioxide*, which is the same gas that causes the bubbles in soda water. As the carbon dioxide cannot escape through the heavy elastic mass, the dough *rises*, that is, swells up, because of the internal pressure of the gas. It is then *kneaded* in order to break up the large irregular bubbles and to distribute them evenly through the mass. Raising and kneading are repeated, usually two or three times, until the dough seems sufficiently light. It is then cut, and worked into pieces which about half fill the pans. When set in a warm place, the dough rises to the top of the pan and is ready for the oven. During the foregoing process of fermentation, the gluten becomes much less tough and rubbery. A temperature between 78° and 82° F. is best for the growth of yeast. Greater heat often leads to the development of bacteria which produce acetic and lactic acids, thus causing the bread to become *sour*.

The first effect of the heat of baking is to expand the small bubbles of gas so that the loaf becomes larger, lighter, and more porous. The yeast is killed, and much of the alcohol and water are driven off as vapor. The starch grains expand and break, thereby becoming much more digestible. The starch on the surface, which is exposed to the high temperature of the oven, is largely changed to dextrin and some is still further changed to caramel. To these chemical changes are due the distinctive color and taste of the crust. Within the loaf, the temperature does not rise much above 212° F. because of the presence of water, which cannot exceed that temperature, the excess heat being exhausted in converting the water into steam.

As bread is a starchy food, it should be well chewed in order that the starch may be changed by saliva to simpler and more digestible compounds. Bread ranks among the most nutritious of staple foods; a pound loaf contains more energy-producing units (calories) than a pound of fish, a pound of potatoes, and a quart of milk, combined.

Brick. A building material made by shaping, drying, and baking a prepared mixture of clay and sand. Brick was made and used in Babylon, where there were neither forests nor quarries, over six thousand years ago, and was probably the first material used for permanent construction. The earlier forms, like the present adobe brick used by

the Indians of the Southwestern states, were merely sun dried and could be used only in regions where rain seldom fell. Straw was customarily mixed with the clay in order to bind it together. This was the case among the ancient Egyptians, who, according to the Biblical account, forced their Israelite captives, not only to make the customary number of bricks, but also to find the necessary straw.

At present, bricks are made chiefly by machinery. The clay is mixed with the proper amounts of sand and water, pressed into form, dried in the air or in drying tunnels, and finally heated to a cherry red in kilns which are usually about 30 feet in diameter by 12 feet high. The firing requires from 6 to 10 days. Some kinds of brick are formed from dry clay by enormous pressure, but most kinds are made by the wet process. In one type of machine, capable of an average daily production of 10,000 to 150,000 brick, the clay is compressed by a screw and is forced out in a long bar that is cut to the proper length by wires. The size varies somewhat but approximates $2\frac{1}{4} \times 4 \times 8\frac{1}{4}$ inches.

The red color of common brick is due to iron oxide. Brick that is almost white may be obtained by adding lime to specially selected clay. Other shades are obtained by the addition of various minerals. *Facing brick* is carefully finished by repressing and is used on the exterior of buildings where a fine appearance is desired. *Fire brick* is made from special clay which will undergo a very high temperature without softening or fusing.

Butter. A food product consisting chiefly of fat which is separated from milk by churning and is worked into a compact mass. Fat in the form of tiny globules is found in the milk of healthy cows in amounts which vary from 2 to 6 per cent, the average being somewhat under 4 per cent. The process by which it is changed into butter is much the same whether carried on in the farmhouse or at the butter factories, or *creameries*. It consists of separation, ripening, churning, and working.

Butter can be churned from milk, but it is much more satisfactorily made by separating the cream from the milk and churning the cream. This is frequently done by allowing the milk to stand until the lighter particles of fat rise to the top, where they may be collected. A much quicker and more efficient method involves the use of a *centrifugal separator*, in which the milk flows into a bowl or hollow spindle rotating from 6000 to 17,000 times per minute. The heavier skim milk is thrown towards the edge and passes out by one pipe, while the cream runs from another pipe near the center. Cream containing 30 to 33 per cent of fat is considered the best for churning.

Because sweet cream yields a butter of very mild flavor, it is usually allowed to sour or ripen, before churning. Ripening is due to bacterial growth which, to a large extent, develops the typical butter flavor and also causes better churning. Cream that has become sour in the natural way often contains harmful bacteria which produce unpleasant flavors. This danger is avoided by using, as a *starter*, a culture containing only such bacteria as have been found to give good results.

When sufficiently ripened, the cream may be churned by hand or in the large revolving, power-driven cylinders used in creameries. Churning causes the tiny particles of fat to combine and become larger, finally attaining such size that they can no longer remain suspended in the liquid. The butter then *breaks*, or separates from the buttermilk in grains about the size of wheat.

The natural yellow color of the fat is due to coloring matter absorbed from the green food of the cows. If their food is changed to dried grass and grain, as often happens in winter, the color of the butter becomes much lighter. In order that the appearance may be uniform, artificial color is often added. The most important butter color is made by boiling the seed of the *annatto* plant with an oil such as cottonseed. A small amount of this colored oil is usually added to the cream before churning. Standards for color vary greatly. Butter exported to South America is often almost red.

When churning is complete, the buttermilk is drawn off and the butter is washed with clean, cool water. Salt is then added, chiefly for flavor, in amounts which are usually between $\frac{3}{4}$ and $1\frac{1}{2}$ ounces per pound of fat. Salted butter does not become moldy so quickly as the unsalted product.

The grainy mass of butter is then worked by hand or under rollers. The purposes of this process are to eliminate any remaining buttermilk, to mix the salt evenly, and to incorporate the proper amount of water so thoroughly that it will not separate. Too much working spoils the grain and leaves a soft, oily butter. The finished product is usually packed in tubs or one-pound cartons.

Renovated, or *process* butter, is prepared by melting strong butter which is no longer acceptable for food, refining the clarified fat, and rechurning it with milk or skimmed milk.

Button. A piece of metal, bone, ivory, or other substance, usually employed for fastening clothing by being pushed through an opening called a buttonhole. The term is used also to designate any small knoblike projection or similar object.

Buttons were first used as ornaments in Europe during the 13th or the 14th century. Later, they served to hold loops of cord, a practice which led to the modern buttonhole. The two principal types are perforated buttons, meant to be attached by sewing, and buttons having on the reverse side a projection or shank, by which the attachment is made. Buttons are usually disk-shaped, but they may have many other forms.

Bone buttons have long been known, but many modern substitutes have also come into use. Several factories, located chiefly at Rochester, N. Y., and at Newark, N. J., are devoted to the production of *vegetable ivory* buttons, made from the kernels of *tagua* or *corozo* nuts, the seed of a South American palm tree. These become hard when heated. Pearl buttons are cut from the lustrous shells of certain species of oysters and mussels. Many of these come from Japan and from the Mississippi river. Disks are drilled from the shell, which is first softened by soaking. Holes are then bored in the disks, the rough back is ground or split away from the mother-of-pearl, and the back and edges are polished. The finished buttons are fastened to cards. Metal buttons and cloth covered buttons are made by machinery.

Buttons of special pattern or design are often worn to indicate membership in some organization or adherence to some political party. The rank of a mandarin is shown by the color and the material of a button worn on his hat.

Cable, Submarine. A telegraph line laid under water. The earliest experimental cables of this type were laid across rivers and ponds, but the first commercially successful cable was laid across the Strait of Dover in 1851. Scotland and Ireland were connected in 1853, and the next year saw Sweden joined with Denmark and Italy with Corsica. The success of these comparatively short lines encouraged attempts to lay a transatlantic cable. Such a line was completed in 1858, but, after a few weeks of use, it ceased to give satisfactory service.

Through the perseverance of Cyrus W. Field, a successful cable was finally completed in 1866 between Heart's Content, Newfoundland, and Valentia, Ireland. These places were selected because they permitted the smallest mileage of cable and because the intervening ocean bed was soft and level. There are now several cables between North America and Europe.

A cable consists of a central strand of twisted copper wires, called the core, which is covered with gutta percha or rubber. Next comes a layer of jute wrapping surrounded by galvanized steel wires. These add strength and afford protection against

anchors, sharp stones, and the attack of fishes. The outer layer is of jute filled with material to make it waterproof. In deep water, such a cable may be less than an inch thick, but, in shallow places, where there is more danger from waves and from ships' anchors, it is usually much better protected.

In 1902, an English cable was completed in the Pacific Ocean between British Columbia and Australia. In 1903, an American cable was laid between San Francisco and the Philippines.

A small strand of wire, over 2000 miles long, can carry only currents which are far too weak to operate ordinary telegraph instruments. The effectiveness of the current is multiplied by surrounding the copper core with a thin layer of permalloy. Two sending keys are used in cabling. One sends a signal corresponding to the dots of the telegraph code; the other sends the dashes. The receiver, called a *syphon recorder*, consists of a slender, carefully adjusted, hollow needle, one end of which dips in ink while the other marks on a moving band of paper. Dot signals move the needle to one side, and dashes pull it to the other. The result is a wavy line, from which the message can be deciphered.

With the first cables, it was possible to telegraph in one direction at the rate of about 7 words per minute. At present, messages can be automatically sent in both directions at the same time at the rate of 2500 letters each minute.

Calico. Cheap cotton cloth printed with a colored pattern. The name comes from Calicut, a city of India, whence the process of decorating cloth by means of a hand stamp moistened with dyes was introduced into Europe. Calico printing is now done almost entirely by machinery.

Cambric. A thin, finely woven, linen cloth, which receives its name from the town of Cambrai, France, where it was originally made. It is used chiefly for handkerchiefs and fine underclothing and as an embroidery linen. Cotton cambric is a similar fabric of plain weave, one surface of which is smooth and easily sheds dust.

Canvas. A strong, coarse cloth, originally made from hemp but now woven also from linen and cotton. Canvas is used to a large extent for awnings, sails, and tents. For oil painting, artists require a canvas of heavy linen. Fine, light grades, called *duck*, are made into summer clothing.

Castor Oil. A clear, thick, almost colorless oil, chiefly known as a reliable cathartic. It is obtained by crushing and pressing the seeds of the castor oil plant. Castor oil is an important ingredient in many transparent soaps. When properly treated with sulphuric acid and ammonia, it is used, under the name of *Turkey red oil*, to prepare cotton for dyeing and printing.

Cellophane. A transparent, paper-like substance widely used for wrapping articles placed on sale. While protecting the articles, it does not interfere with their display to customers and often enhances their attractiveness. The invention of cellophane is due to J. E. Brandenberger, a Frenchman, whose experiments extended from 1900 to 1912. A moisture-proof product was developed in the Du Pont laboratories in 1927.

Cellophane, like rayon, is made from cellulose obtained from wood pulp or cotton linters. By treatment with acids or other chemicals, the raw material is made soluble in alcohol or ether. The solution, after purification, is pressed through a thin slit and emerges as a sheet, which becomes solid on the evaporation of the volatile solvent.

Celluloid. An artificial material which was invented in 1869 by the Hyatt brothers of Newark, N. J. It is used as a substitute for more expensive substances, such as bone, ivory, and hard rubber, which it can be made to resemble very closely. It is produced from some pure form of cellulose, such as tissue paper or cotton fiber, which is treated with a mixture of nitric and sulphuric acids. The resulting *nitrocellulose* is carefully dried and is then kneaded in a mixing machine with alcohols and camphor until it becomes plastic. It is then worked between rollers and afterward pressed and dried. The final product may be transparent or opaque and can be given any desired color. Celluloid can be applied to paper, cloth, or leather to produce a very smooth, waterproof surface. It has a high degree of inflammability, but this may be markedly decreased by mixing with the celluloid a proportion of plastic casein.

Cement, Portland. A fine gray or white powder made by heating and grinding definite proportions of lime and clay. After mixture with water, it gradually sets to form a rocklike mass. The white variety is made from specially selected clay. The name portland is due to Joseph Aspdin, a bricklayer of Leeds, England, who, in 1824, patented the method of making cement and thought that the hardened product bore a slight resemblance to a famous building stone found on the Isle of Portland.

Sometimes the raw materials are found already combined in the proper proportions in certain kinds of rock. But usually clay and some substance rich in lime, such as limestone, chalk, or marl, after being dried and weighed, are carefully mixed and finely ground. Then the powdered product goes to the kilns, which are revolving steel cylinders sometimes 200 feet long. These are lined with fire brick and heated within by a burning blast of pulverized coal, crude oil, or natural gas to a temperature between 2500° and 3000° F. This intense heat causes the powder to fuse slightly, and, as the kilns have a slight slope, the mass works its way downward through the flame and is discharged as clinkers. After cooling, the clinker is ground sufficiently fine to meet the standard requirement—that at least 78 per cent of it shall pass through a sieve having 40,000 holes to the square inch. Before the grinding is complete, a small amount of plaster of Paris or gypsum is added in order to control the time required for the cement to harden.

This exceedingly fine powder is portland cement. When mixed with water, the cement sets rather slowly. Within a few hours, it becomes stiff enough to resist the pressure of a finger and thereafter gains rapidly in strength for the first 30 days, continuing to gain, though much more slowly, for at least two years. Cement sets because of a chemical action that takes place when water and the dry powder are mixed. The exact nature of this change, however, is not known.

Portland cement is used in enormous quantities in making concrete for the construction of buildings, bridges, dams, tunnels, and conduits, as well as for sidewalks and permanent roads. Because of its more extended use, cement is now marketed increasingly in bulk shipments and ready-mixed form. See *Concrete*.

Chocolate. A valuable food product obtained from the seeds of the cacao tree, which is indigenous to the tropical parts of the western hemisphere. Chocolate was used by the natives of Central America long before Columbus crossed the ocean, and it is said that, when Cortez conquered Mexico, he found the emperor of that country drinking chocolate from a golden cup. When cultivated, the cacao attains a height of about 20 feet, although the wild trees are sometimes twice this size. The fruit is a red or yellow melon-shaped pod, between 6 and 8 inches long, which grows directly from the trunk or older branches. It has a rough, thick rind that covers a mass of seeds embedded in a sweet, sticky pulp. The seeds, from which chocolate, cocoa, and cocoa butter are made, are about the size and shape of an almond kernel and are covered with a thin brown shell.

When the fruit is ripe, the rind is cut open, and the seeds and pulp are removed and thrown into piles or into sweating-boxes, where they are allowed to ferment for several days. After the fermentation, which improves the flavor and makes the pulp

easily removable, the seeds are cleaned, dried, packed in bags, and shipped to the markets of the world.

When the cocoa beans arrive at the factory, they are first roasted like coffee in long revolving cylinders. This develops a pleasant aroma and also makes the shell dry and brittle. After roasting, the beans pass first to crushing machines, where they are broken, and then to cleaners, where the germ of each bean and the shells are removed. The clean, broken kernels of the roasted beans, called *cocoa nibs*, are then ground to a smooth paste under heavy stone rollers. If this pasty mass is run into flat molds, it hardens to the well-known dark cakes of *bitter chocolate*. When the chocolate mass is ground with a large proportion of sugar, the resulting product, which is sometimes flavored with vanilla or spices, is *sweet chocolate*. When milk or milk powder is included in the mixture, the result is *milk chocolate*.

Cocoa nibs and bitter chocolate contain about 50 per cent of a hard, yellowish white fat called *cocoa butter*. Because of the large amount of fat, many people find that the drink made from chocolate is too rich. In making *cocoa*, about one-half or two-thirds of the cocoa butter is squeezed out from the warm chocolate by means of a hydraulic press. The resulting cake is broken and ground very fine, giving *cocoa powder*, which usually contains only 20 or 25 per cent of fat.

Candy is covered with a coating of chocolate by being dipped into the soft, warm material. Ordinary sweet chocolate cannot be used for this purpose because it will not melt easily. For candy making, a special product called *dipping* or *coating* chocolate is prepared by adding extra cocoa butter to sweet chocolate. This mixture can be melted in hot water.

Chocolate contains a stimulating alkaloid called theobromine, which is closely related to the caffeine of coffee and tea. For this reason, some people find it difficult to sleep after drinking cocoa. But the various drinks and other products prepared from chocolate have a high food value and are usually considered wholesome and nutritious.

Coke. The substance which remains when the volatile matter has been expelled from soft coal by heating it under controlled conditions. Coke is usually hard, gray, and porous, and it burns with intense heat and a smokeless flame. It was first made to supply the need of a smokeless fuel, but today a large proportion of all coke is used for the production of iron from its ore. It is more satisfactory than anthracite for this purpose because it burns freely in the blast furnace and contains only a small amount of sulphur, which is harmful to iron.

The original method of making coke was to pile soft coal in heaps, which were lighted and allowed to burn until most of the volatile matter was given off. Next came the practice of heating the coal in dome-like furnaces, which were known as *beehive ovens* because of their shape. These ovens make good coke, but, because they allow the volatile matter to escape, they are being supplanted by modern *by-product* coke ovens, which recover gas, ammonia, and coal tar. The gas is burned for heating purposes; the ammonia is used for refrigeration or is made into a valuable fertilizer; and, from the coal tar comes a long list of dyes, medicines, explosives, and roofing and paving materials. A ton of coal gives 5 to 6 pounds of ammonia and from 8 to 10 gallons of tar.

There are many areas in the United States which supply good coking coal, the most important being Pennsylvania, West Virginia, and Kentucky. Much non-coking coal can be processed and blended to produce good-quality metallurgical coal.

Concrete. Artificial stone produced by the setting, or hardening, of a mixture of portland cement, sand, pebbles or broken stone, and water. When steel rods or other forms of steel are placed within this mass in order to add to its strength, we have *re-inforced concrete*. The sand used should be clean and free from dust. The stone, preferably sharp, should range in diameter from ¼ to not more than 1¼ inches. The cement, sand, and water form a mortar which fills up the air spaces and binds the stone to a rocklike mass. The materials are mixed in various proportions, depending on the strength required and the amount of wear the surface will receive.

A 1-2-4 mixture, so called because it contains one part of cement, two of sand, and four of stone, all by volume, is generally used for re-inforced concrete walls and engine foundations. For basement walls and foundations, grain and coal bins, and the lower layer of sidewalks and of floors, a ratio of 1-2½-4 is satisfactory. A 1-2 mixture, without stone, is used for the wearing surface of walks and floors. Walks and floors of but one layer, fence posts, and watering tanks are best made of the proportions 1-2-3. The ingredients are carefully mixed and wet with the least amount of water that will allow the mixture to run together, if the maximum strength is desired. It is then spaded into molds, or *forms*, and requires three to ten days to set. An especially hard, quick-setting concrete, which will take a polish like granite, is made by putting the mixture into forms and adding a minimum of water, which is distributed throughout the mass by a process of high-frequency vibration. Concrete continues to gain in strength for about two years.

Concrete is a structural material of great value because it can be made into almost any desired shape and because when set, it has the strength and permanency of stone. It is comparatively cheap and can be prepared when and wherever needed from materials that are usually available. Roads, dams, bridges, and foundations for buildings provide its largest uses. See *Cement*.

Corduroy. A thick, strong, cotton cloth characterized by a corded or ribbed surface of velvet-like texture. Its excellent wearing qualities make it especially suitable for clothing subject to hard usage. The name, meaning king's cord, was first applied to the material in the 17th century, when it composed the uniform of the French king's huntsmen. Because of the ridged appearance, the name corduroy is sometimes applied also to a road or bridge made of logs laid transversely.

Cork. The outer layer of the bark of an evergreen species of oak. The larger proportion of good cork comes from Spain and Portugal, although the cork oak grows throughout northern Africa and southern Europe. It attains an average height of about 30 feet with a thickness of 2 feet through the trunk.

As the tree grows, layers of dead cells accumulate on the surface of the bark. This growth is cork. It is gathered by making cuts around the trunk just below the branches and just above the ground. These are joined by several vertical cuts, so that each layer of cork can be pried loose. The first stripping, known as virgin cork, is taken when the tree is about 20 years old. It is of poor quality. Succeeding growths are cut at periods of 8 to 10 years, with an average yield of about 45 pounds. The best cork is produced after the tree is 40 years old, and, when carefully done, the process is not injurious to the tree, which lives for 150 years or more.

The slabs of cork are dried for a few days and then steamed or placed in boiling water. This treatment softens the rough outer coating so that it may be scraped off. It also extracts tannin and other soluble matter, increases the bulk and elasticity, and flattens the curved pieces so that, after drying, they may be packed in bales.

Cork is a soft, light, elastic material that is highly resistant to the passage of electricity, heat, water, or air. It is so generally used as stoppers for bottles and jugs that stoppers made of other substances are usually called corks. Because it weighs only one-fourth as much as water, it is used for floats on

fishing nets, in life preservers, and for artificial limbs. Insoles for shoes are often made of cork. Ground cork affords an excellent insulating material and, mixed with thickened linseed oil, is used in the manufacture of *linoleum*. A valuable black pigment is made from burnt cork.

Cotton. A product of the cotton plant, which is probably more generally useful than any other textile fiber. Wool is required chiefly for warm clothing, and silk is demanded because of its beauty, but, while cotton can be made into products almost as warm as wool or as attractive as silk, it also serves for countless purposes where the cost of other fabrics would be prohibitive. Under the microscope, each cotton fiber is seen to resemble a flattened, twisted tube, and it is this characteristic twisted structure which makes cotton so satisfactory for spinning into threads. Columbus found it used by the natives of South America for making cloth, and it had already been employed in India for at least 3000 years. It is a tropical plant, but grows best in a reasonably moist, temperate climate which is free from frost for at least 6 months of the year. North and South America, Egypt, China, India, and Russia all produce important parts of the world's cotton crop, most of which grows between the 36th parallels north and south of the equator.

The plant is a perennial and, in tropical countries, often produces crops for many years; but, in the southern part of the United States, where a large proportion of all cotton is grown, it is treated as an annual. Seeds are planted early in the spring, and the plant, which belongs to the same family as the hollyhock, attains a height of from 2 to 10 feet but is usually about 4 feet tall. When the flowers open, they are cream or yellow, but the color changes to pink on the second day. Before the end of the third day, they usually fall to the ground, leaving a tiny green boll, or seed pod, which grows to about the size of a hen's egg. When ripe, the bolls burst open, and the cotton is ready for gathering. If the bolls were all to ripen at the same time, a great saving could be made by mechanical picking. But, while the work of some picking machines has been very promising, none has so far been a complete success, and the expense of harvesting the crop by hand is one of the largest items in the cost of production. An expert can pick 200 pounds or more in a day, but the average is only about 100 to 125 pounds. Cotton picking time in the Southern states extends from about August 25 to December 10.

The cotton worm, the boll weevil, and the pink cotton-boll worm are the worst enemies of the cotton plant and have caused enormous losses. The most generally used remedies have been insecticides such as paris green and kerosene emulsions. More recently, calcium arsenate, applied as a dust or powder, has proved of great value.

The collected cotton is taken to a ginning mill where the fiber is separated from the seeds and compressed into bales. There are two kinds of gins,—the *saw gin*, which is most generally used, and the *roller gin*, used for treating long-fibered cotton. The saw gin, invented by Eli Whitney in 1793, consists of a set of circular saws with fine teeth which catch the fiber and pull it through an opening too small for the seed to follow. The standard domestic, 500-pound bale, of about 28 × 42 × 56 inches, is covered with coarse jute cloth and bound with steel straps. For export these bales are compressed to about 30 pounds per cubic foot. The average production of cotton in the United States is about 185 pounds per acre.

There are many varieties of cotton, all of which are graded according to the length and the fineness of the fiber. A rough commercial classification may be made into four general types. *Upland* cotton is the standard product and fills about ⅔ of the world's cotton requirements. Its fiber is between ¾ and 1¼ inches long, white, and easy to work. *Peruvian* cotton is long, rough, hairy, and well adapted for mixing with wool. *Egyptian* cotton has strong, silky fibers between 1⅛ and 1⅝ inches in length. Much of it has the tawny color characteristic of balbriggan underwear and natural ecru curtains, but one of the most widely cultivated varieties is white, so that these products are now usually dyed. Egyptian cotton of the finest quality is grown by irrigation in the Imperial valley of California and the Salt River valley of Arizona.

The finest and longest fibers are those of sea-island cotton, which grows chiefly on the sea islands and coast regions of South Carolina, Georgia, and Florida. It averages 1¾ inches in length and is suitable for the finest thread and lace. The seeds of this variety are smaller than those of the upland cotton and are black instead of green.

When the bales reach a cotton mill, they are opened as needed and are mixed so that the quality will be uniform. The packed fiber is then loosened and passed through many mechanical processes, technically known as carding, drawing, slubbing, roving, spinning, and doubling. In the various machines the cotton is formed into a lap much like that of cotton batting. The fibers are carded until they all run in the same direction, and the broad lap is divided into narrow slivers, which are reduced, combined, and redrawn until uniform in size, when they are twisted into yarn or thread. The spinning machines are of two types, called ring spinners and mules. They often have thousands of threads, or bobbins.

The finished threads are then fitted to the great looms and woven into cloth. Preparation of spool, or sewing, thread is also an important branch of the industry. *Mercerized* cotton, invented by John Mercer of Lancashire, England, is produced by treating the thread or cloth, while under tension, with caustic alkali. The fibers shrink and become stronger, more transparent, and almost like silk in appearance. *Absorbent* cotton is made by dissolving from the fibers the natural waxlike material which they contain, so that they become soft and very porous. Cotton is almost pure *cellulose* and is used in great quantities for making artificial silk, celluloid, and many explosives.

Cottonseed Oil. The most valuable product obtained from the seed of the cotton plant. It is occasionally extracted by means of gasoline or some other volatile liquid that will dissolve fat, but usually it is squeezed out of the carefully prepared seed under the enormous power of the hydraulic press. The *crude* oil so obtained is *refined* by treatment with a dilute solution of caustic soda, which removes most of the coloring matter and all of the sharp-tasting fatty acids. These impurities settle to the bottom of the refining tank in a thick, soapy mass, called *foots*, from which the oil is drawn off and washed with water to remove all traces of alkali.

The dark, foggy liquid that runs from the press becomes, by this process, a clear, golden yellow oil with a pleasant taste and odor. If it has been carefully prepared from good seed, it will probably be classed as *prime summer yellow* cottonseed oil, which is the standard grade in the markets of the world. When the color or odor is below standard, it is called *off* oil. Refined oils are classed commercially as summer yellow, summer white, winter yellow, and winter white. The white oils are made from the yellow by bleaching with fuller's earth. At a temperature of 38° to 32° F., summer oils become thick because of the formation of palmitin crystals. For this reason, they are not considered satisfactory salad oils. *Winter* oils have been chilled and pressed to remove these crystals and, consequently, will remain bright and clear at 32° F. Any of the refined products may be *deodorized* by blowing the liquid with steam at high temperatures.

Enormous quantities of prime cottonseed oil are used in the manufacture of oleomargarine and lard

compounds. The winter oils are prepared chiefly for table use. Grades below edible standard in color or flavor are usually made into toilet soap. The foots are used in the preparation of laundry soaps and soap powders. If treated with acid and distilled, the foots yield light-colored fatty acids for the soap industry and a residue of pitch used in roofing tars.

Cottonseed oil was first produced by Dr. Otto, of Bethlehem, Pennsylvania, in 1768, but its value as a food product was not generally appreciated until about 1855. Since that time, the industry has had a remarkable growth due to the continuous discovery of new uses for the various crude products.

Cottonseed Products. For every pound of cotton that is grown, about two pounds of cottonseed are produced. This seed was for many years considered a nuisance and was wasted or burned. It is now a very important part of the cotton crop because it yields food for man, food for cattle, and food, or fertilizer, for growing plants. The dark greenish seeds, about the size of a pea, are covered with short fiber, or *linters*, which is removed by machinery after the seeds have been carefully sifted and cleaned. After delinting, they pass to the *huller*, where they are cut into pieces, beaten, and sifted until the *hulls* are separated from the meats which they contain. The meats are then crushed between heavy rolls, cooked with steam, formed into cakes, and placed in a hydraulic press, where the oil is squeezed out under a pressure of almost 4000 pounds per square inch. The hard, dry cakes which remain are ground into *cottonseed meal*.

One ton of seed yields about 315 pounds of oil, 920 pounds of meal, 600 pounds of hulls, 80 pounds of linters, and 85 pounds of dirt and waste which have no value. The linters are used as a filler for pads and cushions, for making paper, for mixing with wool in shoddy and cheap felt, and in the manufacture of celluloid, guncotton, and smokeless powder. The hulls often serve, like sawdust, for a packing material and are added to concentrated cattle foods to give bulk. The meal is valuable both as a fertilizer and as a rich food for all farm animals, while the oil, which is most important of all, has many uses in the production of edible and technical products. See *Cotton, Cottonseed Oil.*

Dyes and Dyeing. The art of dyeing, or applying color in a more or less permanent form to cloth and other substances, is very ancient. In 1000 B. C., the city of Tyre was already famous for its purple dye, which later became the badge of royalty.

The dyes formerly used were natural products obtained from many sources. *Indigo* was prepared from a plant; *logwood*, from the heart of a tropical tree; *madder*, which gave the famous *Turkey red*, from a root; *cochineal*, from the dried bodies of female insects which live on certain cactus plants; and *Tyrian purple*, from a species of shellfish.

Artificial dyes originated in England in 1856, when Perkin first prepared from aniline the lilac color *mauve*. Similar products which followed were accordingly known as aniline dyes. The term *coal-tar dyes* is now more customary because the basis for most of these colors is benzol, carbolic acid, naphthalene, and other compounds obtained from the tar which results when coal is distilled for the production of gas and coke. Thousands of artificial dyes have been made by chemists, so that the production of madder, indigo, and other natural products is now of minor importance.

Silk and wool combine directly with dyes much more readily than does cotton. In order to produce fast colors, certain substances, called *mordants*, are often used, which can combine both with the fiber and with the dye. Alum, iron salts, and tannin are among the many materials used for this purpose. The fabric is first dipped into a solution of the mordant and is then passed to the dye vat, where it takes up the desired color.

Eau de Cologne. A famous perfume, called in English Cologne water, which was originally made in Cologne by an Italian named Farina. It consists of pure alcohol to which are added several aromatic oils that impart a pleasant and refreshing odor.

Enamel. A glasslike substance fused upon the surface of metal, glass, or other material as a means of protection or of decoration. The familiar enameled kitchen ware is made by baking a smooth coating of enamel upon an iron base. Transparent enamels are usually called glaze. The art of enameling was practiced even in the time of the Egyptians and the Babylonians. It has led to the production of exceedingly beautiful articles, many of which have the appearance of gold covered with a pattern of bright-colored jewels. Enamel is used for glazing some varieties of pottery and of brick. Clock and watch dials are usually enameled. The type of paint known as enamel gives, when dry, a hard, glossy surface resembling that obtained by fusion.

Fire Extinguisher. Any device intended for use in stopping combustion and in extinguishing flame. Under ordinary conditions, fire is due to a violent chemical reaction between combustible material and oxygen of the air. Therefore, any means which will cut off the supply of oxygen from the flame will usually put out the fire.

One of the most common and easily available fire extinguishers is a bucket of water. The water should be spread over the burning material with a sweeping motion, rather than hurled in a mass at the flame. A well-known type of extinguisher consists of a strong metal tank partly filled with a solution of baking soda in water. A hose and nozzle is connected with the top of the tank, and a small, loosely stoppered bottle of sulphuric acid is placed above the solution. When the container is inverted, the acid reacts with the soda to form carbonic acid gas under considerable pressure. This forces out the water in a steady stream.

Many of the most dangerous fires result from the careless handling of gasoline and kerosene. For fighting such fires, water is of little value, but *carbon tetrachloride* is very effective when sprayed from a hand pump or even when sprinkled from a bottle. This chemical, however, should not be used in closely confined or unventilated places, because it may generate dangerous gases. Sand is often successfully used to smother an oil fire which has spread out over a large surface. *Quick action* is most important in fighting a small fire. Consequently, the prompt application of several handfuls of flour, cement, or similar powder may often prevent serious damage.

A bucket of slightly moistened sawdust mixed with two or three pounds of washing soda will often serve to extinguish an oil fire in a deep container where sand would sink and be of no value. When clothing is afire, a blanket, a rug, or an overcoat wrapped closely about the person will usually extinguish the flame.

Fireless Cooker. A cooking device which usually consists of an oven surrounded on all sides by thick layers of insulating material. It is designed to keep the heat where it is needed and thus maintain the proper cooking temperature without wasting fuel.

Heat may be produced within the oven by means of electrical resistance coils, but it is usually supplied by placing stones, heated to the proper temperature, at the top and the bottom of the oven with the container of food between them. As the heat from the stones cannot quickly escape through the nonconducting walls, the temperature of the oven falls very slowly, and the food is thus cooked with a minimum amount of fuel.

Flour. The finely ground meal of wheat or other grains. When used alone, the word refers to wheat flour. *Graham flour* is made from the entire wheat

kernel, but, if the outer layer of bran is removed before grinding, *whole wheat* flour is produced.

The white flour most used for bread making is no longer prepared, as it was for centuries, by crushing the grain between moving stones. In a modern flour mill, wheat which has been carefully cleaned and then moistened or dried to the proper condition is passed through a series of four or five steel rolls, each of which is adjusted to break the pieces a little smaller than the one before. Between each *break*, the fine particles of flour are sifted out, and the coarser pieces, or middlings, are also cleaned and sifted. The purpose of this complicated process is to get as much high grade flour as possible and to eliminate the bran.

After being sifted through fine silk bolting cloth, as many as forty different streams of flour are finally reunited into standard grades called first patent, second patent, first clear or bakers, second clear or low grade, and red dog, the lowest grade of flour made. Standard patent flour, which is the bread flour usually found on the market, includes the first three grades. About 25 per cent of the wheat, consisting of shorts and bran, is classed as offals. Shorts are the fine particles of bran mixed with some flour. The germ is also separated because it contains much fat and, if ground into flour, is likely to develop an unpleasant flavor.

Because of the gluten which it contains, wheat flour makes better bread than that made of other cereals. But the quality of the gluten is just as important as the quantity. Red dog contains about 50 per cent more gluten than the high grade patent flours, but it will not make good bread. The quality of the bread which it yields is the final test of a flour. Crackers and macaroni are important food products made almost entirely from flour. Macaroni flour, or *semolina*, is rather coarsely ground from *durum* or other hard wheat.

During the World War, the United States Food Administration ordered that 100 pounds of wheat should be milled so as to yield at least 74¼ pounds of a product which was officially called 100 per cent flour and popularly known as *war flour*. This should not be confused with 100 per cent extraction flour, which, as previously explained, is Graham flour. Rye flour is an important food product, especially in Europe. Corn flour and potato flour find limited uses, and banana flour is well known in the countries where the fruit grows. See *Bread*.

Gas, Artificial. A combustible gas used for light or heat. It may be classified according to its methods of production as coal gas, water gas, oil gas, air gas, and acetylene.

When soft coal is heated in a closed container, it gives off inflammable gas. *Coal gas* produced in this manner was known as early as 1691, but it was first used in 1792 by William Murdock to light his home in Cornwall, England. Pall Mall, London, was, in 1807, the first street to be lighted with gas, while Baltimore, in 1821, was the first American city to use the new system.

Much coal gas is obtained as a by-product in the manufacture of coke. Large amounts are also produced in retorts built specially for that purpose. Before it can be used, the gas passes through cleaning devices which remove such impurities as tar, ammonia, sulphur, and carbon dioxide. It is then stored in huge tanks, from which it passes to the distributing pipes.

Water gas, which is used in many cities, is made by blowing steam through a furnace full of white hot anthracite or coke. The steam is decomposed and combines with the carbon of the fuel to produce hydrogen and carbon monoxide, gases which burn with great heat. Coal gas and water gas are of chief importance in public gas systems.

Oil gas is produced by heating suitable oils until they break down into permanent gases. These may be purified and compressed into cylinders. *Pintsch* and *blau* gases are of this type. *Air gas* is formed by blowing air through a volatile, inflammable liquid such as gasoline, until the air contains enough vapor to burn. This type is often used in detached houses.

When it was the custom to obtain light directly from burning gas, it was often necessary to add to the gas quantities of hydrocarbons such as ethylene and benzene in order that the flame should produce a certain fixed degree of brightness or candle power. The use of the more efficient incandescent mantles, which require only that the burning gas supply heat sufficient to make them glow, made desirable a standard for gas which should be based on *heating value* rather than on candle power. The change to such a standard was hastened by the World War, when all available benzene was needed for the production of explosives. See *Acetylene*.

Gelatin. A hard, transparent, yellowish white, nitrogenous substance, without taste or smell, which swells when in contact with cold water. It dissolves in hot water and, when the solution is cooled, sets to a stiff, jelly-like mass. Gelatin is formed by the action of boiling water on connective tissue, cartilage, ligaments and tendons, skin, hoofs, and bones. By one commercial process, the selected tissues are washed, soaked in warm diluted soda lye for about ten days, and then heated in an air-tight compartment. They are next washed in revolving drums, bleached by fumes of burning sulphur, and rewashed to remove all sulphur, after which the gelatin is dissolved out with boiling water. Color is removed by means of bleaching charcoal, and the clear hot solution is poured out in thin layers, which, after setting, are cut into small sheets and dried on nets.

Isinglass is a very pure form of gelatin, obtained from the swimming bladders of sturgeon and other fish. It should not be confused with the thin, transparent sheets of mica, which are sometimes incorrectly called isinglass. Ordinary *glue* is impure gelatin, of great value as an adhesive. Many photographic processes require gelatin, which is used to hold the sensitive silver salts on plates and films.

The value of gelatin as a food was for a long time greatly overestimated, for it has been shown that animals, when fed on it exclusively, die of starvation.

Glass. A hard, noncrystalline, artificial substance, usually transparent or translucent, made by melting together a mixture of various materials. The principal ingredients used in glassmaking are: *sand* or other forms of pure silica; *lime* or lead oxide; and some form of *alkali*. Many other materials enter into the production of special kinds of glass. Bottle glass usually contains aluminum. The addition of manganese gives a brown color; cobalt yields a blue; and even gold has been used to produce a particularly beautiful ruby glass. One of the most important characteristics of glass is that it does not melt at any fixed temperature, but softens gradually as the heat increases, and loses plasticity as it cools.

Great care is taken that the materials used shall be as free as possible from iron, which imparts a green color to the finished product. The selected ingredients are melted in a furnace together with a small amount of broken glass or *cullet*, which lowers the melting point of the mixture. The furnaces were formerly huge pots of clay, but now are usually large rectangular tanks.

Plate glass is made by casting molten glass upon large iron tables, where it is flattened by rollers, and then placed in annealing ovens to cool. For mirrors and windows, the sides of the rough plate are ground and carefully polished, but the unfinished plate is quite satisfactory for use as a cheap roofing glass.

In the process of making *window glass*, a large lump of the molten substance is gathered from the furnace on the end of an iron pipe and is then blown by compressed air to a bubble which gradually stretches out in the form of a great bottle. The bottom is then softened by heating and is blown open by air pressure. The blowpipe is broken from the

neck, and the shoulder of the bottle is cracked off, thus leaving a cylinder. The cylinder is opened by being cut on the inside with a diamond, cracked along the cut by means of a piece of hot metal, and placed in a kiln where the heat is sufficient to soften the sides so that they may be flattened. The process is now performed almost entirely by machinery.

Flint glass, in spite of its name, is the softest of the ordinary types. It is usually made from silica, potash, and lead oxide and, because of its brilliancy, is used for tableware and cut glass. A flint glass containing a large proportion of lead forms the *strass* used for making imitation jewels.

Optical glass must be cooled very slowly to prevent distortions due to internal stresses which are caused by unequal contraction.

Safety glass is made by inserting between two sheets of plate glass a sheet of transparent celluloid, which is securely attached to the two glass plates by adhesive material. Glass of this type has become standard for motor car windows.

Float glass comes close to plate glass quality without the polishing and grinding steps. It is a continuous process lending itself to automation. The molten glass mixture runs from the furnace onto the surface of a pool of molten tin. As it floats, it cools with a fine polished surface.

Other new types of glass developed in laboratories include a flexible glass, which bends without breaking; a "shrunk" glass with an extremely low rate of expansion when heated; and an "invisible" glass, which transmits light with more than 99 per cent completeness and will not reflect light from any angle. The last named glass consists of plates fastened together by an invisible varnish in a layer having a thickness of one-fourth of the wave length of light. Waves of reflected light are cancelled, as it were, when meeting waves of oncoming light in the layer of varnish.

Glass which transmits ultra-violet rays is made by including as ingredients boric oxide, excluding lead, and diminishing the proportion of ferric oxide.

Expert glassblowers can work the material into almost any form. Frosted effects are obtained by using a sand blast or hydrofluoric acid. *Cut glass* has its designs sunk into it by sharp edged wheels, or the pattern may be molded and the slightly rounded edges sharpened on a grinding wheel.

Glucose. Commercial glucose is a clear, thick, sirupy liquid, which is about two-thirds as sweet as sugar. In Europe it is made chiefly from potato starch, but in the United States it is produced almost entirely from corn, whence the name corn sirup. The corn is ground under water to obtain the starch, which, after being cleaned, is treated with hydrochloric acid. Under the influence of the acid, the starch molecules combine with water and break down into glucose together with some dextrins and other products. The acid is then neutralized, and the thin liquid is bleached, filtered, and finally concentrated under vacuum to the required consistency.

Repeated experiments by government experts have shown that glucose is in no way inferior to cane sugar in healthfulness. For table use, it is usually flavored with about 15 per cent of sirup obtained from sugar refineries. Large amounts of glucose are required by canning and preserving industries and in the production of candy.

Glycerin. A sweet sirupy liquid without color or odor. It is the principal by-product of the soap and candle making industries, resulting from the decomposition, under heat, of fats with alkali or acid. Glycerin can be obtained from any fat, such as cottonseed oil, lard, or even butter. It is purified by distillation with superheated steam, the pure substance boiling at a temperature (554° F.) higher than the melting point of tin. It does not evaporate easily, but, instead, takes moisture from the air. For this reason, it is added to tobacco, shredded coconut, candy, and inking pads, to prevent drying.

Glycerin is a good solvent for many organic materials and may be used instead of alcohol in the preparation of flavoring extracts. Tea and coffee stains can often be removed by first moistening the spot with glycerin and then applying soap and water. Mixed with litharge, or lead oxide, glycerin makes a valuable cement. Glycerin is used in medicine to allay inflammation. It is valuable also as a cosmetic and is used extensively in the preparation of nitroglycerin for explosives.

Gold Leaf. Extremely thin sheets of gold, used chiefly for gilding. These sheets average $\frac{1}{200000}$ inch in thickness, so that, in this form, an ounce of gold will cover almost 100 square feet.

In making gold leaf, an ingot of gold about an inch wide is first flattened between steel rollers to a long ribbon having the thickness of very thin paper. This ribbon is cut into squares, which are stacked with a sheet of vellum or tough paper between adjacent pieces. The pile is enclosed in a parchment case, placed on a marble table, and beaten with a heavy hammer until each piece has spread to a square having a size of about 3½ inches. These squares are quartered.

Each small piece is next placed between layers of *goldbeater's skin*, a tough membrane prepared from the intestines of cattle. The skins are dusted with fine plaster of Paris to prevent sticking, and beating is continued with a lighter hammer until the gold is again about 3½ inches square. Another quartering and beating then yields foil of the proper thickness. The final pieces are trimmed to about 3¼ inches square and are packed between leaves of dusted paper in books, each containing 25 pieces.

Gold used for beating is usually about 23 carats fine. A small amount of alloy gives the desired color, but, as impure gold does not yield so much foil, adulteration with cheaper metals is seldom practiced.

Gunpowder. An explosive mixture of saltpeter, charcoal, and sulphur. The origin of this product is unknown, but it was probably not the invention of a single person. The Chinese apparently knew of the mixture at the beginning of the Christian era, but, in Europe, Friar Roger Bacon, of Oxford, seems to have been the first to write of its properties. About 1313, a German monk named Barthold Schwartz demonstrated that it might be used for propelling missiles. Cannons existed at least as early as 1326. However, gunpowder was not generally used in warfare until the 16th century.

Standard United States Army black powder contains 75 per cent saltpeter, 15 per cent charcoal, and 10 per cent sulphur. When such a mixture explodes in the breech of a gun, about 43 per cent of it is changed to hot gases, which, by their expansive force, exert an enormous pressure. The large amount of smoke is due to the remaining 57 per cent of solid particles which are thrown out.

In the manufacture of gunpowder, the carefully prepared materials are mixed dry. They are then moistened, and ground under heavy rollers. After grinding, the *meal* is placed between plates of hard rubber in a hydraulic press. High pressure yields a dense, quick-burning powder; lower pressure gives one that acts more slowly. The cakes from the press are broken up into grains, which are sifted and then polished in revolving barrels. After a second sifting, the grains are dried and packed in containers.

Brown, or *cocoa*, *powder* was developed for use in heavy guns. It is usually in the form of prisms about 1⅓ inches long and having a hole through the center in order to increase the burning surface. Partially charred rice straw, which gives a brown color to the powder, is used instead of charcoal. *Blasting*, or *mining*, *powders* are coarser products and usually contain a smaller proportion of saltpeter. Chile saltpeter, or sodium nitrate, is sometimes used instead of the more expensive potassium salt.

These explosives have been almost entirely supplanted by superior products of the smokeless powder type, which are made so that practically all the products of explosion are gases. Smokeless powders are more powerful and less bulky than the black gunpowder and do not leave a large residue of mineral matter. They are usually prepared from materials of the type of guncotton and nitroglycerin modified in such a manner as to retard the speed of explosion. The first smokeless powder for sporting purposes was made in 1867 by Schultze, a German. A Frenchman named Vieille produced the first successful military smokeless powder in 1886, and, in 1889, Richard von Freeden invented a hard-grained sporting powder.

Heating and Ventilating Systems. Heating is ordinarily accomplished by means of open fireplaces, stoves, hot-air furnaces, steam, hot-water, and the vacuum-vapor systems. The hot-air furnace is an *indirect* heater, because the air is warmed by it before entering the room. The other systems are *direct*, because they are placed within the rooms to be heated. A radiator or other heating unit located within a room at the opening of a fresh air intake would be classed as a *direct-indirect* system.

The open fire is a pleasant source of warmth, but it is exceedingly expensive because most of the heat goes up the chimney. It does, however, afford good ventilation. A base-burner stove furnishes one of the most efficient methods of heating, but it requires a large amount of space and is unpleasant on account of the dust that arises when coal is applied and ashes are removed.

With the hot-air furnace, air is generally admitted from outside the building through an intake pipe and passed over a heating surface connected with the fire box. The heated air expands, becomes lighter, and, rising up through the distributing pipes, passes through registers, or grated openings in the floor or wall, into the rooms to be warmed. This system has the advantage of providing fresh air, but it is not always reliable. When a strong wind is blowing, it is a common experience to find that rooms on the windward side cannot be heated. This is usually because the wind leaks into the room through small cracks around the windows and baseboards. The slight pressure then becomes sufficient to prevent warm air from rising in the pipes. The use of storm sash during cold weather has often seemed to double the value of a hot air furnace.

A pipeless furnace has but one large register, placed in the floor directly above the heating plant. From the center of the register, the warm air rises to the ceiling, spreading in all directions. The outer edge of the register is connected as an intake through which the cool air near the floor is drawn to the furnace. The pipeless furnace can heat thoroughly only those rooms into which the warm air finds an easy path. It is therefore most satisfactory where the rooms are few—though not necessarily small—and where the door openings extend to the ceiling.

Steam, hot water, and vacuum-vapor systems use hollow radiators to give off the heat, and a furnace to generate it. The two are connected by a series of pipes. These systems deliver heat where it is needed, without reference to the direction of the wind. Steam radiators do not operate until the water in the boiler has been heated to the boiling point and sufficient pressure generated to force the steam through the pipes. Hot-water systems begin to radiate soon after a fire is started, because, as the water in the furnace becomes warmer, it becomes lighter and is pushed upward through the radiator by the heavier, cooler water entering the furnace from below. Hot-water radiators must be larger than steam radiators to warm the same space because they usually operate at 140° F. to 180° F. compared with 212° F. for steam.

At the ordinary atmospheric pressure of 14.7 pounds per square inch, water boils at 212° F. If, by creating a partial vacuum, this pressure is reduced to 1 pound, the boiling point becomes 101.8° F. The vacuum-vapor system takes advantage of this fact and is practically equivalent to a steam system operating under a vacuum produced by automatic valves or other devices. Under these conditions the water gives off vapor at comparatively low temperatures, and the vapor, meeting but little resistance, quickly flows to the radiator.

Comparative Cost of Heating

System	Initial Cost	Fuel Required
Hot air	1.0	1.0
Pipeless furnace	⅔	1.0
Steam	2.0	¾
Hot water	2⅔	⅔
Vacuum-vapor	3⅔	⅚–⅔

It is impossible to say which system is the best because the answer depends on the conditions and surroundings in which it is to be used. An approximation of the relative cost is given in the above table.

Distribution of heat from a central station as practiced in various communities is often very satisfactory, especially where exhaust steam is available from some large power plant. The use of gas for fuel is convenient, but in some regions gas is more expensive than coal. Similarly, electric heating, which, considered by itself, is almost ideal, is uneconomical except in certain districts which have a large excess of water power as a source of electricity.

According to various calculations, the hourly supply of fresh air in a living room should be from 700 to 1000 cubic feet for each person. But the problem of ventilating the house ordinarily receives very little attention because doors and windows are so frequently opened that the air seldom becomes unwholesome. However, the air in most American homes generally contains about one-half as much moisture as it should contain, or, in technical terms, the *relative humidity* is too low. A living room temperature of 68°–70° with a relative humidity of 60–70 is considered best from the standpoint of health and efficiency.

The prevalence of colds, sore throat, and pneumonia in the United States can to a large extent be attributed to the custom of living in dry, overheated rooms. If the percentage of moisture in the air of these rooms were increased, a lower temperature would be used, for, when the air is very dry, the temperature must be from 7° to 10° higher than would otherwise be comfortable.

In hospitals, theaters, and schools, fresh air is usually provided by means of power driven fans. This air is sometimes cleaned and provided with the proper amount of moisture by means of washing devices. Many commercial establishments, such as candy factories, weaving mills, and offices where color printing is done, find it necessary to install air-conditioning apparatus so that, in winter and in summer, the atmosphere of the operating rooms shall always have the same degree of temperature and humidity. By this means the quality of their product is kept uniform.

Ink. A colored fluid used for writing or printing. Standard writing ink is usually prepared from an extract of nutgalls, a solution of copperas or iron sulphate, and a solution of some gum, such as gum arabic. The gum is added to the extract, which contains gallic acid, and the iron salt is then poured into the mixture. A fine, light-colored precipitate is formed, which is prevented by the gum from settling. A small amount of disinfectant is generally added to prevent the growth of molds.

Such an ink produces writing of a light blue color, which, from the action of oxygen in the air, changes in about a week to intense, permanent black. In order that the writing may immediately have a strong, dark color, a solution of some coal-tar color is often added. Fountain pen inks should contain no sediment. Therefore, in making this type of ink, certain aniline colors, especially nigrosine, are extensively used.

Red ink may be prepared by dissolving eosin and a small amount of gum in water. Gold, silver, and bronze inks may be made by grinding the metallic leaf to extreme fineness in a heavy sirup, such as honey or glucose. The powder is then washed, and suspended in a solution of gum arabic. India ink consists of a stick of finely divided carbon mixed with gum, which is rubbed with water. Lampblack made from pines and mixed with gum was the base of ink used by the Arabs.

Inks used for printing usually consist of the proper color or pigment mixed with linseed oil or resinous varnish. Lampblack and gas black are the best pigments for printing black, while the colored inks are generally made with coal-tar dyes.

Lacquer. This term is generally used today of the synthetic, quick-drying lacquers having a pyroxylin base, which came into wide use about 1923. In distinction from paints and varnishes, its base is an artificially prepared material, pyroxylin. This is made by stirring cotton linters or high grade tissue paper in sulphuric and nitric acid. The excess acid is separated out by centrifugal machines, leaving pyroxylin, a nitrate of cellulose. This is dissolved in wood alcohol, ethyl acetate, acetone, or some other solvent, and pigments are added. The first of these lacquers to be marketed was called duco.

The principal advantage in the use of lacquer is the speed with which it dries. It reduces the time necessary for finishing automobile bodies from several weeks to three days or less. It is also much more durable and less susceptible to scratching than varnish. Its employment on automobiles has made possible the use of colors at moderate prices, since baked enamel, formerly used on metal bodies, lent itself only to black, colors being affected by the baking heat. On the other hand, lacquers do not take as high a gloss as varnishes and baked enamel.

Lead Pencil. The ordinary lead pencil consists of a long, narrow stick of "lead" held in a small circular case, usually composed of wood, but which is frequently made of paper or of metal. The "lead" pencil contains no lead whatever, the marking element being in reality graphite. This was introduced about 1565, when a graphite mine was discovered at Barrowdale, in Cumberland, England. The black mark of a graphite pencil was much superior to that made by metallic lead, which had been used for this purpose from early times by the Romans, the Aztecs, and many other peoples. The new material, under the designation of black lead, gradually displaced the older type.

In the process of manufacture, the graphite is first reduced to an extremely fine powder by crushing. It is then suspended in water and mixed with the proper amount of fine clay. The water is removed by filtering the mixture, and the paste is then forced through perforated plates until it is sufficiently smooth. Finally, the pasty mass is forced, under hydraulic pressure, through a die, from which it emerges as a continuous string of the required size. This string is straightened and is cut into pieces which are packed in trays and baked in ovens until dry. They are then ready for the customary wooden casings or for use in the popular metallic cases equipped with a screw for advancing the lead.

Red cedar or other soft wood is prepared for the casings by being cut into slats 7 inches long, 2 inches wide, and ¼ inch thick. On the surface of the slats, grooves are cut parallel to the long side and just deep enough to receive half the thickness of the lead. Glue is then applied to the grooved surface; a strip of lead is placed in the groove; and a second grooved slat is placed over the first so as to form an oblong block. The dried blocks are then fed to a milling machine, from which they emerge as perfectly shaped lead pencils. These are varnished or painted, the ends are trimmed smooth and, frequently, tipped with a metallic cap holding a rubber eraser.

Leather. The skin from an animal, tanned or treated so that it is more or less soft and flexible when dry. It differs from raw skin in that it does not decompose quickly and does not yield glue when treated with boiling water. Leather may be prepared from any skin, but cattle, sheep, and goats are the chief sources of supply. The skins of the larger animals, such as cattle and horses, are called hides.

A raw skin consists of three layers. That on the outside is hard and scaly; that on the inside is composed of connecting and fatty tissues. Between these is the true skin, a layer of gelatinous fibers from which leather is made.

In preparation for tanning, skins are softened by soaking in water, the hair is loosened by treatment with milk of lime, and the layers of hair and fatty tissues are scraped off with knives. Further soakings are usually given to remove any excess lime. After these preliminary treatments, the inner skin is ready to be *tanned*, or changed to leather.

This change is usually accomplished in one of three ways: by soaking the skin in a solution of tannin extracted from oak or hemlock bark, sumac leaves, quebracho, or other vegetable material; by soaking in a solution of metallic salts, such as aluminum or chromium; by treatment with fish oils. The first method is called *tanning*; the second, *tawing*; and the third, *chamoising*. As the use of tannin is much older than other methods, the word tanning is used as a general term to include all processes.

The tannin process often requires from 4 to 8 months, while tawing with chromium salts can sometimes be completed in a few hours or days. As chrome tannage yields a very durable leather that is soft, light, and almost waterproof, it has become very popular in this country. Most glazed kid, such as that used for women's shoe tops and gloves, is chrome tanned. *Vici kid* is a proprietary name now generally used to describe any black, glazed, chrome-tanned kid. *Sole leather*, *harness leather*, and *belting leather* are produced from heavy cowhides by both methods of tanning.

Chamoising yields soft, pliable, light-colored wash leather of the chamois, doeskin, and suède type. These are made by working fish oil into the skins until all of the moisture is displaced. An oxidation process then occurs, during which the skins are changed to leather. The excess fat, known as *degras* when pressed from the skins, and as *sod oil* when washed out, is highly valued for dressing leather. *Chamois* was originally made from the skin of a small antelope of that name, which lives on the highest mountains of Europe and southwestern Asia. It is now made mostly from sheepskins. *Ooze* refers to leather having a suède finish.

Patent leather is made by applying many coats of oil and nitrocellulose varnish to well tanned skins tightly stretched on frames. The process is not controlled by a patent. *Cordovan leather* is soft, firm, fine-grained, and nearly waterproof. It was originally made in the Spanish city of Cordoba, but is now prepared in many countries from horsehide. Any required color is produced by dyeing. *Russian leather* is tanned with willow and birch bark. It has a peculiar odor due to the oil of birch bark tar with which it is finished.

Morocco was originally a fine red leather made in the vicinity of Morocco from goatskins. Today it is colored leather made from sumac-tanned goatskins which have been worked to bring out the grain. It is considered by bookbinders to be both the most durable and the most beautiful covering for books. *Levant morocco* is the finest and most expensive grade. When the grain of Levant morocco is crushed until the surface is smooth and polished, it is known as *crushed levant*. *French morocco* is made from sheepskin. *Buffing* is the grain, or outside split, from calfskin. It is much used for binding books.

Artificial leather, which has the appearance and many of the characteristics of the more expensive

material, is usually made of cloth coated with some waterproof, flexible substance, such as a preparation of cellulose nitrate. The surface is grained by means of a die.

Lighting Devices, Electric. Illumination by electricity is accomplished by three principal types of lamps,—filament, gaseous, and phosphorescent. The oldest and commonest is the so-called incandescent or filament lamp, in which a current flows through a filament, usually of tungsten, inside a glass bulb either empty of gas or filled with an inert gas. The current heats the filament until the filament glows brilliantly. The filament is looped, each end being connected with a small wire sealed into the neck of the glass bulb.

The gaseous type depends on sending a current of electricity through a glass tube filled with an inert gas, the current causing the gas to glow throughout its entire volume. The terminals for the current are placed at opposite ends of the tube. Different gases produce different colors. They also vary greatly in illuminating efficiency per unit of current. Mercury vapor gives off white light with a bluish tinge, neon a reddish-orange light, argon lamps a green glow, sodium vapor a yellowish light. The glass tubes may be molded to spell words, thus making these lights especially adaptable for advertising signs.

The phosphorescent lamp consists of a glass tube whose inner surface is coated with a phosphorescent substance. Upon the inner surface of the tube are projected invisible ultraviolet rays, which, upon striking the phosphorescent coating, causes it to glow. The advantages of the phosphorescent electric light include greater approximation to daylight, a wider range of possible color, high lighting efficiency, and long life.

The earliest electric lamps used platinum-wire filaments. In 1860, J. W. Swan, an Englishman, exhibited lamps using carbonized threads of paper. Thomas A. Edison, working independently, produced in October 1879 a carbon filament lamp, which was the first to succeed commercially.

In carbon filament lamps it was necessary to exhaust the air from the glass bulb in which the filaments were placed. Otherwise the carbon would burn.

Edison's early lamps used a filament of carbonized bamboo fiber. Later, the filaments were made by forcing a solution of cotton through a fine hole. The threads thus formed were hardened and were changed to carbon by heating. Improvements followed steadily. In 1907, a lamp with a filament made from powdered metallic tungsten was placed on the market; in 1911, stronger filaments of drawn ductile tungsten appeared; and, in 1913, the efficiency was greatly increased by filling the bulb with an inert gas, formerly nitrogen but now chiefly argon. These gas-filled bulbs, unlike the vacuum lamps, become hot when in use because the gas conducts some of the heat from the center to the sides. Nevertheless, they last longer and give more light for less cost than any of the older types.

Lime. A caustic, infusible material which, when pure, consists chiefly of calcium oxide. It is made by roasting limestone, chalk, marble, shells, or other forms of *calcium carbonate*, to a bright red heat. *Carbon dioxide gas* is given off and the residue is lime, or, as it is often called, *quicklime*. The burning is done in lime kilns, some types of which operate continuously while others must be cooled and emptied before another batch can be made.

When lime is mixed with water, chemical combination takes place. Much heat is given off and the lime swells to a powder known as *slaked lime*, or, chemically, as calcium hydroxide. *Milk of lime* consists of slaked lime suspended in a large excess of water. Ordinary *whitewash* is milk of lime to which a size, such as glue or flour, is usually added. *Air slaked lime* has been exposed to the atmosphere, from which it absorbs carbon dioxide and moisture until it falls to a powder. Pure lime which combines easily with water and makes a smooth stiff paste is known as a *fat lime.*

Lime is used principally for making mortar. It is also extensively employed for softening hard water, for neutralizing acid soils, for making bleaching powder and glass, for purifying sugar, in metallurgical operations, and for many other purposes.

Linen. Thread or cloth made from fibers of the flax plant. It is noted for its smoothness, luster, strength, and durability. Well preserved linen cloths have been found in Egyptian mummy cases which were more than 4000 years old. Linen is not easily dyed, consequently it does not hold stains so permanently as cotton, wool, or silk.

In preparing the fiber, the seeds are removed from the plant and the flax is placed either in pools of stagnant water, in streams, or upon a moist meadow. The wet straw ferments, and, during this process, called *retting*, the woody core becomes soft, so that it may be easily removed. When retting is complete, the flax is passed through machines which break the hard parts without injuring the fiber, which is then *scutched*, or beaten until clean and free of foreign materials. The purified flax is combed, or *heckled*, so as to separate the long, straight fibers, called *line*, from the short tangled *tow*. The line is then ready for spinning and weaving, and the tow is used in making cordage or the cheaper fabrics.

Linen thread is used almost exclusively in the manufacture of handmade lace. Table linen, when woven so as to show a pattern, is known as *damask* because of a resemblance to the famous patterned silks of Damascus. The snow white color is obtained by bleaching. Other linen fabrics include fine cambric, shirting, and handkerchief cloth, as well as the coarser butcher linen, crash, and huckaback.

Linen is much used for towels because it absorbs water quickly. As the result of this property, a spot of moisture usually shows on the opposite side of a linen fabric more quickly than it does on cotton. A more reliable method of distinguishing between the two is to put a drop of salad oil on the cloth and press it between blotting paper. Linen becomes more transparent than cotton.

Linoleum. A floor covering made by fixing on a sheet of canvas a mixture of oxidized linseed oil, ground cork, and other materials. The oxidized oil alone is also known as linoleum.

When thin layers of linseed oil are exposed to air, or when air is blown through the oil under proper conditions, oxygen is absorbed and the fluid gradually changes to a tough, elastic solid somewhat similar to rubber. This oxidized product is ground by machinery, mixed with cork, resin, and coloring materials, and fixed upon burlap by means of hot rollers. A decorative pattern is usually printed on the smooth surface.

Better grades of linoleum are made up of a mosaic of colored pieces so that the pattern extends through to the back. These pieces are united into a single layer by the pressure of hot rolls. Good linoleum provides a smooth insulating floor covering which is comfortable to walk on, easy to clean, and much more durable than oilcloth, which it has largely displaced.

Linseed Oil. The most useful of all paint oils. It was probably known in ancient times and was undoubtedly used for paint in the 7th century, but its real value was not generally appreciated until about 1400, when oil painting came into general use.

Linseed oil is dissolved from the crushed seed with naphtha, which has a low boiling point and can easily be removed from the oil by heating. The product is known as *raw linseed oil*. It ranges in color from light amber to dark yellow-brown and has rather an unpleasant odor and taste. Enormous quantities are used in making paint; at least seven and one-half gallons are required for every 100 pounds of white lead. *Boiled linseed oil* is produced when the raw oil is boiled with the addition of certain chemicals, such as manganese dioxide, which hasten the rate of the drying. This form is used chiefly for interior paints. *Refined linseed oil*

receives special treatment which removes any sediment-forming material and gives the lighter color which is demanded by the makers of fine varnish.

Besides its exceptional value in the paint industry linseed oil is required for the manufacture of patent leather, for waterproofing cloth, such as oiled silk, and for making many of the imitation leathers which are often used for automobile tops and book bindings. It is an important ingredient in linoleum and oilcloth, while thousands of gallons are used in printing and lithographic inks. The value of the oil for these purposes is due entirely to its ability to absorb oxygen from the air and thereby change from a liquid to a tough, elastic solid. Oils having this property to a high degree are called drying oils. In addition, linseed oil has minor uses in medicine.

After the oil has been removed from the seed, the residue is known as *linseed oil cake*. When ground, this is called *linseed meal*, a very rich and valuable cattle food, at least four times as nutritious as hay. Linseed meal is also used to some extent as a fertilizer.

Liquid Air. A pale blue liquid, similar to water in density, used for producing very low temperatures. As the name indicates, it is prepared by liquefying air through subjection to high pressure, about 120 times the atmospheric pressure being required for air at normal temperatures. As pressure increases, the temperature falls. The oxygen in the air liquefies at $-182.9°$ C., and the nitrogen at $-195.7°$ C. In evaporating, the liquid absorbs heat, thereby producing very low temperatures. If the oxygen from liquid air is allowed to boil and evaporate off, the nitrogen still remains. Nitrogen is thus obtained for the manufacture of ammonia, cyanamid, and other compounds.

Luminous Paint. A mixture usually consisting of barium sulphide and zinc sulphide together with an exceedingly minute amount of some salt of radium. It has the valuable property of being visible in the dark. The mixture is used as a paint, or as a powder in small glass containers, to mark the hands and dials of clocks and watches, and the position of keyholes, lighting fixtures, gun sights, and other objects the visibility of which in the dark is often desirable.

Before the discovery of radium, luminous paint was generally prepared from mixtures of calcium sulphide with bismuth, from calcium tungstate, or from other materials phosphorescent only after an exposure to daylight. During the World War, the radium paint was extensively used in the front line trenches as it is visible for only a very short distance.

Radiolite is a commercial preparation containing the hexagonal zinc sulphide, called Sidot's blende, and radium. On the hands and dial of a "radiolite" watch there is less than $\frac{1}{1000}$ milligram of radium. Reckoning radium at about $100,000 per gram, there is from five to ten cents' worth of the element on such a watch. This radium gives off each second some 30,000 alpha particles, which strike the zinc sulphide and cause it to become luminous.

Match. A short, slender piece of wood or other inflammable material tipped with some combustible substance which will ignite by friction. Modern matches come under two general classes: safety matches, which must be rubbed on a specially prepared surface; and "strike anywhere" matches.

One of the earliest types of match consisted of a long splinter of wood tipped with sulphur. These were lighted by pressing the tip into glowing tinder. Later the sulphur tip was covered with a mixture of potassium chlorate and sugar, which ignited when dipped into a bottle containing asbestos saturated with strong sulphuric acid. The first true friction match was invented in 1827 by John Walker, an Englishman. It had a sulphur tip covered by a mixture of potassium chlorate and antimony sulphide. Fire was produced by drawing the head of the match between folded sandpaper which was supplied with each package.

Walker's matches were known as *congreves*, while imitations of these, called *lucifers*, were made by several competitors. White phosphorus was first used on the tips of friction matches by Walker and other manufacturers, in 1833. In the United States, improved friction matches were first made at Springfield, Massachusetts, in 1836.

For many years the tips of ordinary matches consisted of sulphur and white phosphorus, often with some chlorate or nitrate. Because of the unpleasant fumes of burning sulphur, these were largely displaced by *parlor matches*, having a more inflammable tip with much less sulphur. A machine for automatically preparing the sticks was invented in 1842.

In 1855, safety matches were introduced by a Swede named Lundstrom. He omitted white phosphorus from the tip and instead placed a friction surface of red phosphorus and sand on the side of the box. Safety matches ignite only when rubbed on this surface.

White phosphorus is an intense poison which was the cause, among match workers, of many cases of necrosis, or rotting of the jawbones. The dangers attendant on its use can be avoided by substituting in its place red phosphorus or phosphorus sesquisulphide. For this reason, the use of white phosphorus in matches has been forbidden in many countries.

Patents covering the use of phosphorus sesquisulphide in the United States were owned by the Diamond Match Company, which in 1911 surrendered these patents so that the process might be employed by anyone. The Esch-Hughes Non Poisonous Match act, passed in 1912, placed a tax of two cents per hundred on matches containing white phosphorus, thus making the use of this material commercially impossible. The exact composition now used for the tips of matches is a carefully guarded trade secret. Safety matches often have potassium chlorate and dichromate on the head, with red phosphorus, manganese dioxide, and glass powder on the rubbing surface. "Strike anywhere" matches generally contain phosphorus sesquisulphide together with such oxidizing materials as red lead, lead peroxide, manganese dioxide, and potassium chlorate. The mixture is often colored, and is held by a binder of glue or dextrin.

In North America, matches are usually made from white pine or California sugar pine which has been seasoned and dried for almost two years. The wood may be cut into planks about two inches thick, which are then sawed into blocks the length of a match. The blocks are fed into a machine which rapidly splits them into match sticks. A second important method of preparation consists in cutting the pine log into a long roll of veneer having the thickness of a match. The veneer is then reduced to splints by machinery.

The splints are automatically fixed in rows on an endless belt, which carries them until the free ends, having been heated and dipped in paraffin, receive the composition that forms the head. This is dried by a blast of warm air. They are then mechanically packed into boxes. Ordinarily, they are from $1\frac{7}{8}$ to $2\frac{1}{4}$ inches long. Matches made of waxed taper, called *vestas*, as well as the small books of cardboard matches so much used for advertising are also made by machinery. Impregnated matches have been dipped in solutions of alum or magnesium sulphate to prevent smoldering of burnt stems. In France the manufacture of matches is a government monopoly. Prior to 1918 practically no safety matches were made in the United States, the entire supply being imported from Norway, Sweden, and Japan.

Mortar. A building material ordinarily made by mixing slaked lime, sand, and water. It becomes hard because of chemical action in which the lime absorbs carbon dioxide from the air and changes to calcium carbonate. Lime is prepared by roasting

limestone, or calcium carbonate, until the carbon dioxide which it contains is driven off. Thus the hardening of mortar is due to a change in which the lime again becomes limestone. Unlike cement, mortar does not harden until fairly dry. Consequently, it should not be used in very damp places.

Nails. Slender pieces of metal usually pointed at one end and flattened or enlarged at the other to form a head. Nails are classified, according to the method of manufacture, as wrought, cut, and wire. All nails were formerly made by hand, but, with the exception of some horseshoe nails, hand wrought products have been displaced by machine made nails.

The first machine for making cut nails was patented in 1786 by Ezekiel Reed, an American. Machines of this type cut the nails from sheets or narrow strips of heated metal, form the head by pressure or by hammering, and drop the flattened nail into a receiving trough. Wire-nail machines seem to have been a French invention, but the process received little recognition until 1876, when, at the Centennial exposition, American made machines were awarded medals over those of foreign manufacturers. These machines are fed from coils of wire, which they grasp, straighten, cut, and form into nails of any size or type, with great rapidity. At present the wire-nail industry produces the greatest proportion of all nails used.

The size of a standard common nail ranges from 2 d. or *two penny*, to 60 d. This odd method of describing nails, which originated in England, finds two explanations. One is that four penny and ten penny nails sold respectively for four pence and ten pence per hundred. According to the second explanation, 4 d. and 10 d. applied to nails, 1000 of which weighed four pounds and ten pounds respectively. The abbreviation "d.," which now means penny, was in earlier times used for pound. The standard size of the common wire nails is shown in the accompanying table.

A *spike* is three inches or more in length and is thicker than a corresponding nail. For example, a 40 d. spike has the same length as a 40 d. nail but is as thick as a 60 d. nail. *Common brads* have the same length and thickness as nails but have a small, thickened head instead of one that is large and flat. *Finishing nails*, made from 2 d. to 20 d., have the same shape and length as brads but are much thinner.

Wire nails are made into hundreds of special forms, such as roofing nails, plaster board nails, basket nails, wagon nails, hinge nails, and boat nails. Sterilized lath nails are marketed because lathers customarily carry nails in their mouths while working. Special nails may be smooth or may have rough, corrugated surfaces. Cement coated nails are extensively used because they have much greater holding power. Nails are generally sold in 100-pound kegs and in boxes of smaller weight. Those of 20 d. size and larger sell for the same price per pound; the cost of smaller nails increases as the size decreases.

Common Wire Nails

Size	Length Inches	Steel Wire Gauge	Diameter Inches	Number Per Pound
2 d.	1	15	.072	876
3 d.	1¼	14	.080	568
4 d.	1½	12½	.099	316
5 d.	1¾	12½	.099	271
6 d.	2	11½	.112	181
7 d.	2¼	11½	.112	161
8 d.	2½	10¼	.131	106
9 d.	2¾	10¼	.131	96
10 d.	3	9	.148	69
12 d.	3¼	9	.148	63
16 d.	3½	8	.162	49
20 d.	4	6	.192	31
30 d.	4½	5	.207	24
40 d.	5	4	.225	18
50 d.	5½	3	.244	14
60 d.	6	2	.263	11

Needle. A slender, pointed instrument of metal or other material, used to carry the thread in sewing, knitting, and similar operations. Most needles are pierced with a hole called the *eye*, through which the thread is passed. The earliest needles were really pins, for they had no eye but were used simply to make an opening through which a thong of leather or vegetable tissue could be passed. Stone needles having an eye at one end have been found among the relics of the Stone age. Delicate needlework was produced by the Egyptians and ancient Greeks, and both common and surgeons' needles were found in the ruins of Pompeii.

It is believed that the Chinese were the first to use steel needles and that knowledge of this practice was eventually carried into Europe by the Moors. By 1370 a needle making industry had become established at Nuremberg. The manufacture of needles in England developed during the reign of Queen Elizabeth. Not until 1885 were needles made and finished by machine.

Most modern needles are made from high grade steel wire cut into pieces two needles long. The pieces are straightened, both ends pointed against a grindstone, the eyes stamped out, and the double needle broken at the center. The rough needles thus formed have the heads ground to the proper shape and are tempered and polished. The eyes may be smoothed with fine emery and waxed thread, and, in the finest needles, are often gilded. Sewing machine needles are often pressed from short blanks of thick wire.

Knitting needles have no means for holding the thread. Crochet needles have a hook on the end. Surgeons' needles are generally curved, and the needles on many welting machines are curved in the arc of a circle. Sewing machine needles have the eye near the point, with grooves on the sides to prevent binding the thread.

Nitroglycerin. A powerful explosive made by treating pure glycerin with a mixture of concentrated nitric and sulphuric acids. The oily product has a yellowish color, is about 1.6 times as heavy as water, and is slightly volatile. It was discovered by Sobrero in 1846. Both the liquid and its fumes are poisonous and usually cause violent headaches, but persons working in the nitroglycerin factories often become immune to its effects. In medicine it is used as a heart stimulant. Pure nitroglycerin is not very sensitive to friction or to a moderate blow. When frozen it is less sensitive than when liquid. A small quantity, when freely exposed to a flame, burns brilliantly without explosion. Somewhat larger amounts, under the same conditions, usually explode, so that all experiments of this sort are uncertain and dangerous.

Liquid nitroglycerin is used in torpedoes for *shooting* wells, to start or hasten the flow of oil. Because of the danger attending its transportation, the liquid is usually absorbed in some very porous material, such as kieselguhr or sawdust, and pressed into sticks, which are carefully wrapped in paraffin paper. This product, which is known as *dynamite*, was invented by Alfred Nobel in 1866. Nitroglycerin is also an ingredient in other explosive compounds such as *gelatin dynamite* and the *smokeless powders*, which include *ballistite* and *cordite*. Dynamite, as well as nitroglycerin, is most effective when exploded by a *detonating cap* fired either by the ordinary fuse or by electricity. Such a detonator acts as a very quick, powerful blow. The safest way to destroy nitroglycerin is to treat it with a solution of ammonium sulphide.

Nylon. A synthetic textile having many properties similar to those of silk. The word is a coinage of E. I. duPont de Nemours & Co., which obtained the patent in 1937. Nylon is defined as the generic name for "synthetic fiber-forming amides having a protein-like chemical structure; derivable from coal, air, and water or other substances; and characterized by extreme toughness and strength and the peculiar property to be formed into fibers and into various

shapes, such as bristles and sheets."

Like rayon, nylon filaments are made by pressing a liquid through small holes. The filaments then become solid but may be cold-drawn to an extreme fineness.

Nylon differs from rayon in that it is not made from cellulose. It has greater strength and elasticity, but is less absorbent than cotton, wool, linen, rayon, or silk. Fabrics knitted from nylon hold their shapes better than those made from any other fabric and excel them in wearing qualities. Nylon takes dyes as well as wool, cotton, or silk. The dye may be incorporated in the yarn or added after it is spun. Among its chief uses are as hosiery and other knitted wear, tooth brush bristles, fish lines. Being relatively non-absorbent, fabrics made from nylon dry quickly and feel cool to the skin. A similar textile made by the Carbide Chemicals Corp. is known as *vinyon*.

Oleomargarine. A mixture of edible fats churned with milk, salted, and worked to a butter-like consistency. This product was invented in 1869 by a Frenchman, Hippolyte Mège-Mouries, in order to secure a prize offered by Napoleon III for a cheap and wholesome butter substitute.

Oleomargarine is made by churning carefully prepared fats with milk which has been pasteurized and then ripened or fermented until it has a strong butter flavor. Oleo oil and neutral lard, or simply *oleo* and *neutral*, are the most important ingredients used, although some vegetable oil, such as cottonseed or coconut, is often added. The term oleo oil is somewhat misleading, as the fat is not an oil at ordinary temperatures. Oleo is prepared from selected beef tallow by slowly cooling the melted fat until it begins to thicken. The pasty mass is wrapped in porous cloths and placed under pressure. This forces out the softer portion into tanks of cold water, where it is chilled to a granular, slightly yellowish solid. Neutral is made from choice lard by a similar process, which has for its purpose the removal of the crystalline portion of the fats so that the final product will be smooth instead of grainy. *Nut margarines* are prepared entirely from vegetable fats by substituting coconut and palm kernel oils for oleo and neutral.

The fats are first melted at low temperatures, weighed out in the exact amounts required by the formula, mixed, and thoroughly churned with the ripened milk. The contents of the churn are then sprayed into ice water, becoming solid so quickly that crystals do not have time to form. This chilled mass is allowed to stand for some time in order that the butter flavor may develop further. Its color is white. It is then salted, and worked by machinery until smooth and firm like butter. It may also be colored to resemble butter.

A household test which will usually distinguish between butter and margarine consists in heating a spoonful of the material over a small flame. Butter foams quietly, while margarine sputters noisily and produces very little foam. See *Butter*, *Cottonseed Oil*.

Paint. A suspension of finely ground pigment in a liquid or other medium, which is applied to objects for decoration or protection. Thus, calcimine and whitewash are paints in which the pigment is suspended in water. However, as generally used, paint refers to a suspension of pigment in a fatty oil. Paint was formerly used only as a means of decoration, but its value as a protection against corrosion and decay is now quite generally recognized.

A good house paint generally contains about 65 per cent by weight of pigment and about 35 per cent of a liquid vehicle, or pigment carrier. The vehicle consists of a mixture of an oil, a solvent or thinner, and a liquid drier. The oil is usually linseed oil, which has the property of absorbing oxygen from the air and of drying to a tough elastic film when spread out. China wood, perilla, soy bean, poppy, fish, and other oils are also used in paints. The solvent is added to make the product penetrate and spread more readily. Among the best solvents are turpentine and benzol. The principal driers are composed chiefly of lead and manganese soaps, which by their presence cause the oil to take up oxygen and to dry more rapidly.

The chief pigments are white lead, zinc oxide, and lithopone. Certain proportions of inert fillers such as barytes, asbestine, silica, and calcium carbonate are often added; but, as a rule, small amounts of these are found in good paint and large amounts in a cheap product. A single pigment in oil does not usually produce the best paint. White lead combined with zinc oxide, with or without a small amount of inert pigments, has been shown by many experiments to give the most satisfactory results. Any desired color may be produced by the addition of natural earth colors, such as sienna and iron oxide, or of artificial pigments, such as lead chromate, prussian blue, and carbon black.

In making prepared paints the pigments are thoroughly mixed by machinery with a small amount of oil. The mixture is then ground to a smooth paste between heavy revolving plates of stone or steel. One barrel of pigment, when ground with oil, yields only ⅓ barrel of paste. Paint is produced by mixing this paste with linseed oil together with the proper amounts of turpentine, liquid drier, and coloring pigments, which have also been ground in oil. The finished product is then sealed in containers and is packed for shipment.

Enamel paints generally consist of zinc oxide and lithopone in blown linseed oil and high grade varnish. Flat wall paints, often called sanitary flat wall paints, usually contain lithopone and zinc oxide ground in treated china wood oil and thinned with turpentine substitute made from petroleum. Floor paint contains a larger proportion of the inert pigments barytes and silica, which are highly resistant to abrasion, while good mixing varnish is added to the vehicle in order to produce a hard, glossy surface. Paints intended for the protection of iron and steel must prevent corrosion. Red lead containing about 15 per cent litharge, zinc oxide, zinc chromate, basic lead chromate, and basic lead sulphate are especially valuable as rust preventives. Steel hulls of ships usually receive a coat of anti-corrosive paint followed by a coat of antifouling paint, which, in order to prevent the growth of animal and vegetable organisms, contains a poison such as cyanide of copper or mercuric oxide. See *Linseed Oil*, *Turpentine*, *Varnish*.

Paper. A substance composed chiefly of cellulose fibers matted or felted into thin sheets. As cellulose is of vegetable origin, the raw materials used for making paper are numerous and include cotton or linen rags, wood pulp, cotton linters, esparto grass, straw, hemp, jute, and old papers The word "paper" is derived from *papyrus*, a Latin word applied to writing material made from an aquatic plant of that name which was used by the Egyptians as early as 2400 B. C.

The manufacture of paper was known to the ancient Chinese, who during the second century B. C. prepared it from the pulp of the mulberry tree. Chinese prisoners taken by the Moslems introduced paper to the Arabs, who at first utilized ramie extensively in its manufacture. Ramie is a plant having tough fibers similar to linen or flax fibers but stronger. After the 14th century, linen fiber predominated. The Arabs passed the invention on to the Western nations, among whom the making of it has been developed into a highly mechanized process. Fine handmade papers are still produced in China, Japan, and Italy. But the same principle is used whether paper is made by machinery or by hand. A film of fibers suspended in water is spread over a flat surface and the water drained off. In making paper by hand, the mixture of pulp and water is dipped from a vat with a shallow tray or mold with a screen bottom. The vat man dips with a shaking motion to interlock the fibers, and most of the water drains out through the bottom of the mold. He then hands

it to the coucher who lays the wet sheet on the "couch" or piece of felt. The pile of alternate layers of felt and paper is pressed and re-pressed to remove more water, and, after sizing with animal glue, the sheets are hung up until thoroughly dry.

At least 250 kinds of paper have been made in the United States. Seventy-five per cent of the total volume is produced from wood pulp; about five per cent, consisting of the highest grades, from rags. The rags are carefully sorted and cut into small pieces, cleaned by boiling with lime, washed, ground in a machine called a *hollander*, bleached with some form of chlorine, and then beaten to a mass of fibers. These fibers are ready to be made into paper.

Wood pulp is classified, according to the method of preparation, as mechanical and chemical. *Mechanical pulp* is made by forcing logs of wood against a revolving grindstone, from which the torn fibers are carried away by a stream of water. *Chemical pulp* is prepared by cutting barked logs into chips, which are cooked with a liquid under pressure until most of the impurities have dissolved. The product is known as *soda*, *sulphite*, or *sulphate pulp*, according as the liquid contained caustic soda, lime and the gas from burning sulphur, or sodium sulphate. Soda pulp lacks strength, while sulphite pulp has good strength and color. Sulphate pulp gives a strong, brown product known as *kraft paper*. Spruce, poplar, pine, and hemlock are the chief pulp woods. Newspaper is usually made from mechanical pulp with which a certain amount of chemical pulp is mixed to impart strength.

The strained pulp, to which has been added any necessary coloring and filling materials, is made into paper on a complicated mechanism called a *Fourdrinier* machine. Wet pulp is first deposited on a long, endless, moving screen of fine wire, from which the water drains rapidly, leaving a soft sheet. A *water mark* is formed at this time by lightly pressing the moist layer with a roller having a raised design. From the moving wire the paper passes to felt rollers, where it is pressed; then to drying rollers; and from these to other rollers, which impart the desired finish to the surface. The edges of the sheet are trimmed and it is wound on a reel. Some Fourdrinier machines can make an endless sheet of paper 180 inches wide at 1000 feet per minute.

Papers to be used for printing and writing are filled with various materials and sized with glue so they will not absorb ink. *Tissue* and *blotting paper* are loosely made without sizing. *Manila paper* was originally made from hemp, jute, or old rope, but it is now produced from wood. The genuine product is called *rope manila*. *Paraffin paper* is made by passing the material through melted paraffin and then through rolls which remove the excess wax.

The skins of various animals when treated so as to afford a smooth surface for writing are known as *parchment*, and a soft, white variety made from calf- or kidskin is called vellum. *Vegetable parchment*, which resembles the animal product, is prepared by rinsing and drying an unsized paper that has been treated with dilute sulphuric acid.

Coated paper is a development of recent years to meet the exacting requirement of the printer so that half tones may be well printed. This paper is mechanically coated on both sides or on one side as may be desired, by either running it through a bath of coating liquid or flowing the liquid onto the paper. The materials used in the coating mixture are largely mineral in character. The mixture may have in it satin white (calcium sulphate and aluminum hydrate), English china clay, blanc fixe (barium sulphate), glue, casein, and starch.

Pins. The first pin was very probably a long thorn, pushed by some primitive man through the animal skins with which he covered himself. Pins made of bone and of bronze have been found among the remains of the ancient Lake Dwellers who inhabited central Europe in prehistoric times. Some of these relics are entirely similar to the present day safety pin. The Egyptians, the Greeks, and the Romans were all familiar with long pins of bronze, bone, and other hard materials.

Development of the process for making wire led to the production of modern pins, which were made first in France and Germany. The manufacture of brass wire pins was introduced into England in 1826. These early pins were cut and sharpened by hand, and the head was formed by wrapping fine wire around one end of the shank. Such handmade pins were expensive, but were considered so necessary an item of dress that the money received or set aside by a woman for her personal expenses came to be known as *pin money*.

The first machine for making solid-headed pins was the invention of an American, Lemuel W. Wright, in 1824. A more satisfactory machine was invented in 1831 by John Ireland Howe, a physician of New York City. A machine for sticking the pins into folded paper, invented by Samuel Slocum, was used in Howe's factory as early as 1841.

The great majority of common pins are made from brass wire; the best are made from fine steel. Coils of wire are placed in the machine, which cuts off and straightens a piece of proper length, holds it in viselike jaws until the head is formed by the blow of a die, and moves the lower end against grinding wheels, which sharpen the point. The pins are next cleaned, coated with tin, and polished. Other automatic machinery arranges them and sticks them into papers. Birmingham is the center of the industry in England; Connecticut, in the United States.

Plastics. A term applied to a group of synthetic chemical products. Their distinctive quality is their capacity to be molded into any shape by moderate heat and pressure and to retain it at ordinary temperatures. They may also be dissolved and used as lacquers, pressed into sheets and panels, or drawn out in threads. They are obtained by chemical treatment from such substances as cellulose (cotton), phenol, or carbolic acid (coal tar), and formaldehyde (wood alcohol). The caseins come from milk; the ureas from ammonia and carbon dioxide (coal, air, and water). The qualities which make these products desirable are their strength, hardness, and electric resistance, the variety of color and finish obtainable, and the possibility of reproducing with exact uniformity.

During World War II, when there were numerous shortages, the plastics industry came to the front by supplying many engineering materials. Considered then to be merely substitutes for older materials, plastics have since won recognition on their own merits, and production has soared from about a billion pounds a year to several times that figure. The development of plastics has had a marked effect on numerous industries. See *Bakelite*, *Cellophane*, *Celluloid*, *Lacquer*, *Nylon*, *Rayon*.

Porcelain. The most highly valued type of fine pottery, differing from inferior grades because of its glasslike, translucent body. It is usually very hard and white. Its common name of *china* indicates the place of its origin; the time is uncertain, perhaps because of the gradual development of the art. The Chinese may have made porcelain of a sort as early as the 7th century A.D. But it is generally acknowledged that not until the Ming dynasty (1368–1644) did their ceramic products develop the qualities for which they became famous.

Porcelain is generally classified, according to the materials of which it is composed, as hard paste, artificial soft paste, and natural soft paste. True hard paste porcelain is made from kaolin, or china clay, and feldspar, which imparts translucency; quartz and special sands are sometimes added. The feldspar is often called Cornish stone because Cornwall, England, has been an important source of this material. From the time that Chinese porcelain first appeared in Europe, great efforts were made to produce a similar product. Articles which resembled porcelain, but were chiefly glass, were made in Florence about 1580. In France, about 1670, artificial soft paste porcelain was first produced.

This contained no kaolin, but was a glasslike substance composed of sand, niter, gypsum, alum, soda, salt, and marl or chalk. It was usually covered with a rich, waxlike glaze. Very little porcelain of this type was produced after 1780. Natural soft paste porcelain, or *bone china*, was an English invention developed during the 18th century. The standard mixture, containing ball clay, kaolin, feldspar, and notable quantities of bone ash, was apparently fixed by Josiah Spode, about 1800. Since that time, it has been the principal product of the chief English potteries.

Hard paste porcelain was first produced in Europe, about 1709, by the alchemist Johann Friedrich Böttger. The factory which he established at Meissen became the source of the famous Dresden china. Manufacture of hard paste was begun at Plymouth, England, in 1768; at Sevres, France, in 1769; and at Philadelphia, U. S. A., in 1825.

Hard porcelain ware is usually baked at a rather low temperature. The resulting biscuit is decorated if desired, covered with glaze, dried, and then fired at temperatures so high that the body almost fuses. Kiln temperatures range from 2000° to 3200° F. The glaze is composed of the same ingredients as the body, although in different proportions. Care is necessary to prepare a glaze which will not crack and separate when the piece cools. When the cracking or crazing of the enamel is uniform and is produced intentionally, the product is known as *crackle ware*.

Parian is a fine grade of thin, unglazed porcelain which receives its name from a resemblance to an ivory tinted marble found on the island of Paros. *Belleek* is thin, light weight porcelain having a beautiful iridescent or pearly glaze. It takes its name from a town in Ireland where it has been made for many years.

The French factories at Sevres and Limoges, the German potteries at Meissen and Berlin, and the Royal Copenhagen factories are recognized as producers of much of the world's finest porcelain. Japan and Austria are also known for their porcelain. The production of high grade porcelain in the United States is constantly increasing, the output of certain potteries being considered by experts equal to the best made in the Continental factories. During the World War a very satisfactory porcelain for use in scientific laboratories was developed in America. See *Pottery*.

Pottery. Any article or product formed from soft, moist clay or claylike material and hardened by means of heat. The term thus includes products ranging in character from ordinary brick to finest porcelain. In common usage, however, *pottery* generally refers to the class of clay or ceramic products which comes between these extremes.

Production of pottery depends chiefly, first, on the fact that moist clay is so plastic that it may be worked or molded into almost any form; secondly, on the fact that, under the action of heat, the plasticity is destroyed, and soft clay becomes hard and durable.

After an article of pottery has been heated or *fired*, it has either a porous, open structure or a nonpermeable, vitrified, or glasslike, body. Porous ware includes terra cotta, fired refractories such as fire brick, and earthenware. *Terra cotta* includes all permeable, unglazed, clay products which fuse or lose shape if heated to 1650° C. The term is applied more narrowly to red-brown or yellowish red ceramic ware used for architectural or decorative purposes. Refractories are similar to terra cotta but must endure a temperature of 1650° C. without fusing or losing shape. Ceramic products having a permeable body covered with a glaze or enamel are classed generally as earthenware. Pottery having a *vitrified body* is divided into *stoneware* and *porcelain*. Stoneware is *opaque* and has usually more or less color; porcelain is *translucent* or partly transparent and is generally white.

The potter's art was known thousands of years before the Christian era. Wherever clay was to be found, man learned in prehistoric times to fashion it into useful articles and to harden these by heat. Thus, pottery was developed independently by the Egyptians, the Chinese, and the Aztecs or their ancestors.

Raw clay must be purified and tempered before satisfactory pottery can be made. For this purpose weathering or exposure to the elements for several months is often practiced. Stones and coarse material may be removed by screening and washing, and uniform plasticity obtained through grinding, kneading, and mixing, usually by machinery. Fine clays are often mixed with large amounts of water so that any coarse particles settle out. The thin mixture is then pumped through filter presses, which retain the clay and allow the water to escape. There are many kinds of clay; the finest—white burning china clay—is called *kaolin*. Iron is the most common impurity, imparting the red color characteristic of terra cotta and brick. Kaolin lacks plasticity; *ball clay* is highly plastic and, when burned, gives rise to white products; *slip clay* melts at low temperatures and is often used as a natural glaze.

When clay has been reduced to proper consistency, it is formed into pottery by *throwing* on a potter's wheel, or by means of molds. A potter's wheel is merely a horizontal, rotating table driven either by power or by the foot of the operator. A lump of clay is placed on the center of the table, and, as it turns under his hands, a skillful potter can produce almost any desired circular form, such as a flat plate or hollow vessel. The surface is smoothed with a wet sponge or a piece of leather and the piece is removed from the wheel. When dry, it may be made perfectly symmetrical by turning in a lathe. Rotating forms called *jiggers* are generally used when many pieces of the same size and shape are to be produced. Irregular shapes are molded, and large vessels may be made up from several molded pieces. Thin pieces are sometimes cast from a mixture of clay and water in a porous plaster of Paris mold, which absorbs much of the moisture. Small parts, such as spouts and handles, are cemented on by means of a thin suspension of clay in water.

When the pieces have dried, they are carefully packed in oven-like, clay containers called *saggers*, which are stacked up in the kiln. Firing requires from 24 to 60 hours, after which the pottery is allowed to cool very slowly. The ware is now in the stage known as *biscuit*. It may be decorated and is then glazed by being dipped into thin, watery mixtures of enamel, dried, and again fired for several hours. During the second firing, most enamels change to a transparent glass through which any decoration is plainly seen. Decoration may also be applied to the unfired enamel or to the fired glaze. Enamels containing tin are white and opaque, while lead enamels are softer and transparent. Very hard, transparent, lead glazes are produced by addition of feldspar, borax, and flint. Salt glaze is made by volatilizing salt in the furnace. The salt vapors combine with the surface of the biscuit ware, yielding a cheap, comparatively soft, but quite effective glaze.

Particular kinds of enamel and types of decoration often characterize the products of certain potteries. Thus Delft, a town in the Netherlands, has long been famous for its decorated, tin enameled pottery. *Majolica*, named from the island of Majorca, is another highly decorative, tin enameled ware. *Yellow ware* is earthenware made from clay which burns to a buff color, covered with transparent glaze. *Rockingham ware* is usually yellow ware covered with a dark brown glaze. It resembles pottery first made on the estate of the marquis of Rockingham. *White granite* or *ironstone* is a bluish white stoneware from which most of the ordinary American crockery is made.

Building bricks were made in Virginia as early as 1612, and white ware was first produced in America about 1684. White ware with underglaze decorations was first produced about 1770, and hard porcelain in 1825. Architectural terra cotta was made in the United States about 1870, and eggshell porcelain, in 1884. Possibly the most famous pottery in America is made at the Rookwood Pottery, of Cincinnati, Ohio. See *Porcelain.*

Pressure Cooker. One of the most popular devices for quick and convenient cooking in the modern American kitchen is the pressure cooker. It is usually made of aluminum or appropriate metal, which may be sealed for cooking or sterilizing under high-pressure superheated steam.

Raisin. A dried grape of special type. All grapes will not make raisins, one requirement being a high content of sugar which not only imparts the characteristic sweet taste but also acts as a preservative. Raisins are produced chiefly in the countries which border on the Mediterranean Sea and in California. The principal varieties of grapes used are the Muscat, Thompson seedless, and Sultana, which is also without seeds.

When the grapes are ripe, the bunches are usually cut from the vines and exposed to the sun on trays, with occasional turning so that drying will be uniform. About three weeks is the average time of curing, and, to hasten the process and avoid the danger of rain, some growers complete the process in artificial dryers.

Rayon. A manufactured textile fiber resembling silk in appearance and sometimes called artificial silk. The material from which it is made is either cotton linters or wood pulp. The raw material is treated with acids or other chemicals in order to make it soluble. It is then dissolved in alcohol and ether, or other suitable solvents, and, after purification, is forced through very small openings. It emerges as fine threads, which become solidified by evaporation of the volatile solvents or by passage through a setting bath.

There are four principal processes in use, of which the above is a generalized description. All are derived from the process devised by a French scientist, Chardonnet, about 1889.

The use of rayon has grown at an amazing rate. In 1922, the consumption of rayon in the United States was by weight about half that of silk. In 1926, the two were about equal. In 1931, 150 million pounds of rayon were used and 79 million pounds of silk. The United States leads the world in rayon production and is followed by Great Britain and Italy.

Rayon is smooth and lustrous, like silk, providing a beautiful fabric at a low cost. Most rayons, being pure cellulose, are very durable if not subject to wear in excess of their strength. Rayon yarn has comparatively low tensile strength, which is still further reduced when the fiber is wet. For this reason, it is frequently mixed with cotton or wool. The resulting fabric usually has better wearing qualities than rayon and is more decorative than cotton or wool.

Rifle. A firearm having spiral grooves cut on the surface of its bore. When a shot is fired, the bullet follows the path of the grooves until it leaves the barrel. It consequently receives a spinning motion, which greatly increases the accuracy of its flight.

A rifle usually means a small gun which is fired from the shoulder. But, with a few exceptions, all modern firearms, from the smallest pistol to the great guns of a battleship, are rifled. *Automatic rifles* and *pistols* are automatic only in the sense that they are self-loading; the trigger must be pulled before each shot. A loaded *machine gun,* however, continues to operate automatically as long as the trigger is depressed.

Rubber or **Caoutchouc.** An elastic gum obtained from the milky juice, or latex, of many tropical trees, vines, and shrubs. This latex contains the rubber as small suspended globules. In 1770, when it was learned that a piece of the material was useful for rubbing out pencil marks, it received the name rubber. The principal source of rubber has been the rubber tree, which is native to the valley of the Amazon.

Early experimenters tried to make shoes and clothing waterproof by covering the fabric with raw rubber. In 1823 Charles Macintosh produced rainproof garments by sewing a thin sheet of rubber between two of cloth. Such articles could not be generally useful because the gum became soft in hot weather and brittle in cold.

This difficulty was solved by Charles Goodyear in 1844, when he patented his process of *vulcanization,* in which rubber is mixed with powdered sulphur and heated. A low temperature and a small amount of sulphur produce a soft, elastic rubber; greater heat and much sulphur produce a completely vulcanized, hard rubber. *Vulcanite,* from which combs and thousands of other articles are made, contains about 32 per cent of sulphur.

Persistent experiments under British initiative in the East Indies resulted, during 1890–1900, in the successful cultivation of the Brazilian rubber tree in that region. As a result of scientific research, the quantity of the latex from each tree was increased and the quality was improved. The latex is coagulated on the plantation by the use of acetic acid or by other methods, thereby improving the texture of the rubber and shortening the time required for treatment in the factories. The coagulated rubber, washed, rolled into sheets, sun dried, and usually smoked to kill enzymes, is then shipped to the factories. Often, however, the latex itself is sent to the factory, where it is sprayed into heated chambers. The moisture evaporates from the latex in the process, and the rubber falls in flakes at the bottom of the chamber.

At the factory, the rubber is heated to make it plastic, and sulphur, fillers, accelerators, and pigments are added. When mixed to a homogeneous mass, it is then shaped into the required forms and heated with steam, which causes it to react with the sulphur and become vulcanized. Rubber spread on cloth, for producing rubberized fabrics, is vulcanized by the "cold" process, being hung in the vapor of sulphur monochloride.

Rugs and Carpets. Patterned fabrics generally employed as floor coverings. A floor rug differs from a carpet by being woven usually in one piece of a definite shape and design. A rug, also, unlike a carpet, is not intended to cover the whole floor. Both fabrics are usually woven with a pile, or raised surface of tufts, either cut or looped.

The weaving of rugs is one of the most ancient of industries. Rare specimens of decorative textiles in the Cairo museum dating from the 15th century B. C. indicate that the more ancient rugs made in Egypt did not have a pile, or nap, but were woven like tapestries. The earliest extant examples of rugs having a piled surface date from the 3rd or 4th century A. D. They were made in Egypt and are now in the Victoria and Albert museum, England.

From time immemorial, China and southwestern Asia have been noted for their beautiful rugs, and this industry remains today in almost the precise form under which it was carried on thousands of years ago. The rugs are laboriously woven by hand in the most primitive manner. By reason of the skill of the weavers, however, rugs of the Orient hold a unique place in the world's markets, being unsurpassed for coloring, artistic patterns, and durability.

Oriental rugs are woven on a simple frame consisting of two poles supporting two rollers. The poles are usually fixed upright in the ground with one roller attached to the top of the poles and the other below it at a distance about equal to the desired length of the rug. To the rollers is fastened a warp of strong threads, the number of which determines the width and fineness of the rug. To each

thread of the warp, short pieces of colored wool, silk, or hair of camels or goats are knotted in such a way that the two ends project toward the worker. The arrangement of these tufts by color produces the design in the finished product. A weft thread is then run in across the warp. A second row of knots are made on the warp threads, and a second weft thread is run in. The rows of tufts and the weft threads are pressed together by a comblike instrument, thus producing a compact textile with a pile. The projecting tufts are carefully clipped to make an even surface. The number of knots to the square inch varies ordinarily from about 50 to 400, although a few rugs are still more closely woven. The royal Ispahan prayer rug, made in the 18th century for the shah of Persia, has more than 1000 knots in each square inch of surface. The designation prayer rug has reference to the wide use of rugs among Mohammedans as a fabric upon which to kneel during prayer. Their designs generally have a religious significance.

Oriental rugs are usually classified according to the geographical divisions in which they are produced. Fabrics from each locality still have a distinctive character, although, in recent years, the sharpness of the distinctions have tended to be obscured because of the demand for rugs made to order. An account of the outstanding types is given in the following paragraphs.

Chinese rugs are readily distinguished by their looser texture and beautiful background of blue, gold, red, or tan. The designs are usually detached figures of dragons, kilins, lion-dogs, the animal signs of the Chinese zodiac, or emblems of Buddhism and are wrought predominantly in grayish blues, yellows, and creams, as well as in delicate pastel pinks and shades borrowed from Chinese silks and porcelains. The warp is always of cotton.

Bokhara rugs are woven by tribes, still largely nomadic, living in Bokhara, a district of Central Asia north of Afghanistan. They are made of fine durable wool with a liberal mixture of goats' hair. A Bokhara rug may be recognized by its wide selvages and long fringes at the ends and by its octagonal patterns on a field of rich maroon or dull crimson. *Afghan rugs* have a somewhat similar design on a deep red background. The choice of red as the dominant color is said to be determined by the religion of the weavers, who are worshippers of fire. *Beluchistan rugs* also are red and have simple floral or mosaic patterns. They come from western India.

Caucasian rugs are lighter in tone than those described in the preceding paragraph. They are made in the district lying between the Caspian Sea and the Black Sea. The finest of them are the *Daghestan rugs*, which are usually made of lambs' wool. The ground color is deep blue or ivory and is always well covered by geometrical designs, including octagons, hooks, crosses, and eight- or six-pointed stars. Daghestan rugs never exceed four by seven feet in size. Other Caucasian rugs are the *Shirvan rug*, very similar to the Daghestan; the *Kazak*, made by brigand Cossack tribes and distinguished by an unusually thick, heavy pile, which gives the fabric great durability; the *Cabistan*, which is long and narrow; the *Soumak*, or *Kashmir*, known by its straight lines and somewhat whitish effect; and the *Saruk* rug, which is richly ornamented with floral designs on a warm red or brown background.

Turkish rugs include the *Bergamo rug*, made near ancient Pergamum and distinguished by an open bold design with rosettes placed here and there and by a wide selvage at each end. The warp and woof are made of colored wool. *Smyrna rugs*, having a linen or hempen warp and filling and a pile on both sides, have been extensively imitated in America by machine processes, although the patterns in the American products are much simplified.

Persian rugs are the finest rugs made. Among the finest Persian rugs are those of *Kirmanshah*, a province on the Arabian Sea. These rugs are closely woven, often having more than 400 knots to the square inch. They usually have a central figure consisting of a floriated medallion on a rich background of old ivory, rose, or blue, and the borders are variegated with a maze of floral designs.

Other Persian rugs include *Mossoul rugs*, *Mahal rugs*, *Serebend rugs*, *Serape rugs*, *Meshed rugs*, *Saruk rugs*, and *Kurdistan rugs*. The last named are readily distinguished by their field color of deep blue or strong, rich red, on which is placed a large central figure. The design of this figure is matched by similar ornamentations at the corners of the rug. The Serebend rug also is easily recognized. On a field of rich blue or red is woven a small uniform loop pattern, which is said to have been intended originally to represent a bend in the sacred river Indus. Mahal rugs come from Sultanabad, in northwestern Persia. The name means "made to order," and, in America, many weaves properly designated by other names are sold as Mahal rugs because they are made at or near Sultanabad in fulfilment of orders. Persian rugs are noticeable in general for the profusion of their conventionalized floral figures.

The weaving of rugs and carpets was introduced into Europe by the Moors, but it was not practiced on a large scale before the 17th century. Ingrain carpet was manufactured at Kidderminster, England, as early as 1735. This carpet is woven with two or more colors of yarn, the design appearing in different colors on different sides of the fabric. It is known as *Kidderminster* or *Scotch carpet*.

Brussels carpet, made in imitation of floor tapestries then manufactured at Brussels, was first produced in England in the middle of the 18th century. It has a warp and a weft of cotton or jute, which serve as a body for extra warps of worsted. These warps are looped over wires and thus produce the characteristic ridges of Brussels carpet. The designs are made by the use of one layer of worsted thread in the warp for each color required in the design, all threads being concealed in each part of the fabric except the one having the desired color.

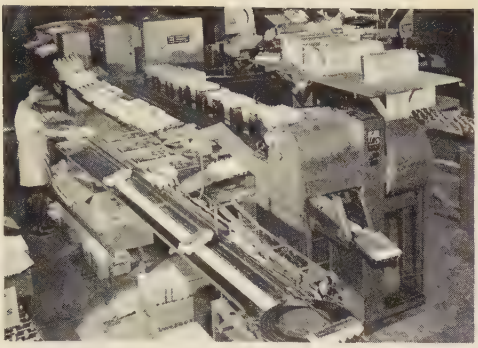
Wilton carpets and *rugs* are made like Brussels carpet, but the loops are cut so that a velvety appearance results. The materials used are generally better, and the weaving is finer. The designs are largely adaptations of Oriental models.

Tapestry and *Velvet rugs* have only one worsted warp instead of several. The designs may be printed on the warp before weaving, allowance being made for the distortions due to looping the worsted threads over the wires. A more recent process is to print the design on the rug after the weaving is completed.

Axminster rugs are distinguished by a loose, soft texture, and the colors in the patterns are not limited by the number of layers of threads in the warp. American Oriental rugs are modifications of Axminsters, the pattern being brought through to the back. They are distinguished from true Orientals by the fact that the tufts are looped about the warp threads instead of being knotted. *Smyrna rugs*, originally woven near Smyrna, Turkey, are made in America by weaving chenille, that is, tufted cords of wool, cotton, or worsted, as an extra weft into a body of cotton or jute warp and weft. They are made with Oriental patterns and are reversible. *Chenille Axminster rugs* are the richest and most costly of machine-made rugs. They are made like the Smyrna rugs, except that the chenille cord is steamed and flattened into a braid with fuzz on one side only. The pile of these rugs varies from three-eighths of an inch to one inch. Most of them have plain fields with two or three tone effects.

Other American rugs include those made by the *Navajo* Indians. These rugs are usually known as blankets, but, on account of their firm texture, they are often employed as floor coverings.

The first carpet factory to be established in America began operation in 1791 at Philadelphia, where now more carpets are produced than in any other city of the world. The best and most costly rugs, however, continue to come from Oriental countries.

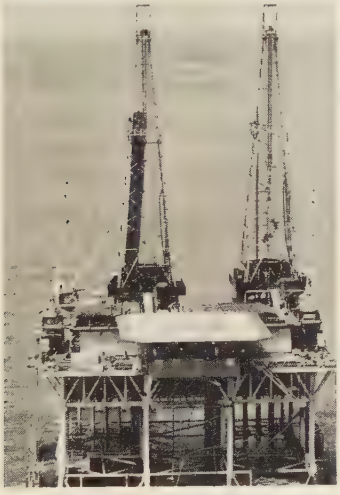


This automatic egg-handling system, with only 3 operators, semi- or fully-automatically handles unpacking, cleaning, blood spot detection, candling, counting, shell processing, packaging, and packing up to 35 cases of eggs per hour.

At work in a West Virginia coal mine, this continuous miner rips coal from the face of the seam and passes it back to a conveyor belt or shuttle cars at a rate of up to eight tons a minute, eliminating the separate operations of cutting, drilling, blasting, and loading.

Photo *Joy Manufacturing Co.*

INDUSTRY IN ACTION I

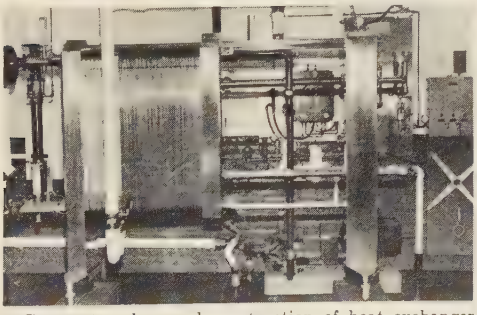


Left Twin drilling derricks tower 238 ft. above the waters of the Gulf of Mexico. The twin-rig platform contains a "built-in" power plant and, under the helicopter deck, living quarters and recreational facilities for the 40 men who drill the wells.

Courtesy *Humble Oil & Refining Co.*

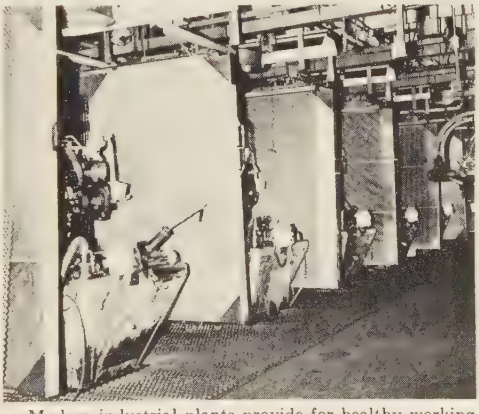
Right The "Newschief," transistorized TV camera and portable television transmitter is shown here. Because it uses less electrical power, the transmitter may also be used with the power supplies of airplanes, land or sea vehicles, or even in missiles. The entire pack weighs less than 30 lbs.

Courtesy *Sylvania Electric Products, Inc.*



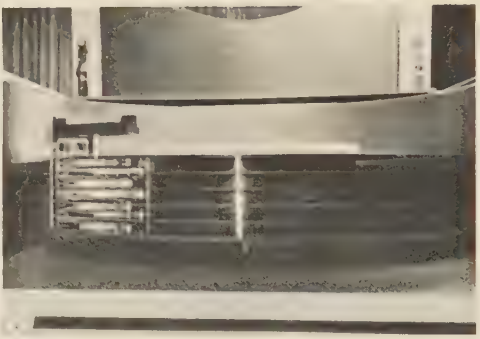
Compact and rugged construction of heat exchanger installations have extremely high heat transfer efficiency. Such modern installations are standard equipment where heating, cooling, pasteurizing, and sterilizing of all types of processed liquid foods and juices must be carried out under very sanitary conditions. Shown here is a wort cooling installation in a brewery, with a capacity of 200 barrels per hour.

Courtesy *A. P. V. Company, Inc.*



Modern industrial plants provide for healthy working conditions. Note the chain wall guards between the motor stands, plus sound shields.

Courtesy *Ford Motor Co.*



Designed for small and medium-size business firms, this compact data processing system is being loaded with a new-type memory disk pack. In the picture sequence, the operator carries a disk pack containing six 14-inch memory disks to the computer. She places the disks on the disk storage drive spindle, removes the pack cover, and the unit is ready to operate—elapsed time: less than one minute. Disk packs can be removed in the same manner and stored like books on a library shelf until they are needed again. It is possible for a company to maintain a separate disk pack for each major data processing job. The disk packs, which weigh less than 10 pounds, have a storage capacity of nearly three million characters of information.

Courtesy *International Business Machines Corp.*

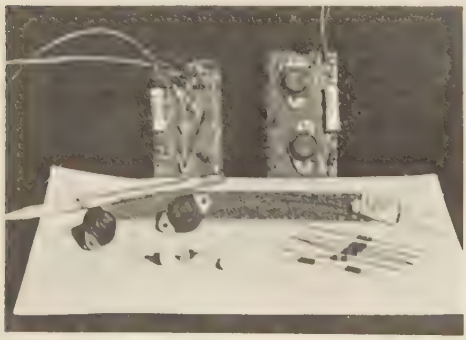


Exhibit of a Digital Computer, by a high school student, for the annual Science Congress. The machine deals with real, rational numbers and can add or subtract numbers up to 10 million. It contains a quarter of a mile of wire and is composed of over 1000 electronic parts. The Science Congress continues to do much to interest and instruct students in all areas of science.

INDUSTRY IN ACTION II

MACHINE STATIONS IN THE AUTOMATED PRODUCTION LINE FOR MAN[illegible] DEPOSITED CARBON RESISTORS

Silk. A fine, strong fiber produced by certain insects, usually for the purpose of providing themselves with a protective covering, or cocoon. Most commercial silk is produced from the cocoon made by the larva of the mulberry-eating silk moth, which is cultivated chiefly in China, Japan, Syria, Persia, Italy, India, and France. According to Chinese history, the industry was begun by Si-ling-Chi, wife of the third emperor, about 2600 B. C. It developed to such a high state of perfection that Chinese silks were sold in Greece and Syria for their weight in gold. Death was the penalty for taking the eggs of the silkworm out of the country, and the secret was so well guarded that the true origin of the beautiful fabrics was unknown in Europe for many centuries. About 550 A. D., at the direction of the Roman emperor Justinian, two monks who had been missionaries in China brought to Constantinople a supply of the eggs concealed in their hollow bamboo staffs.

The silk moth is a small insect having broad, white wings marked with black lines parallel to the sides. In summer, the female, which cannot fly, lays about 500 sticky eggs and dies a few days later. The eggs hatch in the next spring, producing worms about $\frac{1}{8}$ inch long, which feed almost continuously on fresh mulberry leaves, and grow so rapidly that they shed their skins 4 times within 6 weeks. At that time the green worms, which have reached a length of about 3 inches, begin to spin their cocoons. The thread is produced from a gluelike material secreted by two narrow glands which connect with an opening on the upper lip, called the spinneret. On exposure to air, the fluid hardens, forming a sticky thread which the worm winds about itself by a continuous, regular motion of the head.

Spinning is completed in about 3 days, and, if the cocoon is left for 2 or 3 weeks, a moth will force its way out through one end. The escape of the moth breaks so many threads that only enough cocoons are saved to provide another crop of eggs, and the remainder are heated so as to kill the pupa.

They are then assorted according to color and texture, the loose, irregular floss is removed from the outside, and the compact, creamy ovals placed in hot water in order to soften the gum which binds the threads together. Here they are stirred by means of a brush until the loose end of each coil is found. The threads from 4 or more cocoons are twisted together into one strand and then reeled into skeins of *raw silk*. A single thread is usually from 400 to 800 yards long. Only about 70 per cent of a cocoon can be reeled. The remainder, together with damaged cocoons, is combed and spun like wool into *spun silk*. There are about 35,000 silkworm eggs to the ounce. These will yield about 100 pounds of cocoons and 11 pounds of raw silk.

The skeins of raw silk are placed in linen bags and soaked in warm soapsuds to soften the gum; they are then dried and wound on spools. The next process, known as *throwing*, prepares the silk for weaving. That fiber called *organzine*, which will form the *warp* of cloth, is twisted, then doubled and twisted again so as to form a strong thread. *Tram*, or the material for filling the warp, is not twisted so tightly. The threads to be used for crêpes are very highly twisted. After throwing, the thread is stretched evenly on a special machine and then rewound into skeins to be dyed.

The dyer boils the skeins in soapy water until the gum is removed and the threads are soft and lustrous. They are then rinsed and passed to the dye vat. The boiling process causes a loss in weight of about 25 per cent. The desire to avoid this loss resulted in the process of *loading*, by which the fiber is made to unite with chemicals such as compounds of tin, which sometimes weigh several times as much as the silk. This process is generally injurious to the fabric and is not now practiced to such an extent as formerly.

Two of the chief requirements for commercial production of silk are a supply of cheap labor and of mulberry leaves. Lack of the former explains why silk growing has never been successful in the United States. However, silk weaving, performed by very complicated machinery, is a thriving industry. In modern factories two pieces of silk velvet or plush are woven face to face and then separated by a sharp knife which cuts the pile threads. *Crêpe-de-chine* is produced by alternating right and left twisted threads in the warp and filling with a soft tram. *Georgette crêpe* has hard twisted threads in both warp and filling. Sewing silks are highly twisted threads, while floss and embroidery silks are loosely twisted.

A green tinted silk, used in China and Japan, is produced by the Japanese oak-feeding silk moth. The natives of India manufacture *tussah silk* from the hard grayish white cocoon of the undomesticated tussah moth. Several other varieties are also known.

Artificial silk is produced by several processes which usually depend on dissolving cotton or wood pulp to a thick liquid. This is forced through fine holes into some material that will cause the threads to harden. It is not usually so soft, nor has it the strength and elasticity of true silk, but improvement is taking place rapidly and the product is becoming more and more important. See *Rayon*.

Soap. A cleansing agent usually prepared by the action of caustic alkali on vegetable and animal fats. A fat is a chemical compound of glycerin with one or more fatty acids. In the presence of a caustic alkali, the fat breaks down; the acids combine with the alkali to form soap, while the glycerin remains in the solution. The alkalies used are caustic potash, which yields *soft soap*, and caustic soda, which gives the ordinary hard soap. The fats come from many sources and are usually of low grade, but some of the finest soaps are made from edible oils. Coconut, castor, corn, cottonseed, and soy bean oils are consumed in enormous quantities, together with various animal fats and tallows.

The lye and fat may be mixed in the proper proportions and allowed to react without being heated. This produces *cold process* soap. In the *Krebitz process*, the fats are saponified with milk of lime, and the resulting calcium soap is changed to soda soap by boiling with sodium carbonate. But 90 per cent of the soap used in the United States is made by boiling the fat with a solution of caustic soda. When the action is complete, salt is added until the soap is thrown out of solution and floats at the top of the kettle. The spent lye is drawn off and concentrated in vacuum pans in order to recover the glycerin. The soap is then given a second boiling with a small amount of fresh caustic, again salted out, and settled for some time before it is drawn off into *crutchers*, where it is very thoroughly mixed. *Filling*, such as water glass, washing soda, borax, or naphtha, is often added during this so-called *crutching process*. *Floating soaps* are produced by operating the crutcher in such a manner as to incorporate a large amount of air in the soap and thus make it slightly lighter than water. From the crutchers the pasty liquid is drawn into narrow iron boxes called *frames*, where it stands until cool and hard. The iron shell is then removed and the huge slab is cut into cakes by pressing against a series of tightly drawn wires.

Toilet soaps are usually produced by milling. This consists in passing the soap between heavy rollers which reduce it to narrow ribbons. The ribbons may be dried and perfumed and are then forced by a powerful screw press through an opening about the size of the cake into which the pieces are pressed. Transparent soaps are made in various ways; for example, by adding sugar to a soap made with much castor oil, or by dissolving ordinary soap in alcohol and then evaporating the solvent.

Marine soap and *hard water soaps* usually contain a large amount of coconut oil. Cold process soap contains all the glycerin of the original fat. Pure *castile soap*, named from the province of Castile in Spain, is made from olive oil. The best soaps usually result from a mixture of tallow with some

coconut and other vegetable oils. Many soaps contain rosin, but with one or two exceptions rosin is seldom used in a product intended for toilet purposes. *Shaving soap* is prepared chiefly from coconut and palm kernel oils, which impart its lathering qualities. Great care is taken to avoid retaining any free alkali, which is irritating to the skin. Small amounts of gum or other substances are often added so the lather will dry more slowly.

Just how soap washes and cleans is a problem which science has not yet answered completely. The process was formerly believed to be chemical; but, according to more recent views, soap removes the greasy particles of dirt by *emulsifying* the oil which holds them in place. That is, soap causes the oils to separate into minute globules which mix with the water and are carried off by it.

Other *detergents* besides soap are now produced in quantity in the United States. Often called "soapless soap," these synthetic detergents, which are generally sold in powder form under various trade names, are extremely popular for household uses, especially laundering and dishwashing.

Soda Water. A slightly acid beverage having a peculiar pungent taste due to carbon dioxide gas which has been forced into the water under pressure. When the liquid is drawn into a glass and the pressure released, the gas forms characteristic bubbles as it escapes from solution.

Starch. A white, granular substance, insoluble in cold water, that is found in all green plants, where it serves as a reserve food supply. Large amounts are found in many seeds and in certain roots and tubers, especially corn, wheat, rice, beans, potatoes, sweet potatoes, and cassava, or manioc. Food starches also include *arrowroot*, obtained from a West Indian plant; *sago*, from the pith of various palm trees; and *tous-les-mois*, from certain varieties of canna. Pure starch alone will not sustain life, but, in its natural forms or as products made from them, it constitutes the greater proportion of human food.

The grains of starch from different sources generally have a characteristic shape and size by which they can be readily identified when seen under the microscope. Starch turns blue when treated with tincture of iodine, as may be shown by placing a drop of this solution upon a piece of potato or bread. Hot water causes the grains to swell until they burst, and, on cooling, the paste sets to a stiff gelatinous mass.

In Europe, much starch is produced from potatoes, but, in the United States, over 90 per cent is made from corn, usually by the sulphur dioxide process. The grain is soaked from two to four days in water containing one per cent of the gas from burning sulphur. When sufficiently soft, it is ground, and carried by a stream of pure water over sieves, which permit the starch to pass but retain the germs and husks. As the germs float, they are skimmed off and pressed to recover the valuable oil which they contain. The residue is sold for cattle food. The water with its suspended starch is passed over a series of gently sloping surfaces, on which the heavier particles are left. The remainder flows to settling tanks, from which the starchy sediment is collected to be further refined by washing and straining until sufficiently pure. The separated starch is dried by artificial heat until the mass breaks into lumps.

Besides its chief uses for food and laundry purposes, starch is employed in the preparation of glucose and dextrin, in printing and finishing calico and other cloths, and in making special kinds of paste. See *Bread*, *Flour*, *Glucose*, *Sugar*.

Sugar. A sweet crystallizable substance found in the juices of many plants. The term includes a group of chemically related compounds such as *grape sugar*, *fruit sugar*, *milk sugar*, and *malt sugar*; but, except in a technical sense, sugar means the very valuable food called *cane sugar* or *sucrose*. Any substance having a sweet taste was formerly called sugar, hence the name *sugar of lead* for poisonous lead acetate. A sugar of some sort appears to be the first carbohydrate formed in green plants, where it serves as a food for the growing parts or is changed into starch and stored as a reserve. The principal sources of sugar are the *sugar cane* and *sugar beet*.

The use of sugar and of sugar cane seems to have originated in India at a very early period. During the middle ages it was carried by Arabs to Egypt and southern Europe, whence it was introduced into Louisiana in 1751. The first refined sugar was made about 1791, and the first commercial crop was harvested in 1795.

Sugar cane is a giant grass, raised chiefly in Cuba, Puerto Rico, Louisiana, Hawaii, the Philippines, Java, and India. It is usually from 6 to 15 feet high, with narrow cornlike leaves at the top. The stalk is from 1 to 2 inches thick and is composed of short jointed sections which may be yellow, green, purple, or striped, depending on the variety. The plant may be raised from seed, but usually pieces of stalk are planted in shallow furrows running the length of the field. At each joint there is an eye, or bud, from which a new stalk springs up.

In Louisiana the harvesting occurs between October and January; in tropical countries, from January to June. The cane is cut close to the ground with a broad knife about 18 inches long which has a sharp hook on the back. The leaves are stripped off with the hook, the top cut away at the last mature joint, and the cane stacked until it can be taken to the factory. New crops will grow from the stubble for several seasons, but the general practice is to replant a part of the field each year.

At the factory the canes are shredded and then passed through a series of heavy rolls, which squeeze out the juice. Water is usually sprinkled upon the cane before the second pressing in order that the extraction may be as complete as possible. The crushed cane, called *bagasse*, is used for fuel. The juice is a gray or green liquid which contains, in addition to sugar, many impurities, such as glucose, gum, albumin, acids, and ash. These are removed by treatment with lime, other chemicals, and heat.

Sugar is obtained by evaporating the purified juice, usually under vacuum, to a heavy sirup. This is run to another vacuum kettle called the *strike pan*, where boiling is continued until crystals of sugar form and grow to the proper size. The mixture of sugar and sirup, called *massecuite*, is stirred and fed to centrifugal machines lined with fine screen, which retains the crystals and allows the molasses to escape. A second and a third yield of soft sugar are often obtained from the molasses, of which the uncrystallizable residue is ultimately sold to distilleries or for cattle food. A certain amount of the best grade is used in cooking. If the molasses is separated from the massecuite by draining rather than by centrifugal force, the sugar is not so pure and is called *muscovado*.

Brown, or *raw*, *sugar*, so prepared, is usually shipped in bags to a refinery, where it is dissolved, filtered, treated with chemicals, decolorized by means of bone black, and again boiled under vacuum until the small white crystals of granulated sugar are formed. These are dried and sifted into the standard sizes. *Loaf sugar* may be made by molding the sticky grains under centrifugal pressure, then drying and sawing the resulting blocks to the proper size. By a more recent process, however, the individual blocks are molded in presses, from a specially prepared soft, white grain. *Powdered* and *confectioners' sugars* are prepared by passing the crystalline variety through a disintegrator that reduces it to very fine particles, which are graded by sifting.

The sugar beet, which is extensively cultivated in Europe and the United States, grows best in a temperate climate where the soil is suitable and where the average summer temperature is about 70° F. It is white and usually contains 12 to 18 per cent sugar, compared with 10 to 16 per cent in

Louisiana cane. The seeds are usually planted in April and May. At harvest time, which begins in August or September, the beets are pulled up, and the leaves cut off just below the top or neck. The beets are then carried to the factory to be carefully washed and weighed. The clean beets are cut into very thin slices, packed into a series of tanks, and treated with warm water, which dissolves the sugar together with many impurities. The exhausted chips are pressed, dried, and sold for stock food or fertilizer.

The solution is purified with lime, bleached with sulphur fumes, crystallized, and the sugar is refined in much the same way as that from cane. Special efforts are made to obtain as much sugar as possible from the molasses. Neither the raw beet sugar nor the molasses are fit to eat, but, when the raw product has been properly refined, it is impossible to tell whether it came from beet or cane.

Jaggery, the sugar obtained from several varieties of the palm, has been used in India since very ancient times. It is obtained by tapping a hole in the tree and collecting the sap which runs out. This is boiled with a little lime, until a sirup forms which will harden on cooling. A large tree will yield 30 to 40 pounds of sugar per year. The sirup has long been an article of commerce under the name *date honey*.

Maple sugar is made in North America wherever the sugar maple is found, but Quebec, Ontario, New York, Vermont, Ohio, and Pennsylvania are the most important producing centers. Sap begins to flow in the trees at the end of winter and is collected by drilling into the base of the trunk one or more small holes about 1½ inches deep. A spile or trough is driven into each hole to conduct the sap into a bucket. The juice, which is unusually free from impurities, contains an average of 3½ per cent of sugar. It is boiled down over an open fire or in a modern evaporator to a heavy sirup, or, if sugar is wanted, until the liquid will become solid on cooling. The average amount of sugar from each tree varies from 2 to 3 pounds. Maple sugar is highly valued because of its characteristic flavor, and is sold as raw sugar and as sirup. If it were refined, it would be exactly the same as the product of cane or beet.

Thermos Bottle. The trade name for a practical device invented by Sir James Dewar about 1892 for the purpose of containing intensely cold, liquefied gases. It is also called a *vacuum bottle*, as it consists essentially of a double walled bottle or flask in which there is a high vacuum between the walls. Radiation is prevented by silvering the walls, and there is of course nothing to conduct heat across the vacuum. The small opening to the flask is usually stoppered with a thick cork, this material being a very poor conductor of heat.

Hot substances stay hot for long periods in a vacuum bottle because the heat cannot get out, and cold substances remain cold because heat from the outside cannot get in. Such containers have generally been made of glass, which requires careful handling. An improved type is constructed of metal, thus avoiding the fragility of the glass product.

Time-pieces. Modern time-pieces are known chiefly as watches or clocks. Watches, being for personal use, are smaller and are driven by a spring. Clocks are driven either mechanically, by spring or gravity (by means of weights), or by electricity.

Mechanically driven time-pieces consist essentially of a system of wheels controlling indicators, or "hands", on a dial, the wheels being actuated by a force and their revolutions made uniform in speed by a governing device, known as an *escapement*.

The escapement is ordinarily a rod curved in the arc of a circle, each end being provided with a specially shaped cog, or detent. The rod is pivoted at the center. The escapement, being driven usually by the actuating force of the clock, oscillates on its pivot. The ends of the escapement alternately engage and release cogs of a wheel, which is also driven by the actuating force of the clock. The result is to cause the wheel to revolve in equally timed jumps. In gravity clocks, a pendulum governs the movement of the escapement.

With the revolutions of a master wheel thus made uniform in time, a system of cog gears is used to make the axis on which the hands are set revolve at the requisite speed to indicate hours and minutes marked on a dial.

The invention of the first mechanical clock is ascribed to Pope Silvester II in 996 A.D. Watches were first made about the time of the discovery of America in 1492. The chief contribution of America to the development of time-pieces has been the devising of mass production methods of manufacture.

The electric clock in common use in America is driven by a small motor so constructed that it revolves once for each "beat" of an alternating current or in some other fixed relation to the beat. Its uniformity of speed is thus dependent on the accuracy of the dynamo which produces the current. The desired speed of rotation of the hands is secured by gearing from the motor to the axis of the hands.

Turpentine. The resinous exudate of several species of pine trees. In America it is obtained during the spring by cutting and scarring the trunk of the long-leaf pine, which grows abundantly in the Southern states. The sap which runs from the cuts is collected, placed in copper stills, and heated until the volatile products are driven off as vapors. These are condensed by means of cold water to *spirits of turpentine*, which, when pure, is a colorless liquid having a penetrating, aromatic odor, and a bitter, burning taste. After distilling off the "turps," the residue, while still hot, is run into barrels, where it hardens to a brittle, transparent mass of *rosin*.

Turpentine is much used in varnishes to hasten drying and in paints for thinning and for producing a dull surface. It is also used in medicine, internally, as an antispasmodic, as a stimulant, and to stop hemorrhages; externally, as a remedy for ringworm and to relieve inflammation. Rosin is used in the manufacture of varnish, soap, sealing wax, cement, sizing, and for many other purposes.

Varnish. A solution of gums or resins which dries to a hard, smooth, transparent film. Varnishes give a pleasing appearance to most surfaces, protect them against the weather, and bring out the beauty of wood even better than polishing. The many kinds of varnish are classified according to the solvent used. Shellac dissolved in alcohol forms the best-known example of a *spirit varnish*. It dries rapidly to a hard, brittle surface. *Turpentine varnishes* also dry rapidly and, being more brilliant and less brittle, are sometimes used in oil paintings.

Oil varnishes, the most important for general use, are made by adding the proper amount of boiling oil to melted gums and boiling the mixture until it becomes clear. It is then thinned with turpentine, cooled, filtered, and pumped to storage tanks to age for at least six months.

Linseed oil and *copal*, a hard resin found as a fossil and on living trees chiefly in Zanzibar and New Zealand, are the principal ingredients of a good oil varnish. Poppy and tung oils are of increasing importance, while available gums include lac, mastic, sandarac, amber, asphalt, and various synthetic resins. Coloring matter, such as dragon's blood, cochineal, or artificial dye, is often added. *Japanese lacquer* is a natural varnish prepared from the sap of a plant. See *Lacquer*, *Tung Tree*.

Veneer. A thin layer of valuable wood, or occasionally other material, glued to furniture or cabinetwork in order to produce a surface more attractive than that which it covers.

Veneers that are sawed from the solid wood are known as *saw cut*; those that are pared, as *knife cut*. Both are made by machinery. Saw cut veneer varies from 1/32 to 1/16 inch thick, while knife cut

veneer is usually much thinner. The use of veneer does not imply cheapness or poor quality. It is the only method by which some rare and beautiful woods such as curly mahogany and burled walnut can be applied to surfaces.

Vinegar. A sour liquid varying in color from light yellow to brownish red, much used as a condiment and for pickling. It is made from weak alcoholic liquors such as hard cider, wine, beer, beetroot juice, or fermented molasses. When liquids of this sort stand exposed to the air at a temperature of about 76° F.. a slimy scum usually forms on the surface. This scum, commonly known as *mother of vinegar*, is a bacterial growth, in the presence of which the dilute *alcohol* combines with *oxygen* of the air to form *acetic acid*. The sourness of vinegar is due to this organic acid, but the characteristic odor and taste are due to the materials out of which it is made.

In the *new* or *quick* process, now generally used, vinegar is produced by draining the alcoholic liquor over some substance such as beech-wood shavings, or clean charcoal which has been previously soaked in strong vinegar. Such a material provides a very large surface on which thin films of liquid are exposed to the action of the "mother" and to the air. By this method vinegar is produced in from 24 to 36 hours as compared with several weeks required by the old process. Vinegar and foods containing it should be kept in glass or other nonmetallic containers, because acetic acid slowly attacks such metals as tin, copper, and brass, forming soluble compounds highly injurious to health.

The strength of commercial vinegar is usually expressed in *grains*. Each grain represents $\frac{1}{10}$ per cent of acid, so that a bottle of vinegar marked 45 grain contains 4.5 per cent acetic acid.

Water Glass. A heavy, colorless solution of sodium or potassium silicate, which becomes hard and glossy when exposed to the air. It is usually prepared by heating fine sand together with washing soda and charcoal, and extracting the fused mass with boiling water. Uses for the alkaline liquid include painting on glass, protecting wall decorations, glazing, and fireproofing. It is an important ingredient in fireproof cement, and is valuable as a coating material for the inside of barrels because it fills any small holes and leaves a smooth, watertight coating. Large quantities are used for filling cheap soaps. When mixed with sand, it hardens to a useful artificial stone. Eggs are often preserved by keeping them covered with a dilute solution of water glass.

Wool. A soft, wavy, modified form of hair, which grows on domestic sheep. No wild wool-bearing animals are known, and, when sheep are raised without care or protection from the elements, the wool rapidly becomes coarse and hairlike. Wool differs from other textile fibers and from hair chiefly in being covered with scales which can interlock and thus cause the fibers to mat together. Wool is elastic, it does not readily absorb water, and the scales hold air in the spaces of a woolen garment, making it very warm for its weight. These characteristics make wool so valuable that the quantity used each year is second only to cotton. Longer fibers very similar to wool are found on the llama and the alpaca of South America; on the Kashmir goats of India; and on the Angora goat, which yields the wool used in weaving *mohair*.

Sheep are not native to America, but were imported by the earliest settlers, who were accustomed to weave their own clothes from homespun yarn. Practically all standard breeds are now raised in this country, wool from the merino sheep being the finest but not the longest.

The wool is generally clipped from the sheep in the spring, and, when there are large flocks, the clippers are power driven, so that an experienced operator can trim 150 to 200 animals each day. All the clippings from one sheep are called a *fleece* and usually weigh from 5 to 8 pounds. Wool taken from the shoulders and back is the best in quality. Lambs' wool is softer and more wavy than sheep's wool. *Pulled wool* is that removed from pelts of dead animals. It is usually of inferior quality because of the treatment given the skins in order to loosen the fibers. Consequently it is necessary to sort the fleeces into various grades. A certain amount is sorted at the clipping sheds, but most of this work is done at the warehouses and factories.

There are many grades and qualities, and several systems of classification, but in general the fibers may be grouped as *combing wool* when over $2\frac{1}{2}$ inches long and rather straight; as *carding wool* when short, fine, and wavy; and as *carpet*, or *blanket*, *wool* when coarse and stiff. *Woolen* goods are made from carding wool, while *worsteds* are woven from combing wool. The chief difference is that woolen thread is soft and composed of crisscross fibers, while worsted thread is twisted hard after the fibers have been combed until they are parallel. Worsted is firm and shows a definite pattern, while woolens are soft, having the pattern almost concealed by the nap.

When the wool reaches the factory, the fleeces are pulled apart, graded, and beaten to remove dust and dirt. The reason wool does not form a mass of felt on a healthy sheep's back is that each fiber is coated with a mixture of greasy materials called *yolk* and *suint*, secreted by the animal. This is removed from the clipped wool by careful *scouring* with soap and soft water. From the wash water *potash* and *lanolin* are obtained. Lanolin serves as a basis for salves and ointments. Most wool is white, but some is black, gray, fawn, or brown. The fiber can be dyed in the form of wool, yarn, or cloth. After scouring is complete, the material may be "dyed in the wool," and dried.

The matted wool is loosened by revolving, toothed drums, and any seeds or burs are removed either mechanically or by a chemical process, which chars the impurities. Oil is added to restore the natural softness; then all the material is uniformly mixed and passed to a series of *carding machines*. These are cylinders covered with projecting teeth, which arrange the fiber in a continuous flat band. This is divided by a *condensing* machine into narrow strips, or *slivers*, somewhat larger than heavy yarn. The sliver is usually spun into twisted thread on a *mule-jenny* and is then ready for the loom.

After weaving, various processes are used to give a cloth the desired surface and finish. In the first step, *fulling*, the fabric is wet with soap and water and pressed or worked between rolls until the shrinkage and degree of felting are satisfactory. It is then rinsed and supported on hooks until dry. The nap of woolens is raised by means of a conelike spike head covered with sharp hooks, which grows on the teasel plant. Artificial *teasels* are frequently used for this purpose.

The fibers for making worsted, unless very long, are also carded and are then put through *combing* and *gilling* machines, which leave them parallel and free from the short, curly pieces called *noil*. They are then spun to a hard, wiry thread, and are woven. *Felt* is a warm, dense fabric made by pressing and beating together unwoven wool fibers. It is much used for making hats. *Shoddy* might be called secondhand wool, for it is obtained by tearing refuse woolen fabrics into fibers which can be rewoven. It is of great value, and is objectionable only when used to adulterate new wool.

Broadcloths and *beavers* have the nap raised and spread in one direction over the face of the cloth. On *overcoatings* the nap is often formed in little curls. In some goods it is left standing as in velvet, and, in the bare-face finish, it is entirely sheared off. *Tweed* is a soft, rough-finished material, originally made in the villages along the Tweed river, Scotland. It is usually woven from two or more different colored yarns. The cloth is finally brushed, stretched on drums under hot water, and steamed while in a hydraulic press in order to develop the luster.

TEST QUESTIONS

Point out several reasons for the widespread interest in economics. Define the term economics. Discuss some industrial effects of *division of labor* 1197

Illustrate commercial co-operation among states and countries 1197–1198

From what circumstances does the conflict between capital and labor arise? 1198

Discuss the function of money as a medium of exchange 1198

What is "wealth" said to mean today? . . . 1198

Point out some characteristics of the "age of industry" 1198

COMMERCE

In what does commerce consist? What does the term commerce generally imply? Distinguish between *foreign* and *domestic* commerce. Explain the phrase "interstate commerce" 1199

State some of the conditions upon which commerce depends. Explain the interrelation between transportation and commerce . . 1199

Describe the commercial system of the ancient Phœnicians. What were the economic conditions that gave rise to the extensive commerce of the Greeks? 1199

What service to commerce did Rome render for five centuries? 1199

What people controlled commerce during the period immediately after the fall of Rome? Summarize the conditions that prevented commerce in Europe in this period 1200

Explain the rise of markets and guilds in the towns of medieval Europe. Indicate the use and importance of the medieval fairs . . . 1200

Indicate the purpose and the power of the Hanseatic league. Point out some events to which Venice owed her commercial supremacy in the Mediterranean 1200

What states became strong commercial powers in the 14th and 15th centuries? 1200

What new sea routes were opened about the end of the 15th century? To what city did commercial supremacy fall at this period? . 1200

By what influences was the commercial power of Spain destroyed? How did Portugal lose her greatness in trade? 1201

Outline the growth and decline of Dutch commerce in the 17th and 18th centuries . . . 1201

Point out the commercial advantages possessed by France between 1500 and 1800. Explain her failure in world commerce 1201–1202

To what two chief factors is the commercial success of England in the 17th and 18th centuries ascribed? Name the most important English trading companies of this period. What were the staple articles of English commerce? 1202–1203

Summarize the chief features of the growth of Canadian commerce. What are the chief articles of Canadian export? 1203

Outline the leading facts about American commerce down to 1812 1203

Describe the important economic development of the United States in the period from 1812 to 1860. Compare the list of chief exports in 1800 with that of 1860 1203–1204

Explain the phrase "triangular exchange" . 1204

What were the most notable effects of the Civil War upon the economic development of the United States? 1204

Show by statistics the growth of United States export trade from 1870 to 1892. Account for the decline of the American merchant marine. Give figures which show the growth of the foreign commerce of the United States after 1860 1204

Point out the amount, and the distribution by countries, of United States foreign commerce in 1913. Show the proportions of United States foreign trade taken by leading countries in 1935 1205

How does the internal commerce of the United States compare in importance with the foreign trade of the United States and of the world? 1205

State the changes in the ranking of leading nations in foreign commerce since World War II. How was the foreign trade of the United States affected? 1205–1206

COMMUNICATION

What emperor first opened the postal system to private use? 1208

By whom were three early European postal systems established? Who was the first "Master of the Post" in England? By whom was he appointed? When and for what purpose was the English money order system established? 1208

Give the date of the introduction of the following in England: penny rate of postage; perforated stamps; mail boxes 1208

Outline the history and some of the regulations of the Universal Postal Union . . . 1208

Outline the history of the colonial postal system in America before the Revolution. Summarize the important reforms and extensions of the United States postal system, giving the date of each 1208–1209

Mention some of the chief conveniences afforded by the parcel post service in the United States 1209

Indicate the rapid development of the air mail service 1209

State examples of the extensive practical development of radio communication 1210

TRANSPORTATION

What methods of propelling their vessels were used by ancient peoples around the Mediterranean Sea? Account for the phrase "galley slave" 1211

Review the early history of the building and use of steamships 1211

Name two Frenchmen and two Scotchmen who are famous in the history of modern road building 1211

Summarize important facts about the history of canal building 1211

State approximately in tons the size of ocean-going ships of American colonial times. Name two famous American shipowners of the beginning of the 19th century . . 1211–1212

Show the conditions that brought about the building of the American clipper ships . . 1212

Outline the development of the chief types of engines used in ships 1212

Trace the increase in size of ocean-going vessels in the 20th century 1212–1213

Recount the story of the American merchant marine down to the World Wars. Indicate the effect of the wars on American shipbuilding. Show by statistics the part played by American ships in carrying American import and export cargoes 1213–1214

Of what importance were rivers in ancient and medieval commerce? 1214

Review the most important canal building projects of modern times in France and England 1214

In what canal building plans was George Washington interested? By what different means were his purposes later realized? . . 1214

In what way did the War of 1812 influence the United States as to the internal improvement policy? 1215

Show why Federal expenditure for rivers and harbors could be renewed and enlarged after the Civil War 1215
Of what economic importance was the Erie canal? 1215–1216
Trace the history of canal development in Canada 1216
State the main features of the Saint Lawrence power-navigation project 1216
By whom was the Suez canal constructed? State its dimensions and original cost. Name the largest stockholder in the canal company 1217
Name the two men to whom the chief credit for the Panama canal construction is due. Describe the course of the canal. What is its height above sea level in Gatun lake? What was the total cost of the canal? . . 1217
Outline the proposed system of coastwise canals between Boston and Norfolk. . . . 1217
Point out the remarkable growth of railroad building in the United States between 1865 and 1910. What was the track mileage of railroads in the United States in 1920? in 1930? 1218
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Summarize the main facts as to the distribution of railway mileage among the various states 1218
When and where was the first railway placed in operation in Canada? Enumerate, with important dates, the chief Canadian railway projects. Outline the relations of the Canadian grovernment with Canadian railroads 1219
In what four types of service is the electric preferable to the steam locomotive? . . . 1220
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Give the dates of the introduction of horse car service in various American cities; of the introduction of cable lines; of elevated roads. In what chief cities of the world have subways been constructed? 1221
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Trace the history of highway building in the United States 1222
Who invented the idea of aircraft driven by a propeller with rotating blades? 1223

LABOR RELATIONS

Name two advantages which employers ordinarily have over employees in a test of collective strength 1225
On what grounds is governmental intervention in labor relations justified? 1225
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When was the first labor injunction granted by a Federal court? 1226
Before they were forbidden by law, what were three successful methods of defeating the right of employees to organize? 1226
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Wherein do "unfair labor practices" under the Taft-Hartley act differ from those forbidden under the Wagner act? 1227
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In what way are strikers in a stronger position if the strike is caused by unfair labor practices of an employer than if it is caused merely for the purpose of securing better working conditions? 1228
What is the difference between closed shop and union shop? 1228
If an employee is expelled from a union having a union-shop contract, what are the consequences if (1) the reason is nonpayment of dues? (2) the reason is breaking union rules? 1228
If an employer discharges an employee because he is a member of a union, what is the employer ordinarily required to do by the labor board to make amends? 1229d
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By what token can one distinguish between voluntary arbitration and compulsory arbitration? between arbitration of rights and arbitration of interests? 1231
Tell the difference between a craft union and an industrial union 1231
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What is the oldest national trade union in America? 1232
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Name the law by which Congress takes responsibility for promoting full employment 1234

MARKETING

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Characterize the society of the United States, and show the effects of social factors upon the manner in which marketing is carried on. 1236
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agement policies and 2) external environmental influences 1241
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Explain in general terms the philosophy underlying the marketing legislation of the 20th century 1244
Explain and account for the differences in the practice of marketing in some foreign country and in the United States 1245

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Government and Politics

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GOVERNMENT · POLITICS
OF THE PEOPLE · BY THE PEOPLE · FOR THE PEOPLE

GOVERNMENT AND POLITICS

INTRODUCTORY

It may be useful to distinguish between the art of politics and the science of politics. The art, ideally, is the practice of government so that it accords with justice, so that the dignity and the effectiveness of institutions are maintained and good and able men are kept in control of public affairs. The science of politics analyzes and elaborates the theory of the state and examines the various types of public administration, past, present, and proposed. The two things flow into each other. The fields of "morals and legislation" tend to become closely united. It has been a common conception, from the time of Hobbes to the present day, that the state creates morals or standards of conduct; that what the state decides and commends is ethically right. But there is a different view; namely, that there is a Moral Order higher than any human laws, higher than the state itself, by which all acts of authority are to be judged. This, in the final analysis, was the ethical issue in World War I and subsequent wars.

Need for Government. There is a widespread disposition, by no means of recent origin, to question the usefulness of the state. To the anarchist, laws are a stumbling block and a stone of offense, and, to radical reformers generally, governments are institutions for the exploitation of the many by the few. But a scientific canvass of society in its various stages, from savagery to civilization, reveals the certain fact that, however much governments have been and still are associated with acts of oppression, there is no escape from human ills in anarchy. Mankind, without a common authority, is predatory. Society released, as occasionally happens, from the respect and dread of government, promptly exhibits the most violent and terrible tendencies. Imperfect as governments are, discriminating in their bestowal of advantages as they too frequently are, nevertheless they are the safeguard and security for the advantages of life. The sentimental philosophers of the 18th century imagined a natural state enjoyed by savage peoples, in which the blessings of simplicity and freedom were attained. Modern study of primitive society reveals no such happy "state of nature," but everywhere a cramped and cruel savage existence in which life is never free from danger and the human mind seldom released from terror.

History of Political Philosophy. The science or philosophy of politics is one of the richest fields of human inquiry. It possesses a great and classical literature. Its scope and its form of reasoning were first clearly developed by the Greek philosopher, Aristotle, whose *Politics* lies at the base of subsequent discussion. Aristotle's studies were limited to the Greek "city-state," which, to his mind, represented the highest attainment of human freedom and law. His method was concrete and inductive. He collected hundreds of city-state constitutions, compared their provisions, and deduced general principles. The state, to Aristotle, was not a Utopia such as that imagined by Plato, but it was an actual institution realized in hundreds of examples throughout the Ægean and Mediterranean seas. No writer has stated better, or in fewer words, the purpose of civilized society. "The state," says Aristotle, "comes into existence, that man may live. It continues, that man may live well." "Good life," in all its rich and noble expressions, is the aim and object of the state.

Centuries after Aristotle, another political philosopher, the Italian statesman Machiavelli, examined the city-states of his own day, with results that offer startling contrasts. Machiavelli's political studies are embraced in two works. The first, called *The Prince*, is a discussion of the sinister principles whereby the Italian despot of that day maintained himself in power. The other, *The Discourses*, which is a far nobler and more suggestive work, examines the principles whereby a republic may endure.

A century later comes the period where national governments rise above feudal conditions. The king attains an absolute power and destroys the independence of the nobles. This monarchical movement met with opposition. In England it was overthrown by revolution. Out of the struggles of the period came several notable works, the most influential one being *The Leviathan*, by Thomas Hobbes, who attempted to justify monarchical absolutism by the theory of a "social contract" between subjects and kings.

Later, in the 18th century, John Locke, in his two treatises on civil government, turns the doctrine of the social contract against the monarchists, laying the basis for the "right of revolution" in the abusive exercise of a power which monarchs have contracted to use with justice and discretion. "Men are," said Locke, "by nature all free, equal, and independent." Only by free consent does man enter into the obligations of society, resigning his natural rights to a public authority in return for benefits which, if not satisfactorily conferred, he is at liberty to end. Misrule by a monarch, in Locke's view, not only justifies rebellion but makes it inevitable. Locke powerfully affected the minds of the English colonists in America, and some of his actual language appears in the Declaration of Independence. The revolutionary ideas of Locke were put into a winged form by Rousseau, whose *Social Contract* contributed incalculably to the French Revolution and has remained to the present day an inspiration to political revolt.

Latin America. Particularly in the countries of South and Central America,the example of the American revolution against Great Britain exerted a powerful influence. Country after country threw off the Spanish yoke and adopted a republican form of government modeled after that of the United States and incorporating such ideas as bicameral legislatures, the legal separation of powers between legislative, executive, and judicial departments, commitment of executive office to a president popularly elected for a fixed term, and the constitutional guarantees of civil and political rights.

Independence and an attempt at self-government has not always brought stability to Latin-American countries, for several reasons. In the first place, the people lacked political experience. During the entire period of her empire, Spain never established or permitted a representative legislature in any of her American colonies, but instead built a tradition of strong executive authority with centralized initiative and direction. On this account conditions in the newly-freed nations were favorable for an occasional military coup or other form of revolt unseating a president and creating at least a tem-

porary dictatorship. A second reason was the lack of a middle class to bridge the gap between an oligarchy of rich citizens and a mass of destitute illiterate people. Finally, and perhaps the root cause, was an economic system with origins in feudalism which tended to perpetuate the inequalities. Latin American countries differ greatly in the extent to which they still suffer from this unfortunate political heritage. They are all affected by two newer influences: international advice and assistance to make their economies more efficient, as exemplified by the Alliance for Progress, and the efforts of Communist powers to persuade them that the road to plenty is through the dictatorship of the proletariat. Cuba exemplified the latter.

Early Asiatic Revolutions. In Asia, the constitutional movement made its way from Europe to Turkey in 1908, Persia in 1909, and China in 1911. Absolute monarchies were overthrown or limited by constitutional enactments and by the introduction of representative institutions. Pressure was building up in India for self-government and the rejection of British rule.

Governments and World War I. World War I brought to the surface much that had been germinating in secret. The empires of Central Europe and Russia disappeared. Through the disintegration of monarchical states, the number of nations increased.

Among other effects produced in these European states by World War I was a widening of democracy. The war had given an illustration of the possible power of governments over economic systems, which was reflected by the drift toward socialism in many constitutions. The New World felt these influences of the war much less than did Europe.

Rise of the New Autocracy. World War I and its after-effects led to a crisis in human government on a colossal scale. As early as 1848, Karl Marx issued the "Communist Manifesto," a landmark in an underground revolutionary movement based on the belief that the ills of an industrial society could be cured only if the laboring class seized power. War-shattered Russia proved ripe for application of the idea and fell under the spell and power of one of its ablest protagonists, Lenin. He established the first dictatorship of the proletariat with himself as dictator. Unlike tyrants of earlier ages, he had a program of social transformation for his country and all other countries as well. This program was pushed by a party organized publicly in Russia and secretly in other countries.

Predictably, the party's success in Russia and the threat it presented elsewhere struck terror in the hearts of rulers of other lands, particularly in countries seriously weakened by the war. Ostensibly to combat the new threat, Mussolini in Italy in 1920 and Hitler in Germany in 1933 overthrew their constitutional governments and assumed autocratic power with the assistance, in each case, of a party acting outside the law. In these two countries constitutional government was restored after their defeat in World War II, but the Russian influence was widened after that struggle, and a number of adjacent European countries fell within Russia's orbit as satellites. Finally, in 1949, a revolution in China brought that country also under a totalitarian regime dedicated to the doctrines of Karl Marx.

Twilight of the Empires. The unsettling effects of World War II, combined with the accelerating unification of the world by radio, television, and air travel, bore harvest in an almost universal demand for independence by peoples long subject to the control of other nations. A measure of its success appears in the fact that the United Nations, organized immediately after the war with 51 members, had by 1964 admitted a total of 63 new members, nearly all being countries which achieved independence after the war. Furthermore, in contrast with experience in earlier ages, all but two achieved their independence without warfare, the exceptions being Algeria and Viet-Nam.

The proliferation of new states offered a field day for the competing political ideals of constitutional government and the newer programs of Communist dictatorships. In general the new governments tended to adapt to their use the political institutions of their former rulers but usually chose republics on the American or French models. Their cultural and economic ties were usually retained, often with formal affiliation, as in the British Commonwealth or French Community. As in Latin America, however, the harsh realities of their economic life forced compromises, and many dictators appeared. But the Communists had a minimum of success in securing their adherence.

Some of the more forward-looking leaders of the new nations sought to advance their power collectively by federation. Egypt attempted to form an Arab super-state under the title of the United Arab Republic, but failed to achieve permanent success. Under the leadership of Ghana, an Organization of African Unity was formed by 30 countries in Addis Ababa in 1963 looking toward cooperative action.

Social Ideals in Politics. Parallel with the evolution of formal political development throughout the world, and speeded up by competition with the Communist revolution, has progressed a vast social movement designed to increase the well-being of the masses of the people and to secure a wider distribution of the proceeds of industry.

The free play of individual initiative, which theoretically accompanied modern democracy, is no longer permitted by even the most democratic governments. It is limited by a vast amount of "social legislation" supported by taxation, by organizations of workmen and employers, and by various forms of cooperation. Even governmental planning, the key operation under Communist rule, is resorted to and applied by means of differential tax rates and by credit policies with the objective of achieving the optimum economic growth.

Internationally, there has been a parallel development. By means of credit, technical assistance, and outright gifts, the better developed nations have sought to stimulate the economic progress of those nations emerging from more primitive economies. The motive has been partly to achieve political influence but partly also to forestall social disorder and the attendant dangers of warfare.

Politics and History. In thought, politics is often associated with history. But while history is, largely, the record of political activities, the two subjects differ widely in scope and in method. History surveys the past. The historian has the advantage of adequate accumulations of materials. He studies episodes and movements that are completed. He may separate himself from the partisanship and emotions of the time he describes. The student of politics does not have these advantages. He is dealing, primarily, not with the past, but with the present and with the future. His mind must be incessantly occupied with the morrow. Political sense comprises not only good judgment of actual events, but prescience for the future. Politics is not static, but dynamic; political forces are constantly altering, finding new directions, and attaining new balances. Institutions tend to constant change. The activity of the lawmaker is incessant. The materials for the study of politics thus constantly become obsolete and remain incomplete and unsatisfactory. Practical considerations of the highest importance, none the less, demand constant fresh examination of governments and policies and require the training of special faculties of the mind.

The Department of Politics of this work is divided into three parts. The first deals with the government of the United States, Federal, state, and local. In the second part are described the governments of foreign states, while the third part is composed of a dictionary of political terms and institutions.

THE UNITED STATES OF AMERICA

THE United States arose through the union of thirteen of the colonies of Great Britain in North America into a new nation under a federal form of government. This union was brought about by successive stages of development, after experiences with several forms of concerted action, and by a common protest and resistance to acts of the British king and Parliament.

Intercolonial Assemblies. This common resistance found expression in several intercolonial assemblies, first in the Stamp Act Congress (1765), which met at New York, was attended by delegates of nine colonies, and adopted a declaration of "rights and grievances," a petition to the king and a memorial and a petition to the House of Lords; second, by the First Continental Congress (1774), called by Massachusetts and Virginia and attended by delegates from all the colonies except Georgia. This Congress passed resolutions called the "Association" binding the colonies in a far-reaching boycott of British trade.

Independence of Colonies. The Second Continental Congress assembled after warfare had actually begun. It recruited a Continental army to resist the British forces, and appointed George Washington commander in chief. On July 4, 1776, it declared the independence of the colonies from Great Britain, and, in the absence of any more effectual organization, united the efforts of the colonies for the prosecution of the war until the adoption of the Articles of Confederation in 1781. The original Declaration of Independence is on display at the National Archives Exhibition Hall, Washington, D. C.

DECLARATION OF INDEPENDENCE

THE UNANIMOUS DECLARATION OF THE THIRTEEN UNITED STATES OF AMERICA, IN CONGRESS, JULY 4, 1776.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident—that all men are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness That, to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that, whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies; and such is now the necessity which constrains them to alter their former systems of government. The history of the present king of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute tyranny over these states. To prove this, let facts be submitted to a candid world.

He has refused his assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operations till his assent should be obtained; and, when so suspended, he has utterly neglected to attend them.

He has refused to pass other laws for the accommodation of large districts of people, unless these people would relinquish the right of representation in the legislature—a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable and distant from the repository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing with manly firmness, his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the state remaining in the meantime, exposed to all the dangers of invasion from without and convulsions within.

He has endeavored to prevent the population of these states; for that purpose obstructing the laws for the naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice, by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers, to harass our people and eat out their substance.

He has kept among us, in times of peace, standing armies, without the consent of our legislatures.

He has affected to render the military independent of, and superior to, the civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitutions and unacknowledged by our laws; giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us;

For protecting them, by a mock trial, from punishment for any murders which they should commit on the inhabitants of these states;

For cutting off our trade with all parts of the world;

For imposing taxes on us without our consent;

For depriving us, in many cases, of the benefits of trial by jury;

For transporting us beyond seas, to be tried for pretended offenses;

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies;

For taking away our charters, abolishing our most valuable laws, and altering, fundamentally, the forms of our governments;

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burned our towns, and destroyed the lives of our people.

He is at this time transporting large armies of foreign mercenaries, to complete the works of death, desolation, and tyranny, already begun with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrection among us, and has endeavored to bring on the inhabitants of our frontiers the merciless Indian savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms: our repeated petitions have been answered only by repeated injury. A prince whose character is thus marked by every act which may define a tyrant is unfit to be the ruler of a free people.

Nor have we been wanting in our attentions to our British brethren. We have warned them, from time to time, of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity and we have conjured them by the ties of our common kindred, to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They, too, have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them as we hold the rest of mankind—enemies in war—in peace, friends.

We, therefore, the representatives of the United States of America, in general Congress assembled, appealing to

the Supreme Judge of the world for the rectitude of our intentions, do, in the name, and by the authority of the good people of these colonies, solemnly publish and declare that these united colonies are, and of right ought to be, free and independent states; that they are absolved from all allegiance to the British crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that, as free and independent states, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent states may of right do. And for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our lives, our fortunes and our sacred honor.

The foregoing declaration was, by order of Congress, engrossed, and signed by the following members:

JOHN HANCOCK.

New Hampshire

Josiah Bartlett, Matthew Thornton.
Wm. Whipple,

Massachusetts Bay

Saml. Adams, Robt. Treat Paine,
John Adams, Elbridge Gerry.

Rhode Island, etc.

Step. Hopkins, William Ellery.

Connecticut

Roger Sherman, Wm. Williams,
Sam'el Huntington, Oliver Wolcott.

New York

Wm. Floyd, Frans. Lewis,
Phil. Livingston, Lewis Morris.

New Jersey

Richd. Stockton, John Hart,
Jno. Witherspoon, Abra. Clark.
Fras. Hopkinson,

Pennsylvania

Robt. Morris, Jas. Smith,
Benjamin Rush, Geo. Taylor,
Benja. Franklin, James Wilson,
John Morton, Geo. Ross.
Geo. Clymer,

Delaware

Cæsar Rodney, Tho. M'Kean.
Geo. Read,

Maryland

Samuel Chase, Thos. Stone,
Wm. Paca, Charles Carroll of Carrollton.

Virginia

George Wythe, Thos. Nelson, Jr.,
Richard Henry Lee, Francis Lightfoot Lee,
Th. Jefferson, Carter Braxton.
Benja. Harrison,

North Carolina

Wm. Hooper, John Penn.
Joseph Hewes,

South Carolina

Edward Rutledge, Thomas Lynch, Jr.,
Thos. Heyward, Jr., Arthur Middleton.

Georgia

Button Gwinnett, Geo. Walton.
Lyman Hall,

The Continental Congress. The defects of the Continental Congress as an agency for united effort were serious and were early apprehended. It rested on no constitution and commanded no support except as a revolutionary body. Its members represented the colonies from which they came, and voted under instructions, each state having one vote. The states regarded themselves as independent and able to disregard Congress when it appeared to their interest to do so.

The same session that produced the Declaration of Independence provided also a committee to draw up a plan for a better union. A committee was appointed which produced the Articles of Confederation, the first constitution of a united America. Nearly five years passed, however, before, on March 1, 1781, these articles became effective. The Congress did not adopt the committee's report until November 15, 1777. Eleven states ratified within a year following, but Delaware withheld ratification until 1779, and Maryland until 1781.

Articles of Confederation. As the precursor of the Constitution of the United States, the Articles of Confederation is a political document of first interest. As its name indicates, it provided for a "confederation," not for a "federal" government. It left the independence and the "sovereignty" of the thirteen states unimpaired (Article II). The states delegated certain powers to the national government; but, in spite of the use of the word "perpetual" in the document, they undoubtedly regarded themselves as possessing the right to withdraw if they desired.

The government created dealt only with the states. It could not act upon the individual. As in the Continental Congress, each state possessed one vote, and could send a number of "delegates," not less than two nor more than seven. These delegates the state chose and compensated in any desired manner (Article V). Action under the really important powers granted to the Congress required the assent of nine states to be effective (Article IX, 6th paragraph). The government created consisted only of the Congress, a single chamber body. A "president" was authorized (Article IX, 5th paragraph) to serve not "more than one year in any term of three," but he was simply a presiding officer. Executive functions were intrusted to "committees" of which a great number were eventually created. During recess a "Committee of the States," with one representative from each state, was authorized. To it was delegated a limited control.

The Congress had no independent power to enforce its measures. It was dependent upon the states for all resources and for troops; it had no courts nor officers to enforce its laws. Nevertheless, the government here created was an advance toward actual national union, and it furnished an experience essential to the final production of the constitution. The document in its entirety follows:

ARTICLES OF CONFEDERATION OF THE UNITED STATES OF AMERICA.

TO ALL TO WHOM THESE PRESENTS SHALL COME, WE THE UNDERSIGNED DELEGATES OF THE STATES AFFIXED TO OUR NAMES, SEND GREETING.

Whereas the delegates of the United States of America in Congress assembled did on the 15th day of November in the year of our Lord 1777, and in the second year of the independence of America agree to certain Articles of Confederation and perpetual union between the States of New Hampshire, Massachusetts Bay, Rhode Island and Providence Plantations, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina and Georgia, in the words following, viz

ARTICLES OF CONFEDERATION AND PERPETUAL UNION BETWEEN THE STATES OF NEW HAMPSHIRE, MASSACHUSETTS BAY, RHODE ISLAND AND PROVIDENCE PLANTATIONS, CONNECTICUT, NEW YORK, NEW JERSEY, PENNSYLVANIA, DELAWARE, MARYLAND, VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA, AND GEORGIA.

Article I. The style of this confederacy shall be "The United States of America."

Article II. Each state retains its sovereignty, freedom and independence, and every power, jurisdiction and right, which is not by this confederation expressly delegated to the united states, in Congress assembled.

Article III. The said states hereby severally enter into a firm league of friendship with each other, for their common defense, the security of their liberties, and their mutual and general welfare, binding themselves to assist each other, against all force offered to, or attacks made upon them, or any of them, on account of religion, sovereignty, trade, or any other pretense whatever.

Article IV. The better to secure and perpetuate mutual friendship and intercourse among the people of the different states in this union, the free inhabitants of each of these states, paupers, vagabonds, and fugitives from justice excepted, shall be entitled to all privileges and immunities of free citizens in the several states; and the people of each state shall have free ingress and regress to and from any other state, and shall enjoy therein all the privileges of trade and commerce, subject to the same duties, impositions and restrictions as the inhabitants thereof respectively, provided that such restriction shall not extend so far as to prevent the removal of property imported into

any state, to any other state of which the owner is an inhabitant; provided also that no imposition, duties or restriction shall be laid by any state, on the property of the United States, or either of them.

If any person guilty of, or charged with treason, felony, or other high misdemeanor in any state, shall flee from justice, and be found in any of the united states, he shall upon demand of the Governor or executive power, of the state from which he fled, be delivered up and removed to the state having jurisdiction of his offense.

Full faith and credit shall be given in each of these states to the records, acts and judicial proceedings of the courts and magistrates of every other state.

ARTICLE V. For the more convenient management of the general interest of the united states, delegates shall be annually appointed in such manner as the legislature of each state shall direct, to meet in Congress on the first Monday in November, in every year, with a power reserved to each state, to recall its delegates, or any of them, at any time within the year, and to send others in their stead, for the remainder of the year.

No state shall be represented in Congress by less than two, nor by more than seven members; and no person shall be capable of being a delegate for more than three years in any term of six years; nor shall any person, being a delegate, be capable of holding any office under the united states, for which he, or another for his benefit receives any salary, fees or emolument of any kind.

Each state shall maintain its own delegates in any meeting of the states, and while they act as members of the committee of the states.

In determining questions in the united states, in Congress assembled, each state shall have one vote.

Freedom of speech and debate in Congress shall not be impeached or questioned in any court, or place out of Congress, and the members of Congress shall be protected in their persons from arrests and imprisonments, during the time of their going to and from, and attendance on Congress, except for treason, felony, or breach of the peace.

ARTICLE VI. No state without the consent of the united states in Congress assembled, shall send any embassy to, or receive any embassy from, or enter into any conference, agreement, alliance or treaty with any king, prince or state; nor shall any person holding any office of profit or trust under the united states, or any of them, accept of any present, emolument, office or title of any kind whatever from any king, prince or foreign state; nor shall the united states in Congress assembled, or any of them, grant any title of nobility.

No two or more states shall enter into any treaty, confederation or alliance whatever between them, without the consent of the united states in Congress assembled, specifying accurately the purposes for which the same is to be entered into, and how long it shall continue.

No state shall lay any imposts or duties, which may interfere with any stipulation in treaties, entered into by the united states in Congress assembled, with any king, prince or state, in pursuance of any treaties already proposed by Congress, to the courts of France and Spain.

No vessels of war shall be kept up in time of peace by any state, except such number only, as shall be deemed necessary by the united states in Congress assembled, for the defense of such state, or its trade; nor shall any body of forces be kept up by any state, in time of peace, except such number only, as in the judgment of the united states, in Congress assembled, shall be deemed requisite to garrison the forts necessary for the defense of such state; but every state shall always keep up a well regulated and disciplined militia, sufficiently armed and accoutred, and shall provide and have constantly ready for use, in public stores, a due number of field pieces and tents, and a proper quantity of arms, ammunition and camp equipage.

No state shall engage in any war without the consent of the united states in Congress assembled, unless such state be actually invaded by enemies, or shall have received certain advice of a resolution being formed by some nation of Indians to invade such state, and the danger is so imminent as not to admit of a delay, till the united states in Congress assembled can be consulted: nor shall any state grant commissions to any ships or vessels of war, nor letters of marque or reprisal, except it be after a declaration of war by the united states in Congress assembled, and then only against the kingdom or state and the subjects thereof, against which war has been so declared, and under such regulations as shall be established by the united states in Congress assembled, unless such state be infested by pirates, in which case vessels of war may be fitted out for that occasion, and kept so long as the danger shall continue, or until the united states in Congress assembled shall determine otherwise.

ARTICLE VII. When land forces are raised by any state for the common defense, all officers of or under the rank of colonel, shall be appointed by the legislature of each state respectively by whom such forces shall be raised, or in such manner as such state shall direct, and all vacancies shall be filled up by the state which first made the appointment.

ARTICLE VIII. All charges of war, and all other expenses that shall be incurred for the common defense or general welfare, and allowed by the united states in Congress assembled, shall be defrayed out of a common treasury, which shall be supplied by the several states, in proportion to the value of all land within each state, granted to or surveyed for any person, as such land and the buildings and improvements thereon shall be estimated according to such mode as the united states in Congress assembled, shall from time to time, direct and appoint.

The taxes for paying that proportion shall be laid and levied by the authority and direction of the legislatures of the several states within the time agreed upon by the united states in Congress assembled.

ARTICLE IX. The united states in Congress assembled, shall have the sole and exclusive right and power of determining on peace and war, except in the cases mentioned in the sixth article—of sending and receiving ambassadors—entering into treaties and alliances, provided that no treaty of commerce shall be made whereby the legislative power of the respective states shall be restrained from imposing such imposts and duties on foreigners, as their own people are subjected to, or from prohibiting the exportation or importation of any species of goods or commodities whatsoever—of establishing rules for deciding in all cases, what captures on land or water shall be legal, and in what manner prizes taken by land or naval forces in the service of the united states shall be divided or appropriated —of granting letters of marque and reprisal in times of peace—appointing courts for the trial of piracies and felonies committed on the high seas and establishing courts for receiving and determining finally appeals in all cases of captures, provided that no member of Congress shall be appointed a judge of any of the said courts.

The united states in Congress assembled shall also be the last resort on appeal in all disputes and differences now subsisting or that hereafter may arise between two or more states concerning boundary, jurisdiction or any other cause whatever; which authority shall always be exercised in the manner following. Whenever the legislative or executive authority or lawful agent of any state in controversy with another shall present a petition to Congress, stating the matter in question and praying for a hearing, notice thereof shall be given by order of Congress to the legislative or executive authority of the other state in controversy, and a day assigned for the appearance of the parties by their lawful agents, who shall then be directed to appoint by joint consent, commissioners or judges to constitute a court for hearing and determining the matter in question: but if they cannot agree, Congress shall name three persons out of each of the united states, and from the list of such persons each party shall alternately strike out one, the petitioners beginning, until the number shall be reduced to thirteen; and from that number not less than seven, nor more than nine names as Congress shall direct, shall in the presence of Congress be drawn out by lot, and the persons whose names shall be so drawn or any five of them, shall be commissioners or judges, to hear and finally determine the controversy, so always as a major part of the judges who shall hear the cause shall agree in the determination: and if either party shall neglect to attend at the day appointed, without showing reasons, which Congress shall judge sufficient, or being present shall refuse to strike, the Congress shall proceed to nominate three persons out of each state, and the secretary of Congress shall strike in behalf of such party absent or refusing; and the judgment and sentence of the court to be appointed, in the manner before prescribed, shall be final and conclusive; and if any of the parties shall refuse to submit to the authority of such court, or to appear or defend their claim or cause, the court shall nevertheless proceed to pronounce sentence, or judgment, which shall in like manner be final and decisive, the judgment or sentence and other proceedings being in either case transmitted to Congress, and lodged among the acts of Congress for the security of the parties concerned: provided that every commissioner, before he sits in judgment, shall take an oath to be administered by one of the judges of the supreme or superior court of the state, where the cause shall be tried, "well and truly to hear and determine the matter in question, according to the best of his judgment, without favor, affection or hope of reward": provided also that no state shall be deprived of territory for the benefit of the united states.

All controversies concerning the private right of soil claimed under different grants of two or more states, whose jurisdictions as they may respect such lands, and the states which passed such grants are adjusted, the said grants or either of them being at the same time claimed to have originated antecedent to such settlement of jurisdiction, shall on the petition of either party to the Congress of the united states, be finally determined as near as may be in the same manner as is before prescribed for deciding disputes respecting territorial jurisdiction between different states.

The united states in Congress assembled shall also have the sole and exclusive right and power of regulating the alloy and value of coin struck by their own authority, or by

that of the respective states—fixing the standard of weights and measures throughout the United States—regulating the trade and managing all affairs with the Indians, not members of any of the states, provided that the legislative right of any state within its own limits be not infringed or violated—establishing and regulating post offices from one state to another, throughout all the united states, and exacting such postage on the papers passing through the same as may be requisite to defray the expenses of the said office—appointing all officers of the land forces, in the service of the united states, excepting regimental officers—appointing all the officers of the naval forces, and commissioning all officers whatever in the service of the united states—making rules for the government and regulation of the said land and naval forces, and directing their operations.

The united states in Congress assembled shall have authority to appoint a committee, to sit in the recess of Congress, to be denominated "A Committee of the States," and to consist of one delegate from each state; and to appoint such other committees and civil officers as may be necessary for managing the general affairs of the united states under their direction—to appoint one of their number to preside, provided that no person be allowed to serve in the office of president more than one year in any term of three years; to ascertain the necessary sums of money to be raised for the service of the united states, and to appropriate and apply the same for defraying the public expenses—to borrow money, or emit bills on the credit of the united states, transmitting every half year to the respective states an account of the sums of money so borrowed or emitted—to build and equip a navy—to agree upon the number of land forces, and to make requisitions from each state for its quota, in proportion to the number of white inhabitants in such state; which requisition shall be binding, and thereupon the legislature of each state shall appoint the regimental officers, raise the men and clothe, arm and equip them in a soldierlike manner, at the expense of the united states; and the officers and men so clothed, armed and equipped shall march to the place appointed, and within the time agreed on by the united states in Congress assembled: But if the united states in Congress assembled shall, on consideration of circumstances judge proper that any state should not raise men, or should raise a smaller number than its quota, and that any other state should raise a greater number of men than the quota thereof, such extra number shall be raised, officered, clothed, armed and equipped in the same manner as the quota of such state, unless the legislature of such state shall judge that such extra number cannot be safely spared out of the same, in which case they shall raise, officer, clothe, arm and equip as many of such extra number as they judge can be safely spared. And the officers and men so clothed, armed and equipped, shall march to the place appointed, and within the time agreed on by the united states in Congress assembled.

The united states in Congress assembled shall never engage in a war, nor grant letters of marque and reprisal in time of peace, nor enter into any treaties or alliances, nor coin money, nor regulate the value thereof, nor ascertain the sums and expenses necessary for the defense and welfare of the united states, or any of them, nor emit bills, nor borrow money on the credit of the united states, nor appropriate money, nor agree upon the number of vessels of war, to be built or purchased, or the number of land or sea forces to be raised, nor appoint a commander in chief of the army or navy, unless nine states assent to the same: nor shall a question on any other point, except for adjourning from day to day be determined, unless by the votes of a majority of the united states in Congress assembled.

The Congress of the united states shall have power to adjourn to any time within the year, and to any place within the united states, so that no period of adjournment be for a longer duration than the space of six months, and shall publish the journal of their proceedings monthly, except such parts thereof relating to treaties, alliances or military operations, as in their judgment require secrecy; and the yeas and nays of the delegates of each state on any question shall be entered on the journal, when it is desired by any delegate; and the delegates of a state, or any of them, at his or their request shall be furnished with a transcript of the said journal, except such parts as are above excepted, to lay before the legislatures of the several states.

Article X. The committee of the states, or any nine of them, shall be authorized to execute, in the recess of Congress, such of the powers of Congress as the united states in Congress assembled, by the consent of nine states, shall from time to time think expedient to vest them with; provided that no power be delegated to said committee, for the exercise of which, by the Articles of Confederation, the voice of nine states in the Congress of the united states assembled is requisite.

Article XI. Canada acceding to this Confederation, and joining in the measures of the united states shall be admitted into, and entitled to all the advantages of this union: but no other colony shall be admitted into the same, unless such admission be agreed to by nine states.

Article XII. All bills of credit emitted, moneys borrowed and debts contracted by, or under the authority of Congress, before the assembling of the united states, in pursuance of the present Confederation, shall be deemed and considered as a charge against the united states, for payment and satisfaction whereof the said united states, and the public faith are hereby solemnly pledged.

Article XIII. Every state shall abide by the determinations of the united states in Congress assembled, on all questions which by this Confederation is submitted to them. And the articles of this Confederation shall be inviolably observed by every state, and the union shall be perpetual; nor shall any alteration at any time hereafter be made in any of them; unless such alteration be agreed to in a Congress of the united states, and be afterwards confirmed by the legislatures of every state.

And whereas it hath pleased the Great Governor of the World to incline the hearts of the legislatures we respectively represent in Congress, to approve of, and to authorize us to ratify the said Articles of Confederation and perpetual union. Know ye that we the undersigned delegates, by virtue of the power and authority to us given for that purpose, do by these presents, in the name and in behalf of our respective constituents, fully and entirely ratify and confirm each and every of the said Articles of Confederation and perpetual union, and all and singular the matters and things therein contained: And we do further solemnly plight and engage the faith of our respective constituents, that they shall abide by the determinations of the united states in Congress assembled, on all questions which by the said Confederation are submitted to them. And that the articles thereof shall be inviolably observed by the states we respectively represent, and that the union shall be perpetual.

In witness whereof we have hereunto set our hands in Congress. Done at Philadelphia in the State of Pennsylvania the ninth day of July in the year of our Lord, 1778, and in the third year of the independence of America.

On the part and behalf of the State of New Hampshire.

Josiah Bartlett, John Wentworth, Jun., August 8, 1778.

On the part and behalf of the State of Massachusetts Bay.

John Hancock, Francis Dana,
Samuel Adams, James Lovell,
Elbridge Gerry, Samuel Holten.

On the part and behalf of the State of Rhode Island and Providence Plantations.

William Ellery, John Collins.
Henry Marchant,

On the part and behalf of the State of Connecticut.

Roger Sherman, Titus Hosmer,
Samuel Huntington, Andrew Adams.
Oliver Wolcott,

On the part and behalf of the State of New York.

Jas. Duane, William Duer,
Fras. Lewis, Gou'r Morris.

On the part and behalf of the State of New Jersey.

Jno. Witherspoon, Nath'l Scudder, November 26, 1778.

On the part and behalf of the State of Pennsylvania.

Robt. Morris, William Clingan,
Daniel Roberdeau, Joseph Reed, July 22, 1778.
Jona Bayard Smith,

On the part and behalf of the State of Delaware.

John Dickinson, May 5, 1779, Thos. M'Kean, February 12, 1779.
Nicholas Van Dyke,

On the part and behalf of the State of Maryland.

John Hanson, March 1, 1781, Daniel Carroll, March 1, 1781.

On the part and behalf of the State of Virginia.

Richard Henry Lee, Jno. Harvie,
John Banister, Francis Lightfoot Lee.
Thomas Adams,

On the part and behalf of the State of North Carolina.

John Penn, July 21, 1778, Jno. Williams.
Corns. Harnett,

On the part and behalf of the State of South Carolina.

Henry Laurens, Richard Hutson,
William Henry Drayton, Thos. Heyward, Jun.
Jno. Matthews,

On the part and behalf of the State of Georgia.

Jno. Walton, 24th July, 1778, Edw'd Langworthy.
Edw'd Telfair,

CONSTITUTION OF THE UNITED STATES

The unsatisfactory character of the union effected by the Articles of Confederation became increasingly apparent during the period of its existence. The Congress had no power to raise money by taxation. It could borrow, issue paper money, and make requisitions on the states; but the use of these ineffective powers only added to the financial difficulties and lowered the public credit. Congress sought the right to levy tariff duties, but the opposition of one or more states defeated this amendment.

The Constitutional Convention. The increasing gravity of American affairs, the growing probability of disruption, gradually convinced the people of the states of the need of a "more perfect union." A group of talented statesmen, led by Washington, Madison, Hamilton, and Franklin, worked unceasingly to this end, and in 1787 their labors were rewarded by the convention which met at Philadelphia in May and framed the Constitution of the United States.

Seventy-three delegates in all were appointed by the states, but only fifty-five ever attended. The average number present was from thirty to thirty-five, nearly all thoroughly experienced in public affairs and representative of the varying views of the states, while among them were a group of men distinguished for greatness of character and for political sagacity. Moreover, all were practical men, interested in effective forms of government, rather than in theoretical expedients. They were interested also in the protection of those ancient civil rights for which their race had contended for centuries, rather than in vague conceptions of political felicity.

Organization of Convention. The convention organized on May 25, and George Washington was unanimously chosen president. It adjourned on September 17. The convention met behind closed doors. It imposed a bond of secrecy on its members as to the differences and disputes which divided them, and this obligation of protecting the reputation of all concerned was never violated.

The journal of the convention was not published until 1818, when Congress so ordered. Nearly all that is known of the debates and adjustments of this meeting is derived from a private journal kept by Madison and first published in 1840. But it is apparent that no body of men intrusted with a comparable responsibility ever labored with greater disinterestedness and patriotism or strove in greater loyalty to bring the different views which separated them into a common agreement and workable plan.

The First Constitution. The Constitution, which is the first of modern constitutions in point of time, is easily the first also in the praise it has evoked and in the confidence of those who live under it. It may also be said that no political instrument ever framed embodies a more remarkable series of contributions to government or has exerted a wider influence on the subsequent history of states.

Among the institutions given original form in the Constitution are (1) Federal government, subsequently initiated in such widely different states as the Dominion of Canada, the Swiss Confederation, the German Empire, the Mexican and Argentine republics, and the Commonwealth of Australia; (2) the Senate, with its principle of equality of representation of member states as contrasted with a House of Representatives based on population; (3) the office of president, a plan of government which contrasts with ministerial or parliamentary executive as one of the two predominant types of national administration; (4) the supreme court, with its august and remarkable power of judicially interpreting the provisions of the Constitution itself, and of declaring void national or state legislation in conflict with the Constitution; (5) the creation of a sphere of constitutional liberty inviolable by government and protected by judicial power; (6) the creation of complete freedom of movement and of commerce within the union of states, subject only to Federal control.

Character of the Constitution. The Constitution is remarkable for the brevity and for the exactness of its language. While it is an instrument based on experience in government, extending over a long period of colonial and revolutionary statesmanship, its original character justifies the eulogy of Gladstone, that it is "the most wonderful work ever struck off at a given time by the brain and purpose of man."

In spite of the expansion of the United States since 1787 and the growth of the American people, the amendments to the Constitution have been relatively few and have little altered its original character as the first plan of the government. These amendments are 24 in number; their character and dates of adoption are as given below.

Ratification of Constitution. The Constitution was signed on September 17, 1787, by all members present except Mr. Gerry of Massachusetts and Mr. Mason and Mr. Randolph of Virginia. The president of the convention transmitted it to Congress and Congress on September 28 directed it to be "transmitted to the several legislatures in order to be submitted to a convention of delegates chosen in each state by the people thereof, in conformity to the resolves of the convention."

The Constitution was ratified by the thirteen original states in the following order:

Delaware, December 7, 1787, unanimously.
Pennsylvania, December 12, 1787, vote 46 to 23.
New Jersey, December 18, 1787, unanimously.
Georgia, January 2, 1788, unanimously.
Connecticut, January 9, 1788, vote 128 to 40.
Massachusetts, February 6, 1788, vote 187 to 168.
Maryland, April 28, 1788, vote 63 to 12.
South Carolina, May 23, 1788, vote 149 to 73.
New Hampshire, June 21, 1788, vote 57 to 46.
Virginia, June 25, 1788, vote 89 to 79.
New York, July 26, 1788, vote 30 to 28.
North Carolina, November 21, 1789, vote 193 to 75.
Rhode Island, May 29, 1790, vote 34 to 32.

The original document is on display at the National Archives Exhibition Hall, Washington, D. C.

Amendment of the Constitution. The Constitution (Article V) provides the method of its amendment. The initiative may come either from Congress by a two-thirds vote of both Houses, or by the applications of the legislatures of two-thirds of the states. An amendment thus legally proposed becomes a part of the Constitution when three-fourths of the states have ratified it. This ratification may be given either by the legislatures of the states or by conventions called for this purpose. The dates and circumstances occasioning the amendments are as follows:

Articles I–X were declared in force December 15, 1791.

The Constitution, as originally submitted, contained no code of fundamental civil rights. To remedy what was considered a defect, as well as to make unequivocal the retention by the people or by the states of powers not expressly conferred upon the national government, these ten amendments were enacted by the first Congress and submitted to the states.

Article XI was declared in force January 8, 1798.

Article XII altered in some particulars the method of choosing the president and the vice president. It was ratified by all the states except Connecticut, Delaware, Massachusetts, and New Hampshire, which rejected it. It was declared in force September 25, 1804.

Article XIII, the emancipation amendment, was ratified by 31 of the 36 states; rejected by Delaware and Kentucky; not acted on by Texas; conditionally ratified by Alabama and Mississippi. Pro-

claimed December 18, 1865.

Article XIV, the reconstruction amendment, was ratified by 23 northern states; rejected by Kentucky, Delaware, Maryland, and 5 southern states; and not acted on by California. New Jersey, Ohio, and Oregon withdrew ratification. The 5 southern states subsequently ratified under pressure. Proclaimed July 28, 1868.

Article XV, Negro citizenship amendment, was not acted on by Tennessee; rejected by California, Delaware, Kentucky, Maryland, New Jersey, and Oregon. It was ratified by the remaining 30 states; New York rescinded its ratification January 5, 1870. Proclaimed March 30, 1870.

Article XVI, income tax amendment, was ratified by 39 states. It was proclaimed February 25, 1913.

Article XVII, providing for the direct election of senators, became *de facto* a part of the Constitution on its ratification by the last of the required number of states on April 8, 1913.

Article XVIII, the prohibition amendment, had on January 16, 1919, been ratified by 36 states, and on January 29, 1919, was formally proclaimed to take effect on January 16, 1920. Connecticut and Rhode Island alone failed to ratify.

Article XIX, the equal suffrage amendment, was adopted between June 10, 1919, and August 19, 1920. by three-fourths of the states, and proclaimed in effect August 26, 1920.

Article XX, the "lame duck" amendment, had been ratified by 39 states by February 6, 1933, when it was proclaimed valid.

Article XXI, repealing the prohibition amendment, article *XVIII*, was ratified by the 36th state, Utah, on December 5, 1933, and was immediately proclaimed valid.

Article XXII, limiting presidential terms of office to two. Went into effect February 26, 1951.

Article XXIII, enabling the District of Columbia to choose presidential electors on the same basis of representation as the states. Went into effect April 3, 1961.

Article XXIV, forbidding disqualification for voting which is based on failure to pay any poll or other tax. Became effective January 23, 1964.

CONSTITUTION OF THE UNITED STATES

PREAMBLE.—We the people of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

ARTICLE I

SECTION I. All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

SECTION II. 1. The House of Representatives shall be composed of members chosen every second year by the people of the several states, and the electors in each state shall have the qualifications requisite for electors of the most numerous branch of the state legislature.

2. No person shall be a representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that state in which he shall be chosen.

3. Representatives and direct taxes shall be apportioned among the several states which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and excluding Indians not taxed, three-fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of representatives shall not exceed one for every thirty thousand, but each state shall have at least one representative; and until such enumeration shall be made, the state of New Hampshire shall be entitled to choose 3; Massachusetts, 8; Rhode Island and Providence Plantations, 1; Connecticut, 5; New York, 6; New Jersey, 4; Pennsylvania, 8; Delaware, 1; Maryland, 6; Virginia, 10; North Carolina, 5; South Carolina, 5; and Georgia, 3. See *Article XIV., Amendment.*

4. When vacancies happen in the representation from any state, the executive authority thereof shall issue writs of election to fill such vacancies.

5. The House of Representatives shall choose their speaker and other officers; and shall have the sole power of impeachment.

SECTION III. 1. The Senate of the United States shall be composed of two senators from each state, chosen by the legislature thereof, for six years; and each senator shall have one vote (Superseded by the 17th Amendment).

2. Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one-third may be chosen every second year; and if vacancies happen by resignation, or otherwise, during the recess of the legislature of any state, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies.

3. No person shall be a senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that state for which he shall be chosen.

4. The vice president of the United States shall be president of the Senate, but shall have no vote, unless they be equally divided.

5. The Senate shall choose their other officers, and also a president pro tempore, in the absence of the vice president, or when he shall exercise the office of president of the United States.

6. The Senate shall have the sole power to try all impeachments. When sitting for that purpose, they shall be on oath or affirmation. When the president of the United States is tried, the chief justice shall preside: and no person shall be convicted without the concurrence of two-thirds of the members present.

7. Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust, or profit under the United States; but the party convicted shall nevertheless be liable and subject to indictment, trial, judgment, and punishment, according to law.

SECTION IV. 1. The times, places, and manner of holding elections for senators and representatives shall be prescribed in each state by the legislature thereof; but the Congress may at any time by law make or alter such regulations, except as to the places of choosing senators.

2. The Congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December, unless they shall by law appoint a different day.

SECTION V. 1. Each House shall be the judge of the elections, returns, and qualifications of its own members, and a majority of each shall constitute a quorum to do business; but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner, and under such penalties as each House may provide.

2. Each House may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two-thirds, expel a member.

3. Each House shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may in their judgment require secrecy; and the yeas and nays of the members of either House on any question shall, at the desire of one-fifth of those present, be entered on the journal.

4. Neither House, during the session of Congress, shall, without the consent of the other, adjourn for more than three days, nor to any other place than that in which the two Houses shall be sitting.

SECTION VI. 1. The senators and representatives shall receive a compensation for their services, to be ascertained by law, and paid out of the treasury of the United States. They shall in all cases, except treason, felony, and breach of the peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same; and for any speech or debate in either House, they shall not be questioned in any other place.

2. No senator or representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased, during such time; and no person holding any office under the United States, shall be a member of either House during his continuance in office.

SECTION VII. 1. All bills for raising revenue shall originate in the House of Representatives; but the Senate may propose or concur with amendments as on other bills.

2. Every bill which shall have passed the House of Representatives and the Senate, shall, before it become a law, be presented to the president of the United States; if he approve he shall sign it, but if not he shall return it, with his objections, to that House in which it shall have originated, who shall enter the objections at large on their journal, and proceed to reconsider it. If after such reconsideration two-thirds of that House shall agree to pass the bill, it shall be sent, together with the objections, to the other House, by which it shall likewise be reconsidered, and, if approved by two-thirds of that House, it shall become a law. But in all such cases the votes of both Houses shall be determined by yeas and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each House respectively. If any bill shall not be returned by the president within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law.

3. Every order, resolution, or vote to which the concurrence of the Senate and House of Representatives may be necessary (except on a question of adjournment) shall be presented to the president of the United States; and before the same shall take effect, shall be approved by him, or being disapproved by him, shall be repassed by two-thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.

Section VIII. The Congress shall have power:

1. To lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts, and excises shall be uniform throughout the United States.

2. To borrow money on the credit of the United States.

3. To regulate commerce with foreign nations, and among the several states, and with the Indian tribes.

4. To establish an uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States.

5. To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures.

6. To provide for the punishment of counterfeiting the securities and current coin of the United States.

7. To establish post offices and post roads.

8. To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

9. To constitute tribunals inferior to the supreme court.

10. To define and punish piracies and felonies committed on the high seas, and offenses against the law of nations.

11. To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water.

12. To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years

13. To provide and maintain a navy.

14. To make rules for the government and regulation of the land and naval forces.

15. To provide for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions.

16. To provide for organizing, arming, and disciplining, the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the states respectively, the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress.

17. To exercise exclusive legislation in all cases whatsoever, over such district (not exceeding ten miles square) as may, by cession of particular states, and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the state in which the same shall be, for the erection of forts, magazines, arsenals, dockyards, and other needful buildings.

18 To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof.

Section IX. 1. The migration or importation of such persons as any of the states now existing shall think proper to admit, shall not be prohibited by the Congress prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation, not exceeding ten dollars for each person.

2. The privilege of the writ of habeas corpus shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it.

3. No bill of attainder or ex post facto law shall be passed.

4. No capitation, or other direct, tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken (Changed by the 16th Amendment).

5. No tax or duty shall be laid on articles exported from any state.

6. No preference shall be given by any regulation of commerce or revenue to the ports of one state over those of another: nor shall vessels bound to, or from, one state be obliged to enter, clear, or pay duties in another.

7. No money shall be drawn from the treasury, but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.

8. No title of nobility shall be granted by the United States: And no person holding any office of profit or trust under them, shall, without the consent of the Congress, accept of any present, emolument, office, or title, of any kind whatever, from any king, prince, or foreign state.

Section X. 1. No state shall enter into any treaty, alliance, or confederation; grant letters of marque and reprisal; coin money; emit bills of credit; make anything but gold and silver coin a tender in payment of debts; pass any bill of attainder, ex post facto law, or law impairing the obligation of contracts, or grant any title of nobility.

2. No state shall, without the consent of the Congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws: and the net produce of all duties and imposts, laid by any state on imports or exports, shall be for the use of the treasury of the United States; and all such laws shall be subject to the revision and control of the Congress.

3. No state shall, without the consent of Congress, lay any duty of tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another state, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay.

ARTICLE II

Section I. 1. The executive power shall be vested in a president of the United States of America. He shall hold his office during the term of four years, and, together with the vice president, chosen for the same term, be elected as follows.

2. Each state shall appoint, in such manner as the legislature thereof may direct, a number of electors, equal to the whole number of senators and representatives to which the state may be entitled in the Congress: but no senator or representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.

3. The electors shall meet in their respective states, and vote by ballot for two persons, of whom one at least shall not be an inhabitant of the same state with themselves. And they shall make a list of all the persons voted for, and of the number of votes for each; which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the president of the Senate. The president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates, and the votes shall then be counted. The person having the greatest number of votes shall be the president, if such number be a majority of the whole number of electors appointed; and if there be more than one who have such majority, and have an equal number of votes, then the House of Representatives shall immediately choose by ballot one of them for president; and if no person have a majority, then from the five highest on the list the said House shall in like manner choose the president. But in choosing the president, the vote shall be taken by states, the representation for each state having one vote; A quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. In every case, after the choice of the president, the person having the greatest number of votes of the electors shall be the vice president. But if there should remain two or more who have equal votes, the Senate shall choose from them by ballot the vice president (Superseded by the 12th Amendment).

4. The Congress may determine the time of choosing the electors, and the day on which they shall give their votes; which day shall be the same throughout the United States.

5. No person except a natural born citizen, or a citizen of the United States, at the time of the adoption of this Constitution, shall be eligible to the office of president; neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and have been fourteen years a resident within the United States.

6. In case of the removal of the president from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the vice president, and the Congress may by law provide for the case of removal, death, resignation, or inability, both of the president and vice president, declaring what officer shall then act as president, and such officer shall act accordingly, until the disability be removed, or a president shall be elected.

7. The president shall, at stated times, receive for his services, a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period

any other emolument from the United States, or any of them.

8. Before he enter on the execution of his office, he shall take the following oath or affirmation:—

"I do solemnly swear (affirm) that I will faithfully execute the office of President of the United States, and will, to the best of my ability, preserve, protect, and defend the Constitution of the United States."

SECTION II. 1. The president shall be commander in chief of the army and navy of the United States, and of the militia of the several states, when called into the actual service of the United States; he may require the opinion, in writing, of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment.

2. He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two-thirds of the senators present concur; and he shall nominate, and by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the supreme court, and all other officers of the United States, whose appointments are not herein otherwise provided for, and which shall be established by law: but the Congress may by law vest the appointment of such inferior officers, as they think proper, in the president alone, in the courts of law, or in the heads of departments.

3. The president shall have power to fill up all vacancies that may happen during the recess of the Senate, by granting commissions which shall expire at the end of their next session.

SECTION III. He shall from time to time give to the Congress information of the state of the Union, and recommend to their consideration such measures as he shall judge necessary and expedient; he may, on extraordinary occasions, convene both Houses, or either of them, and in case of disagreement between them, with respect to the time of adjournment, he may adjourn them to such time as he shall think proper; he shall receive ambassadors and other public ministers; he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States.

SECTION IV. The president, vice president, and all civil officers of the United States shall be removed from office on impeachment for, and conviction of, treason, bribery, or other high crimes and misdemeanors.

ARTICLE III

SECTION I. The judicial power of the United States, shall be vested in one supreme court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges, both of the supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services, a compensation, which shall not be diminished during their continuance in office.

SECTION II. 1. The judicial power shall extend to all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority;—to all cases affecting ambassadors, other public ministers and consuls;—to all cases of admiralty and maritime jurisdiction;—to controversies to which the United States shall be a party;—to controversies between two or more states;—between a state and citizens of another state;—between citizens of different states;—between citizens of the same state claiming lands under grants of different states,—and between a state, or the citizens thereof, and foreign states, citizens, or subjects.

2. In all cases affecting ambassadors, other public ministers and consuls, and those in which a state shall be party, the supreme court shall have original jurisdiction. In all the other cases before mentioned, the supreme court shall have appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations as the Congress shall make.

3. The trial of all crimes, except in cases of impeachment shall be by jury; and such trial shall be held in the state where the said crimes shall have been committed; but when not committed within any state, the trial shall be at such place or places as the Congress may by law have directed

SECTION III. 1. Treason against the United States, shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court.

2. The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted.

ARTICLE IV

SECTION I. Full faith and credit shall be given in each state to the public acts, records, and judicial proceedings of every other state. And the Congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof.

SECTION II. 1. The citizens of each state shall be entitled to all privileges and immunities of citizens in the several states.

2. A person charged in any state with treason, felony, or other crime, who shall flee from justice, and be found in another state, shall on demand of the executive authority of the state from which he fled, be delivered up, to be removed to the state having jurisdiction of the crime.

3. No person held to service or labor in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due.

SECTION III. 1. New states may be admitted by the Congress into this Union; but no new state shall be formed or erected within the jurisdiction of any other state; nor any state be formed by the junction of two or more states, or parts of states, without the consent of the legislatures of the states concerned as well as of the Congress.

2. The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this Constitution shall be so construed as to prejudice any claims of the United States, or of any particular state.

SECTION IV. The United States shall guarantee to every state in this Union a republican form of government, and shall protect each of them against invasion; and on application of the legislature, or of the executive (when the legislature cannot be convened) against domestic violence.

ARTICLE V

The Congress, whenever two-thirds of both Houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; provided that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the Ninth Section of the First Article; and that no state, without its consent, shall be deprived of its equal suffrage in the Senate.

ARTICLE VI

1. All debts contracted and engagements entered into before the adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

2. This Constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, anything in the Constitution or laws of any state to the contrary notwithstanding.

3. The senators and representatives before mentioned, and the members of the several state legislatures, and all executive and judicial officers, both of the United States and of the several states, shall be bound by oath or affirmation, to support this Constitution; but no religious test shall ever be required as a qualification to any office or public trust under the United States.

ARTICLE VII

The ratification of the conventions of nine states, shall be sufficient for the establishment of this Constitution between the states so ratifying the same.

Done in convention by the unanimous consent of the states present the seventeenth day of September in the year of our Lord one thousand seven hundred and eighty-seven, and of the independence of the United States of America the twelfth. In witness whereof we have hereunto subscribed our names,

GO: WASHINGTON—
Presidt. and Deputy from Virginia

New Hampshire
JOHN LANGDON
NICHOLAS GILMAN

Massachusetts
NATHANIEL GORHAM
RUFUS KING

Connecticut
WM. SAML. JOHNSON
ROGER SHERMAN

New York
ALEXANDER HAMILTON

New Jersey
WIL: LIVINGSTON
DAVID BREARLEY
WM. PATERSON
JONA: DAYTON

Pennsylvania
B. FRANKLIN
THOMAS MIFFLIN
ROBT. MORRIS
GEO. CLYMER
THOS. FITZSIMONS
JARED INGERSOLL
JAMES WILSON
GOUV. MORRIS

Delaware
GEO: READ
GUNNING BEDFORD JUN
JOHN DICKINSON
RICHARD BASSETT
JACO; BROOM

Maryland
JAMES MCHENRY
DAN OF ST. THOS. JENIFER
DANL. CARROLL

Virginia
JOHN BLAIR—
JAMES MADISON JR.

North Carolina
WM. BLOUNT
RICHD. DOBBS SPAIGHT
HU WILLIAMSON

South Carolina
J. RUTLEDGE
CHARLES COTESWORTH PINCKNEY
CHARLES PINCKNEY
PIERCE BUTLER

Georgia
WILLIAM FEW
ABR. BALDWIN

Attest WILLIAM JACKSON,
Secretary

AMENDMENTS TO THE CONSTITUTION

** Date when declared ratified by a sufficient number of states.*

ARTICLE I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

ARTICLE II

A well regulated militia, being necessary to the security of a free state, the right of the people to keep and bear arms, shall not be infringed.

ARTICLE III

No soldier shall, in time of peace, be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.

ARTICLE IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

ARTICLE V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

ARTICLE VI

In all criminal prosecutions the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the state and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

ARTICLE VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any court of the United States, than according to the rules of the common law.

ARTICLE VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

ARTICLE IX

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

ARTICLE X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people.

** The first ten amendments (Bill of Rights) were declared in force December 15, 1791.*

ARTICLE XI

The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States, by citizens of another state, or by citizens or subjects of any foreign state.

** January 8, 1798*

ARTICLE XII

The electors shall meet in their respective states, and vote by ballot for president and vice president, one of whom, at least, shall not be an inhabitant of the same state with themselves; they shall name in their ballots the person voted for as president, and in distinct ballots the person voted for as vice president, and they shall make distinct lists of all persons voted for as president, and of all persons voted for as vice president, and of the number of votes for each, which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the president of the Senate;—the president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted; —the person having the greatest number of votes for president, shall be the president, if such number be a majority of the whole number of electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as president, the House of Representatives shall choose immediately, by ballot, the president. But in choosing the president, the votes shall be taken by states, the representation from each state having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. And if the House of Representatives shall not choose a president whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the vice president shall act as president, as in the case of the death or other constitutional disability of the president. The person having the greatest number of votes as vice president, shall be the vice president, if such number be a majority of the whole number of electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the vice president; a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of president shall be eligible to that of vice president of the United States. **September 25, 1804*

ARTICLE XIII

1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

2. Congress shall have power to enforce this article by appropriate legislation. **December 18, 1865*

ARTICLE XIV

1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside. No state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any state deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

2. Representatives shall be apportioned among the several states according to their respective numbers, counting the whole number of persons in each state, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for president and vice president of the United States, representatives in Congress, the executive and judicial officers of a state, or the members of the legislature thereof, is denied to any of the male inhabitants of such state, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such state.

3. No person shall be a senator or representative in Congress, or elector of president and vice president, or hold any office, civil or military, under the United States, or under any state, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any state legislature, or as an executive or judicial officer of any state, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any state shall assume or pay any debt

or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations, and claims shall be held illegal and void.

5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article. **July 28, 1868*

ARTICLE XV

1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

2. The Congress shall have power to enforce this article by appropriate legislation. **March 30, 1870*

ARTICLE XVI

The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several states, and without regard to any census or enumeration. **February 25, 1913*

ARTICLE XVII

The Senate of the United States shall be composed of two senators from each state, elected by the people thereof, for six years, and each senator shall have one vote. The electors in each state shall have the qualifications requisite for electors of the most numerous branch of the state legislatures.

When vacancies happen in the representation of any state in the Senate, the executive authority of such state shall issue writs of election to fill such vacancies: Provided, that the legislature of any state may empower the executive thereof to make temporary appointments until the people fill the vacancies by election as the legislature may direct.

This amendment shall not be so construed as to affect the election or term of any senator chosen before it becomes valid as part of the Constitution. **May 31, 1913*

ARTICLE XVIII

1. After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof, for beverage purposes, is hereby prohibited.

2. The Congress and the several states shall have concurrent power to enforce this article by appropriate legislation.

3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of the several states, as provided in the Constitution, within seven years from the date of submission hereof to the states by the Congress. **January 29, 1919*

ARTICLE XIX

1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any state on account of sex.

2. Congress shall have power, by appropriate legislation, to enforce the provisions of this article. **August 26, 1920*

ARTICLE XX

1. The terms of the president and vice president shall end at noon on the 20th day of January, and the terms of senators and representatives at noon on the 3d day of January, of the years in which such terms would have ended if this article had not been ratified; and the terms of their successors shall then begin.

2. The Congress shall assemble at least once in every year, and such meeting shall begin at noon on the 3d day of January, unless they shall by law appoint a different day.

3. If, at the time fixed for the beginning of the term of the president, the president elect shall have died, the vice president elect shall become president. If a president shall not have been chosen before the time fixed for the beginning of his term, or if the president elect shall have failed to qualify, then the vice president elect shall act as president until a president shall have qualified; and the Congress may by law provide for the case wherein neither a president elect nor a vice president elect shall have qualified, declaring who shall then act as president, or the manner in which one who is to act shall be selected, and such person shall act accordingly until a president or vice president shall have qualified.

4. The Congress may by law provide for the case of the death of any of the persons from whom the House of Representatives may choose a president whenever the right of choice shall have devolved upon them, and for the case of the death of any of the persons from whom the Senate may choose a vice president whenever the right of choice shall have devolved upon them. **February 6, 1933*

ARTICLE XXI

1. The 18th article of amendment to the Constitution of the United States is hereby repealed.

2. The transportation or importation into any state, territory, or possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited.

3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by conventions in the several states, as provided in the Constitution, within seven years from the date of the submission thereof, to the states by the Congress. **December 5, 1933*

ARTICLE XXII

1. No person shall be elected to the office of the President more than twice, and no person who has held the office of President, or acted as President, for more than two years of a term to which some other person was elected President shall be elected to the office of the President more than once. But this article shall not apply to any person holding the office of President when this article was proposed by the Congress, and shall not prevent any person who may be holding the office of President, or acting as President, during the term within which this article becomes operative from holding the office of President or acting as President during the remainder of such term.

2. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislators of three fourths of the several states within seven years from the date of its submission to the states by the Congress. **February 26, 1951*

ARTICLE XXIII

1. The District constituting the seat of government of the United States shall appoint in such manner as the Congress may direct:

A number of electors of President and Vice President equal to the whole number of Senators and Representatives in Congress to which the District would be entitled if it were a State, but in no event more than the least populous State; they shall be in addition to those appointed by the States, but they shall be considered, for the purpose of the election of President and Vice President, to be electors appointed by a State; and they shall meet in the District and perform such duties as provided by the twelfth article of amendment.

2. The Congress shall have power to enforce this article by appropriate legislation. **April 3, 1961*

ARTICLE XXIV

1. The right of the citizens of the United States to vote in any primary or other election for President or Vice President, for electors for President or Vice President, or for Senator or Representative in Congress, shall not be denied or abridged by the United States or any State by reasons of failure to pay any poll tax or any other tax.

2. The Congress shall have power to enforce this article by appropriate legislation. **January 23, 1964*

THE FEDERAL GOVERNMENT

THE LEGISLATIVE DEPARTMENT

THE CONGRESS

Consisting of both the Senate and the House of Representatives as co-ordinate bodies.

DURATION.—The term of each Congress is for two years, beginning January 3d of the odd years.

REGULAR SESSIONS—Annual, beginning at noon on January 3d.

SPECIAL SESSIONS.—At the call of the president.

MEMBERSHIP.—Each House is the judge of the elections and qualifications of its own members.

The Senate

NUMBER.—Two senators from each state.

ELECTED.—By direct vote of the people.

TERM.—Six years; one-third of the Senate being elected every two years.

ELIGIBILITY.—Citizen of the United States nine years; resident of state; minimum age, 30 years.

SALARY.—Fixed by law at $30,000 per year.

PRESIDENT OF THE SENATE.—The vice president of the United States.

POWERS OF THE SENATE:—

Confirms or rejects nominations of the president.
Ratifies or rejects treaties with foreign powers.
Elects president *pro tempore* of the Senate, and its other officers.

Elects vice president of the United States if regular election fails.
Acts as a court for the trial of impeachments.

The House of Representatives

NUMBER.—Four hundred thirty-five members.*
ELECTED.—By voters of congressional districts.
TERM.—Two years,—the entire House being elected every two years.
ELIGIBILITY.—Citizen of the United States seven years; resident of the state; minimum age 25 years.
SALARY.—Fixed by law at $30,000 per year; the speaker, $43,000 per year and $10,000 for expenses.
POWERS OF THE HOUSE OF REPRESENTATIVES:—
Elects its speaker (presiding officer) and its other officers.
Elects president of the United States if the regular election fails.
Prosecutes impeachments before the Senate.
Originates all bills for raising revenue.

*There is besides a resident commissioner from Puerto Rico, who has the right to speak and to make motions, but not to vote.

THE EXECUTIVE DEPARTMENT

THE PRESIDENT

HOW ELECTED.—In several steps as follows:
State electors are chosen at a general election held on the Tuesday following the first Monday of November of every fourth year, the number of electors of each state being equal to the number of senators and representatives to which the state is entitled in Congress. The date of the election was fixed by act of Congress in 1845.
The electors meet in their respective states on December 15 and vote by ballot for president and vice president; at the same time they make certificates of their vote and transmit the same to the president of the Senate.
The Senate and the House of Representatives meet jointly and count the votes of the state electors, when, if there is an election, the president of the Senate declares who are elected president and vice president.
In case there is no choice by the state electors, the president is elected by the House of Representatives from the three candidates who received the most electoral votes for president, in which election the vote is taken by states, each state having but one vote, and a majority of all the states being necessary to a choice.
TERM OF OFFICE.—Four years, from January 20.
ELIGIBILITY.—A natural born citizen; resident of the United States 14 years; minimum age, 35.
SALARY.—$100,000 a year; also $50,000 taxable and $40,000 non-taxable for expenses.

POWERS AND DUTIES OF THE PRESIDENT:—
Commander in chief of the army and navy.
Receives representatives of foreign governments.
Communicates with Congress by message.
Approves or disapproves acts of Congress.
Calls and adjourns special sessions of Congress.
Makes treaties with advice and consent of the Senate.
Appoints public officers with the advice and consent of the Senate.
Commissions public officers of the United States.
Grants reprieves and pardons for offenses against the United States.

The Vice President

HOW ELECTED.—Elected by state electors the same as the president; or by the Senate, in case there is no choice by the state electors.
TERM AND ELIGIBILITY.—Same as for president.
SALARY.—$53,000 a year, which includes $10,000 for expenses.
THE PRESIDENTIAL SUCCESSION:—In case of the removal, death, resignation, or inability:
Of the president, the vice president takes the president's place.
Of both president and vice president, under the Presidential Succession act of July 18, 1947, the Speaker of the House of Representatives, if constitutionally eligible, shall resign his position and act as president. If there is no speaker, the president pro tempore of the Senate may resign and serve. If both these offices are vacant, then the heads of the departments in the order given below, if constitutionally eligible. The individual so succeeding shall serve out the current term, except that in case both president-elect and vice president-elect fail to qualify, or in case both are temporarily disabled, he shall serve only until one of them qualifies, or the disability is removed.

The Executive Departments

DEPARTMENT OF STATE.—Has charge of foreign affairs.
TREASURY DEPARTMENT.—Has charge of fiscal affairs.
DEPARTMENT OF DEFENSE. — Has charge of the national defense forces: army, navy, and air force.
DEPARTMENT OF JUSTICE.—Has charge of the legal affairs of the government.
POST-OFFICE DEPARTMENT.—Has charge of postal affairs.
DEPARTMENT OF THE INTERIOR.—Has charge of domestic affairs, including public lands, pensions.
DEPARTMENT OF AGRICULTURE.—Has charge of agricultural affairs, etc.
DEPARTMENT OF COMMERCE.—Has charge of domestic and foreign affairs relating to commerce, transportation, supervision of Weather Bureau, etc.
DEPARTMENT OF LABOR.—Has charge of labor affairs and naturalization.
DEPARTMENT OF HEALTH, EDUCATION AND WELFARE.—Has charge of public health service, office of education, social security administration.
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT.—Has charge of public housing, mortgage insurance, planning for city development and transportation.

The Cabinet

MEMBERS.—Heads of the executive departments.
APPOINTMENT.—By the president with the advice and consent of the Senate.
SALARY.—All cabinet members, $35,000 annually.

The President and Legislation

Acts of Congress become laws:
When signed (approved) by the president, not vetoed within ten days if Congress is in session, or passed over his veto. See *Law, Enactment of.*

THE JUDICIAL DEPARTMENT

JUDGES OF THE UNITED STATES COURTS

APPOINTMENT.—By the president with the advice and consent of the Senate.
TENURE OF OFFICE.—During life or good behavior; but may retire on full salary after reaching the age of seventy years, and after ten years' service on the bench.

THE SUPREME COURT OF THE UNITED STATES

MEMBERS.—A chief justice and eight associate justices.
SALARIES.—Chief justice, $40,000; associate justices, each, $39,500. Retirement at full pay optional after 70½ years of age.
TERMS OF COURT.—One each year, beginning on the second Monday in October.
ORIGINAL JURISDICTION.—In all cases affecting ambassadors, ministers, and consuls, and in all cases in which a state is a party.
APPELLATE JURISDICTION.—In cases of law and equity where the inferior courts have original jurisdiction, with such exceptions and regulations as Congress has made.
THE CHIEF JUSTICE.—Presides over the Senate when it sits as a court of impeachment for the trial of the president.

INFERIOR COURTS

JURISDICTION:—
In cases between citizens of different states.
In cases in which the United States is a party.
In cases of admiralty and maritime jurisdiction.
In trials for crimes against the United States; but the trial of crimes must be by jury, and must be held in the state where the crime was committed.
Appeals to the supreme court may be had in all cases of law and equity, with such exceptions and regulations as Congress has made.

United States Circuit Courts of Appeals:—

Organized in 1891 to relieve the United States supreme court in appellate cases.

NUMBER.—One in each of the ten judicial circuits and one in the District of Columbia.

SALARY OF CIRCUIT JUDGE.—$33,000 per year.

MEMBERS.—Three judges: the chief justice, or the associate justice assigned to the circuit, or any circuit or district judge within the circuit, is competent to sit.

United States District Courts:—

NUMBER OF DISTRICTS.—One or more in each state and territory. At present there are eighty-eight judicial districts within the United States and the District of Columbia, and one each for Virgin Islands, Puerto Rico, Canal Zone, and Guam.

SALARY OF DISTRICT JUDGE.—Fixed by law at $30,000 per year.

United States Court of Claims:—

JURISDICTION.—Claims against the United States, including those referred to it by Congress.

MEMBERS.—One chief justice and four associate justices.

SALARIES.—All justices, $33,000 annually.

United States Court of Customs and Patent Appeals:—

JURISDICTION.—Cases involving appeals from customs duties and from the patent office.

MEMBERS.—One chief justice and four associate justices.

SALARIES.—Fixed by law at $33,000 per year.

CONGRESS

All legislative power granted by the Constitution is intrusted to the "Congress of the United States," which consists of a Senate and a House of Representatives. The number of members of each of these bodies, method of election, term, salary, conditions of eligibility, are given above in tabulated form. Each house of the Congress has some special powers.

The Senate. To the Senate is given the power of ratifying nominations of the president to public office. The Constitution specifically mentions judges of the supreme court and "ambassadors, other public ministers and consuls" for appointment "with the advice and consent of the Senate." The Senate, however, is never formally consulted. It has no right of nomination, but it does at times reject the president's appointments, though rarely in the case of heads of executive departments or "cabinet positions."

Foreign treaties are made "by and with the consent of the Senate, provided two-thirds of the Senators present concur." These two special powers associate the Senate with the president in the determining of foreign policy and in the guidance of foreign relations. Other facts indicate the same intention: the Senate's title, derived from the Roman Senate, which was largely occupied with foreign relations; its constitutional privilege to deliberate behind closed doors or in "executive session"; its relatively small membership; the more mature age of its members and the fact that as a body it "never dies" but is reconstituted gradually. Yet this responsibility for foreign policy has been sparingly and rather negatively exercised by the Senate.

The president is considered to have the sole right of negotiating with representatives of other nations and the Senate has never received either foreign delegates or communications. The president does not formally consult the Senate upon foreign relations, though he generally seeks to maintain touch with Senate opinion through its committee on foreign affairs. The president retains complete control of a treaty until he delivers it to the Senate, and he may even then withdraw it. He is not bound to disclose to the Senate correspondence with foreign states, or even to give information within his possession. For these reasons the president, rather than the Senate, generally determines foreign policy, though subject to the severe limitation of having his treaties rejected. The president also has repeatedly conducted foreign negotiations through "personal representatives," unconfirmed by the Senate, or he may himself negotiate personally and directly, as did President Wilson at Paris.

It may also be noticed that, through the treaty ratifying power, the Senate, with the president, may end war and conclude peace, though only Congress can declare war. For the trial of impeachments, the Senate sits as a judicial body, a concurrence of two-thirds of the members present being necessary for conviction. (Article I, sec. 3, par. 6). The chief justice presides at the impeachment trial of a president.

The vice president of the United States is the constitutional presiding officer of the Senate, but a president *pro tempore* is chosen from among the senators. In presidential elections, in case no person should receive a majority of votes of the electors, the vice president would be chosen by the Senate.

The House of Representatives. The House of Representatives, likewise, has special powers. It alone can vote impeachment and prosecute the trial of an impeached officer. It alone can initiate bills for raising revenue, though such measures are frequently totally altered by the Senate. In case of a failure of a presidential election to give a majority of electors for one person, the House of Representatives is empowered to select the president by ballot; each state casting one ballot.

During the early history of Congress, the House of Representatives appeared to be the more important body and membership in it was preferred to the Senate. Gradually the Senate became the more important body, and the position of senator far exceeded in influence that of representative. This lesser rôle played by the House of Representatives is in striking contrast to the predominant position held by the chambers of deputies in France and Belgium, as contrasted with the senates of those countries.

Powers of Congress. Other than as above stated, the two houses possess equality in legislation. The Constitution limits this legislative faculty, however, to expressly defined fields.

To provide for the raising and disbursement of revenue.
To borrow money; to coin money and to regulate its value; and to fix the standard of weights and measures.
To regulate foreign and interstate commerce.
To declare war, and to maintain an army and a navy.
To establish post offices and post roads.
To enact patent and copyright laws.
To enact uniform naturalization and bankruptcy laws.
To provide for the punishment of crimes against the United States.
To establish courts inferior to the supreme court.
To provide for organizing and calling out the militia.
To admit new states into the Union.
To provide for the government of the territories.
To exercise exclusive jurisdiction over the District of Columbia, public lands, public buildings, forts, and navy yards.
To enact all laws necessary and proper for carrying into execution all the powers vested by the Constitution in the government of the United States.

SPEAKERS OF THE HOUSE

Name	State	Born	Died	Congress	Years
F. A. Muhlenberg	Pa.	1750	1801	1	1789–91
Jonathan Trumbull	Conn.	1740	1809	2	1791–93
F. A. Muhlenberg	Pa.	1750	1801	3	1793–95
Jonathan Dayton	N. J.	1760	1824	4, 5	1795–99
Theo. Sedgwick	Mass.	1746	1813	6	1799–01
Nathaniel Macon	N. C.	1758	1837	7–9	1801–07
Joseph B. Varnum	Mass.	1750	1821	10, 11	1807–11
Henry Clay	Ky.	1777	1852	12, 13	1811–14
Langdon Cheves	S. C.	1776	1857	13	1814–15
Henry Clay	Ky.	1777	1852	14–16	1815–20
John W. Taylor	N. Y.	1784	1854	16	1820–21
Philip P. Barbour	Va.	1783	1841	17	1821–23
Henry Clay	Ky.	1777	1852	18	1823–25
John W. Taylor	N. Y.	1784	1854	19	1825–27
Andrew Stevenson	Va.	1784	1857	20–23	1827–34
John Bell	Tenn.	1797	1869	23	1834–35
James K. Polk	Tenn.	1795	1849	24, 25	1835–39
R. M. T. Hunter	Va.	1809	1887	26	1839–41
John White	Ky.	1805	1845	27	1841–43
John W. Jones	Va.	1791	1848	28	1843–45
John W. Davis	Ind.	1799	1859	29	1845–47
Robert C. Winthrop	Mass.	1809	1894	30	1847–49
Howell Cobb	Ga.	1815	1868	31	1849–51
Linn Boyd	Ky.	1800	1859	32, 33	1851–55
Nathaniel P. Banks	Mass.	1816	1894	34	1855–57
James L. Orr	S. C.	1822	1873	35	1857–59
Wm. Pennington	N. J.	1796	1862	36	1859–61
Galusha A. Grow	Pa.	1823	1907	37	1861–63
Schuyler Colfax	Ind.	1823	1885	38–40	1863–69
James G. Blaine	Me.	1830	1893	41–43	1869–75
Michael C. Kerr	Ind.	1827	1876	44	1875–76
Samuel J. Randall	Pa.	1828	1890	44–46	1876–81
Joseph W. Keifer	Ohio	1836	1932	47	1881–83
John G. Carlisle	Ky.	1835	1910	48–50	1883–89
Thomas B. Reed	Me.	1839	1902	51	1889–91
Charles F. Crisp	Ga.	1845	1896	52, 53	1891–95
Thomas B. Reed	Me.	1839	1902	54, 55	1895–99
David B. Henderson	Iowa	1840	1906	56, 57	1899–03
Joseph G. Cannon	Ill.	1836	1926	58–61	1903–11
Champ Clark	Mo.	1850	1921	62–65	1911–19
Fred. H. Gillett	Mass.	1851	1935	66–68	1919–25
Nicholas Longworth	Ohio	1869	1931	69–71	1925–31
John N. Garner	Tex.	1868	....	72	1931–33
Henry T. Rainey	Ill.	1860	1934	73	1933–34
Joseph W. Byrnes	Tenn.	1869	1936	74	1935–36
Wm. B. Bankhead	Ala.	1874	1940	74–76	1936–40
Sam Rayburn	Tex.	1882	1961	76–79	1940–47
Joseph W. Martin, Jr.	Mass.	1884	....	80	1947–49
Sam Rayburn	Tex.	1882	1961	81–82	1949–53
Joseph W. Martin, Jr.	Mass.	1884	....	83	1953–55
Sam Rayburn	Tex.	1882	1961	84–86	1955–61
John W. McCormack	Mass.	1891	....	87–	1962–

Interpreted Powers. The practice of legislation has grown and taken on new aspects through the felt necessity of extending the scope of the national government. The supreme court has usually given a liberal interpretation to these powers, especially to the power to regulate interstate commerce and to enact needed laws to carry into execution the powers vested by the constitution in the national government. The court having decided, however, that the Constitution did not give the power to levy a direct tax on incomes, the 16th amendment was adopted in 1913, giving Congress this right.

Limitations on Powers of Congress. The Constitution limits Congress to powers expressly conferred. It also forbids Congress to:

Suspend the writ of habeas corpus unless, in case of rebellion or invasion, the public safety so requires.
Pass any bill of attainder or ex post facto law.
Lay any direct per capita tax, other than an income tax, without apportionment among the states according to population.
Lay any tax or duty on articles exported from any state.
Give any preference to the ports of one state over those of another.
Grant any title of nobility.
Create a new state within the jurisdiction of another state or out of its territory, without the consent of the state.
Make any law respecting the establishment of religion or prohibiting its free exercise.
Abridge the freedom of speech or of the press.
Forbid the right of peaceable assembly.
Forbid the right of petition.
Pass any law for the quartering of soldiers in private houses, without the consent of the owners, in time of peace.
Pass any law providing for unreasonable searches and seizures, or for the issue of warrants without the usual judicial process.
Infringe the right to keep and bear arms.
Pass any law providing for the holding of a person for a capital or otherwise infamous crime, unless on presentment and indictment of a grand jury, except in cases arising in the land or naval forces or in the militia when in actual service in time of war or public danger.
Pass any law that would subject a person to being twice put in jeopardy of life or limb or deprive him of life, liberty, or property, without due process of law.
Pass any law taking private property for public use without just compensation.
Pass any law denying or abridging the right of citizens of the United States to vote, by reason of race, color, sex, or previous condition of servitude.
Assume or pay any debt or obligation incurred in aid of rebellion or insurrection against the United States, or to pay any claim for the loss of slaves.
Pass any law denying the rights of an accused person to a speedy and public trial by a jury of the locality where the crime is committed, to be informed of the nature and cause of the accusation against him, to be confronted with the witnesses against him, and to compel witnesses to testify in his favor, and to have the assistance of a counsel.
Pass any law forbidding jury trial for suits at common law, where the value in controversy exceeds twenty dollars.
Pass any law requiring excessive bail or imposing excessive fines or cruel and unusual punishments.

These prohibitions apply to the power of Congress in legislating for the Union. It will be noted that they refer explicitly to Congress, not to the states. However, the 14th amendment does place certain restrictions on the states. See *State Rights*.

Enactment of a Law. The process of making laws is long and complex. An understanding of the essential steps in it, however, is necessary for an intelligent grasp of newspaper accounts of the progress of legislation.

Of the numerous steps which a measure may have to pass through before becoming a law, the 16 listed below are the most important. For the sake of simplicity, it will be assumed that the typical bill here traced through Congress originates in the House of Representatives, although all bills except those relating to appropriations may originate also in the Senate. If the Senate acts first on a measure, the rôles of the houses as described here will be reversed. Here are the principal steps:

1. A bill is introduced by an individual Congressman. This step may be preceded by a message from the president recommending action. The message is ordinarily referred to a committee, the chairman of which introduces a bill embodying the proposals. (See *Congressional Committees*.)

2. The bill is referred for study to a standing committee of the House, designated by the speaker.

3. The committee, if it so decides, may take testimony regarding the measure from spokesmen for interested groups, these hearings usually including executive officers of the government.

4. The committee may then report the bill back to the House, with or without amendments and with or without recommendation for enactment. If the committee takes no action, the bill is said to die in committee. The House may, however, discharge the committee from further consideration of the bill and so place the bill on the legislative calendar.

5. If passed, the bill is sent to the Senate.

6. There it is referred to a committee, as in the House.

7. The Senate committee may, at its discretion, report the bill for favorable action, with or without changes, or it may substitute another bill already before it or an entirely new bill on the subject.

8. If the Senate approves the bill as it came from the House, it goes to the president for his signature. If defeated in the Senate, the bill is dead, barring a reconsideration. The third possible action is approval in amended form.

9. In this last case, the bill goes back to the House, which may accept the amendments, thus making it ready for the president's signature.

10. If the House refuses to accept the Senate amendments or makes others which the Senate refuses to accept, the bill "goes to conference." This means that the measure is submitted to a group consisting of 3 or 5 members of the House and the same number of members of the Senate, each panel appointed by the presiding officer of the house represented. The duty of conferees is to reconcile differences in the bill as approved by the two houses.

11. If no agreement is reached, the bill is said to "die in conference." Otherwise the conferees report their agreement to both houses, and the conference report is either sent back for further efforts or is accepted.

12. When the conference report is accepted by both houses, the bill goes to the president.

13. The president may sign the bill, usually after consultation with his advisers. It then becomes a law, and is classified by the secretary of state as public or private, and is given a number.

14. The president may fail to sign the bill after he has had it for ten days, exclusive of Sundays. In that case, it becomes law without his signature, except in one circumstance, which is described below under *Pocket Veto*.

15. The president may return the bill to Congress with a veto.

16. Congress may then repass the bill by two-thirds majorities in both houses. If this is done, the bill becomes law without the president's signature. If either house fails to override the veto by this majority, the bill is dead.

Pocket Veto. This term is popularly applied when the president withholds for ten days his approval of a bill and Congress adjourns before the end of the ten days. Under these circumstances, the bill dies without having been specifically vetoed.

Congressional Committees. These bodies form bottle-necks, as it were, by which the vast majority of bills are kept from consideration by Congress, only those regarded as the most important being allowed to pass through. It is by these committees also that the only genuine study in Congress is made of the need and probable effect of the prospective laws. Partly for this reason, the recommendations of the committees carry great weight with the members of Congress, none of whom ordinarily has had an opportunity to consider the merits of the bills advocated.

Representation of the political parties on committees is in approximate proportion to their strength in the legislative body. The chairman of each committee is always a member of the majority party. It is for this reason that few laws are ever enacted which have not the support of the party in power.

The most powerful committees include the appropriations committee, which handles measures for spending money, and the ways and means committee, which deals with tax bills. Measures from these committees have the right of way at all times. The power to give preferential places on the calendar to other bills rests with the committee on rules. The so-called steering committee is made up of leaders of the majority party only. Its purpose is to hasten legislation favored by the party in power.

Kinds of Congressional Action. Bills are measures which, on approval, become acts. Resolutions represent Congressional action of a "non-legislative" character. Senate resolutions and House resolutions require action by one house only. Concurrent resolutions require approval by both houses but not by the president. Joint, or public, resolutions require the same procedure as bills. They are frequently indistinguishable from bills except in form and name.

THE PRESIDENT

The president of the United States is the highest representative of the nation. Elected by the suffrage of the voters of all the states for a fixed term of years, he is independent of Congress, the courts, and sectional demands. In spite of the theory of separation of powers, in accordance with which the constitution-makers created the office, the president has immense influence over legislation and is held responsible by the people for the work of Congress.

The president's influence springs from his power of veto; from his constitutional practice of submitting recommendations to Congress, which he may do either orally, in the presence of both houses, or by written message; and from his vast influence with the nation as the molder of public opinion. His power of appointment, with his ability to distribute "patronage" among members of Congress, serves to keep the members who are of his party in accord with his policies.

The National Leader. While dependent on his party for nomination and support, he is the recognized national leader of his party and frequently dominates its views and controls its organization. He is, moreover, the head of the entire national administration. Members of Congress, the president, and the vice president are the only elected officers of the United States. All others are appointed by the president or by heads of departments under his control. The president's removal power extends to nearly all offices, except the judicial or quasi judicial. In 1926, the Supreme Court in the case of *Myers v. U. S.* upheld the president's removal power over an office given fixed tenure by Congress.

Powers of President. The president is the commander in chief of the army and of the navy, with the right to determine their employment and to dispatch armed forces upon foreign missions. While Congress alone can legally declare war, the president has repeatedly, of his own authority, used the army or navy in acts of warfare and for hostile invasion. On his will and judgment, more even than on the attitude of Congress, seems to rest the momentous decision of peace and of war. By his direction the attorney-general undertakes judicial investigations and prosecutions. These may be suspended or abandoned by the president's direction. He may grant pardon to convicted persons, and amnesty to political prisoners or to those in rebellion. He may commute or suspend sentences after conviction or during the trial itself.

The Cabinet. The cabinet, or conference of heads of departments, meets solely to advise with the president and may not with propriety assemble without his presence. Its views are purely consultative and in no manner bind his freedom of decision. He may at any time direct the action of the head of a department, and in the field of foreign relations frequently does so, and may alter or reverse a department's decision.

Disability of President. The president remains in office, irrespective of the attitude of Congress or of the support of the nation, until the end of his term, or until his death in office. The Constitution provides that, in case of the disability of the president, the vice president may act; but no procedure is laid down for determining the president's disability, and, while more than one president has suffered long and prostrating illness, no vice president has ever assumed office during the president's lifetime.

Place of Power. The official actions of the president need not be taken at the national capital. He may exercise any power at any place within the country or even while abroad. For more than a century no president left the national territory during his term of office, but this tradition has been broken by presidents in recent years without legally impairing their position or their actions.

Impeachment of President. There is no way of disciplining the president except by impeachment; and, while this method was once attempted (1868, Andrew Johnson), it was unsuccessful, more than one-third of the members of the Senate present at

the trial having refused to vote for conviction. Furthermore, while Federal courts have in certain instances directed writs against heads of departments, such writs apparently cannot be issued against the president himself nor can his actions thus be judicially reviewed.

Authority in Crises. During war time, the president becomes virtually a national dictator, concentrating in his office the strength and the will of the nation. It may be observed, however, that, while Congress and the nation have given unreserved support and authority to the president during war, they have jealously limited him in the arrangement of peace. In the economic crisis in 1933, the president was granted powers in many respects even greater than those given in time of war.

Magnitude of Power. Reviewing the office of president in the light of other national executives, it is probably correct to say that it exceeds all other modern offices in the breadth of its powers and in the respect which it commands. Since the term of Washington, it has steadily grown in independence and in influence. It has gained many functions and has surrendered none. It appears to reflect the American preference for strong, responsible, unified, executive authority. The extension of the powers of Congress has been repeatedly resisted. For many years there has been opposition to the review power of the supreme court and advocacy of its reconstitution. But no movement has succeeded in diminishing the office of the president.

Furthermore, it may be added that no president has been tempted to the gross abuse of his power; no financial scandal has ever besmirched the chief executive, nor has any president carried into private life the ambition illegally to prolong or unconstitutionally to regain his vast authority. The keen and unrelaxing public interest which surrounds the office, the light of publicity which beats upon it, the force of the great traditions which attach to it, and the sobering effect of its occupancy have sufficed to keep the American president responsible to the Constitution and to the will of the nation.

THE EXECUTIVE DEPARTMENTS

These are now ten in number. All have been established by acts of Congress. The heads of the departments constitute the president's cabinet. The departments with the dates of their establishment are as follows: State (1789), Treasury (1789); Post Office (head admitted to the cabinet 1829), Interior (1849); Justice (1870); Agriculture (1889); Commerce (1903); Labor (1913); Defense (1947); Health, Education and Welfare (1953). With the exception of the attorney-general and the postmaster-general, department heads are usually called "secretary."

Heads of Departments. The departments have from one to several assistant secretaries and a chief clerk. They are divided into bureaus and divisions, each with a single head known as "director" or "commissioner," "chief," etc. Subject always to his subordination to the president, who appoints and may at any time remove him, and who is politically responsible for his official acts, a department head directs the entire service under him; appoints and removes many subordinate officials; issues "regulations" governing the administrative work; and decides a variety of disputes or controversies arising from the actions of his subordinates.

In many cases the decision of the department head is final, though in others there is appeal to the president. The list of bureaus and of other divisions as fixed by statute is given in a tabulated form below, together with the list of department heads and the years of their service. In spite of the possession of a number of important dependencies, there is no department corresponding to the ministry of colonies in other governments. The Department of the Interior supervises the Virgin Islands, Guam, and Tituila (Samoa). The Canal Zone is under army direction.

In 1949, and again in 1955, a commission, headed by ex-president Hoover, made a series of reports on the reorganization of the whole executive department, with recommendations for its administrative improvement.

THE DEPARTMENT OF STATE

The secretary of state, in event of the death of the president, is fourth in the line of presidential succession. Thus far, no secretary of state has been called to fill this place. All treaties are negotiated by the secretary of state, who often conducts the discussions in person, through interviews with foreign representatives. The secretary, under the direction of the president, is charged with the duties of correspondence with ministers and consuls of the United States, and with representatives of foreign powers accredited to the United States. He is charged also with negotiations of whatever character relating to foreign affairs.

The secretary of state is also the regular medium of communication between the president and the governors of the several states of the United States. He has certain functions relating to presidential elections, such as receiving from the governors of the states the certification of appointment of presidential electors, and the receipt and the transmission to Congress of any challenge of the ballot as reported. He has the custody of the Great Seal of the United States, and countersigns and affixes the seal to all executive proclamations.

He is also custodian of the treaties made with foreign states, and of the laws of the United States. He grants and issues passports. Exequaturs (formal recognitions of power to act) to foreign consuls in the United States are issued through his office. He publishes the laws and resolutions of Congress, amendments to the constitution, and proclamations declaring admission of new states.

SECRETARIES OF STATE

Presidents	Cabinet Officers	Residences	Appointed
Washington	Thomas Jefferson	Va.	1789
Washington	Edmund Randolph	Va.	1794
Washington	Timothy Pickering	Mass.	1795
Adams	Timothy Pickering	Mass.	1797
Adams	John Marshall	Va.	1800
Jefferson	James Madison	Va.	1801
Madison	Robert Smith	Md.	1809
Madison	James Monroe	Va.	1811
Monroe	John Quincy Adams	Mass.	1817
J. Q. Adams	Henry Clay	Ky.	1825
Jackson	Martin Van Buren	N. Y.	1829
Jackson	Edward Livingston	La.	1831
Jackson	Louis McLane	Del.	1833
Jackson	John Forsyth	Ga.	1834
Van Buren	John Forsyth	Ga.	1837
Harrison	Daniel Webster	Mass.	1841
Tyler	Daniel Webster	Mass.	1841
Tyler	Hugh S. Legaré	S. C.	1843
Tyler	Abel P. Upshur	Va.	1843
Tyler	John C. Calhoun	S. C.	1844
Polk	James Buchanan	Pa.	1845
Taylor	John M. Clayton	Del.	1849
Fillmore	Daniel Webster	Mass.	1850
Fillmore	Edward Everett	Mass.	1852
Pierce	William L. Marcy	N. Y.	1853
Buchanan	Lewis Cass	Mich.	1857
Buchanan	Jeremiah S. Black	Pa.	1860
Lincoln	William H. Seward	N. Y.	1861
Johnson	William H. Seward	N. Y.	1865
Grant	Elihu B. Washburn	Ill.	1869
Grant	Hamilton Fish	N. Y.	1869
Hayes	William M. Evarts	N. Y.	1877
Garfield	James G. Blaine	Me.	1881
Arthur	F. T. Frelinghuysen	N. J.	1881
Cleveland	Thomas F. Bayard	Del.	1885
B. Harrison	James G. Blaine	Me.	1889
B. Harrison	John W. Foster	Ind.	1892
Cleveland	Walter Q. Gresham	Ill.	1893
Cleveland	Richard Olney	Mass.	1895
McKinley	John Sherman	Ohio	1897
McKinley	William R. Day	Ohio	1898
McKinley	John Hay	Ohio	1898
T. Roosevelt	John Hay	Ohio	1901
T. Roosevelt	Elihu Root	N. Y.	1905

SECRETARIES OF STATE—Con.

PRESIDENTS	Cabinet Officers	Residences	Appointed
T. Roosevelt	Robert Bacon	N. Y.	1909
Taft	Philander C. Knox	Pa.	1909
Wilson	William J. Bryan	Nebr.	1913
Wilson	Robert Lansing	N. Y.	1915
Wilson	Bainbridge Colby	N. Y.	1920
Harding	Charles E. Hughes	N. Y.	1921
Coolidge	Charles E. Hughes	N. Y.	1923
Coolidge	Frank B. Kellogg	Minn.	1925
Hoover	Frank B. Kellogg	Minn.	1929
Hoover	Henry L. Stimson	N. Y.	1929
F. D. Roosevelt	Cordell Hull	Tenn.	1933
F. D. Roosevelt	Edward R. Stettinius	N. Y.	1944
Truman	Edward R. Stettinius	N. Y.	1945
Truman	James F. Byrnes	S. C.	1945
Truman	George C. Marshall	Pa.	1947
Truman	Dean G. Acheson	Md.	1949
Eisenhower	John Foster Dulles	N. Y.	1953
Eisenhower	Christian A. Herter	Mass.	1959
Kennedy	Dean Rusk	N. Y.	1961
Johnson	Dean Rusk	N. Y.	1963

THE DEPARTMENT OF DEFENSE

This department was established by the act of July 26, 1947, creating the National Military Establishment, with the object of unifying our armed forces. At its head is the Secretary of Defense. Subordinate to him are the Secretaries of the Army, the Navy, and the Air Force, who are not of cabinet rank, but have direct access to the president.

SECRETARIES OF DEFENSE

PRESIDENTS	Cabinet Officers	Residences	Appointed
Truman	James Forrestal	N. Y.	1947
Truman	Louis A. Johnson	W. Va.	1949
Truman	George C. Marshall	Pa.	1950
Truman	Robert A. Lovett	N. Y.	1951
Eisenhower	Charles E. Wilson	Mich.	1953
Eisenhower	Neil H. McElroy	Ohio	1957
Kennedy	Robert S. McNamara	Mich.	1961
Johnson	Robert S. McNamara	Mich.	1963

The Secretaries appointed since consolidation are:

Army. Kenneth C. Royall, 1947; Gordon Gray, 1949; Frank Pace, Jr., 1950; Earl D. Johnson (acting), 1953; Robert T. Stevens, 1953; Wilbur M. Brucker, 1955; Elvis Stahr, 1961; Cyrus Vance, 1962; Stephen Ailes, 1964; Stanley R. Resor, 1965.

Navy. John L. Sullivan, 1947; Francis P. Matthews, 1949; Dan A. Kimball, 1951; Robert B. Anderson, 1953; Charles S. Thomas, 1954; Thomas S. Gates, Jr., 1957; Wm. B. Franke, 1959; John B. Connally, Jr., 1961; Fred Korth, 1961; Paul Nitze, 1963.

Air Force. W. Stuart Symington, 1947; Thomas K. Finletter, 1950; Harold E. Talbott, 1953; Donald A. Quarles, 1955; James H. Douglas, 1957; Dudley C. Sharp, 1959; Eugene Zuckert, 1961; Harold Brown, 1965.

The War Department. Before 1947, the Secretary of War, a civilian, had charge of purchases and expenditures for the army; river and harbor improvements, and military posts; supervised military education, fortifications, and the Panama Canal Zone. The department was created in 1789.

SECRETARIES OF WAR

PRESIDENTS	Cabinet Officers	Residences	Appointed
Washington	Henry Knox	Mass.	1789
Washington	Timothy Pickering	Mass.	1795
Washington	James McHenry	Md.	1796
Adams	James McHenry	Md.	1797
Adams	Samuel Dexter	Mass.	1800
Adams	Roger Griswold	Conn.	1801
Jefferson	Henry Dearborn	Mass.	1801
Madison	William Eustis	Mass.	1809
Madison	John Armstrong	N. Y.	1813
Madison	James Monroe	Va.	1814
Madison	William H. Crawford	Ga.	1815
Monroe	John C. Calhoun	S. C.	1817
J. Q. Adams	James Barbour	Va.	1825
J. Q. Adams	Peter B. Porter	N. Y.	1828
Jackson	John H. Eaton	Tenn.	1829
Jackson	Lewis Cass	Ohio	1831

SECRETARIES OF WAR—Con.

PRESIDENTS	Cabinet Officers	Residences	Appointed
Jackson	Benjamin F. Butler	N. Y.	1836
Van Buren	Joel R. Poinsett	S. C.	1837
Harrison	John Bell	Tenn.	1841
Tyler	John Bell	Tenn.	1841
Tyler	John C. Spencer	N. Y.	1841
Tyler	James M. Porter	Pa.	1843
Tyler	William Wilkins	Pa.	1844
Polk	William L. Marcy	N. Y.	1845
Taylor	George W. Crawford	Ga.	1849
Fillmore	Charles M. Conrad	La.	1850
Pierce	Jefferson Davis	Miss.	1853
Buchanan	John B. Floyd	Va.	1857
Buchanan	Joseph Holt	Ky.	1861
Lincoln	Simon Cameron	Pa.	1861
Lincoln	Edwin M. Stanton	Ohio	1862
Johnson	Edwin M. Stanton	Ohio	1865
Johnson	U. S. Grant (*ad in.*)	Ill.	1867
Johnson	Lor. Thomas (*ad in*)	Del.	1868
Johnson	John M. Schofield	N. Y.	1868
Grant	John A. Rawlins	Ill.	1869
Grant	William W. Belknap	Ia.	1869
Grant	Alphonso Taft	Ohio	1876
Grant	James Don. Cameron	Pa.	1876
Hayes	George W. McCrary	Ia.	1877
Hayes	Alexander Ramsey	Minn.	1879
Garfield	Robert T. Lincoln	Ill.	1881
Arthur	Robert T. Lincoln	Ill.	1881
Cleveland	William C. Endicott	Mass.	1885
B. Harrison	Redfield Proctor	Vt.	1889
B. Harrison	Stephen B. Elkins	W. Va.	1891
Cleveland	Daniel S. Lamont	N. Y.	1893
McKinley	Russell A. Alger	Mich.	1897
McKinley	Elihu Root	N. Y.	1899
T. Roosevelt	Elihu Root	N. Y.	1901
T. Roosevelt	William H. Taft	Ohio	1904
T. Roosevelt	Luke E. Wright	Tenn.	1908
Taft	J. M. Dickinson	Tenn.	1909
Taft	Henry L. Stimson	N. Y.	1911
Wilson	Lindley M. Garrison	N. J.	1913
Wilson	Newton D. Baker	Ohio	1916
Harding	John W. Weeks	Mass.	1921
Coolidge	John W. Weeks	Mass.	1923
Coolidge	Dwight F. Davis	Mo.	1925
Hoover	James W. Good	Ill.	1929
Hoover	Patrick J. Hurley	Okla.	1929
F. D. Roosevelt	George H. Dern	Utah	1933
F. D. Roosevelt	Harry W. Woodring	Kansas	1936
F. D. Roosevelt	Henry L. Stimson	N. Y.	1940
Truman	Henry L. Stimson	N. Y.	1945
Truman	Robert P. Patterson	N. Y.	1945
Truman	Kenneth C. Royall	N. C.	1947

Department of the Navy. By the act of July 26, 1947, the navy department, originally established in 1798, was merged in the department of defense. The secretary has general superintendence of the construction, manning, armament, equipment, and employment of vessels of war and of the operation of the naval bases, shipyards, and training stations. The department prepares hydrographic maps; operates the naval observatory and broadcasts time signals 20 times daily; supervises naval aeronautics.

SECRETARIES OF THE NAVY

PRESIDENTS	Cabinet Officers	Residences	Appointed
Adams	Benjamin Stoddert	Md.	1798
Jefferson	Benjamin Stoddert	Md.	1801
Jefferson	Robert Smith	Md.	1801
Jefferson	Jacob Crowninshield	Mass.	1805
Madison	Paul Hamilton	S. C.	1809
Madison	William Jones	Pa.	1813
Madison	B. W. Crowninshield	Mass.	1814
Monroe	B. W. Crowninshield	Mass.	1817
Monroe	Smith Thompson	N. Y.	1818
Monroe	Samuel L. Southard	N. J.	1823
J. Q. Adams	Samuel L. Southard	N. J.	1825
Jackson	John Branch	N. C.	1829
Jackson	Levi Woodbury	N. H.	1831
Jackson	Mahlon Dickerson	N. J.	1834
Van Buren	Mahlon Dickerson	N. J.	1837
Van Buren	James K. Paulding	N. Y.	1838
Harrison	George E. Badger	N. C.	1841
Tyler	George E. Badger	N. C.	1841
Tyler	Abel P. Upshur	Va.	1841
Tyler	David Henshaw	Mass.	1843
Tyler	Thomas W. Gilmer	Va.	1844

SECRETARIES OF THE NAVY—Con.

Presidents	Cabinet Officers	Residences	Appointed
Tyler	John Y. Mason	Va.	1844
Polk	George Bancroft	Mass.	1845
Polk	John Y. Mason	Va.	1846
Taylor	William B. Preston	Va.	1849
Fillmore	William A. Graham	N. C.	1850
Fillmore	John P. Kennedy	Md.	1852
Pierce	James C. Dobbin	N. C.	1853
Buchanan	Isaac Toucey	Conn.	1857
Lincoln	Gideon Welles	Conn.	1861
Johnson	Gideon Welles	Conn.	1865
Grant	Adolph E. Borie	Pa.	1869
Grant	George M. Robeson	N. J.	1869
Hayes	Richard W. Thompson	Ind.	1877
Hayes	Nathan Goff, Jr.	W. Va.	1881
Garfield	William H. Hunt	La.	1881
Arthur	William E. Chandler	N. H.	1882
Cleveland	William C. Whitney	N. Y.	1885
B. Harrison	Benjamin F. Tracy	N. Y.	1889
Cleveland	Hilary A. Herbert	Ala.	1893
McKinley	John D. Long	Mass.	1897
T. Roosevelt	John D. Long	Mass.	1901
T. Roosevelt	William H. Moody	Mass.	1902
T. Roosevelt	Paul Morton	N. Y.	1904
T. Roosevelt	Charles J Bonaparte	Md.	1905
T. Roosevelt	Victor H. Metcalf	Cal.	1906
T. Roosevelt	Truman H. Newberry	Mich.	1908
Taft	George von L. Meyer	Mass.	1909
Wilson	Josephus Daniels	N. C.	1913
Harding	Edwin Denby	Mich.	1921
Coolidge	Edwin Denby	Mich.	1923
Coolidge	Curtis D. Wilbur	Cal.	1924
Hoover	Charles F. Adams	Mass.	1929
F. D. Roosevelt	Claude A Swanson	Va.	1933
F. D. Roosevelt	Charles Edison	N. J.	1940
F. D. Roosevelt	Frank Knox	Ill.	1940
F. D. Roosevelt	James Forrestal	N. Y.	1944
Truman	James Forrestal	N. Y.	1945

THE DEPARTMENT OF THE TREASURY

The secretary of the treasury is charged by law with the management of the national finances. He prepares plans for the improvement of the revenues and for the support of the public credit, including the issuing of government bonds and treasury certificates; superintends the collection of customs and the internal revenue, including income taxes and taxes on tobacco and other commodities or articles; directs the forms of keeping and rendering public accounts and of making returns; grants warrants for all moneys drawn from the treasury.

This department also handles the planning, construction, and maintenance of public buildings. It coins metallic money and engraves and prints the paper currency; directs the coast guard service, and the suppression of illicit traffic in narcotics.

An annual estimate of revenues and expenses of the government is prepared by the treasury department for presentation to Congress by the president. The secretary is, *ex officio*, the presiding officer of the Federal Reserve Board. He reports annually to Congress.

SECRETARIES OF THE TREASURY

Presidents	Cabinet Officers	Residences	Appointed
Washington	Alexander Hamilton	N. Y.	1789
Washington	Oliver Wolcott	Conn.	1795
Adams	Oliver Wolcott	Conn.	1797
Adams	Samuel Dexter	Mass.	1801
Jefferson	Samuel Dexter	Mass.	1801
Jefferson	Albert Gallatin	Pa.	1801
Madison	Albert Gallatin	Pa.	1809
Madison	George W. Campbell	Tenn.	1814
Madison	Alexander J. Dallas	Pa.	1814
Madison	William H. Crawford	Ga.	1816
Monroe	William H. Crawford	Ga.	1817
J. Q. Adams	Richard Rush	Pa.	1825
Jackson	Samuel D. Ingham	Pa.	1829
Jackson	Louis McLane	Del.	1831
Jackson	William J. Duane	Pa.	1833
Jackson	Roger B. Taney	Md.	1833
Jackson	Levi Woodbury	N. H.	1834
Van Buren	Levi Woodbury	N. H.	1837
Harrison	Thomas Ewing	Ohio	1841
Tyler	Thomas Ewing	Ohio	1841
Tyler	Walter Forward	Pa.	1841
Tyler	John C. Spencer	N. Y.	1843

SECRETARIES OF THE TREASURY—Con.

Presidents	Cabinet Officers	Residences	Appointed
Tyler	George M. Bibb	Ky.	1844
Polk	Robert J. Walker	Miss.	1845
Taylor	William M. Meredith	Pa.	1849
Fillmore	Thomas Corwin	Ohio	1850
Pierce	James Guthrie	Ky.	1853
Buchanan	Howell Cobb	Ga.	1857
Buchanan	Philip F. Thomas	Md.	1860
Buchanan	John A. Dix	N. Y.	1861
Lincoln	Salmon P. Chase	Ohio	1861
Lincoln	William P. Fessenden	Me.	1864
Lincoln	Hugh McCulloch	Ind.	1865
Johnson	Hugh McCulloch	Ind.	1865
Grant	George S. Boutwell	Mass.	1869
Grant	Wm. A. Richardson	Mass.	1873
Grant	Benjamin H. Bristow	Ky.	1874
Grant	Lot M. Morrill	Me.	1876
Hayes	John Sherman	Ohio	1877
Garfield	William Windom	Minn.	1881
Arthur	Charles J. Folger	N. Y.	1881
Arthur	Walter Q. Gresham	Ind.	1884
Arthur	Hugh McCulloch	Ind.	1884
Cleveland	Daniel Manning	N. Y.	1885
Cleveland	Charles S. Fairchild	N. Y.	1887
B. Harrison	William Windom	Minn.	1889
B. Harrison	Charles Foster	Ohio	1891
Cleveland	John G. Carlisle	Ky.	1893
McKinley	Lyman J. Gage	Ill.	1897
T. Roosevelt	Lyman J. Gage	Ill.	1901
T. Roosevelt	Leslie M. Shaw	Ia.	1902
T. Roosevelt	George B. Cortelyou	N. Y.	1907
Taft	Franklin MacVeagh	Ill.	1909
Wilson	William G. McAdoo	N. Y.	1913
Wilson	Carter Glass	Va.	1918
Wilson	David F. Houston	Mo.	1920
Harding	Andrew W. Mellon	Pa.	1921
Coolidge	Andrew W. Mellon	Pa.	1923
Hoover	Andrew W. Mellon	Pa.	1929
Hoover	Ogden Mills	N. Y.	1932
F. D. Roosevelt	William H. Woodin	N. Y.	1933
F. D. Roosevelt	Henry Morgenthau, Jr.	N. Y.	1934
Truman	Henry Morgenthau, Jr.	N. Y.	1945
Truman	Frederick M. Vinson	Ky.	1945
Truman	John W. Snyder	Mo.	1946
Eisenhower	George M. Humphrey	Ohio	1953
Eisenhower	Robert B. Anderson	Texas	1957
Kennedy	Douglas Dillon	N. Y.	1961
Johnson	Douglas Dillon	N. Y.	1963
Johnson	Henry H. Fowler	Va.	1965

THE GENERAL ACCOUNTING OFFICE

By the act of June 10, 1921, this office under the "comptroller general" was made wholly independent. It has complete and general power of audit over all branches of government except the post office. The decisions of the comptroller are final. His term of office is fifteen years.

DEPARTMENT OF JUSTICE

The attorney-general is head of the department of justice and chief law officer of the government. He directs and controls a large force of attorneys and marshals, not only in the office at Washington, but also in the 85 judicial districts into which the United States and the Territories are divided. He furnishes opinions and interpretations of the laws for the guidance of the president and the heads of executive departments. In the performance of this last duty he may approve and adopt the opinions of his subordinates except upon questions involving the construction of the Constitution, but upon such questions he must give his own opinion. Immigration and naturalization laws, federal prisons and paroles, are administered by this department. The department of justice conducts a bureau of investigation (F.B.I.) (est. 1908) to secure evidence against crimes that violate Federal laws and to assist states and localities in law enforcement.

ATTORNEYS-GENERAL

Presidents	Cabinet Officers	Residences	Appointed
Washington	Edmund Randolph	Va.	1789
Washington	William Bradford	Pa.	1794
Washington	Charles Lee	Va.	1795

ATTORNEYS-GENERAL

PRESIDENTS	Cabinet Officers	Residences	Appointed
Adams	Charles Lee	Va.	1797
Jefferson	Levi Lincoln	Mass.	1801
Jefferson	John Breckinridge	Ky.	1805
Jefferson	Cæsar A. Rodney	Del.	1807
Madison	Cæsar A. Rodney	Del.	1809
Madison	William Pinkney	Md.	1811
Madison	Richard Rush	Pa.	1814
Monroe	Richard Rush	Pa.	1817
Monroe	William Wirt	Va.	1817
J. Q. Adams	William Wirt	Va.	1825
Jackson	John McP. Berrien	Ga.	1829
Jackson	Roger B. Taney	Md.	1831
Jackson	Benjamin F. Butler	N. Y.	1833
Van Buren	Benjamin F. Butler	N. Y.	1837
Van Buren	Felix Grundy	Tenn.	1838
Van Buren	Henry D. Galpin	Pa.	1840
Harrison	John J. Crittenden	Ky.	1841
Tyler	John J. Crittenden	Ky.	1841
Tyler	Hugh S. Legaré	S. C.	1841
Tyler	John Nelson	Md.	1843
Polk	John Y. Mason	Va.	1845
Polk	Nathan Clifford	Me.	1846
Polk	Isaac Toucey	Conn.	1848
Taylor	Reverdy Johnson	Md.	1849
Fillmore	John J. Crittenden	Ky.	1850
Pierce	Caleb Cushing	Mass.	1853
Buchanan	Jeremiah S. Black	Pa.	1857
Buchanan	Edwin M. Stanton	Ohio	1860
Lincoln	Edward Bates	Mo.	1861
Lincoln	James Speed	Ky.	1864
Johnson	James Speed	Ky.	1865
Johnson	Henry Stanbery	Ohio	1866
Johnson	William M. Evarts	N. Y.	1868
Grant	Ebenezer R. Hoar	Mass.	1869
Grant	Amos T. Ackerman	Ga.	1870
Grant	George H. Williams	Oreg.	1871
Grant	Edwards Pierrepont	N. Y.	1875
Grant	Alphonso Taft	Ohio	1876
Hayes	Charles Devens	Mass.	1877
Garfield	Wayne MacVeagh	Pa.	1881
Arthur	Benjamin H. Brewster	Pa.	1881
Cleveland	Augustus H. Garland	Ark.	1885
B. Harrison	William H. H. Miller	Ind.	1889
Cleveland	Richard Olney	Mass.	1893
Cleveland	Judson Harmon	Ohio	1895
McKinley	Joseph McKenna	Cal.	1897
McKinley	John W. Griggs	N. J.	1898
McKinley	Philander C. Knox	Pa.	1901
Roosevelt	Philander C. Knox	Pa.	1901
Roosevelt	William H. Moody	Mass.	1904
Roosevelt	Charles J. Bonaparte	Md.	1906
Taft	George W. Wickersham	N. Y.	1909
Wilson	James C. McReynolds	Tenn.	1913
Wilson	Thomas W. Gregory	Texas	1914
Wilson	A. Mitchell Palmer	Pa.	1919
Harding	Harry M. Daugherty	Ohio	1921
Coolidge	Harry M. Daugherty	Ohio	1923
Coolidge	Harlan F. Stone	N. Y.	1924
Coolidge	John G. Sargent	Vt.	1925
Hoover	William D. Mitchell	Minn.	1929
F. D. Roosevelt	Homer S. Cummings	Conn.	1933
F. D. Roosevelt	Frank Murphy	Mich.	1939
F. D. Roosevelt	Robert H. Jackson	N. Y.	1940
F. D. Roosevelt	Francis Biddle	Pa.	1941
Truman	Thomas C. Clark	Tex.	1945
Truman	J. Howard McGrath	R. I.	1949
Truman	J. P. McGranery	Pa.	1952
Eisenhower	Herbert Brownell, Jr.	N. Y.	1953
Eisenhower	William P. Rogers	N. Y.	1957
Kennedy	Robert F. Kennedy	Mass.	1961
Johnson	Robert F. Kennedy	Mass.	1963
Johnson	Nicholas deB. Katzenbach	Pa.	1965

DEPARTMENT OF THE INTERIOR

The secretary supervises public business relating to promotion of the domestic welfare; oversees surveying and mapping of the country; improvement of national parks; land reclamation; construction of large dams and the disposal of their power.

The department has supervision of Indian affairs, including educational, hygienic, and relief activities on reservations; also with supervising insular affairs, fisheries, and biological surveys. It controls the distribution of appropriations for agricultural colleges and mechanical institutions in the states and territories, and for certain hospitals and charitable institutions in the District of Columbia. The secretary supervises the conservation of petroleum resources and collects information on minerals and mining.

SECRETARIES OF THE INTERIOR

PRESIDENTS	Cabinet Officers	Residences	Appointed
Taylor	Thomas Ewing	Ohio	1849
Fillmore	Thos. M. T. McKennan	Pa.	1850
Fillmore	Alexander H. H. Stuart	Va.	1850
Pierce	Robert McClelland	Mich.	1853
Buchanan	Jacob Thompson	Miss.	1857
Lincoln	Caleb B. Smith	Ind.	1861
Lincoln	John P. Usher	Ind.	1863
Johnson	John P. Usher	Ind.	1865
Johnson	James Harlan	Iowa	1865
Johnson	Orville H. Browning	Ill.	1866
Grant	Jacob D. Cox	Ohio	1869
Grant	Columbus Delano	Ohio	1870
Grant	Zachariah Chandler	Mich.	1875
Hayes	Carl Schurz	Mo.	1877
Garfield	Samuel J. Kirkwood	Iowa	1881
Arthur	Henry M. Teller	Colo.	1882
Cleveland	Lucius Q. C. Lamar	Miss.	1885
Cleveland	William F. Vilas	Wis.	1888
B. Harrison	John W. Noble	Mo.	1889
Cleveland	Hoke Smith	Ga.	1893
Cleveland	David R. Francis	Mo.	1896
McKinley	Cornelius N. Bliss	N. Y.	1897
McKinley	Ethan A. Hitchcock	Mo.	1898
T. Roosevelt	Ethan A. Hitchcock	Mo.	1901
T. Roosevelt	James R. Garfield	Ohio	1907
Taft	Richard A. Ballinger	Wash.	1909
Taft	Walter L. Fisher	Ill.	1911
Wilson	Franklin K. Lane	Cal.	1913
Wilson	John Barton Payne	Ill.	1920
Harding	Albert B. Fall	N. M.	1921
Harding	Hubert Work	Colo.	1923
Coolidge	Hubert Work	Colo.	1923
Coolidge	Roy O. West	Ill.	1928
Hoover	Ray L. Wilbur	Cal.	1929
F. D. Roosevelt	Harold L. Ickes	Ill.	1933
Truman	Harold L. Ickes	Ill.	1945
Truman	Julius A. Krug	Wis.	1946
Truman	Oscar L. Chapman	Colo.	1949
Eisenhower	Douglas McKay	Ore.	1953
Eisenhower	Frederick A. Seaton	Nebr.	1956
Kennedy	Stewart L. Udall	Ariz.	1961
Johnson	Stewart L. Udall	Ariz.	1963

POST-OFFICE DEPARTMENT

The postmaster-general is the executive head of the Federal postal service. He appoints all officers and employees of the post-office department except the four assistant postmasters-general and the purchasing agent, who are presidential appointees. The postmaster-general is thus the manager of the largest business organization in the nation, employing upwards of 500,000 persons and operating about 41,500 offices. He is also the director of the postal savings system. The department maintains a detective agency to protect property and prosecute persons who use the mails illegally.

Subject to the approval of the president, the postmaster-general makes postal treaties with foreign governments. He also makes contracts for the carrying of mail.

POSTMASTERS-GENERAL

PRESIDENTS	Cabinet Officers	Residences	Appointed
Washington	Samuel Osgood	Mass.	1789
Washington	Timothy Pickering	Mass.	1791
Washington	Joseph Habersham	Ga.	1795
Adams	Joseph Habersham	Ga.	1797
Jefferson	Joseph Habersham	Ga.	1801
Jefferson	Gideon Granger	Conn.	1801
Madison	Gideon Granger	Conn.	1809
Madison	Return J. Meigs, Jr.	Ohio	1814
Monroe	Return J. Meigs, Jr.	Ohio	1817
Monroe	John McLean	Ohio	1823
J. Q. Adams	John McLean	Ohio	1825
Jackson	William T. Barry	Ky.	1829
Jackson	Amos Kendall	Ky.	1835
Van Buren	Amos Kendall	Ky.	1837
Van Buren	John M. Niles	Conn.	1840
Harrison	Francis Granger	N. Y.	1841
Tyler	Francis Granger	N. Y.	1841
Tyler	Charles A. Wickliffe	Ky.	1841
Polk	Cave Johnson	Tenn.	1845

POSTMASTERS-GENERAL—Con.

PRESIDENTS	Cabinet Officers	Residences	Appointed
Taylor	Jacob Collamer	Vt.	1849
Fillmore	Nathan K. Hall	N. Y.	1850
Fillmore	Samuel D. Hubbard	Conn.	1852
Pierce	James Campbell	Pa.	1853
Buchanan	Aaron V. Brown	Tenn.	1857
Buchanan	Joseph Holt	Ky.	1859
Buchanan	Horatio King	Me.	1861
Lincoln	Montgomery Blair	Md.	1861
Lincoln	William Dennison	Ohio	1864
Johnson	William Dennison	Ohio	1865
Johnson	Alexander W. Randall	Wis.	1866
Grant	John A. J. Creswell	Md.	1869
Grant	James W. Marshall	Va.	1874
Grant	Marshall Jewell	Conn.	1874
Grant	James N. Tyner	Ind.	1876
Hayes	David McK. Key	Tenn.	1877
Hayes	Horace Maynard	Tenn.	1880
Garfield	Thomas L. James	N. Y.	1881
Arthur	Timothy O. Howe	Wis.	1881
Arthur	Walter Q. Gresham	Ind.	1883
Arthur	Frank Hatton	Ia.	1884
Cleveland	William F. Vilas	Wis.	1885
Cleveland	Don M. Dickinson	Mich.	1888
B. Harrison	John Wanamaker	Pa.	1889
Cleveland	Wilson S. Bissell	N. Y.	1893
Cleveland	William L. Wilson	W. Va.	1895
McKinley	James A. Gary	Md.	1897
McKinley	Charles Emory Smith	Pa.	1898
Roosevelt	Charles Emory Smith	Pa.	1901
Roosevelt	Henry C. Payne	Wis.	1902
Roosevelt	Robert J. Wynne	Pa.	1904
Roosevelt	George B. Cortelyou	N. Y.	1905
Roosevelt	George von L. Meyer	Mass.	1907
Taft	Frank H. Hitchcock	Mass.	1909
Wilson	Albert S. Burleson	Tex.	1913
Harding	Will H. Hays	Ind.	1921
Harding	Hubert Work	Colo.	1922
Harding	Harry S. New	Ind.	1923
Coolidge	Harry S. New	Ind.	1923
Hoover	Walter F. Brown	Ohio	1929
F. D. Roosevelt	James A. Farley	N. Y.	1933
F. D. Roosevelt	Frank C. Walker	N. Y.	1940
Truman	Robert E. Hannegan	Mo.	1945
Truman	Jesse M. Donaldson	Ill.	1947
Eisenhower	Arthur E. Summerfield	Mich.	1953
Kennedy	J. Edward Day	Cal.	1961
Kennedy	John A. Gronouski	Wis.	1963
Johnson	John A. Gronouski	Wis.	1963
Johnson	Lawrence F. O'Brien	Mass.	1965

THE DEPARTMENT OF AGRICULTURE

The secretary directs all public business relating to agricultural industry. He administers laws on marketing, subsidizing, and insurance of crops, also laws on land use and control of surpluses.

The department engages in agricultural research and maintains information services. It works to control plant and animal diseases and to improve crops and livestock. It provides weather reports and crop reports and estimates, and forest services, grants credits to farmers on crops, farms, and cooperatively constructed rural electrification projects.

SECRETARIES OF AGRICULTURE

PRESIDENTS	Cabinet Officers	Residences	Appointed
Cleveland	Norman J. Colman	Mo.	1889
B. Harrison	Jeremiah M. Rusk	Wis.	1889
Cleveland	J. Sterling Morton	Nebr.	1893
McKinley	James Wilson	Ia.	1897
T. Roosevelt	James Wilson	Ia.	1901
Taft	James Wilson	Ia.	1909
Wilson	David F. Houston	Mo.	1913
Wilson	Edwin T. Meredith	Ia.	1920
Harding	Henry C. Wallace	Ia.	1921
Coolidge	Henry C. Wallace	Ia.	1923
Coolidge	Howard M. Gore	W. Va.	1924
Coolidge	W. M. Jardine	Kans.	1925
Hoover	Arthur M. Hyde	Mo.	1929
F. D. Roosevelt	Henry A. Wallace	Ia.	1933
F. D. Roosevelt	Claude R. Wickard	Ind.	1940
Truman	Clinton P. Anderson	N. M.	1945
Truman	Charles F. Brannan	Colo.	1948
Eisenhower	Ezra T. Benson	Utah	1953
Kennedy	Orville Freeman	Minn.	1961
Johnson	Orville Freeman	Minn.	1963

DEPARTMENT OF COMMERCE

The secretary of commerce is charged with the promotion of the commerce of the United States and with its manufacturing, shipping, fishing, and transportation interests. He investigates the organization and management of corporations engaged in interstate commerce (except railroads), and enforces laws for the protection of life and property on the water.

The department also supervises the National Bureau of Standards, the Patent Office, the Coast and Geodetic Survey, the Weather Bureau, the Bureau of Public Roads, and the Bureau of the Census. The different divisions gather and distribute information on industries and markets and encourage standardization in manufacture.

A division of the department is the Civil Aeronautics Administration, which is charged with the licensing of pilots, the certifying of commercial planes, and the maintenance of landing fields and equipment.

SECRETARIES OF COMMERCE *

PRESIDENTS	Cabinet Officers	Residences	Appointed
T. Roosevelt	George B. Cortelyou	N. Y.	1903
T. Roosevelt	Victor H. Metcalf	Cal.	1904
T. Roosevelt	Oscar S. Straus	N. Y.	1906
Taft	Charles Nagel	Mo.	1909
Wilson	William C. Redfield	N. Y.	1913
Wilson	Joshua W. Alexander	Mo.	1919
Harding	Herbert C. Hoover	Cal.	1921
Coolidge	Herbert C. Hoover	Cal.	1923
Coolidge	William F. Whiting	Mass.	1928
Hoover	Robert P. Lamont	Ill.	1929
Hoover	Roy D. Chapin	Mich.	1932
F. D. Roosevelt	Daniel C. Roper	S. C.	1933
F. D. Roosevelt	Harry Hopkins	Iowa	1939
F. D. Roosevelt	Jesse Jones	Tex.	1940
F. D. Roosevelt	Henry A. Wallace	Iowa	1945
Truman	Henry A. Wallace	Iowa	1945
Truman	W. Averell Harriman	N. Y.	1946
Truman	Charles W. Sawyer	Ohio	1948
Eisenhower	Sinclair Weeks	Mass.	1953
Eisenhower	Frederick H. Mueller	Mich.	1959
Kennedy	Luther H. Hodges	N. C.	1961
Johnson	Luther H. Hodges	N. C.	1963
Johnson	John T. Connor	N. J.	1964

*Prior to 1913 these officers were known as Secretaries of Commerce and Labor.

DEPARTMENT OF LABOR

The secretary of labor is charged with the duty of fostering, promoting, and developing the welfare of wage earners, improving their working conditions, and advancing their opportunities for profitable employment. He administrates and assists in the enforcement of the Fair Labor Standards act. He takes the initiative in seeking co-operation with state legislatures for protecting labor's welfare. He also gathers and publishes data on labor conditions and controversies abroad.

In addition, the secretary of labor makes available information on the cost of living and the extent of employment and pay rolls in industry and trade. The department is charged also with conduct of the national employment offices.

SECRETARIES OF LABOR

PRESIDENTS	Cabinet Officers	Residences	Appointed
Wilson	William B. Wilson	Pa.	1913
Harding	James J. Davis	Pa.	1921
Coolidge	James J. Davis	Pa.	1923
Hoover	James J. Davis	Pa.	1929
Hoover	William N. Doak	Va.	1930
F. D. Roosevelt	Frances Perkins	N. Y.	1933
Truman	Lewis B. Schwellenbach	Wash.	1945
Truman	Maurice J. Tobin	Mass.	1948
Eisenhower	Martin P. Durkin	Ill.	1953
Eisenhower	James P. Mitchell	N. J.	1953
Kennedy	Arthur J. Goldberg	D. C.	1961
Kennedy	William W. Wirtz	Ill.	1962
Johnson	William W. Wirtz	Ill.	1963

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

The secretary of this department supervises the extension work of the Public Health Service in the field of medical research and in the maintenance of hospitals. Through the Office of Education, information is collected on all matters pertaining to education, and funds are allotted which are made available by Congress in federal aid to education. The department also has oversight of the Social Security Administration.

SECRETARIES OF HEALTH, EDUCATION AND WELFARE

Presidents	Cabinet Officers	Residences	Appointed
Eisenhower .	Oveta Culp Hobby . .	Tex.	1953
Eisenhower .	Marion B. Folsom . .	N.Y.	1955
Eisenhower .	Arthur S. Flemming .	Ohio	1958
Kennedy . .	Abraham Ribicoff . .	Conn.	1961
Kennedy . .	Anthony J. Celebrezze .	Ohio	1962
Johnson . . .	Anthony J. Celebrezze .	Ohio	1963
Johnson . . .	John W. Gardner . . .	N.Y.	1965

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

The secretary of this department supervises agencies which insure mortgages, coordinates programs of agencies having major impact on community development, including local transportation.

SECRETARIES OF HOUSING AND URBAN DEVELOPMENT

Presidents	Cabinet Officers	Residences	Appointed
Johnson . . .	Robert C. Weaver . . .	D.C.	1966

FEDERAL AGENCIES AND COMMISSIONS

Outside of the executive departments, a large and growing number of important functions of the government are entrusted to boards, agencies, and commissions. Created by Congress and operating in conjunction with the executive branch, these bodies nevertheless have a large measure of freedom in performing the specific tasks assigned to them.

In addition to the major commissions, the business of the federal government is carried on by numerous bodies known variously as administrations, agencies, authorities, boards, bureaus, committees, corporations, councils, offices and systems, some being chiefly advisory but all having far-reaching powers within the controls exercised by the legislative and executive branches to which they are responsible. A partial but representative list follows:

Administrations.—Veterans; Federal Housing; National Aeronautics and Space; Civil Defense; Pure Food and Drug.
Agencies.—Central Intelligence; Federal Loan; Advanced Research Projects (added 1957).
Authorities.—Tennessee Valley Authority.
Boards.—Civil Aeronautics; Railroad Retirement.
Bureaus.—Standards; Indian Affairs.
Commissions.—Atomic Energy, Civil Rights, Civil Services, Federal Power, Federal Trade, Interstate Commerce, Tariff, Securities and Exchange.
Committees.—National Advisory Committee for Aeronautics; President's Committee for Employment of the Physically Handicapped.
Corporations.—Commodity Credit; St. Lawrence Seaway Development.
Councils.—Council of Economic Advisers.
Offices.—Office of Education; General Services.
Systems.—Selective Service System, Federal Reserve.

To illustrate the history, responsibilities, and operations of such bodies, a descriptive account of some typical agencies and commissions is given below.

Federal Loan Agency. This agency coordinates the work of bodies making or insuring federal loans, for example, the reconstruction finance corporation, organized to make emergency loans to industry, and the Federal housing administration, which insures loans on urban residences.

Agencies exempted from the scope of the reorganization act include all those described below, with the exception of the Smithsonian Institution and the national Munitions Control Board. Other exempt agencies are treated in other parts of this volume as shown in the index. They include the Federal Deposit Insurance Corporation, the Federal Reserve Board, the National Labor Relations Board, the National Mediation Board, and the Securities Exchange Commission. See the index also for the Tennessee Valley Authority.

Civil Service Commission. The commission was created by the Civil Service act of 1883, and consists of three members, not more than two of whom shall belong to the same political party. The members are appointed by the president, with the consent of the Senate. The objects of the act are to introduce the principle of merit into government appointments, to give security of tenure against political influence, and to protect employees against demands for financial contributions to party funds. With the approval of the president, the commission classifies the public service into various grades and conducts examinations for determining the eligibility of applicants for appointment. It certifies such eligibles, the highest three being preferred, and keeps service records of employees.

Federal Communications Commission. This body was created under an act approved June 19, 1934. Its duty is to supervise, and safeguard the public interest in, interstate communications, including radio and television, telegraph, and telephone. It licenses broadcasting stations, assigns wave lengths for their use, and promulgates rules regarding programs and speeches.

Federal Power Commission. Created by the Federal Water Power act of 1920, this commission licenses hydroelectric developments on navigable streams and values investment made as a guide to possible government purchase at the expiration of the license period, which is 50 years. Its authority was enlarged in 1935 to include regulation of interstate transmission of electricity, sale and purchase of properties by utility companies engaged in interstate commerce, and the right of individuals to hold offices in related companies.

Federal Trade Commission. Created by an act of September 26, 1914. It is composed of five members appointed by the president, with the consent of the Senate, for a term of seven years. It has the duty of supervising and regulating corporations, partnerships, or persons engaged in interstate commerce other than those under the jurisdiction of the interstate commerce commission. Its main purpose was to create a body to deal administratively and judicially with trusts and unfair and illegal competitive practices, as these are defined by law, and particularly by the Sherman act of 1890 and the Clayton act of 1914.

The commission also is empowered to gather and to publish information and to require corporations under its jurisdiction to file reports and accounts. On application of the attorney-general it may recommend adjustments of the business of corporations to bring it within requirements of the law. The commission's mandates are known as "cease and desist orders". In practice corporations against which issuance of such orders are contemplated may give assurances that the practices complained of will be discontinued.

The commission's duties were enlarged in 1936 to include enforcement of an act forbidding price discrimination by manufacturers and wholesalers among their customers. The law authorizes the commission to set limits to price discounts on the basis of quantity and forbids discriminatory rebates and advertising allowances.

Interstate Commerce Commission. Created by an act of February 4, 1887, the powers and scope of the commission have been increased by later legislation. Among the important amendatory enact-

ments are the act of March 2, 1889; the Elkins act, February 19, 1903; the Hepburn act, June 29, 1906; the Mann-Elkins act, July 18, 1910; the acts of August 24, 1912, and May 29, and August 9, 1917; and the Transportation act of 1920. The members of the commission, originally five, were increased to seven in 1906, to nine in 1907, and finally to eleven in 1920. Appointments are made by the president with the advice of the Senate.

The commission has power to regulate the rates and service of railroads, steamboat lines, express companies, pipe lines carrying oil, gas, or water, telephone and telegraph lines, cable and wireless companies, and other "public service utilities" doing business across state boundaries. These last were made, under a law passed in 1935, to include buses and trucks doing an interstate business. The commission licenses companies engaged in such business and has wide authority to order changes in service, safety devices, and rates. Companies seeking to enter the business are required to prove that their services are in the public interest.

Smithsonian Institution. This institution "for the increase and diffusion of knowledge," was created by act of Congress in 1846 in accordance with the will of James Smithson, of England, who in 1826 bequeathed his property to the United States government for the purpose. It carries on its function by means of research, publication, and the collection and exhibition of objects of scientific, historical, and artistic interest. Visitors number between 10 and 20 million yearly.

The institution includes, in Washington, D.C., the national museum, comprising the "old Smithsonian" (the original building) and the more recent natural history museum and history and technology division. It includes also the national gallery of art, the Freer gallery of art, the national portrait gallery, and the John F. Kennedy center for the performing arts. Other branches located in Washington are the national zoological park and the astrophysical observatory. It operates also the Canal Zone biological area and a division of radiation and organisms.

United States Tariff Commission. The commission was created by the act of September 8, 1916, and consists of six members appointed by the president, with the consent of the Senate, for a term of twelve years. Its duties are to investigate the fiscal and industrial effects of the customs laws of the United States; to furnish the president, the ways and means committee of the House, and the finance committee of the Senate, when requested, any information at its command; and to make such investigations upon native and foreign industries affected by the tariff as may be requested by the president or by the congressional committees.

Among the duties added by later laws are studies on the basis of which the president, under the Tariff act of 1930, may raise or lower customs rates by a maximum of 50 per cent so as to equalize domestic and foreign costs of production. The commission advises and aids the department of state in negotiating reciprocal trade agreements and advises the president of foreign discrimination against American trade. New duties were added in 1962 preparatory to negotiating under the international commercial treaty, the General Agreement on Tariffs and Trade (GATT). These relate chiefly to making findings regarding injury caused or threatened by tariff concessions and to proposing remedies.

Veterans' Administration. This establishment represents a consolidation of all government agencies affecting war veterans. Formed under authority of an act passed in 1930, it supervises the payment of pensions and disability allowances to veterans and their relatives, administers war risk insurance, the hospitalization, medical care, and vocational rehabilitation of veterans, and has charge of the payment of adjusted compensation certificates.

THE FEDERAL JUDICIARY

The Constitution (Art. III) provides that the judicial power of the United States shall be vested in one supreme court and inferior courts established by Congress and that all Federal judges shall hold office during good behavior, with compensation that may not be diminished during their term of office.

Organization. Congress in 1789 passed a judiciary act providing for the organization of the supreme court, with a chief justice and five associate justices. Later laws were revised and codified in the act of March 3, 1911. Since 1863 the court has consisted of a chief justice and eight associate justices. The annual salary of the chief justice is $40,000 and of the associate justices, $39,500.

Two attempts, one in 1802 and the other in 1866, made by Congress to reduce the size of the court by enacting that the next vacancy occurring should not be filled, were repealed before the vacancies occurred.

District courts of the United States have increased from 13, in 1789, to 81 within the continental territory of the United States. There are also 7 U. S. district courts, four in Alaska and one each in Hawaii, Puerto Rico, and the Canal Zone. All districts are entirely within the boundaries of single states. Twenty-four states have one district each, eighteen states are divided into two, four states into three, and New York and Texas into four districts. Usually there is one judge for each district court, but in two states one judge sits in both districts. In a number of districts there are two judges; in the district of New Jersey, three; and in the southern district of New York, four.

Since their first organization the supreme court and the district courts have remained practically unchanged. The system of circuit courts, however, has varied at different times. At present it has the form of ten circuit courts of appeals. Each court is formed of a member of the United States supreme court, designated as circuit justice, and several circuit judges, who are frequently appointed from among the United States district judges. No more than three judges sit at a single hearing. These courts were created to relieve the supreme court from its excessive burden of appealed litigation. They hear most cases of appeals from the district courts, and, except in a narrow range of cases, their decisions are final.

Constitutional Jurisdiction. The Constitution fixes the jurisdiction of the Federal courts and limits it to:

- Cases arising under the Constitution.
- Cases under Federal laws and treaties.
- Cases affecting ambassadors, ministers, and consuls.
- Cases in admiralty and maritime jurisdiction.
- Cases in which the United States is a party.
- Controversies between states; between citizens of different states; or by a state against the citizens of another state.
- Cases between American citizens and foreign states, citizens, or subjects.
- Cases between citizens of the same state claiming lands under grants of different states.

The Constitution limits the court's appellate power by making it subject to exceptions and regulations determined by Congress. Congress has never attempted to use this power.

In cases affecting ambassadors, public ministers, and consuls, and in cases in which the state is a party, the supreme court has "original jurisdiction." Other cases before the supreme court come to it on appeal from the district courts, where the evidence is taken. It is thus rare for the supreme court to take evidence, its business being interpretation of the law and listening to arguments thereon.

A unique feature of the United States courts is their practice of passing upon the constitutionality

of both congressional and state legislation. The Constitution (Art. VI, clause 2) provides: "This Constitution and the laws of the United States which shall be made in pursuance therewith, and all treaties made or which shall be made under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, anything in the constitution or laws of any state to the contrary notwithstanding."

It follows naturally from this provision of the Constitution that the supreme court and other Federal courts have been called upon to determine whether certain laws were in harmony or in conflict with the "supreme law of the land." This power was exercised very sparingly in the first 70 years of American history, but with increasing frequency later. Up to 1861, only three Federal laws had been invalidated by the court. By 1936, out of some 24,300 public laws passed by Congress, 65 were declared unconstitutional. This judicial determination of constitutionality is a feature of government original with the American tradition. It has been copied in many more recent constitutions.

Critics, including certain members of the court itself, have contended that some of the court's decisions have encroached on the functions of legislation. At any rate, the power of enforcing its own interpretation of the Constitution has placed the court in a position to determine, within limits, how wide Federal powers are. Under John Marshall's 34 years as chief justice a broad interpretation was given to Federal powers, provided they were clearly derived from the Constitution. In the present century this tendency was carried further, although with a temporary reversal in 1935-36, when numerous economic laws of the Roosevelt administration were declared invalid. A statute of 1937 provided that one-man Federal courts might not enjoin enforcement of laws on the ground of unconstitutionality and that, when injunctions were issued on this ground, appeal might be taken direct from District court to Supreme court.

It should be noted that the supreme court and other Federal courts limit their pronouncements upon state legislation to the question of whether it is in harmony with the Federal Constitution, laws, and treaties.

A majority opinion only among the justices of the supreme court participating is necessary to a decision. The decision presenting the majority view is prepared and signed by a member of the court designated by the chief justice. A justice holding the majority view, but upon other grounds than those expressed in the opinion of the court, may offer a "concurring decision." A dissenting justice may submit a "dissenting opinion." In voting on a final decision, the youngest judge in point of service votes first, followed by the next youngest, and so on, with the Chief Justice voting last.

The Court of Customs and Patent Appeals. This court, established in 1909, consists of five judges appointed by the president for life. It reviews decisions of the board of general appraisers on collection of customs duties and decisions of the patent office.

JUSTICES OF THE SUPREME COURT*

Name	Term	Yrs.	Born	Died
John Jay, N. Y.	1789–1795	6	1745	1829
John Rutledge, S. C.	1789–1791	2	1739	1800
William Cushing, Mass.	1789–1810	21	1733	1810
James Wilson, Pa.	1789–1798	9	1742	1798
John Blair, Va.	1789–1796	7	1732	1800
Robert H. Harrison, Md.	1789–1790	1	1745	1790
James Iredell, N. C.	1790–1799	9	1751	1799
Thomas Johnson, Md.	1791–1793	2	1732	1819
William Paterson, N. J.	1793–1806	13	1745	1806
John Rutledge, S. C.	1795–1795	..	1739	1800
Samuel Chase, Md.	1796–1811	15	1741	1811
Oliver Ellsworth, Ct.	1796–1800	4	1745	1807
Bushrod Washington, Va.	1798–1829	31	1762	1829

JUSTICES OF THE SUPREME COURT (Cont.)

Name	Term	Yrs.	Born	Died
Alfred Moore, N. C.	1799–1804	5	1755	1810
John Marshall, Va.	1801–1835	34	1755	1835
William Johnson, S. C.	1804–1834	30	1771	1834
Brock, Livingston, N. Y.	1806–1823	17	1757	1823
Thomas Todd, Ky.	1807–1826	19	1765	1826
Joseph Story, Mass.	1811–1845	34	1779	1845
Gabriel Duval, Md.	1811–1835	25	1752	1844
Smith Thompson, N. Y.	1823–1843	20	1767	1843
Robert Trimble, Ky.	1826–1828	2	1777	1828
John McLean, Ohio	1829–1861	32	1785	1861
Henry Baldwin, Pa.	1830–1844	14	1779	1844
James M. Wayne, Ga.	1835–1867	32	1790	1867
Roger B. Taney, Md.	1836–1864	28	1777	1864
Philip P. Barbour, Va.	1836–1841	5	1783	1841
John Catron, Tenn.	1837–1865	28	1786	1865
John McKinley, Ala.	1837–1852	15	1780	1852
Peter V. Daniel, Va.	1841–1860	19	1785	1860
Samuel Nelson, N. Y.	1845–1872	27	1792	1873
Levi Woodbury, N. H.	1845–1851	6	1789	1851
Robert C. Grier, Pa.	1846–1870	23	1794	1870
Benj. R. Curtis, Mass.	1851–1857	6	1809	1874
John A. Campbell, Ala.	1853–1861	8	1811	1889
Nathan Clifford, Me.	1858–1881	23	1803	1881
Noah H. Swayne, Ohio	1862–1881	20	1804	1884
Samuel F. Miller, Iowa	1862–1890	28	1816	1890
David Davis, Ill.	1862–1877	15	1815	1886
Stephen J. Field, Cal.	1863–1897	34	1816	1899
Salmon P. Chase, Ohio	1864–1873	9	1808	1873
William Strong, Pa.	1870–1880	10	1808	1895
Joseph P. Bradley, N. J.	1870–1892	22	1813	1892
Ward Hunt, N. Y.	1872–1882	10	1811	1886
Morrison R. Waite, Ohio	1874–1888	14	1816	1888
John M. Harlan, Ky.	1877–1911	34	1833	1911
William B. Woods, Ga.	1880–1887	7	1824	1887
Stanley Matthews, Ohio	1881–1889	8	1824	1889
Horace Gray, Mass.	1881–1902	21	1828	1902
Samuel Blatchford, N. Y.	1882–1893	11	1820	1893
Lucius Q. C. Lamar, Miss.	1888–1893	5	1825	1893
Melville W. Fuller, Ill.	1888–1910	22	1833	1910
David J. Brewer, Kan.	1889–1910	21	1837	1910
Henry B. Brown, Mich.	1890–1906	16	1836	1913
George Shiras, Jr., Pa.	1892–1903	11	1832	1924
Howell E. Jackson, Tenn.	1893–1895	2	1832	1895
Edward D. White, La.	1894–1921	27	1845	1921
Rufus W. Peckham, N. Y.	1895–1909	14	1837	1909
Joseph McKenna, Cal.	1898–1925	27	1843	1926
Oliver W. Holmes, Mass.	1902–1932	30	1841	1935
William R. Day, Ohio	1903–1922	19	1849	1923
William H. Moody, Mass.	1906–1910	4	1853	1917
Horace H. Lurton, Tenn.	1909–1914	5	1844	1914
Charles E. Hughes, N. Y.	1910–1916	6	1862	1948
Willis VanDevanter, Wyo.	1910–1937	27	1859	1941
Joseph R. Lamar, Ga.	1910–1916	6	1857	1916
Mahlon Pitney, N. J.	1912–1923	11	1858	1924
Jas. C. McReynolds, Tenn.	1914–1941	27	1862	1946
Louis D. Brandeis, Mass.	1916–1939	23	1856	1941
John H. Clarke, Ohio	1916–1922	6	1857	1945
William H. Taft, Conn.	1921–1930	9	1857	1930
George Sutherland, Utah	1922–1938	16	1862	1942
Pierce Butler, Minn.	1922–1939	17	1866	1939
Edward T. Sanford, Tenn.	1923–1930	7	1865	1930
Harlan F. Stone, N. Y.	1925–1946	21	1872	1946
Charles E. Hughes, N. Y.	1930–1941	11	1862	1948
Owen J. Roberts, Pa.	1930–1945	15	1875	1955
Benjamin N. Cardozo, N.Y.	1932–1938	6	1870	1938
Hugo L. Black, Ala.	1937–	..	1886	
Stanley F. Reed, Ky.	1938–1957	19	1884	
Felix Frankfurter, Mass.	1939–1962	23	1882	1965
William O. Douglas, Conn.	1939–	..	1898	
Frank Murphy, Mich.	1940–1949	9	1890	1949
Robert H. Jackson, N. Y.	1941–1954	13	1892	1954
James F. Byrnes, S. Car.	1941–1942	1	1879	
Wiley B. Rutledge, Jr., Iowa	1943–1949	6	1894	1949
Harold H. Burton, Ohio	1945–1958	13	1888	1964
Frederick M. Vinson, Ky.	1946–1953	7	1890	1953
Thomas C. Clark, Texas	1949–	..	1899	
Sherman Minton, Ind.	1949–1956	7	1890	
Earl Warren, Cal.	1953–	..	1891	
John M. Harlan, N. Y.	1955–	..	1899	
William J. Brennan, Jr., N.J.	1956–	..	1906	
Charles E. Whittaker, Mo.	1957–1962	5	1901	
Potter Stewart, Ohio	1958–	..	1915	
Byron R. White, Colo.	1962–	..	1917	
Arthur J. Goldberg, Ill.	1962–1965	3	1908	
Abe Fortas, Tenn.	1965–	..	1910	

*Names of Chief Justices appear in italics.

Court of Claims of the United States. The court was established by an act of February 24, 1855, with general jurisdiction over all claims upon the United States government, except pension claims, and, since 1915, except claims growing out of the Civil War. The court consists of five judges, the concurrence of three being necessary to a decision. Where the court finds for the complainant, judgment is entered against the United States payable out of the public treasury.

AMERICAN STATE GOVERNMENT

The United States of America is a Federal union of fifty commonwealths, or "states." It has been defined as "an indestructible union of indestructible states." Two classes of government are created or recognized by the Constitution: the national or "Federal" government; and the state governments. Back of both of these governments is the nation, with its political sovereignty in the entire people.

State government is older than the Federal government, which was created by the bestowal upon it of powers previously existent in the states. These powers are definitely prescribed by the Federal Constitution. All powers not given to the Federal government are reserved to the states. This constitutional arrangement gave to the modern world its first expression of "federalism."

Federal Expansion. The tendency of successful federal government is to augment gradually the scope and the authority of the national government as against the state governments. This tendency is observable in America. The theory that sovereignty still existed in the states and not in the national government was extinguished by the outcome of the Civil War, 1861–65. The existence of complete free trade between the states, as guaranteed by the Constitution, has built up an industrial organization within the United States that recognizes no state boundaries or lines. Transportation and commerce have become largely "interstate." The population moves unhindered from state to state, while domicile with political rights is a matter of automatic transfer of residence. These and other considerations have constantly tended to extend the Federal government and to strengthen its control over industry and transportation on a national scale.

Concurrent Powers. The result of this process at times has seemed to menace the original character of the state governments. Nevertheless, while the activity of the national government is more impressive and of much more interest to the average citizen of the United States, the authority of the state government comes closer to his person, to his business, and to his home. The field of administration exercised by the state embraces the establishment and control of local and municipal government, of public instruction (except so far as it is assisted and consequently influenced by Federal grants or subventions), and of public health (except where the Federal government may exercise authority in the case of national epidemic). It embraces also the care of dependents and defectives; the construction of highways and other communications; private law, including domestic relations, inheritance, rights of property, contracts; the exclusive control of corporate industry (except where it takes on an interstate character); the punishment of criminals; and the protection of public order.

In this last and important field the president may, on request of the governor of a state, apply the power of the national government. In cases where interstate commerce has suffered interference or the movement of the United States mails has been stopped by violent acts the president has dispatched United States troops and placed localities under military control without application of the governor, and even in the face of his protest. While generally the police powers exercised by the Federal government and by the state governments are distinct fields, they are frequently used in collaboration. Thus Federal authority, under the 21st amendment to the Constitution, may be used to prevent transportation of intoxicating liquor into states which forbid its sale within their borders.

Furthermore, since about 1906 the state governments have taken on new vigor, which has expressed itself in a large variety of social and industrial legislation, in the creation of new administrative agencies, and in movements to reorganize and strengthen state administration.

Interstate Compacts. With the permission of Congress states may enter into treaties or compacts for dealing with common problems. Compacts have been authorized by Congress for concerted action on such matters as use of water from a common river, limitation of petroleum production, and regulation of labor standards. They have been found more satisfactory when involving one definite arrangement, as in a boundary agreement, but less so when used as a substitute for unified authority in meeting a complex problem.

STATE CONSTITUTIONS

The written constitutions of the American states are older than the Federal Constitution. They are, in fact, an American political invention. They grew out of the colonial charters of the period of English sovereignty. They assumed their typical form during the Revolutionary War, 1775–1783. They still bear the marks of their origin and of the political theory of that day. A century and a half of growth has occasioned an extraordinary number of changes and recastings of these organic acts, without radically altering their general type.

Upon the outbreak of the Revolutionary War in 1775, the Continental Congress, a body formed by representatives of the thirteen American colonies which were united in revolution, recommended to these colonies the adoption of new constitutions, to take the place of the governments which had existed under British royal authority. Certain colonies adopted this suggestion in the following order: New Hampshire, South Carolina, Virginia, New Jersey, Delaware, Pennsylvania, North Carolina, and Maryland. Virginia was the first state to devise a constitution with a complete frame of government and with a code of popular rights.

None of these new constitutions was "popularly ratified." Massachusetts, by its constitution of 1780, inaugurated a further step. An assembly elected for that sole purpose framed the constitution, which was then submitted to the suffrage of the people of the commonwealth. Thereby was initiated the practice of popular ratification of constitutions, now the representative procedure.

Some 140 state constitutions have been prepared and put into execution during the history of American state government. Each of the 50 American states is governed by such an organic act. Some states (Louisiana, South Carolina, Virginia, Georgia) have, in the course of their history, had as many as six different constitutions. Massachusetts still retains, with some amendments, the constitution of 1780; Maine, her constitution of 1819.

Admission to Statehood. "Admission to the Union" is an action taken by the Congress under one of its most important constitutional powers. With the exception of the 13 original states, Texas, Vermont, Maine, West Virginia, and California, all of the states, before admission, were territories governed under acts of Congress. The territories were not members of the Union. Their people had no constitutional political rights and did not participate in national elections. "Admission" of a territory to statehood, however, was admission to full equality with all other states. Congress, when it judged the time ripe for the admission of a territory as a new state, by an "enabling act," authorized an election for the purpose of drafting a constitution.

This action, if satisfactory, led to the admission by Congress into the Union. Congress, more than once, by legislation, has prescribed conditions under which a given territory should be admitted to statehood, as, by the suppression of polygamy in the case of Utah. Such limitations, however, imposed by the Federal government, become invalid as soon as the state is admitted to the Union.

Arizona was admitted to statehood in 1912 only after removing from its proposed constitution, at the insistence of the president and the Congress of the United States, a provision for the recall of judges. Immediately after admission into the Union, however, the state of Arizona exercised its right to replace this provision in its constitution. The dates of the original ratifications of the Federal Constitution and of admission of states since the formation of the Union, in 1789, are given in the table entitled *Historical Statistics of the United States*.

Amendments to State Constitutions. Three procedures exist for the amendment of a state constitution, two being operative in the great majority of states. These are (1) amendment on proposal of the legislature; (2) amendment by a constitutional convention; and (3) amendment by popular initiative. The oldest and most generally utilized method of amendment is by a proposal of the legislature. This form of procedure is authorized in every state of the Union except New Hampshire, where all amendments must originate in a constitutional convention.

The Legislative Proposal. Differing conditions attend the legislative proposal: (1) that it must be passed by two successive legislatures (in Delaware this procedure enacts the amendment); (2) passage by an extraordinary majority—two-thirds or three-fifths vote of all members elected; (3) limitations as to the number of amendments proposed at one time, or the frequency with which the same amendment can be passed. In all states but Delaware the proposal, having passed the legislature, is submitted to popular ratification.

In most states a majority of votes cast ratifies the amendment and makes it a part of the constitution. Idaho, Indiana, and Wyoming require a majority of the electors of the state; Rhode Island three-fifths, and New Hampshire two-thirds, of those voting thereon; Nebraska requires a majority of those voting on the measure, provided votes cast in favor are not less than 35 per cent of total votes cast at the election. A majority of all votes cast at the election is required in 9 states—Alabama, Arkansas, Illinois, Minnesota, Mississippi, Indiana, Ohio, Oklahoma, Tennessee.

Constitutional Conventions. Constitutional conventions or extraordinary legislative bodies, popularly elected for the purpose of revising the constitution, are the usual method where a *general revision* of the constitution is sought. In most states the proposal to call a constitutional convention is submitted to popular vote, and in six states—New Hampshire, Iowa, Michigan, Maryland, New York, Ohio—the constitution requires that such a proposal be submitted regularly at the conclusion of a certain interval of years. In Georgia, Louisiana, Maine, Mississippi, and Wyoming, the legislature may call a convention without popular approval.

Popular Initiative. Amendment by popular initiative is now authorized in Arizona, Arkansas, California, Colorado, Massachusetts, Michigan, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, and Oregon. The petition must be signed by a definite number of voters or by a number equal to a certain percentage (8 to 15) of the total vote cast for some state officer at the last preceding election. The secretary of state, having verified these signatures, places the amendment upon the list of measures to be voted upon by the people at the next general election.

In Michigan the popularly initiated amendment must receive the approval of the legislature before being placed upon the ballot. In Massachusetts it must receive the approval of at least one-fourth of all members of two successive legislatures and in both cases the legislature may submit a competing or substitute measure.

Popular Ratification. The practice of referring to popular ratification constitutions framed or revised by a convention has steadily grown. The early constitutions, except in New Hampshire and in Massachusetts, were not submitted to the people, but from 1784 to 1840 all such constitutions were submitted except in the cases of Delaware, Minnesota, and Arkansas.

During the Civil War period the practice was against submission. Between 1870 and 1890 there was a return to the pre-war practice and all constitutions drafted by conventions were submitted to popular ratification. From 1890 to 1910, of eleven constitutions adopted, five were popularly ratified. Since 1910, new constitutions or important revisions have been effected by constitutional conventions in the following states: Ohio (1912), Mass. (1917-18), Neb. (1919-20), N. H. (1918-21), La. (1913, 1921), Ill. (1920-22), and Mo. (1922-23). Arizona and New Mexico (1912) adopted constitutions before entering the Union. In all cases, except in that of Louisiana, these constitutions were popularly ratified. Michigan changed its constitution in 1963.

CONSTITUTIONAL LIMITATIONS UPON THE POWERS OF STATE LEGISLATURES

By the Constitution of the United States, all legislative powers not expressly bestowed upon the national Congress are reserved to the states. Thus no enumeration of the powers of a state legislature is necessary in a state constitution. "All residuary legislative power" being implied, the only original restraint is that state laws must not conflict with the Constitution of the United States, with the laws of Congress, or with United States treaties.

The early state constitutions were framed at a time of great popular confidence in elected legislatures. Gradually, however, as legislatures were tempted into passing unrepresentative legislation or yielding to corrupt influences, restrictions upon the powers of legislatures were introduced by amendments to state constitutions. Louisiana in 1845 and Iowa in 1846 adopted constitutional provisions that forbade "special legislation." The constitution of Michigan (1847) and that of California (1849) contained similar restrictions on the legislature.

Special Municipal Laws. The purpose of these changes was to prohibit the legislatures from appropriating money or conferring other benefits upon private individuals or corporations. In 1850-51, the states of Ohio and Indiana prohibited state legislatures from passing special laws for municipalities. This action was to remedy a growing abuse of interfering with municipal government and even of penalizing cities in the interests of partisan politics.

The movement initiated by Ohio became general, particularly in western and southern states. Five-eighths of the states have adopted constitutional provisions that no special law shall be enacted where a general law can be made applicable. In the New England states alone are the legislatures generally free to enact laws applying to a particular person, city, town, or other corporation.

Legislative Freedom. Undeniably, the process of placing fetters upon state legislatures has been carried too far and has resulted in denying to state legislatures a discretion which is properly theirs and which it would be to the interest of state government to have exercised. A movement has become apparent to restore to state legislatures a freedom

which nearly a century of constitutional amendment largely destroyed. The adoption by many states of the legislative referendum, creating, as this does, a popular check upon vicious legislation or legislative favoritism, logically would seem to call for the removal of other and hampering restrictions.

STATE LEGISLATURES

In all American states excepting Nebraska, which voted to adopt the unicameral legislature in 1937, the legislative power is intrusted to a representative body consisting of two chambers and usually known as the state legislature, or general assembly. In Massachusetts and in New Hampshire it is called the general court. The bicameral or two-chamber plan has been adopted in American states in obedience to the "theory of checks and balances," one house halting and correcting the wrong or impulsive action of the other. In all states the "upper" and uniformly smaller body, being elected for a longer term and with sometimes a higher age qualification for its members, is called the Senate. The larger or more popular house in all but four states is called the House of Representatives; in the others it is called the Assembly.

Qualifications. In all states the qualifications for voting for both houses are the same. The "aristocratic" character of the electors of the upper house long ago disappeared. Among the qualifications for election, certain states require a higher age for the Senate (frequently 30 years) than for the lower house (21 to 25 years). Residence in the state for a prescribed term before election to the legislature is a usual condition, as is residence in the district from which a member is chosen. This last requirement has the result of increasing the representative's responsibility to his constituency, since, if defeated by unpopularity in the district in which he resides, he cannot without change of residence stand for election in another. Federal officeholders are generally ineligible, as are paid officials of the state, with certain customary exceptions (notaries, national guard officers, soldiers, etc.).

Organization and Legislation. State constitutions usually provide that the lieutenant governor or vice governor shall be the presiding officer of the Senate, and provisions have been introduced into many constitutions regarding the procedure of legislation, the publication of bills, etc. Other than these, both houses are free to organize themselves in their own way. The American system of legislative committees everywhere prevails. Members of either house have an almost unlimited privilege of introducing bills, which, after being read by title, are referred to the appropriate committee for examination. The unrestrained practice of introducing bills results in legislatures being burdened, at each session, with bills which cannot be properly examined or discussed.

The interest felt by members in the passage of their bills and the political reputation made or lost by the success or failure of such measures leads to the practice of members supporting one another's projects in return for support of their own, and results in the loading of American statute books with ill-digested, unwise, and practically undebated laws.

Another embarrassment to American state legislation is the mass of detail written into statutes, the effort of the legislator being to cover every possible assumed contingency. These provisions, being frequently purely theoretical and not based upon experience with the measure, usually require a large amount of amendment or alteration by subsequent legislatures with resulting delays and embarrassments in their enforcement.

Distrust of state legislatures and apprehensions felt as to radical action by them led, in many states, to constitutional provisions limiting the frequency of legislative meetings and the duration of their proceedings. The earlier practice of annual meetings of legislatures has given way to biennial legislatures. All legislatures now meet biennially except those of New Jersey, New York, Rhode Island, and South Carolina, where the session is annual.

These and other obvious disadvantages of state legislatures have led to proposals for their reconstitution, one being to abolish the bicameral system in favor of a single legislative body. The successful practice of the provinces of the Dominion of Canada, seven of whom have single-chamber legislatures, is cited. It is sometimes overlooked, however, that in the case of the Canadian provinces, the system of ministries responsible to the provincial legislature has preserved the British practice of having most bills originate with the administration. Thus measures have the advantage of careful drafting and discussion by responsible cabinets before their introduction.

Legislative Bureaus. Another device to avoid defects of drafting, duplication, and other bad features of state legislation is the creation of the legislative reference bureau, a permanent office filled by legislative experts whose business it is to make comparative studies of state legislation, to afford information to members of the legislature, and to assist members in the preparation of their bills. Such legislative service is given in the following American states: Arizona, Arkansas, California, Colorado, Connecticut, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, Virginia, and Wisconsin.

Legislative Councils. Led by Kansas and Michigan in 1933, a number of states established legislative councils with paid staffs to study, plan for, and prepare legislative proposals in advance of the sessions. They usually consist of legislators only, but may include administrative officers.

Members of state legislatures receive compensation for their services; but this compensation varies greatly in different states, as may be seen from the table *Tabulated Data on State Governments*.

REFERENDUM AND INITIATIVE OF LAWS

The original sole competence of legislatures to enact laws has been modified in 21 states by the adoption of the "legislative referendum" and in 19 states by the "legislative initiative." These modifications of "representative government" are Swiss devices and were first adopted in America as joint measures by the state of South Dakota in 1898. While usually associated, the two institutions are unlike in spirit, the referendum being a conservative practice, the initiative, radical.

A referendum of constitutional measures, as stated above, dates from the early Revolutionary constitutions. The practice is old, also, of requiring local bond issues and exceptional fiscal measures to be ratified by voters of state, county, school district, or city. But, since the example of South Dakota, the practice has spread of giving to the people the right of annulling an act of the legislature or of originating laws to be submitted to popular judgment either without legislative consideration, "direct initiative," or together with a similar measure proposed by the legislature in its place, "indirect initiative."

The referendum of a law is accomplished by securing signatures to a petition to suspend the operation of the act and to submit it to popular judgment as expressed at a general election. The number of signatures required is usually 5 per cent of the votes of the state. Such a petition must be signed and submitted to the secretary of state for verification within a certain period (usually 90 days) following the adjournment of the legislature. The initiative petition requires a higher number of signatures, usually 8 per cent. Maryland and New Mexico have the referendum only.

The states possessing both initiative and referendum, with date of adoption and percentage of signatures required, are as follows: Arizona (1912, extended, 1914, referendum 5%, initiative 10%), Arkansas (1910, ref. 6%, init. 8%), California (1911, ref. 5%, init. 8%), Colorado (1910, ref. 5%, init. 8%), Idaho (1933, ref. 10%, init. 10%), Maine (1908, ref. 10,000, init. 12,000), Massachusetts (1918, ref. 10% plus 15,000, init. 10% plus 20,000, plus 5000), Michigan (1908, ref. 5%, init. 8%), Missouri (1908, ref. 5%, init. 8%, ⅔ cong. dists.), Montana (1906, ref. 5%, ⅗ of counties; init. 8%, ⅗ of counties), Nebraska (1912, ref. 5%, init. 7% or 5% in ⅗ counties), Nevada (1904, init. only, 1912 both ref. and init. 10%), North Dakota (1914, ref. 7000, init. 10,000), Ohio (1912, ref. 6%, ½% from ½ of counties, init. 3% plus 3% indirect, ½% from ½ of counties), Oklahoma (1907, ref. 5%, init. 8%), Oregon (1902, ref. 5%, init. 8%), South Dakota (1898, ref. 5%, init. 5%), Utah (1917, ref. and init. 10% of maj. of counties), Washington (1913, ref. 6%, init. 10%).

In a number of states a still higher requirement than that given above exists for the initiative of a constitutional amendment. Maine, Montana, South Dakota, Utah, and Washington make no provision for the popular initiative of a constitutional amendment.

THE GOVERNOR

The executive power in all American states is intrusted to a governor. The office, both in its functions and in its title, is an inheritance from the colonial period. The Revolution substituted the practice of popular election of the governor for that of appointment. In all states the governor is directly elected by the qualified voters, for a definite term.

Qualifications. Among the qualifications for election as governor frequently provided by state constitutions are American citizenship, previous residence in the state of from 1 year (Connecticut, Minnesota, Washington, Wisconsin) to 7 years (Alabama, Arkansas, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Tennessee), and minimum age usually 30 years. In fifteen states, the governor is not eligible for re-election. The term varies from 2 years (15 states) to 4 years (35 states).

Authority of Governor. As the period of early state constitution making showed a confidence in legislatures, so it exhibited a marked distrust of executive or gubernatorial authority. This prejudice survived the entire first century of the history of state governments. In no state had the governor an administrative power over state affairs comparable to that of the president over national administration. The executive departments were entrusted to officers popularly elected and independent of the governor's control. It was thus impossible to hold the governor responsible for the general conduct of the state's business and equally impossible for him to enforce a consistent policy throughout the state administration. The governor seldom had the power of appointment of state or local officials, nor the right to remove for negligence, inefficiency, or malfeasance. Beginning with the second decade of the present century, however, came a movement to enlarge the authority of the governor over state administration. One proposal was that of the so-called "short ballot," whereby a governor alone would be elected, other state officials being generally his appointees. More recently, in many states radical reorganization has been effected, both by constitutional amendment and by legislation. State services have been centralized, or organized in departments, with the suppression of numerous independent boards and commissions. The department heads are made appointable and removable by the governor, and in some states now sit with the governor as an administrative and advisory "cabinet." There has been an increase in the number of officials holding office at the pleasure of the governor rather than for fixed terms. One of the most radical of such measures was that passed in Iowa in 1933 centralizing financial control in the hands of the governor. A somewhat similar measure was passed in New Jersey the same year. The trend is toward lengthening the governor's term.

On the political side, the position of governor is an honorable and conspicuous one. His influence in state and national politics is great, and tends to increase. It is from the class of successful state governors that strong presidential candidates are usually derived. The dignity and the influence of the position are sufficient to attract, as candidates for the office, able and representative citizens. Nevertheless American state administration remains generally "decentralized" in contrast to the national administration.

The Veto Power. Although the office of governor was originally conceived as entirely distinct from the legislative power, the "doctrine of separation of powers" being generally avowed by American state constitutions, the governor has come to possess a great influence over the legislature and its legislation. This has been accomplished in several ways. First, by the bestowal upon the governor of the veto power.

In the earlier state constitutions, the veto power was generally absent, but, by successive amendments, it has been created until now it exists in all states except North Carolina. Furthermore, in eleven states (Ill., Mass., Nev., N. D., O., Okla., Oreg., S. C., Va., Wash., Wyo.) the governor's veto powers may extend not only to the entire measure, but to any item in any bill, while in 39 states the governor may veto any item in an *appropriation bill*. This provision enables the governor practically to determine the state's budget, and places upon him the responsibility of defeating riders to appropriation bills. Public opinion in American states, furthermore, has come to require the governor to frame and press upon the legislature at each session an "administrative program."

Influence on Legislation. The influence possessed by the governor over legislatures, not only by the importance of his position, but by his power of vetoing bills in which members are interested and by reason of his leadership in the party, gives a special character to what are called "administrative measures" or bills proposed or supported by him, and it is hardly too much to say that the governor is today judged quite as much for the legislation which he secures as for his general conduct of the state's executive business.

A governor, faced with an unwilling legislature, frequently goes directly to the people of the state, and, through interviews or radio addresses, organizes the force of public opinion to bear upon the legislature to favor measures upon which he has staked his political reputation. These practices, while they have contradicted the theory of the separation of powers, undoubtedly have introduced into American state government a necessary authority and have enabled the voters of the states to hold the government to a closer responsibility.

The Power to Pardon. Another important power of the governor is that of pardon. This power may be classified in its several forms as the power to "commute" a sentence or reduce it below the punishment fixed by a court, the power to "pardon" or entirely free a person from the consequences of guilt, the power to grant "reprieves" or postpone sentence, and the power to remit fines and forfeitures.

In 32 states the sole power of pardon, except in cases of treason or impeachment, resides in the governor; in 29 states the governor alone has the power to commute sentence. In 41 states he has the sole power to grant reprieves and in 22 states the

A traditional American spirit is preserved in the clean lines of Delaware's capitol at Dover.

A. Ken. Pfist

Functional design for practicality and classic lines for beauty distinguish Oregon's capitol at Salem.

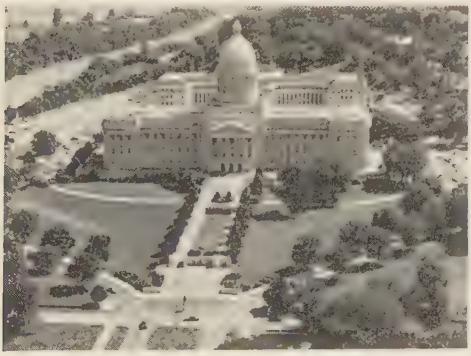
Oregon State Highway Department

STATE CAPITOLS

Towering above the prairie landscape, North Dakota's new state building at Bismarck accentuates the modern skyscraper design.

A wooded background suggesting the "Green Mountain State" frames Vermont's classic capitol at Montpelier.

Vermont Development Commission



Kentucky's capitol at Frankfort is placed far back in a landscaped setting that enhances its beauty.

Dept. of Public Relations, Frankfort, Ky.

Appropriately, the capitol of New Mexico at Sante Fe reflects the Spanish influence characteristic of southwestern United States.

New Mexico State Tourist Bureau

The National War College situated at Fort McNair, D. C., is the top educational institution of our armed forces. Operated under the Joint Chiefs of Staff, it trains selected personnel of the armed forces and State Department in strategic planning and high level policy. There are about 114 students who study intensively for ten months.

This group of buildings at Colorado Springs, Colo., houses the United States Air Force Academy, newest of the Armed Forces schools.

The United States Military Academy at West Point has an authorized strength of 2496 cadets, who are under strict military control during the four year course. Graduates become 2nd lieutenants in the Army or Air Force.

The United States Naval Academy at Annapolis trains the officers for our Navy and Marine Corps. Properly qualified graduates receive commissions as Navy ensigns or Marine Corp 2nd lieutenants. Many foreign naval students are also trained.

The United States Coast Guard Academy at New London, Connecticut, was founded in 1876. Its cadets receive a four year course in engineering, military science and cultural subjects and become Coast Guard ensigns when they graduate. The U. S. Coast Guard is under the jurisdiction of the Secretary of the Treasury.

ARMED SERVICES SCHOOLS

sole power to remit fines and forfeitures. In 12 states the governor has the power to pardon, when acting with his council, or on the recommendation of a board of pardons; in 9 states he similarly exercises the power of commuting sentence; and in 6 states he similarly exercises the power of remitting fines and forfeitures. In 6 states, however (Connecticut, Florida, Idaho, Nevada, New Jersey, and Utah), the pardoning power resides exclusively in a board of pardons.

The power of remitting fines or forfeitures is less frequently confided to the governor, and 21 states by constitutional provision entirely prohibit its exercise.

STATE OFFICERS

Besides a governor and a lieutenant governor (in 36 states), the usual officers are a secretary of state (all states), an attorney-general (all states), a treasurer (all states except New York), an auditor or comptroller (all but 3 states), and a superintendent of public instruction (all states). These are usually popularly elected at the same time and for the same term as the governor. In a few cases the secretary of state (Delaware, Maryland, New Jersey, New York, Pennsylvania, Texas, Virginia), or the superintendent of public instruction (7 states), is appointive by the governor, while in a few states (Maine, New Hampshire, New Jersey, Tennessee) one or more of these officers may be elected by the legislature. In 8 states the school superintendent is elected by a board of education. Other usual officers are the adjutant general of the national guard or state militia, of which the governor is the commander in chief, and a surveyor-general, or a registrar of lands.

As stated above, by recent legislation in a few states, the heads of departments now constitute a "cabinet" of the governor. Usually, however, they perform their duties independently of him and may even represent political parties other than that with which the governor is affiliated.

Nearly all other state offices have been created, not by the constitution, but by legislation, and have come into existence gradually as the state has assumed added responsibilities or taken private professions and certain classes of business under its control.

Types of Administration. Several types of administration have been adopted to discharge new forms of state business: (1) the "*ex officio* board," composed of the governor, secretary of state, the attorney-general, an executive officer, and frequently other members; (2) the "lay board," a corporation of citizens, unsalaried, and usually appointed by the governor for fixed terms, with the power to choose the executive of a state institution (educational, penal, charitable, etc.), and to direct its conduct; (3) a "bureau type" where a branch of administration is intrusted to a single directive head (commissioner of insurance, banks, corporations, etc.); (4) the "commission type" where public business is intrusted to a salaried board whose members are considered technically qualified or expert administrators and who have a joint or "collegiate" responsibility (public service commissions, boards of control, etc.).

Boards and Commissions. Practically all states have public service commissions, charged with regulating public utilities. Admission to the practice of certain professions is secured in most states only after examination and certification by boards composed of selected representatives of these professions (law, medicine, dentistry, pharmacy, architecture, public accounting). The number of these offices, boards, and commissions has multiplied to an astonishing degree, many states having over 100 such bodies. The system has obvious disadvantages; viz., duplication of expense, overlapping functions, absence of responsibility, and undue independence of common administrative authority.

REORGANIZATION OF STATE GOVERNMENT

Reorganization of state administrations to assure simplicity, efficiency, economy, and responsibility is a perennial problem of American government. Because the citizens of a state are already obliged to meet growing demands from federal and local governments, the raising of state income is increasingly difficult. And yet, the states have many long-term commitments as well as unpredictable expenditures. In fiscal 1963, for example, state tax collections totaled $21.1 billion, an increase of 7.5 per cent over 1962. From time to time different state administrations have made serious efforts to reduce expenses. Sometimes overlapping services have been consolidated into fewer departments, sometimes commissions have been organized to operate independent of executive control, and hence comparatively free from political pressure. In some instances central purchasing agencies and bureaus of audit and investigation have been added. In recent years such matters peculiar to the states have been discussed at Governors' Conferences.

Some forms of reorganization have increased, instead of limiting, the power of the governor. The aim has been to make him the head of the state administration as the president is of the federal government, with power to appoint and remove heads of departments and directors in charge of administrative services. Such reorganization has been accomplished by constitutional amendment where necessary, or by legislation. In some states the governor has control of the budget, as in California, New York, Iowa, and New Jersey. In Iowa the spending agencies must submit quarterly estimates to the governor, who is empowered to cut allowances not covered by prospective revenue income.

CIVIL SERVICE

One consideration operating against the "short ballot" and the enlargement of the governor's control of state administration is fear of the misuse of this power to reward political adherents and to create "political machines." The number of employees in certain states is large (52,000 in New York). The unrestricted power to employ and to dismiss so great a force undeniably offers opportunities for serious abuses. While the power to appoint department staffs is legally vested in the heads of the offices, the actual choice may be made by party leaders or "bosses" regardless of the efficiency of the service. Public service has become highly specialized and can be well discharged only by trained and conscientious officials holding office for considerable terms and free from the disturbing vicissitudes of party contests.

Tenure of Office. As in the Federal service, so in the state, including local and municipal administration, advocates of civil service reform have sought to secure laws establishing a "merit system" for public office with security of tenure for competent and faithful public servants. The movement, however, has not met with wide success, and, as yet, no state has adopted a general standard for determining the fitness of aspirants to all offices, local as well as state.

Civil service laws are in force in Alabama, California, Colorado, Connecticut, Illinois, Indiana, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New York, Ohio, Rhode Island, Tennessee, Virginia, and Wisconsin. The usual method of administering a civil service system is by a commission, which is given power to "classify" the public positions, fix qualifications for each grade of employment, hold examinations to determine fitness, certify "eligibles" to the appointing power, keep official service records of employees, and in some cases to try or investigate charges of unfitness. Civil service laws usually declare public positions open on equal conditions to both men and women.

THE RECALL

The recall has been defined as "a special election to determine whether an official shall be superseded before the ordinary expiration of his term." It is in use in 12 states, on petition of a certain percentage of voters, as follows: Arizona (1911, 1912, 25%), California (1911, 12% at least 5 counties for state officers, 20% for local officers), Colorado (1912, 25%), Idaho (1933, 10% for state officers, 20% for local officers), Kansas (1914, 10%, 15%, and 25%), Louisiana (1914, 25%), Michigan (1913, 25%), Nevada (1912, 25%), North Dakota (1920, 30%), Oregon (1908, 25%), Washington (1912, 25% and 35%), Wisconsin (1926, 25%). California, Arizona, and Colorado apply the recall only to elected officers, Washington, Michigan, and Louisiana except judges.

LOCAL GOVERNMENT

The organization of local government (county, township, district, municipality) is entirely a function of the states. Local government serves two purposes: (1) the need of the state for agencies in conducting its administration and enforcing its laws in the subdivisions of the state; (2) the need of communities for organization to satisfy local or community needs. Theoretically, a county may be considered a local agency of the state and a town or city a community organization for determining and supplying its own public wants; but actually state and local activities overlap, or merge and separate in response to an altering social order.

Education, public health, charities, and communications are likely to command the interest of both the state and the town. Justice and preservation of public order are clearly state, not local, functions; but the American practice of "decentralizing" public authority and a prejudice for local self-government have influenced the state usually to leave these essential services to be performed by judges and peace officers locally elected and responsible but to the people of the locality.

Division into Counties. All of the 50 states are divided into counties (in Louisiana called "parishes"). Within the counties (largely rural in character), cities and towns exist as incorporated municipalities. There are more than 3000 counties in the United States, the average number for each state being more than 60. But Delaware has only 3 counties, Rhode Island has 5, while Texas has 253. In New England, county government is mainly limited to the administration of justice, though the county may be a unit of senatorial representation. Elsewhere, it is the usual unit for maintaining roads and bridges, for poor relief, for school administration, and in some states for health supervision and for agricultural aid.

County Government. County government is organized according to no general principle. Outside of Connecticut, Rhode Island, and Georgia, there is an elective board of commissioners or supervisors, with powers, in southern and western states, to assess county taxes, to care for county property, to maintain highways and roads, and to conduct county institutions. In addition, the usual officers are the judge or judges of the county or "superior" court, the sheriff, the attorney, the clerk, the recorder of deeds and other instruments, the assessor of taxes, the collector of taxes, the school superintendent, the health officer, etc. The term of office varies from two to six years.

There is an absence of any responsible head for the county administration and usually county officers are subject to a little or to no state supervision. Removal power is rarely placed in the hands of the governor.

MUNICIPAL GOVERNMENT

In 1950 more than half the population of the United States was living in a standard metropolitan area containing at least one city of 50,000 population or more. The residents living in these central cities and their outlying communities totalled 83,929,863.

City government in the United States follows no accepted plan. Three chief forms are found: the mayor and council plan with separation of executive and legislative functions; the "commission" plan; and the "city manager" plan. The first is the most common. The mayor is popularly elected and may be given a veto over legislation of the council and a large control over city offices. Earlier practice was to divide the council into two chambers.

Commission Form of Government. The commission plan had its origin in Galveston in 1901. It has been adopted in all parts of the Union but particularly in Pa., N. J., Ill., Kans., Okla., and Tenn. Pennsylvania, in 1913, made commission government compulsory for all cities of the third class. Cities of largest population which have employed this form are Newark, N. J., New Orleans, La., Jersey City, N. J., Portland, Ore., St. Paul, Minn., Oakland, Cal., Omaha, Nebr., Birmingham, Ala., Memphis, Tenn., San Antonio, Tex., Dallas, Tex., Houston, Tex., Des Moines, Iowa, Trenton, N. J., Salt Lake City, Utah, Reading, Pa., Spokane, Wash. Under this plan both executive and legislative functions are entrusted to a commission, usually of five. They are popularly elected and are chosen, not by districts, but "at large," though not necessarily all at the same election. This commission employs the city officials and directs the entire administration. In some instances it appoints a city manager, as explained below.

City Manager Plan. This plan was first tried in Staunton, Va., in 1908. Dayton, Ohio, in 1913, was the first large city to adopt it. Between that date and 1945, approximately 450 American cities altered their charters or ordinances to provide for city managers. The maximum number of adoptions, 53, occurred in 1921. In addition to these American cities, 17 cities in Canada and 2 in New Zealand have adopted the plan. Under this plan the elected city council or commission engages a manager who is the head of the entire municipal administration and confines its attention to determining policies, raising revenue, making appropriations, and supervising the administration of the manager.

Municipal Charters. Municipal governments under the American legal system have only those powers and functions which are specifically given them by their charters or by statutes. Originally a city was incorporated and provided with a charter by an act of the legislature. This practice has been altered in two ways: first, by the provision of standard types of city government (corresponding to populations of different sizes or "classes") laid down in "general laws"; and, secondly, by allowing city populations to frame their own charters, which, when ratified by the legislature, become effective.

Such "freeholders' charters" are now provided for by the constitutions of 13 states: California, Colorado, Michigan, Ohio, Missouri (cities over 100,000), Washington, Minnesota, Oklahoma, Arizona, Oregon, Nebraska, Texas, Maryland (only Baltimore and counties), while statutory provisions granting a similar "municipal home rule" have been adopted in Iowa, South Carolina, Mississippi, Florida, and Connecticut.

DEPENDENCIES

The Spanish American war of 1898 brought new responsibilities which made the United States one of the principal "colonial powers" of the world. The chief scene of hostilities was Cuba, and that island was conquered from Spain in 1898. Puerto Rico and the Philippines were ceded outright by Spain to the United States by the treaty of Paris, ratified in 1899. The acquisition of the right to build the Panama Canal, with other responsibilities also, flowed from the war and resulted in practical acquisition of the Canal Zone although Panama retained the right to fly its flag there beside the American flag.

The liquidation of the American "colonial empire" began early. Cuba was given its freedom in 1903, subject to the right of American intervention in case of civil disorder—a right which was exercised a number of times before its abrogation in 1934. A naval base on the island was also retained.

The Philippines was granted independence in two steps. By the first, in 1934, the Philippines became a "dominion" for a ten-year transitional period. The period expired during World War II, which had the effect of postponing the final step until 1946.It then became an independent republic.

Puerto Rico. After a period of military rule, a liberal government was created for the island of Puerto Rico, which was modified by the Organic act of Congress of 1917. This act granted American citizenship to the people of Puerto Rico. Legislative power is vested in two houses, a Senate of 19 members and a House of Representatives of 39 members. These are elected partly from districts and partly at large. The franchise is possessed by all citizens, and no property qualifications may be imposed. The governor, who ruled with an executive council of department heads, was appointed by the president, as were most of the executive officers.

In August 1947 the organic act was amended in response to long continued demands from the island. By the new law the governor is elected for a term of four years, beginning in August 1948, by the Puerto Rican people. This is the only case of such election in any American dependency. The governor now appoints the department heads. The president appoints the auditor and a co-ordinator of federal agencies. The new constitution drafted by the people of Puerto Rico was approved by Congress July 3, 1952. It made Puerto Rico a commonwealth.

The judiciary consists of a United States District judge and a supreme court of 5 justices, appointed by the president. The governor appoints the judges of the lower courts: 17 judges of 9 district courts, the judges and officials of the 36 municipal courts, and the justices of the peace.

Puerto Rico has a resident commissioner in Washington who has a voice but not a vote in the House of Representatives.

Virgin Islands. The Virgin islands, formerly known as the Danish West Indies, were purchased by the United States from Denmark in 1917, for 25 million dollars. At first all governing powers were vested in the governor. By the organic act of 1936 legislative powers are exercised by the two municipal councils of St. Thomas-St. John and St. Croix, who meet in joint session once a year to act on matters common to all the islands. The governor, appointed by the president, has limited veto power. The suffrage is extended to residents who are United States citizens and can read and write the English language. The islands are supervised by the Department of the Interior.

Canal Zone. By treaty with Panama, ratified 1904, the United States acquired title to the Canal Zone, a strip 10 miles wide, with use and control of waters and islands at each end of the canal for purposes of construction, maintenance, or defense of the canal. See *Panama.* This interoceanic strip is, by act of Congress of 1912, placed under the control of the president, who commits its administration to a governor, who is an army officer.

Guam. The largest island of the Ladrones or Marianas group, ceded to the United States by Spain in 1898. It is an important strategic outpost, an air and naval base, and a communications center.

Its affairs were formerly administered by the Navy department, a naval officer acting as governor; but by executive order of President Truman the civil administration was placed in charge of the Department of the Interior, the transfer being completed in June 1950. A month later U. S. citizenship was granted to the inhabitants.

The civil governor is appointed by the president. There is a Guamian Congress, made up of a House of Council and a House of Assembly, elected by the permanent residents. Its powers are largely advisory, but the veto of the governor may be overridden, and an appeal taken directly to Washington. There is a court of appeals, with an island court, a justice court, and a police court, without juries. The law administered is a code based on California law.

Guam was captured by the Japanese in December 1941, but was retaken by United States forces in July 1944. The capital and port of entry, Agana, was totally destroyed during World War II, but has since been rehabilitated.

Samoa. American Samoa, the principal island of which is Tutuila, was acquired by the United States through a tripartite treaty with Great Britain and Germany, November 14, 1899, whereby the other two countries renounced claims over this part of the Samoan islands. America had been in the islands, however, since 1872, when the harbor of Pago Pago was purchased from a native king. Since 1951 this dependency has been supervised by the Department of the Interior, with a civilian governor. Before that it was controlled by the Navy Department and a naval officer was governor. A bicameral legislature with advisory powers chosen by the Samoans was established in 1948. There are district and magistrates courts, and a High Court with a chief justice, who is an American civilian; all other judges are natives. Native lands may not be sold to foreigners.

Pacific Islands. A number of small islands in the Pacific have become important in naval defense, and for trans-Pacific aviation. These are:

Midway and *Kure* islands, 1200 miles northwest of Hawaii, claimed by the United States since 1869; under control of the Navy department.

Wake island, 2130 miles west of Hawaii; annexed in 1898 and under the Navy department. Midway and Wake figured prominently in World War II.

Johnston island, southwest of Hawaii; made a bird refuge under the Department of Agriculture in 1929.

Kingman island, on the direct route to Samoa; the smallest of our island possessions; under the Navy department.

Palmyra island, under the jurisdiction of Hawaii.
Swains island, under the jurisdiction of Samoa.
Howland, Jarvis, and *Baker* islands lie near the equator; they were assigned to the Interior department in 1936.

Canton and *Enderbury* islands, in the Phoenix group, were also claimed by Great Britain. In 1938 it was agreed to leave the question of title in abeyance, and they are used by both nations in common for aviation purposes.

The *Caroline, Marianas,* and *Marshall* islands, formerly a Japanese mandate under the League of Nations, are now administered by the United States as a Trustee under the United Nations.

Ryukyu islands, extending 500 miles southwest of Japan between Kyushu and Formosa, are subject to American jurisdiction under the Japanese peace treaty of 1952. Residual sovereignty rests with Japan, which agreed in advance to any American proposal to have the islands placed under the sole trusteeship of the United States.

Protectorates. During the first three decades of the 20th century, the United States acquired protectorates, official or unofficial, over Cuba, Panama, Haiti, Dominican Republic, and Nicaragua. These relationships were largely abrogated by treaty revision or withdrawal of troops during the administration of President F. D. Roosevelt beginning in 1933.

TABULATED DATA ON

State	Capital	Legislature: Size of Legislature		Legislature: Term of Members (Yrs.)		Legislature: Frequency of Session	Legislature: Limit of Regular Session	Legislature: Salaries of Members for Regular Session Exclusive of Travel Allowance
		Sena's	Repre's	Sena's	Repre's			
Alabama	Montgomery	35	106	4	4	Biennial	36 days	$30 per diem *p*
Alaska	Juneau	20	40	4	2	Annual		$3000 per annum
Arizona	Phoenix	28	80	2	2	Annual	60 days	$1800 per annum
Arkansas	Little Rock	35	100	4	2	Biennial	60 days	$1200 per annum
California	Sacramento	40	80	4	2	Annual	None *e*	$6000 per annum
Colorado	Denver	35	65	4	2	Annual	None	$4800 per biennium
Connecticut	Hartford	36	294	2	2	Biennial	60 days	$2500 per term
Delaware	Dover	17	35	4	2	Annual	60 days	$3000 per annum
Florida	Tallahassee	38	95	4	2	Biennial	60 days	$100 a month *h*
Georgia	Atlanta	54	205	2	2	Annual	70 days	$50 per diem *p*
Hawaii	Honolulu	25	51	4	4	Annual	60 days	$2500 per session
Idaho	Boise	44	65	2	2	Biennial	60 days	$25 per diem, 60 days
Illinois	Springfield	58	177	4	2	Biennial	None	$12,000 per biennium
Indiana	Indianapolis	50	100	4	2	Biennial	61 days	$1800 per annum
Iowa	Des Moines	50	108	4	2	Biennial	None	$30 per diem
Kansas	Topeka	40	125	4	2	Annual	None	$5 per diem *p*
Kentucky	Frankfort	38	100	4	2	Biennial	60 days	$25 per diem
Louisiana	Baton Rouge	39	105	4	4	Annual	60 days	$50 per diem
Maine	Augusta	34	151	2	2	Biennial	None	$1600 per term
Maryland	Annapolis	29	142	4	4	Annual	90 days	$1800 per annum
Massachusetts	Boston	40	240	2	2	Annual	None	$5200 per annum *p*
Michigan	Lansing	34	110	2	2	Annual	None	$7000 per annum
Minnesota	St. Paul	67	135	4	2	Biennial	90 days	$4800 per session
Mississippi	Jackson	49	140	4	4	Biennial	None	$3000 per session
Missouri	Jefferson City	34	163	4	2	Biennial	None	$4800 per annum
Montana	Helena	56	94	4	2	Biennial	60 days	$20 per diem
Nebraska *k*	Lincoln	43 Legislators; 2 year term				Biennial	None	$200 a month
Nevada	Carson City	17	37	4	2	Biennial	60 days	$25 per diem
New Hampshire	Concord	24	400	2	2	Biennial	None	$200 per term
New Jersey	Trenton	21	60	4	2	Annual	None	$5000 per annum
New Mexico	Santa Fe	32	66	4	2	Biennial	60 days*e*	$20 per diem
New York	Albany	58	150*m*	2	2	Annual	None	$10,000 per annum
North Carolina	Raleigh	50	120	2	2	Biennial	None	$15 per diem, 120 days
North Dakota	Bismarck	49	113	4	2	Biennial	60 days	$5 per diem, 60 days
Ohio	Columbus	33	99	4	2	Biennial	None	$5000 per annum
Oklahoma	Oklahoma City	44	120	4	2	Biennial	None	$15 a day when in session $100 a month when not in session
Oregon	Salem	30	60	4	2	Biennial	50 days	$600 per annum
Pennsylvania	Harrisburg	50	210	4	2	Annual	None	$6000 per annum
Rhode Island	Providence	46	100	2	2	Annual	None	$5 per diem, 60 days
South Carolina	Columbia	46	124	4	2	Annual	None	$1800 per annum
South Dakota	Pierre	35	75	2	2	Annual	60 days	$1800 per term
Tennessee	Nashville	33	99	2	2	Biennial	None	$15 per diem
Texas	Austin	31	150	4	2	Biennial	None	$4800 per annum *p*
Utah	Salt Lake City	25	64	4	2	Biennial	60 days	$500 per annum
Vermont	Montpelier	30	246	2	2	Biennial	None	$70 per week
Virginia	Richmond	40	100	4	2	Biennial	60 days*j*	$1080 per session
Washington	Olympia	49	99	4	2	Biennial	60 days	$1200 per annum
West Virginia	Charleston	32	100	4	2	Annual	60 days	$1500 per annum
Wisconsin	Madison	33	100	4	2	Biennial	None	$300 a month *p*
Wyoming	Cheyenne	27	56	4	2	Biennial	40 days	$12 per diem

a Figures for each state number of Congressmen plus 2 U. S. Senators. *b* Not eligible to succeed himself. *c* Chief justice. *d* After [illegible] *e* Maximum [illegible] *h* Maximum larger counties. *j* May be extended 30 days. *k* One-chamber legislature. *l* Until 70 [illegible] *p* Seven years with re-appointment for life.

Governor		Highest Court					Electorial College *a* (Inc. 3 for Dist. Col.) Total, 538	State
Term (Yrs.)	Salary	Name	How Chosen	Number of Judges	Term of Judges	Salaries of Judges		
4 *b*	$25,000	Supreme Court .	Elected	7	6 years . .	$16,500	10	Alabama
4	25,000	Supreme Court .	Elected	3	10 years . .	23,500 *c* 22,500	3	Alaska
2	22,500	Supreme Court .	Elected	5	6 years . .	19,500	5	Arizona
2	10,000	Supreme Court .	Elected	7	8 years . .	15,000	6	Arkansas
4	44,100	Supreme Court .	Elected	7	12 years . .	29,400 *c* 27,300	40	California
4	20,000	Supreme Court .	Elected	7	10 years . .	18,000	6	Colorado
4	15,000	Supreme Court of Errors	By Governor and General Assembly	5	8 years . .	22,500 *c* 21,500	8	Connecticut
4 *g*	17,500	Supreme Court .	By Governor and Senate	3	12 years . .	22,500 *c* 22,000	3	Delaware
4 *b*	25,000	Supreme Court .	Elected	7	6 years . .	19,500	14	Florida
4 *b*	20,700	Supreme Court .	Elected	7	6 years . .	22,500	12	Georgia
4	27,500	Supreme Court .	Elected	5	7 years . .	23,625 *c* 23,100	4	Hawaii
4	15,000	Supreme Court .	Elected	5	6 years . .	15,000	4	Idaho
4	30,000	Supreme Court .	Elected	7	10 years . .	30,000	26	Illinois
4 *b*	25,000	Supreme Court .	Elected	5	6 years . .	20,400	13	Indiana
2	18,500	Supreme Court .	Elected	9	8 years . .	16,000	9	Iowa
2	20,000	Supreme Court .	Elected	7	6 years . .	17,500 *c* 16,500	7	Kansas
4 *b*	18,000	Court of Appeals	Elected	7	8 years . .	20,000	9	Kentucky
4 *b*	20,000	Supreme Court .	Elected	7	14 years . .	25,000 *c* 22,500	10	Louisiana
4	15,000	Supreme Judicial Court	By Governor and Council	6	7 years . .	18,000 *c* 17,000	4	Maine
4	15,000	Court of Appeals	Elected	7	15 years . .	25,500 *c* 25,000	10	Maryland
2	35,000	Supreme Judicial Court	By Governor and Council	7	Life . . .	28,000 *c* 27,000	14	Massachusetts
2 *f*	27,500	Supreme Court .	Elected.	7	7 years . .	25,500	21	Michigan
4	22,500	Supreme Court .	Elected	7	6 years . .	23,500 *c* 22,500	10	Minnesota
4 *b*	25,000	Supreme Court .	Elected	9	8 years . .	16,000 *c* 15,000	7	Mississippi
4 *b*	25,000	Supreme Court .	Elected	7	12 years . .	22,500	12	Missouri
4	22,000	Supreme Court .	Elected	5	6 years . .	17,000 *c* 16,000	4	Montana
2	14,000	Supreme Court .	Elected	7	6 years . .	13,000	5	Nebraska
4	20,000	Supreme Court .	Elected	3	6 years . .	20,000	3	Nevada
2	16,588	Supreme Court	By Governor and Council	5	*l*	16,500 *c* 16,000	4	New Hampshire
4	35,000	Supreme Court .	By Governor and Senate	7	*q*	27,000 *c* 26,000	17	New Jersey
2 *d*	17,500	Supreme Court .	Elected	5	8 years . .	17,500	4	New Mexico
4	50,000	Court of Appeals	Elected	7	14 years . .	41,500 *c* 39,000	43	New York
4 *b*	25,000	Supreme Court .	Elected	7	8 years . .	22,500 *c* 21,500	13	North Carolina
2	13,000	Supreme Court .	Elected	5	10 years . .	14,000	4	North Dakota
4	40,000	Supreme Court .	Elected	7	6 years . .	22,000 *c* 20,000	26	Ohio
4 *b*	25,000	Supreme Court .	Elected	9	6 years . .	16,500 *h*	8	Oklahoma
4	21,500	Supreme Court .	Elected	7	6 years . .	19,000	6	Oregon
4 *b*	35,000	Supreme Court .	Elected	7	21 years . .	33,000 *c* 32,500	29	Pennsylvania
2	25,000	Supreme Court .	By Legislature .	5	Life . . .	21,000 *c* 20,000	4	Rhode Island
4 *b*	20,000	Supreme Court .	By Legislature .	5	10 years . .	20,000 *c* 19,500	8	South Carolina
2	15,500	Supreme Court .	Elected	5	6 years . .	14,000	4	South Dakota
4 *b*	18,500	Supreme Court .	Elected	5	8 years . .	21,500 *c* 20,000	11	Tennessee
2	25,000	Supreme Court *n*	Elected	12*n*	6 years . .	20,000	25	Texas
4	15,000	Supreme Court .	Elected	5	10 years . .	14,200 *c* 13,700	4	Utah
2	13,750	Supreme Court .	By Legislature .	5	2 years . .	11,000 *c* 10,500	3	Vermont
4 *b*	25,000	Supreme Court of Appeals	By Legislature .	7	12 years . .	21,000 *c* 19,500	12	Virginia
4	22,500	Supreme Court .	Elected	9	6 years . .	20,000	9	Washington
4 *b*	17,500	Supreme Court of Appeals	Elected	5	12 years . .	19,000	7	West Virginia
2	25,000	Supreme Court .	Elected	7	10 years . .	25,000 *c* 24,000	12	Wisconsin
4	20,000	Supreme Court .	Elected	4	8 years . .	15,000	3	Wyoming

wo consecutive terms, not eligible to serve two terms thereafter. *e* Split or bifurcated. *f* Four years beginning Jan. 1, 1967. *g* Eligi-ears of age. *m* Assemblymen. *n* Highest civil court, 9 members. Highest criminal court is Court of Criminal Appeals, 3 members.

SUFFRAGE REQUIREMENTS IN

A citizen of the United States includes male and female citizens of twenty-one years and over.

STATE	Requirements Other Than Citizenship Literacy or other requirements may not be applied so as to discriminate by color or race; a sixth-grade education is proof presumptive of literacy.	Previous Residence Required			
		In State	In County	In Town	In Precinct
Alabama	Registration	2 years	1 year	3 months	3 months
Alaska *b*	Literacy	1 year	.....	.....	30 days
Arizona	Literacy, registration	1 year	30 days	30 days	30 days
Arkansas		1 year	6 months	1 month	30 days
California	Ability to read Constitution and write name, registration	1 year	90 days	.....	54 days
Colorado	Registration	1 year	90 days	30 days	15 days
Connecticut	Literacy, registration	1 year	.....	6 months	.....
Delaware	Ability to read a state law, registration	1 year	3 months	.....	30 days
Florida	Registration	1 year	6 months	.....	.....
Georgia *a*	Literacy or registration for general election of 1956	1 year	6 months	6 months	.....
Hawaii *c*	Registration; renewal required after failure to vote	1 year	.....	.....	3 months
Idaho *b*	Registration	6 months	30 days	.....	.....
Illinois	Registration	1 year	90 days	30 days	30 days
Indiana	Registration	6 months	60 days	60 days*	30 days
Iowa	Registration, ability to speak English	6 months	60 days	10 days	10 days
Kansas	Registration	6 months	.....	30 days	30 days
Kentucky *a*	Registration	1 year	6 months	60 days	60 days
Louisiana	Literacy or good moral character, registration	1 year	6 months†	4 mos.§§	3 months
Maine	Ability to read Constitution and write name, registration	6 months	.....	3 months	3 mos.‡
Maryland	Registration	1 year	6 months	6 months	6 months
Massachusetts	Ability to read Constitution and write name, registration	1 year	.....	6 mos.‡	.....
Michigan	Registration	6 months	.....	30 days*	.....
Minnesota	Registration	6 months	.....	30 days	30 days
Mississippi	Literacy, registration	2 years	1 year	1 year	1 year
Missouri	Registration	1 year *d*	60 days	60 days‡	60 days§
Montana	Registration	1 year	30 days	.....	30 days
Nebraska	Registration	6 months	40 days	10 days	10 days
Nevada	Registration	6 months	30 days	10 days	10 days
New Hampshire	Registration	6 months	6 months	6 months	6 months
New Jersey	Registration	6 months	60 days	.....	.....
New Mexico	Registration	1 year	90 days	30 days	30 days
New York	Ability to read and write English, registration	1 year	4 months	30 days‡	.....
North Carolina	Literacy, registration	1 year	.....	4 months	30 days
North Dakota		1 year	90 days	.....	30 days
Ohio	Registration	1 year	40 days	.....	40 days
Oklahoma	Registration	1 year	6 months	.....	30 days
Oregon	Literacy, registration	6 months	.....	.....	.....
Pennsylvania	Registration	1 year	.....	.....	60 days
Rhode Island	Registration	1 year	.....	6 mos.††	.....
South Carolina	Literacy or property ownership; registration	2 years	1 year	4 months	4 months
South Dakota	Registration	1 year	90 days	.....	30 days
Tennessee	Registration	1 year	3 months	.....	.....
Texas		1 year	6 months	.....	.....
Utah	Registration	1 year	4 months	.....	60 days
Vermont	Registration	1 year	3 months	3 months	3 mos.‡
Virginia	Registration	1 year	6 months	30 days	30 days
Washington	Ability to read or speak English, registration	1 year	90 days	30 days	30 days
West Virginia	Registration	1 year	60 days	.....	.....
Wisconsin	Registration	1 year	.....	10 days	10 days
Wyoming	Literacy, registration	1 year	60 days	10 days	10 days

*In township. †In parish. ‡In election district. §In cities of over 10,000 inhabitants. **Except veterans. ††In town or city
a. 18 year olds may vote. *b*. 19 year olds may vote. *c*. 20 year olds may vote. *d*. 60 days when voting in National election

ALL STATES OF THE UNION

By Constitutional amendment, in 1961, the residents of the District of Columbia were given the right to vote in national elections.

Grounds for Disqualification, in Addition to Idiocy, Insanity, and Conviction of Felony	Adult Population 1960 Census	Votes Cast Presidential Election 1964 ‡ ‡	State
Bribery, malfeasance, election crimes, vagrancy after conviction, immorality	1,834,000	454,318	Alabama
	124,000	55,136	Alaska
	732,000	467,882	Arizona
	1,043,000	527,429	Arkansas
	9,660,000	6,818,738	California
Status under guardianship, incarceration	1,031,000	766,378	Colorado
Immorality	1,591,000	1,216,890	Connecticut
Corrupt practices	267,000	200,765	Delaware
		191,373	Dist. of Col.
Betting on elections, bribery, status under guardianship, incarceration	3,088,000	1,763,031	Florida
Immorality, illiteracy	2,231,000	1,038,303	Georgia
	348,000	206,931	Hawaii
Immorality, incarceration, bigamy, bribery, Chinese	372,000	290,771	Idaho
Penitentiary sentence, election offenses	6,281,000	4,632,955	Illinois
	2,778,000	2,071,080	Indiana
	1,664,000	1,180,085	Iowa
Bribery, dueling, status under guardianship, dishonorable discharge from office	1,322,000	830,913	Kansas
Bribery, incarceration	1,764,000	1,038,874	Kentucky
Maintenance in institutions except soldiers' homes, "interdicted" persons, bribery, incarceration, military desertion, dishonorable discharge	1,804,000	891,356	Louisiana
Pauperism, status under guardianship	581,000	381,527	Maine
	1,845,000	1,119,019	Maryland
Election crimes, pauperism, status under guardianship, corrupt practices	3,245,000	2,206,177	Massachusetts
	4,580,000	3,188,163	Michigan
Status under guardianship	2,001,000	1,543,387	Minnesota
Bribery, status of untaxed Indian	1,171,000	412,756	Mississippi
Status under guardianship, pauperism, incarceration, conviction of crime interfering with right of suffrage	2,696,000	1,694,646	Missouri
Pauperism, incarceration, election misdemeanor	389,000	277,336	Montana
	858,000	554,053	Nebraska
Dueling	175,000	133,068	Nevada
Pauperism	373,000	288,826	New Hampshire
	3,861,000	2,788,042	New Jersey
	501,000	326,010	New Mexico
Betting on elections, bribery	10,881,000	7,012,056	New York
	2,557,000	1,437,586	North Carolina
Status under guardianship	355,000	241,003	North Dakota
Bribery	5,839,000	3,960,927	Ohio
Status of a non-native Indian, maintenance in institution,** incarceration**	1,416,000	931,587	Oklahoma
	1,073,000	758,726	Oregon
	7,100,000	4,604,993	Pennsylvania
Bribery, status under guardianship	540,000	376,472	Rhode Island
Election crimes, pauperism, immorality, incarceration	1,266,000	530,757	South Carolina
Status under guardianship	392,000	287,788	South Dakota
Subversive activities	2,093,000	1,147,257	Tennessee
Pauperism	5,534,000	2,577,990	Texas
	468,000	401,811	Utah
Conviction within five years of violating absent voters law	231,000	162,804	Vermont
Dueling, pauperism	2,313,000	1,040,867	Virginia
Status as an untaxed Indian	1,718,000	536,591	Washington
Pauperism	1,083,000	783,860	West Virginia
Betting on elections, dueling, status under guardianship, bribery	2,354,000	1,685,899	Wisconsin
	190,000	136,226	Wyoming

‡‡Total vote cast in the United States was 68,795,587. §§In municipality.

POPULAR AND ELECTORAL VOTE FOR PRESIDENT AND VICE PRESIDENT FROM 1789 TO THE PRESENT

Strictly speaking, there is no popular vote for president and vice president; the people vote for electors, and those chosen in each state meet therein and vote for the candidates for president and vice president. The record of any popular vote for electors prior to 1824 is so meager and imperfect that a compilation would be useless. In most of the states, for more than a quarter century following the establishment of the government, the state legislatures "appointed" the presidential electors, and the people therefore voted only indirectly for them, their choice being expressed by their votes for members of the legislature. In this tabulation, only the electoral vote for candidates for president and vice president in the first nine quadrennial elections appears. In a few instances, candidates receiving an extremely insignificant number of votes have been omitted.

ABBREVIATIONS: Amer., American; Antimas., Antimasonic; Cm., Communist; Const. Un., Constitutional Union; D. or Dem., Democrat; D. & L. R., Democrat and Liberal Republican; Dem.-Rep., Democratic Republican; Far.-L., Farmer-Labor; Fed., Federalist; F. S., Free Soil; F. S. D., Free Soil Democrat; Gr'b., Greenback; Ind., Independent; Indep., Independence; L., Labor; Nat. Rep., National Republican; P., Populist; Prog., Progressive; Pro., Prohibition; Rep., Republican; Soc., Socialist; Soc. Dem., Social Democrat; Soc. L., Socialist Labor; St. R., States' Rights; Temp., Temperance; U. L., Union Labor.

YEAR	Presidential Candidates	State	Party	VOTE				CANDIDATES FOR VICE PRESIDENT		
				States Voting	Total Vote	Electoral Vote	Popular Vote	Name	State	Electoral Vote
1789*	George Washington	Va.		10†	73	69		John Adams	Mass.	34
	John Adams	Mass.				34				
	John Jay	N. Y.				9				
	R. H. Harrison	Md.				6				
	John Rutledge	S. C.				6				
	John Hancock	Mass.				4				
	George Clinton	N. Y.				3				
	Samuel Huntington	Conn.				2				
	John Milton	Ga.				2				
	James Armstrong	Ga.				1				
	Benjamin Lincoln	Mass.				1				
	Edward Telfair	Ga.				1				
	Vacancies††					4				
1792	George Washington	Va.	Fed.	15	135	132		John Adams	Mass.	77
	John Adams	Mass.	Fed.			77				
	George Clinton	N. Y.	Dem.-Rep.‡			50				
	Thomas Jefferson	Va.				4				
	Aaron Burr	N. Y.				1				
1796	John Adams	Mass.	Fed.	16	138	71		Thomas Jefferson	Va.	68
	Thomas Jefferson	Va.	Dem.-Rep.			68				
	Thomas Pinckney	S. C.	Fed.			59				
	Aaron Burr	N. Y.	Antifed.			30				
	Samuel Adams	Mass.	Dem.-Rep.			15				
	Oliver Ellsworth	Conn.	Fed.			11				
	George Clinton	N. Y.	Dem.-Rep.			7				
	John Jay	N. Y.	Ind.-Fed.			5				
	James Iredell	N. C.	Fed.			3				
	George Washington	Va.	Fed.			2				
	John Henry	Md.	Ind.			2				
	S. Johnston	N. C.	Ind.-Fed.			2				
	C. C. Pinckney	S. C.	Ind.-Fed.			1				
1800	Thomas Jefferson	Va.	Dem.-Rep.	16	138	73§		Aaron Burr	N. Y.	73
	Aaron Burr	N. Y.	Dem.-Rep.			73§				
	John Adams	Mass.	Fed.			65				
	C. C. Pinckney	S. C.	Fed.			64				
	John Jay	N. Y.	Fed.			1				
1804	Thomas Jefferson	Va.	Dem.-Rep.	17	176	162		George Clinton	N. Y.	162
	C. C. Pinckney	S. C.	Fed.			14		Rufus King	N. Y.	14
1808	James Madison	Va.	Dem.-Rep.	17	176	122		George Clinton	N. Y.	113
	C. C. Pinckney	S. C.	Fed.			47		Rufus King	N. Y.	47
	George Clinton	N. Y.	Ind.-Rep.			6		John Langdon	N. H.	9
	Vacancy					1				
								James Madison	Va.	3
								James Monroe	Va.	3
1812	James Madison	Va.	Dem.-Rep.	18	218	128		Elbridge Gerry	Mass.	131
	De Witt Clinton	N. Y.	Fusion			89		Jared Ingersoll	Pa.	86
1816	James Monroe	Va.	Rep.	19	221	183		D. D. Tompkins	N. Y.	183
	Rufus King	N. Y.	Fed.			34		John E. Howard	Md.	22
	Vacancies					4		James Ross	Pa.	5
								John Marshall	Va.	4
								Robert G. Harper	Md.	3

* Prior to 1804 each elector was entitled to vote for two candidates for president. The candidate receiving the greatest number of votes was declared elected, while the candidate receiving the next highest vote was declared vice president.

† Three states not voting. New York legislature failed to agree on electors; N. Carolina and Rhode Island had not ratified the Constitution.

‡ The Democratic-Republican (also called Republican) party was the predecessor of the present Democratic party.

†† "Vacancies" means electors absent or not voting.

§ As there was no election the choice was decided by the House of Representatives.

POPULAR AND ELECTORAL VOTE FOR PRESIDENT AND VICE PRESIDENT FROM 1789 TO THE PRESENT—Con.

Year	Presidential Candidates	State	Party	Vote: States Voting	Vote: Total Vote	Vote: Electoral Vote	Vote: Popular Vote	Candidates for Vice President: Name	State	Electoral Vote
1820	James Monroe	Va.	Rep.	24	235	231		D. D. Tompkins	N. Y.	218
	John Q. Adams	Mass.	Ind.-Rep.			1		Richard Stockton	N. J.	8
	Vacancy							Daniel Rodney	Del.	4
								Robert G. Harper	Md.	1
								Richard Rush	Pa.	1
1824	John Q. Adams	Mass.	No party	24	261	84§	108,740	John C. Calhoun	S. C.	182
	Andrew Jackson	Tenn.				99§	153,544	Nathan Sanford	N. Y.	30
	Henry Clay	Ky.				37	47,136	Nathaniel Macon	N. C.	24
	W. H. Crawford	Ga.				41	46,618	Andrew Jackson	Tenn.	13
								Martin Van Buren	N. Y.	9
								Henry Clay	Ky.	2
	Vacancy									1
1828	Andrew Jackson	Tenn.	Dem.	24	261	178	647,286	John C. Calhoun	S. C.	171
	John Q. Adams	Mass.	Nat. Rep.			83	508,064	Richard Rush	Pa.	83
								William Smith	S. C.	7
1832	Andrew Jackson	Tenn.	Dem.	24	288	219	687,502	Martin Van Buren	N. Y.	189
	Henry Clay	Ky.	Nat. Rep.			49	530,189	John Sergeant	Pa.	49
	John Floyd	Ga.	Ind.-Dem.			11		Henry Lee	Mass.	11
	William Wirt	Md.	Antimas.			7		Amos Ellmaker	Pa.	7
	Vacancies					2		William Wilkins	Pa.	30
1836	Martin Van Buren	N. Y.	Dem.	26	294	170	762,978	R. M. Johnson	Ky.	147
	Wm. H. Harrison	Ohio	Whig.			73		Francis Granger	N. Y.	77
	Hugh L. White	Tenn.	Whig.			26	736,250	John Tyler	Va.	47
	Daniel Webster	Mass.	Whig.			14		William Smith	Ala.	23
	W. P. Mangum	N. C.	Ind.			11				
1840	Wm. H. Harrison	Ohio	Whig.	26	294	234	1,275,016	John Tyler	Va.	234
	Martin Van Buren	N. Y.	Dem.			60	1,129,102	R. M. Johnson	Ky.	48
	James G. Birney	N. Y.	Liberty				7,069	L. W. Tazewell	Va.	11
								James K. Polk	Tenn.	1
1844	James K. Polk	Tenn.	Dem.	26	275	170	1,337,243	George M. Dallas	Pa.	170
	Henry Clay	Ky.	Whig			105	1,299,062	T. Frelinghuysen	N. J.	105
	James G. Birney	N. Y.	Liberty				62,300	Thomas Morris	Ohio	
1848	Zachary Taylor	La.	Whig.	30	290	163	1,360,099	Millard Fillmore	N. Y.	163
	Lewis Cass	Mich.	Dem.			127	1,220,544	Wm. O. Butler	Ky.	127
	Martin Van Buren	N. Y.	F. S.				291,263	Chas. F. Adams	Mass.	
1852	Franklin Pierce	N. H.	Dem.	31	296	254	1,601,474	William R. King	Ala.	254
	Winfield Scott	N. J.	Whig.			42	1,386,580	Wm. A. Graham	N. C.	42
	John P. Hale	N. H.	F. S. D.				155,825	George W. Julian	Ind.	
1856	James Buchanan	Pa.	Dem.	31	296	174	1,838,169	J. C. Breckinridge	Ky.	174
	John C. Fremont	Cal.	Rep.			114	1,341,264	Wm. L Dayton	N. J.	114
	Millard Fillmore	N. Y.	Amer.			8	874,534	A. J. Donelson	Tenn.	8
1860	Abraham Lincoln	Ill.	Rep.	33	303	180	1,866,452	Hannibal Hamlin	Me.	180
	J. C. Breckinridge	Ky.	Dem.			72	849,781	Joseph Lane	Ind.	72
	Stephen A. Douglas	Ill.	Dem.			12	1,376,957	H. V. Johnson	Ga.	12
	John Bell	Tenn.	Const. Un.			39	588,879	Edward Everett	Mass.	39
1864	Abraham Lincoln	Ill.	Rep.	36	314	212	2,216,037	Andrew Johnson	Tenn.	212
	Geo. B. McClellan	N. J.	Dem.			21	1,802,237	G. H. Pendleton	Ohio	21
1868	Ulysses S. Grant	Ill.	Rep.	37	317	214	3,015,071	Schuyler Colfax	Ind.	214
	Horatio Seymour	N. Y.	Dem.			80	2,709,615	F. P. Blair, Jr.	Mo.	80
	Not counted					23				
1872	Ulysses S. Grant	Ill.	Rep.	37	366	286	3,597,132	Henry Wilson	Mass.	286
	Horace Greeley	N. Y.	D. & L. R.			||	2,834,125	B. Gratz Brown	Mo.	47
	Charles O'Conor	N. Y.	Straight D.				29,489	John Q. Adams	Mass.	
	James Black	Pa.	Temp.				5,608	John Russell	Mich.	
	Thos. A. Hendricks	Ind.	Ind.-Dem.			42		Geo. W. Julian	Ind.	5
	B. Gratz Brown	Mo.	Dem.			18		A. H. Colquitt	Ga.	5
	Charles J. Jenkins	Ga.	Dem.			2		J. M. Palmer	Ill.	3
	David Davis	Ill.	Dem.			1		T. E. Bramlette	Ky.	3
	Not counted					17		W. S. Groesbeck	Ohio	1
								W. B. Machen	Ky.	1
								N. P. Banks	Mass.	1
1876	Ruth'd B. Hayes	Ohio	Rep.	38	369	185	4,033,768	Wm. A. Wheeler	N. Y.	185
	Samuel J. Tilden	N. Y.	Dem.			184	4,285,992	T. A. Hendricks	Ind.	184
	Peter Cooper	N. Y.	Gr'b.				81,737	Samuel F. Cary	Ohio	
1880	James A. Garfield	Ohio	Rep.	38	369	214	4,449,053	Chester A. Arthur	N. Y.	214
	Win'd S. Hancock	Pa.	Dem.			155	4,442,035	Wm. H. English	Ind.	155
	James B. Weaver	Iowa	Gr'b.				307,306	B. J. Chambers	Tex.	

§ As there was no election the choice was decided by the House of Representatives.
|| Owing to the death of Horace Greeley the Democratic electors scattered their vote.

POPULAR AND ELECTORAL VOTE FOR PRESIDENT AND VICE PRESIDENT FROM 1789 TO THE PRESENT—Con.

Year	Presidential Candidates	State	Party	Vote				Candidates for Vice President		
				States Voting	Total Vote	Electoral Vote	Popular Vote	Name	State	Electoral Vote
1884	Grover Cleveland	N. Y.	Dem.	38	401	219	4,911,017	T. A. Hendricks	Ind.	219
	James G. Blaine	Me.	Rep.	. .	. .	182	4,848,334	John A. Logan	Ill.	182
	John P. St. John	Kans.	Pro.	. .	. .	. .	133,825	William Daniel	Md.	
1888	Benjamin Harrison	Ind.	Rep.	38	401	233	5,440,216	Levi P. Morton	N. Y.	233
	Grover Cleveland	N. Y.	Dem.	. .	. .	168	5,538,233	A. G. Thurman	Ohio	168
	Clinton B. Fisk	N. J.	Pro.	. .	. .	. .	249,907	John A. Brooks	Mo.	
1892	Grover Cleveland	N. Y.	Dem.	44	444	277	5,556,918	A. E. Stevenson	Ill.	277
	Benjamin Harrison	Ind.	Rep.	. .	. .	145	5,176,108	Whitelaw Reid	N. Y.	145
	James B. Weaver	Iowa	People's	. .	. .	22	1,041,028	James G. Field	Va.	22
1896	William McKinley	Ohio	Rep.	45	447	271	7,035,638	Garret A. Hobart	N. J.	271
	William J. Bryan	Nebr.	Dem.					Arthur Sewall	Me.	149
	William J. Bryan	Nebr.	People's	. .	. .	176	6,467,946	Th. E. Watson	Ga.	27
1900	William McKinley	Ohio	Rep.	45	447	292	7,219,530	Theo. Roosevelt	N. Y.	292
	William J. Bryan	Nebr.	Dem. & P.	. .	. .	155	6,358,071	A. E. Stevenson	Ill.	155
	John G. Woolley	Ill.	Pro.	. .	. .	. .	209,166	Henry B. Metcalf	R. I.	
	Eugene V. Debs	Ind.	Soc. Dem.	. .	. .	. .	94,768	Job Harriman	Cal.	
1904	Theodore Roosevelt	N. Y.	Rep.	45	476	336	7,628,834	Charles W. Fairbanks	Ind.	336
	Alton B. Parker	N. Y.	Dem.	. .	. .	140	5,084,491	Henry G. Davis	W. Va.	140
	Eugene V. Debs	Ind.	Soc.	. .	. .	. .	402,400	Benjamin Hanford	N. Y.	
1908	William H. Taft	Ohio	Rep.	46	483	321	7,679,006	James S. Sherman	N. Y.	321
	William J. Bryan	Nebr.	Dem.	. .	. .	162	6,409,106	John W. Kern	Ind.	162
	Eugene V. Debs	Ind.	Soc.	. .	. .	. .	420,820	Benjamin Hanford	N. Y.	
1912	Woodrow Wilson	N. J.	Dem.	48	531	435	6,286,214	Thos. R. Marshall	Ind.	435
	William H. Taft	Ohio	Rep.	. .	. .	8	3,483,922	Nicholas M. Butler	N. Y.	8
	Theodore Roosevelt	N. Y.	Prog.	. .	. .	88	4,126,620	Hiram W. Johnson	Cal.	88
1916	Woodrow Wilson	N. J.	Dem.	48	531	277	9,129,606	Thos. R. Marshall	Ind.	277
	Chas. E. Hughes	N. Y.	Rep.	. .	. .	254	8,538,221	Chas. W. Fairbanks	Ind.	254
	A. L. Benson	N. Y.	Soc.	. .	. .	. .	585,113	G. R. Kirkpatrick	N. J.	
1920	Warren G. Harding	Ohio	Rep.	48	531	404	16,152,200	Calvin Coolidge	Mass.	404
	James M. Cox	Ohio	Dem.	. .	. .	127	9,147,353	Franklin D. Roosevelt	N. Y.	127
	Eugene V. Debs	Ind.	Soc.	. .	. .	. .	919,799	Seymour Stedman	Ill.	
1924	Calvin Coolidge	Mass.	Rep.	48	531	382	15,725,016	Charles G. Dawes	Ill.	382
	John W. Davis	W. Va.	Dem.	. .	. .	136	8,385,586	Charles W. Bryan	Neb.	136
	Robert LaFollette	Wis.	Prog.	. .	. .	13	4,822,856	Burton K. Wheeler	Mont.	13
1928	Herbert Hoover	Cal.	Rep.	48	531	444	21,392,190	Charles Curtis	Kans.	444
	Alfred E. Smith	N. Y.	Dem.	. .	. .	87	15,016,443	Joseph T. Robinson	Ark.	87
	Norman M. Thomas	N. Y.	Soc.	. .	. .	. .	267,420	James H. Maurer	Pa.	
	William Z. Foster	Ill.	Workers	. .	. .	. .	48,770	Benjamin Gitlow	N. Y.	
1932	Franklin D. Roosevelt	N. Y.	Dem.	48	531	472	22,821,857	John N. Garner	Tex.	472
	Herbert Hoover	Cal.	Rep.	. .	. .	59	15,761,841	Charles Curtis	Kans.	59
	Norman M. Thomas	N. Y.	Soc.	. .	. .	. .	884,781	James H. Maurer	Pa.	
	William Z. Foster	Ill.	Workers	. .	. .	. .	102,991	James W. Ford	Ala.	
1936	Franklin D. Roosevelt	N. Y.	Dem.	48	531	523	27,752,309	John N. Garner	Tex.	523
	Alfred M. Landon	Kans.	Rep.	. .	. .	8	16,682,524	Frank R. Knox	Ill.	8
	William Lemke	N. D.	Union	. .	. .	. .	892,793	Thomas C. O'Brien	Mass	
	Norman Thomas	N. Y.	Soc.	. .	. .	. .	187,342	George A. Nelson	Wis.	
	Earl Browder	Kans.	Cm.	. .	. .	. .	80,096	James W. Ford	Ala.	
1940	Franklin D. Roosevelt	N. Y.	Dem.	48	531	449	27,245,422	Henry A. Wallace	Iowa	449
	Wendell L. Willkie	N. Y.	Rep.	. .	. .	82	22,333,801	Charles L. McNary	Ore.	82
	Norman Thomas	N. Y.	Soc.	. .	. .	. .	116,796	Maynard C. Kreuger	Ill.	
	Roger W. Babson	Mass.	Pro.	. .	. .	. .	58,674	Edgar V. Moorman	Ill.	
	Earl Browder	Kans.	Cm.	. .	. .	. .	49,028	James W. Ford	Ala.	
1944	Franklin D. Roosevelt	N. Y.	Dem.	48	531	432	25,602,505	Harry S. Truman	Mo.	432
	Thomas E. Dewey	N. Y.	Rep.	. .	. .	99	22,006,278	John W. Bricker	Ohio	99
	Norman Thomas	N. Y.	Soc.	. .	. .	. .	80,518	Darlington Hoopes	Pa.	
	Claude A. Watson	Cal.	Pro.	. .	. .	. .	74,758	Andrew Johnson	Ky.	
1948	Harry S. Truman	Mo.	Dem.	48	531	304	24,045,052	Alben W. Barkley	Ky.	304
	Thomas E. Dewey	N. Y.	Rep.	. .	. .	189	21,896,927	Earl Warren	Cal.	189
	J. Strom Thurmond	S. C.	St. R.	. .	. .	38	1,168,687	Fielding L. Wright	Miss.	38
	Henry A. Wallace	Iowa	Prog.	. .	. .	. .	1,137,957	Glen Taylor	Ida.	
	Norman Thomas	N. Y.	Soc.	. .	. .	. .	95,908	Tucker P. Smith	Mich.	
1952	Dwight D. Eisenhower	N. Y.	Rep.	48	531	442	33,927,549	Richard M. Nixon	Cal.	442
	Adlai E. Stevenson	Ill.	Dem.	. .	. .	89	27,311,816	John J. Sparkman	Ala.	89
1956	Dwight D. Eisenhower	N. Y.	Rep.	48	531	457	35,575,420	Richard M. Nixon	Cal.	457
	Adlai E. Stevenson	Ill.	Dem.	. .	. .	73*	26,033,065	Estes Kefauver	Tenn.	73
1960	John F. Kennedy	Mass.	Dem.	50	537	303	34,221,531	Lyndon B. Johnson	Texas	303
	Richard M. Nixon	Cal.	Rep.		**	219	34,108,474	Henry Cabot Lodge	Mass.	219
1964	Lyndon B. Johnson	Texas	Dem.	50	538	486	42,328,350	Hubert H. Humphrey	Minn.	486
	Barry M. Goldwater	Ariz.	Rep.			52	26,840,650	William E. Miller	N. Y.	52

* One presidential elector on the Democratic ticket did not vote for Stevenson. ** Eight electors from Mississippi, [illegible] from Alabama and [illegible] from Oklahoma voted for Harry F. Byrd.

FOREIGN GOVERNMENTS

THIS section on Foreign Governments comprises the accounts of all independent states, other than the United States of America, which are recognized as possessing "sovereignty." The usual test of sovereignty is the recognized conduct of foreign affairs through fully accredited diplomatic agents. Nearly all sovereign states are members of the United Nations, but such membership is not a test of sovereignty. Some old and powerful nations are not members, and some constituent republics of the Soviet Union are members.

Earlier Forms of Government. The earliest form of political organization goes back to the tribe, which itself is an extended form of the family. The chief held absolute power. When hunting as the means of subsistence gave way to agriculture and husbandry, it was possible to store the means of subsistence, initially in the form of grain, cattle, and land. These constituted wealth, and usually the control of wealth spells power. Cities then for the first time became possible with a multitude of new activities—industry, trade, better weapons, and organized armies. Writing was invented initially to keep records of wealth but soon was utilized to strengthen control by the more powerful. Kings succeeded chiefs of the earlier tribal ages. More powerful cities extended their power over their weaker neighbors, thus creating empires which rose and fell with the fortunes of war. The king held power of life and death over his subjects and, in general, was the source of all law. Such was the picture in the parts of the world where the early civilizations arose on the Nile and the Tigris. These spread through southwestern Asia and northeastern Africa and made their way into southeastern Europe over a period of several thousand years.

Toward the Modern Age. Beginning in the 5th century B.C., a golden interlude supervened. In the city states of Greece, the power of the kings was first broken, authority was shared by wider groups, and ultimately resided in the ordinary citizen in the leading cities of the Greek world. In the same general period, Rome developed a constitutional system which, while less radically democratic than that of Greece, was better able to perpetuate itself. Political ideas from the two peoples, gaining prestige with the Roman conquest of Greece and most of the rest of the then known world, established the forms and much of the vocabulary of government which prevails today.

Actually, there was an "iron-age" interlude between the period of Greco-Roman political thought and practice and that of the modern world. The Roman empire was succeeded by over a thousand years of a resurgent feudalism, which in turn was succeeded by a period of absolute monarchies. Cities again grew up, and the earlier evolution from absolutism to democracy was essentially repeated in Europe from the 16th to the 19th century.

As intimated above, our language of government is dominated by words which have come down from Greece and Rome. From Greece, for example, we have the terms monarchy (rule by one person), aristocracy (rule by the upper class), and democracy (rule by the common people). From Rome the terms republic (rule by elected officials under constitutional forms), empire (wide-spread control through military strength), and senate (legislative body originally of more experienced citizens).

Realities Behind the Forms. In seeking to understand the nature of the government of any country, it is necessary to look behind the terms used to describe them. There are several reasons for this.

First, many governments have evolved from one type to another without changing the language describing them. For example, Great Britain and Sweden are monarchies, but real control lies, not with the monarch, but with the ordinary citizen; these countries are no less democratic than many other democracies and much more so than many governments which are called democracies.

Second, many so-called democracies are so designated because of what their leaders hope they will become rather than because of what they are. For example, some newly independent African countries call themselves democratic republics even though they may still be ruled by an oligarchy of tribal chieftains or by a dictator. In practice, their ruler may ignore the constitutional forms which were based on ideas learned from democratic European states or from the United States of America.

Third, the 20th century has witnessed the rise of a number of governments which have democratic republican constitutions but which operate their institutions by means of one party, and the party is governed by rules entirely outside the constitution. This party manipulates the institutions so that the ordinary citizen has no effective choice in selecting his rulers. Russia and China are outstanding examples.

It thus appears that, while the constitutions are the forms of government, the way a nation is actually governed depends on the experience and character of the people who rule and are ruled. A people which, over a long period of time, has developed the habit of individual liberty tempered by self-restraint in respecting the liberty of fellow citizens can govern itself well even under a constitution which does not guarantee civil rights, whereas a people without such a habit of liberty is apt to be governed tyrannically despite an elaborate bill of rights in its constitution. Canada, for example, has no bill of rights in its fundamental law, apparently not having felt the need for a formal guarantee of what was customarily enjoyed. A recent law corrects the oversight. On the other hand, the Russian constitution has an elaborate bill of rights, which serves as a hope rather than a reality.

It may be said that, at best, constitutions show the legal framework within which a country is actually governed and that, at worst, they set up a legal standard which hopefully may some day be attained. The fact that practically every nation does have such a legal standard is eloquent testimony that the days of arbitrary disregard of public opinion by rulers are numbered.

Present-Day Status of Nations. The 20th century has witnessed a vast expansion in the number of independent nations. In 1907, 48 states were invited to send representatives to the Second Hague Conference, and this was considered the number of the "family of nations" at that time. The number of nations was increased by World War I. Following World War II, there were, in 1951, 60 members of the United Nations, with over a dozen others awaiting admission or which chose not to be members. The next two decades saw an unexampled proliferation of states as the peoples of Asia and Africa threw off the political yoke of their former masters.

This section contains brief descriptions of the governments of 120 states. Four of these states have two governments each—Germany, China, Korea, and Viet-Nam—and each of the governments claims to represent the entire country. A description of both governments is given in each such case. Summaries indicate the time and manner in which each state became independent and set forth the main points in its formal framework of government based on an examination of the constitution. Where the realities of government differ markedly from its form, this also is indicated. The reader is enabled thereby to understand better the day-to-day political happenings in these states, the importance of which, in today's closely knit world, readily overleaps national boundaries and affects the interests of all.

ABYSSINIA

See *Ethiopia*.

AFGHANISTAN

Afghanistan was ruled as an absolute monarchy until 1922, when the king shared his power to a limited extent with an elected Assembly. A new constitution of 1965 declares Afghanistan to be an Islamic constitutional monarchy. The legislature consists of a House of Representatives with 211 members elected by universal suffrage for a 4-year term and a Senate of 84 members. One-third of the Senate is popularly elected for a 4-year term, one-third is appointed by the king from elder citizens, and one-third is chosen by the 28 provincial councils, 1 from each.

The king appoints the prime minister and, on his recommendation, the other members of the cabinet, who hold office subject to the confidence of the House. Money bills originate only with the king or his cabinet. All bills must be passed by both houses, differences being settled in committee conferences, and approved by the king.

The constitution may be amended on the initiative of the cabinet or one-third of the House subject to the approval of the Grand National Assembly, which consists of members of both houses and the heads of the provincial councils. This body is convened also to take charge in times of national crisis.

ALBANIA

Ruled for 450 years by the Turks, Albania was set up as an independent state in 1912 but was conquered by Italy and Germany in World War II. On their defeat, Albania again became independent in 1945, when the Albanian Labor Party, a branch of the Communist party, established Albania as a people's republic. The supreme ruling body both of the state and the party is the Politburo, with 11 full members and 4 candidate members. In addition, there is a People's Assembly of deputies, one for each 8000 inhabitants, elected for 4-year terms, the names of the candidates being selected by the party. In the ideological rift between Russia and China in the 1960's, Albania sided with China.

ALGERIA

After 132 years of French rule, Algeria became independent in 1962 as an Islamic republic. A constitution adopted in 1963 provided for a one-party government. A National Assembly is elected for 5 years by universal suffrage, the candidates being designated by the party, the National Liberation Front. The party also designates a candidate for president of the republic, who is then elected by popular vote. The Assembly, led by its president and cabinet, passes legislation, which is promulgated by the president of the republic within 10 days or, if he fails to do so, by the Assembly's president. If the Assembly censures the policy of the president of the republic, the Assembly's president may take over the latter's duties.

ANDORRA

A small, neutral "republic" on the Franco-Spanish frontier. It is a surviving specimen of the semi-independence of feudal lordship, possessed in medieval times by many valleys of these mountains. It is governed by a council of 24 members elected for 4 years by men over 25 years old. A first and a second "syndic" are chosen by the council as presiding officers and executives of the republic. The state is under the joint suzerainty of the Spanish bishop of Urgel and the president of France, as successor to the Bourbon kings. Andorra pays nominal tribute to France and to the bishop.

ARGENTINA

Argentina arose out of the Spanish viceroyalty of La Plata. May 25, 1810, the city of Buenos Aires revolted and elected a provisional committee. July 9, 1816, the Congress of Tucuman declared the Argentinian provinces an independent republic. Spanish authority was never again recognized in Argentina, but independence was not completely secure until the battle of Ayacucho in Peru in 1824. Within the United Provinces of La Plata local feeling was strong, especially in Buenos Aires, and the opposition between state privileges and national authority has been a constant element in Argentine constitutional history. A period of internal struggle among local chiefs led up to the dictatorship of Juan Manuel de Rosas, from 1829 to 1852. Rosas was arbitrary, but he at least suppressed the local *caudillos* (bosses) and gave a degree of order and unity.

The present constitution, which was adopted in 1957, follows generally the liberal constitution of 1853 but gives the central government greater control over the country's economy. It resembles the constitution of the United States, particularly in its union of the provinces of the country into a federal republic. These provinces are 22, besides one federal district, Buenos Aires. The provinces, like the American states, elect their own legislatures and governors and have a constitutional jurisdiction over provincial affairs. Powers not granted to the nation are retained by the provinces, but the federal government has more extensive powers than those granted by the United States constitution. This condition arises from the fact that the provinces were artificially created federal units and from the need felt for a strong central authority. The constitution can be amended only by a constitutional convention, which may be called pursuant to a two-thirds vote of Congress.

Executive Organization. Under the theory of separation of powers, the federal government is declared to be divided into executive, legislative, and judicial departments. The executive authority is conferred upon a president, who occupies the position of an independent executive but who is limited by numerous constitutional provisions to prevent the abuse of authority or the assumption of dictatorship. Both president and vice president are elected indirectly through a college of electors, equal to double the number of senators and deputies in Congress, chosen by direct vote of the citizens of the 22 provinces and federal district. The tenure is 6 years. They may not succeed themselves. The vice president becomes president *pro tempore* if the president leaves the federal capital, which he may not do without the consent of Congress. Conditions of eligibility for election as president or vice president include: the age of 30 years; membership in the Roman Catholic Church; an annual minimum income of 2000 pesos; and native birth or, in case of birth abroad, native parentage.

In addition to the usual powers of an American executive, the president of the Argentine Republic makes all appointments to federal offices without the limitation of senatorial confirmation, except in the appointment of magistrates of the supreme and superior courts, diplomatic representatives, and higher officers of the army, where the advice and consent of the Senate are required. The president is the administrative head of the government of the federal district. He has the right of presentation for appointment to bishoprics.

The president is assisted by a cabinet of 8 ministers. They are appointed by the president, may be removed by him, and in practice are responsible to him alone, although a provision of the constitution declares that 'every minister is responsible for the acts which he authorizes." Ministers cannot be members of Congress, but they may attend sessions and can be compelled to do so to make explanations and reports. The president has the right of convoking Congress both in ordinary and in extraordinary sessions and of proroguing it.

The Congress. The federal legislative authority is vested in a Congress composed of a Senate and a

Chamber of Deputies, which meet in regular session annually beginning on May 1. The 46 senators are elected by the legislatures of the 22 provinces and by a special body of electors in the federal district. The term is 9 years, one-third retiring every 3 years. The Senate is the judicial body in cases of impeachment.

Deputies are elected by the people in electoral districts of 85,000 inhabitants or a major fraction thereof each, with a minimum of 2 for each province. The term is 4 years, half of the chamber being renewed every 2 years. All tax bills and bills for the raising of troops must originate in the Chamber of Deputies. To the deputies alone belongs the right of preferring charges of impeachment, which, by an unusual provision of the constitution, extends to common crimes as well as to constitutional offenses. The president has a veto power which may be overridden by a two-thirds vote of both houses. A bill is considered approved if it is not returned to Congress within 10 days.

Judiciary. Argentinian private law is nationalized and expressed in civil, penal, commercial, and mining codes. The system of national and provincial courts and the division of jurisdiction between them resembles that of the United States. There is a national supreme court with five judges in Buenos Aires, and below it courts of appeals and district courts. Each province has its own system. Trial by jury is not generally used.

AUSTRALIA

The Commonwealth of Australia is a federal union of six "original states," formerly British colonies, formed in 1901 in pursuance of an act of the British Parliament, passed in 1900, after five of the colonies, by acts of their legislatures, confirmed by popular referendum, had expressed themselves in favor of union. The five states are New South Wales, Victoria, Queensland, South Australia, and Tasmania; the sixth state, Western Australia, joined immediately. Northern Australia is a territory ceded to the federal union by South Australia in 1911; on the same date, New South Wales ceded a district, later named Canberra, as a federal territory to be the seat of the commonwealth government.

The federal government consists of a governor-general, who represents the crown; of a Senate composed of 60 members, 10 chosen by each state; and of a House of Representatives whose members are chosen by each state in proportion to its population but limited to about double the number of senators. The senators are chosen for 6 years; the representatives for 3 years unless Parliament is dissolved earlier. As in the United States, the federal jurisdiction consists of "enumerated powers," while other, or "residuary," powers are reserved to the states. The Senate may not originate or amend money bills. In case of disagreement between the houses, the House may be dissolved or the 2 bodies meet in joint session.

The administration is conducted by a prime minister presiding over a cabinet of 11 other ministers, and there are an additional 11 ministers who are invited to be present when matters in their departments are under discussion. There is a federal judiciary, including a high court. The constitution may be amended by an act of Parliament, ratified by a majority of voters and a majority of the states.

Each state has a governor, a parliament of two chambers (except Queensland, which has one chamber), and a responsible ministry. There is universal suffrage. Voting is compulsory on pain of a fine. About 90 per cent of the electorate cast their ballots.

AUSTRIA

Following World War I the dual monarchy of Austria-Hungary was dismembered by the Treaty of Versailles into Austria, Czechoslovakia, Hungary, and Yugoslavia. In 1918 Austria became a republic and continued as an independent state until forcibly annexed by the German Reich in 1938. After the liberation of Austria by the Allies in 1945, the republic was re-established but, owing to the persistent delay of the Soviet Union in negotiating an Austrian peace treaty, the country was under occupation by the United States, Britain, France, and the U.S.S.R. until May 1955, when the treaty restoring sovereignty to the Republic of Austria was signed in Vienna by the foreign ministers of the occupying powers.

Under its constitution of 1945, Austria is a federal republic with some features of a parliamentary democracy. The component states are Burgenland, Lower Austria, Upper Austria, Salzburg, Styria, Carinthia, Tyrol, Vorarlberg, and the city of Vienna, each with its own legislature.

The federal president is elected for a 6-year term by universal suffrage, voting being compulsory. He may serve a maximum of 2 terms. The president can be recalled by referendum which, in effect, is a new election and begins a new 6-year term. Such a referendum may be authorized by a two-thirds vote of the National Assembly. The president may introduce legislation into the National Assembly. He appoints the chancellor and, with the latter's recommendations, the other ministers, who may not be members of the Assembly.

The legislature is bicameral—National Assembly and a Senate. The National Assembly is elected for a 4-year term by universal suffrage. The Senate is chosen by the state legislatures by proportional representation as to parties. The most populous state names 12 senators and the others name a number in proportion to their population with a minimum of 3.

The Senate has a suspensive veto of 8 weeks over bills passed by the Assembly. On petition of 200,000 eligible voters or a majority from 3 states, initiative bills may be brought before the National Assembly. The Assembly also may have one or more ministers removed by a lack of confidence vote, in which case it may be dissolved by the president.

Austria is pledged to neutrality in international affairs.

BELGIUM

The Kingdom of Belgium is composed of 9 ancient provinces—West Flanders, East Flanders, Anvers (Antwerp), Brabant, Limburg (in part), Luxembourg (in part), Liége, Namur, and Hainaut. In its present form, Belgium was established in 1830 under a guarantee of neutrality by Austria, Russia, Britain, and Prussia. The country repudiated this status after World War I, which began with German violation of this "scrap of paper." The Belgian constitution, framed in 1831, has been much praised as a scientific charter of liberal, representative, monarchical government.

The King. By the constitution, sovereignty is vested in the Belgian nation, but the leadership of the state is vested in the "king of the Belgians." The constitution applies to kingship the strict "Salic law," whereby the throne can be occupied only by a male. If there is no male heir, the king may name his successor, subject to approval by Parliament. While the government is conducted by ministers responsible to Parliament, the king exerts large influence on national policy. He may convoke, prorogue, and dissolve Parliament.

Parliament. Parliament consists of a Chamber of Deputies and a Senate. The Chamber of Deputies is composed of 202 members but not more than one to each 40,000 population. They sit for 4 years unless a dissolution is ordered. Eligibility consists of citizenship, possession of civil and political rights, age of 25 years, and residence in Belgium. The Senate is renewed every 4 years and, besides the sons of the king, is composed of 3 classes: (1) elected senators (equal to half the number of deputies) from 21 categories or walks of life; (2) provincial senators chosen by provincial councils; (3) Co-opted senators chosen by the Senate.

The ministry, organized with a fairly permanent body of officials, is divided into these departments: foreign affairs, interior, education, agriculture, public works, social security, justice, finance, defense, post, foreign trade and technical assistance, economics and power, health and family affairs, employment and labor, and middle class affairs.

Provincial Autonomy. The provinces, representing one-time separate principalities, have a considerable degree of autonomy which is recognized by the constitution. Each has a provincial assembly chosen by the qualified electorate. In the intervals between assembly meetings, a permanent commission of 6 representatives watches over the conduct of provincial affairs. The head of the provincial administration is a governor, appointed by the king. In his hands particularly are all details of police. The governor, like the French prefect, is the local representative of the different ministries at Brussels. Each province, moreover, is divided into 4 or 5 *arrondissements*, each of which has a commissioner and a staff of officials responsible to the governor.

Communes. The real Belgian local autonomy, however, is expressed in the "communes," the towns. These are among the most famous cities of Europe. In them, modern municipal life took its rise. Ghent (Gand), Bruges, Ypres, Antwerp (Anvers), Malines, Bruxelles, and Mons represent centuries of civil growth and stubborn attachment to municipal rights. In the Belgian kingdom, there are some 2672 communes. They are governed according to a common plan and are under one municipal law, but here the comparison with French communes largely ceases. The center of civic government is the *hotel de ville*, frequently a noble example of Gothic architecture. Here the council meets and here are the offices of the burgomaster, or municipal head, and of his 2 to 4 assistants, called *echevins*, each of whom superintends the work of one or more branches of municipal administration. The burgomaster of the Belgian commune is more than a local official. He is the representative of the kingdom in his town, has command of the police, and, in matters of public safety, has jurisdiction independent of the municipal council.

The Belgian nation is composed of two distinct European peoples, the Flemish and the Walloons. The Flemish occupy the northern portion of Belgium; in speech (Flamand) and in physical appearance they are akin to the Dutch. The Walloons are a darker, less phlegmatic race who speak French. The dividing line between these two populations has not altered in centuries; it runs east and west across the country and passes directly through the field of the battle of Waterloo.

Prior to 1914, a system of plural voting granted 2 votes to the possessor of certain means and 3 votes to those having additional qualifications. Now, however, suffrage is uniform and universal. Belgium was one of the earliest countries to adopt proportional representation.

Belgium formerly possessed a vast African empire consisting mainly of the Belgian Congo. But in 1960 independence was granted to these territories.

BOLIVIA

The revolution against Spain was initiated 1809–10 in the territory of Bolivia, then known as Upper Peru. After the achievement of independence in 1824, the Bolivians met with representatives of Argentina to determine whether or not they would join that country. They unanimously voted to remain a separate nation under the style of the "Republic of Bolivia," the name being taken from Simon Bolivar, the liberator of South America. The independence of the republic was proclaimed August 26, 1825. The territory claimed for the new republic was that which, under Spanish authority, was subject to the Audiencia of Charcas.

Constitutional System. Bolivia has experienced many constitutional changes—1829, 1831, 1834, 1836 (a confederation with Peru, dissolved in 1839), 1841, 1843, 1851, 1861, and 1880. In 1964, a constitution of 1961 was abrogated in favor of an earlier constitution of 1947. The executive power is given to a president who, along with a vice president, is elected by popular vote for 4 years and is eligible for immediate re-election. The ministers, or department heads, are his appointees and executive agents. The president's veto of legislation may be overridden by re-enactment of the vetoed measure in the succeeding session of Congress in joint session, a three-fourths majority being required to override.

Congress is composed of a Senate of 27 members, 3 from each department into which the republic is divided, and of a Chamber of 74 deputies elected in proportion to the population of the electoral districts. All members of Congress are elected by universal compulsory suffrage. Senators have a 6-year term, one-third retiring every 2 years, while the deputies are elected for 4 years, one-half retiring every 2 years. There is a supreme court with 10 judges appointed by Congress for a 10-year term, and a district court in each department. The constitution may be amended on proposal of either chamber and submission by the president to a joint session of Congress, in which a three-fourths majority of the membership is required for approval.

For administration, the republic is divided into 8 departments administered by prefects; 3 national colonial territories; 71 provinces, under sub-prefects; and 940 cantons, under *corregidores*. Municipal districts are headed by *alcaldes*. Prefects and sub-prefects are appointed by the president; the lower administrative officers, by the prefects. Municipal councils are elected by popular vote and have a certain degree of autonomy.

Western Bolivia is Andean, with a population largely of native Indians. Prior to the "War of the Pacific," 1879–83, Bolivia claimed Pacific Coast territory. Chile's victory in this war against Bolivia and Peru extinguished Bolivia's rights to a Pacific port and the country still remains without direct access to the sea.

BRAZIL

The United States of Brazil is a federal republic, comparable in area to the United States of America. It was a dependency of Portugal from the time of its discovery in 1500 until 1822, except for a period of 60 years, 1581–1640, during which Portugal was united to Spain. The vast area comprising the Amazon region and most of the east coast of South America was divided under Portugal into a number of jurisdictions or "captaincies," a fact which may in part explain the tendencies that have opposed centralization in government and have made Brazil a federal republic.

Brazil was the seat of the Portuguese government and the residence of the royal family from 1807 to 1821. On the return of the Portuguese royal family to Portugal, a national congress assembled in Brazil and chose Pedro, the king's son, as "Perpetual Defender of Brazil." In the same year, Pedro proclaimed the independence of Brazil and was chosen constitutional emperor. Brazil remained an American empire until 1889, when Pedro II was dethroned and the imperial family was exiled. The decree of banishment against the family was repealed August 6, 1920.

The Republic. A republican constitution was promulgated in 1891 bearing a close resemblance to the Constitution of the United States, the old provinces acquiring the position of states. The country was governed under this framework of law until 1930, when the union was saved only at the cost of civil war. A new constitution was adopted in 1934, the chief alteration being the large powers granted to the federal government to control economic activities. These powers included the right to

regulate industry, gradually to nationalize the banks and insurance companies, and to take over any form of industry, subject to payment of compensation. This constitution was altered in the direction of still greater centralization in 1937 and 1946.

The union comprises 22 states, a federal district, and 4 territories. Each state is self governing, but federal laws must be enforced within them. The federal government may intervene to reorganize state finances.

By the constitution of 1946, the executive authority is placed in the hands of a president elected, simultaneously with a vice president, for a 5-year term by universal and compulsory suffrage.

As laid down by the 1946 constitution, the president must be a native of Brazil and more than 35 years of age. He is commander in chief of the army and navy, appoints and dismisses ministers, and may veto bills, but the veto may be overridden by a two-thirds majority of both houses in joint session. He may also introduce bills into the Chamber of Deputies.

The departments of government are 13, namely: finance; justice and interior; foreign affairs; transport, communications, and public works; agriculture; labor; industry and commerce; education and culture; public health; mines and power; war; marine; and air.

Federal legislative authority is intrusted to a national Congress consisting of the Chamber of Deputies and the Senate, both chosen by proportional representation for parties. The deputies are elected for 4-year terms, each state having one for each 150,000 inhabitants up to 20 and, above that, one for each 200,000 inhabitants, with a minimum of 7 for each province and the federal district. Each territory has one. The senators are elected for 8-year terms but after each 4-year period one-third or two-thirds of the representation alternately is renewed. Each state and the federal district elects 3 senators and a deputy for each, the latter to act in the event of a vacancy.

The supreme federal tribunal is composed of 11 judges, which number may be increased on the tribunal's proposal if approved by the legislature. They are appointed by the president with Senate approval. There are federal courts and a federal jurisdiction within each state. Federal judicial appointments are for life. A labor court is empowered to mediate and judge labor disputes. State courts administer state law. Foreigners enjoy all civil rights. Divorce is not recognized.

Frontier Settlements. The frontiers of Brazil adjoin the territory of every other South American state except Ecuador and Chile, and also touch the possessions of France, Great Britain, and Holland (the Netherlands). Boundary disputes with the Guianas were settled by negotiation and arbitration in 1901, 1904, and 1906.

The boundary between Brazil and Venezuela was settled in 1905, after a long period of negotiations, and the demarcation was made by a mixed commission in 1914. In 1872, Brazil and Paraguay signed a treaty whereby the title to Brazilian territory north of the Rio Apa was determined. The boundary with Argentina was settled by an arbitral decision by the president of the United States in 1895. The Brazilian contention was sustained. A remaining boundary difficulty between Brazil, Peru, and Colombia was settled by agreement at Washington, March 4, 1925.

In boundary negotiations with Uruguay, Brazil, by a treaty of 1851, secured rich territory that, by a treaty of 1777, had been admitted to belong to Spain. In this case, as in others, Brazil was able to acquire territories beyond those fixed during the period of Spanish domination. Thus, by means of a series of remarkable negotiations and awards, there was ended the long competition between Spain and Portugal that began in 1493, when the bull of Pope Alexander divided between those two countries the discovery and the conquest of the world.

BULGARIA

Bulgaria, long a subject territory of Turkey, obtained autonomy in 1878 by the treaty of Berlin, which ended the Russo-Turkish war. In 1885 Rumelia, the Bulgar-inhabited province south of the Balkan mountains, obtained union with Bulgaria. In 1908, during a revolution in Istanbul, Bulgaria declared her complete independence, and her reigning prince, Ferdinand, of the house of Saxe-Coburg-Gotha, proclaimed himself king of the Bulgarians. By the second Balkan war, 1913, Bulgaria lost territory to Rumania. In World War I she suffered further losses, but by treaty in 1924 regained an outlet to the Aegean. After World War II she retained the southern Dobruja, ceded by Rumania in 1940.

The first constitution of Bulgaria was adopted in 1879, and amended in 1893 and in 1911. The legislative power was entrusted to a one chamber assembly, called the *Sobranje*, whose members were chosen by national manhood suffrage for a 4-year term. The government was conducted by responsible ministers, but the king had considerable power.

At the end of World War II, Bulgaria, which had joined the Axis powers, was at the mercy of Russia. The monarchy was abolished by popular vote, and a constitutional convention set up a people's republic under a constitution of 1947. A single-chamber Assembly is elected each 4 years by universal suffrage. However, all candidates are nominated by the Fatherland Front, of which the executive body, or politburo, exercises the ultimate power in the state although it is not mentioned in the constitution. The assembly elects the Presidium, which is the highest organ of the state. The constitution, although declaring protection of private enterprise and savings, also declares that the land belongs to those who work on it. By a law of 1950, Russian citizens residing in Bulgaria may vote and hold public office.

BURMA

Under British influence or rule since about 1610, the Union of Burma became an independent republic in 1948 pursuant to a treaty ratified by the British Parliament in 1947. All ties with the British Commonwealth were severed.

A constitution was adopted providing for a president with a 5-year term who may be re-elected once. The president has no veto power. He is elected by the Union Parliament, which consists of a Chamber of Deputies of about 250 members and a Chamber of Nationalities with 125 members. Of the latter, 62 members represent the central unit, and 63 represent states and special areas. Although members of Parliament are elected for 4-year terms, a new election may be held earlier if the prime minister, chosen by the deputies, loses his majority in the Chamber. The supreme court, consisting of the chief justice and 3 other judges, is the court of final appeal and has supervision over all other courts. Its members are appointed by the president with the approval of both houses in joint session. In the event of the president's death or incapacity, the presidential powers are exercised by a commission consisting of the chief justice and the speakers of the two houses of the legislature.

Buddhism is established as the state religion. The constitution guarantees private property and private enterprise, but private monopolist organizations are forbidden. The government may take over branches of the national economy or single enterprises upon payment of compensation to the owners.

Constitutional rule was suspended by the military during 1958–60 and again in 1962. Parliament was dissolved. Legislatures of the individual states were reconstituted as state supreme councils under appointed chairmen.

BURUNDI

This kingdom, part of the former colony of Belgian Congo, became independent in 1962. Although a 32-member Legislative Assembly passes laws, they must be sanctioned and promulgated by the king, assisted by a cabinet of his choosing. Cabinet members need not be members of the Assembly, which body the king may dissolve. The king makes rules for carrying out the laws. He also controls the army and foreign relations.

CAMBODIA

This kingdom was under French rule and protection until after World War II. In 1953, France handed over its military authority to the Cambodian government. Under the king is a Royal Council, a council of ministers (cabinet), and a National Assembly of 91 members, chosen by universal suffrage for 4-year terms.

The Royal Council is made up of 2 members of the royal family, 2 persons chosen by the National Assembly, 8 representatives of regions, and 8 representatives of professions. It examines bills introduced into the Assembly. Bills of which it disapproves cannot be taken up for 2 months. The king promulgates laws finally enacted.

The council of ministers is headed by a president selected by the king after consultation with the president of the Assembly, the Royal Council, and party chiefs. When chosen, he selects the 15 other ministers and must obtain a vote of confidence from the Assembly. The Assembly interprets the laws.

CAMEROON

This republic is a federation dating from 1961, formed by two provinces, East Cameroon and West Cameroon. The territory was taken from Germany in World War I. It was divided, and the parts were placed under the trusteeship of France and Great Britain. East Cameroon, formerly under French control, became an independent Republic in 1960. West Cameroon is part of the former British territory of Cameroon, whose southern region voted to join with the French territory and became federated with it on October 1, 1961.

The constitution of 1960 provides for a National Assembly, whose 50 members are chosen for 5-year terms by universal suffrage, 40 from East Cameroon and 10 from West Cameroon. The president is chosen for a 5-year term by an electoral college composed of members of the Assembly, members of the general councils of provinces, and delegates from municipal assemblies. While the president commands the armed forces, the prime minister is clothed with most of the executive power. Through his cabinet he directs general policies, makes treaties, appoints public officers, and issues regulations in addition to introducing legislation in the assembly. The president has no veto power.

CANADA

Canada was originally a French settlement ceded to England in 1763. The portion colonized by the French, known as Lower Canada, and Ontario, or Upper Canada, which was inhabited by British settlers, were united in 1867 with two other British colonies—Nova Scotia and New Brunswick—to form the Dominion of Canada. To this union were subsequently admitted, as provinces of the federation, Manitoba (1870), British Columbia (1871), Prince Edward Island (1873), Alberta and Saskatchewan (1905), and Newfoundland (1949). The Yukon and Northwest Territories are governed by commissioners appointed by the federal government.

In Canada was developed and inaugurated the principle of self-government and later of independence within the British Commonwealth of Nations. The early British colonial policy in America was to reserve executive power to a proprietary, or royal, governor, while granting local legislative power to a representative assembly. The laws of the colonies were subject to the approval of the governor and of the home government. After the separation of the colonies composing the United States, the desire for self-government in Canada led to continuous difficulty with the royal governors and even to local rebellion. In 1838, when political relations in Canada had reached a deadlock, the British government sent out a commission of inquiry headed by Lord Durham, who recommended the recognition of self-government in the Canadian colonies and the formation, in each colony, of a ministry that would be politically responsible for the legislature and not to the British government. This principle was adopted. The governor, or representative appointed by the British crown, became the nominal representative of imperial authority, while a "premier" responsible to the local Parliament became the actual head of government.

When 4 colonies confederated in 1867, a form of government was established by the British North America act, which, with many amendments, forms the basis of the Canadian constitution. Profiting by the lesson of the American Civil War, it aimed at a strong federal government, to which was given residual powers beyond those assigned to the federal government, to the provincial governments, or to both concurrently. The constitution does not exist as a formal document. It includes much which is not in the original act and its amendments, such as the role of the cabinet based on custom and a bill of rights, adopted by the Canadian Parliament as a law in 1960. The most important amendment of the basic British act was the Westminster statute of 1931, which provides that the British Parliament may not legislate for Canada except on the specific authorization of the Canadian Parliament. A law of 1947 created Canadian citizenship; previously Canadians had been known as British subjects. Queen Elizabeth II of Great Britain was declared queen of Canada by Canadian law.

Federal and Provincial Powers. The following subjects are specifically enumerated as reserved to the national Parliament:

- Amendment of the constitution, except regarding legislative authority of the provinces, schools, use of French and English languages, and duration of Parliament.
- The public debt and property.
- The regulation of trade and commerce.
- The raising of money by any mode or system of taxation.
- The borrowing of money on the public credit.
- Postal service.
- The census statistics.
- Militia, military and naval service, and defense.
- The fixing of, and providing for, the salaries and allowances of civil and other officers of the government of Canada.
- Beacons, buoys, lighthouses, and Sable Island.
- Navigation and shipping.
- Quarantine, and the establishment and maintenance of marine hospitals.
- Seacoast and inland fisheries.
- Ferries between a province and any British or foreign country, or between two provinces.
- Currency and coinage.
- Banking, incorporation of banks, and the issue of paper money.
- Savings banks.
- Weights and measures.
- Bills of exchange and promissory notes.
- Interest.
- Legal tender.
- Bankruptcy and insolvency.
- Patents of invention and discovery.
- Copyrights.
- Indians and lands reserved for the Indians.
- Naturalization and aliens.
- Marriage and divorce.
- The criminal law, except the constitution of courts of criminal jurisdiction, but including the procedure in criminal matters.
- The establishment, maintenance, and management of penitentiaries.
- Such classes of subjects as are expressly reserved from the provincial legislatures.

The powers expressly bestowed upon the provincial legislatures are as follows:

The amendment of the provincial constitution, except as regards the office of the lieutenant governor.
Direct taxation for provincial purposes.
Borrowing of money on sole credit of the province.
The organization of the provincial administration.
The management or sale of provincial lands.
Reformatory prisons.
Hospitals, asylums, and charitable institutions other than marine hospitals.
Municipal institutions.
Local excises.
Provincial works, including railways, canals, telegraph systems, shipping lines.
The incorporation of stock companies.
Solemnization of marriage.
Definition of property and civil rights within the province.
Administration of justice, including provincial courts.
Imposition of punishments for enforcing provincial laws.
In general, all matters of a merely local nature.

Both the federal and provincial governments may legislate on immigration, education, and social welfare. However, an attempt to restrict oriental immigration by British Columbia was invalidated by the national government. The organic law permits the provinces to conduct education but provides also for protection of the educational rights of minorities in the different provinces.

Governor-General. The crown is represented in Canada by a governor-general, a Canadian citizen chosen by the crown on the advice of the prime minister. Originally, the governor-general was assisted by a privy council, chosen from the royal family, former prime ministers and other high officials, and the current cabinet. The privy council, however, never meets but its function is carried on by the cabinet, which is responsible to the House of Commons. The term of the governor-general is not fixed but usually lasts from 4 to 7 years. His salary is $48,600 with an expense allowance of $100,000.

Parliament. The federal Parliament consists of two houses—a Senate and a House of Commons. A senator must be at least 30 years of age, a natural born or naturalized Canadian subject, possess at least $4,000 in excess of liabilities, be a resident of the province for which he is appointed, and, in the case of Quebec, he must either be a resident of the district which he represents or hold the qualifying amount of real property therein. Senators are nominated for life by the governor-general, but their actual selection rests with the Canadian prime minister. The Senate consists of 102 members, 24 from Ontario, 24 from Quebec, 10 from Nova Scotia, 10 from New Brunswick, 4 from Prince Edward Island, and 6 from each of the following: Manitoba, British Columbia, Alberta, Saskatchewan, Newfoundland. The total number may not exceed 104.

The House of Commons consists of 265 members elected by universal suffrage from the provinces roughly in proportion to their populations. Its term is 5 years unless it is dissolved earlier. When it first meets, the leader of the dominant party assumes the office of prime minister, while the leader of the other or next strongest party is the leader of the opposition. The prime minister chooses a cabinet of 15 to 30 ministers, practically always from the House but not necessarily so. The salary of the prime minister is $25,000 per session, and that of the leader of the opposition is $15,000. If the prime minister is defeated on a crucial issue in the House, he may resign or advise the governor-general to dissolve the House. The governor-general may persuade him or the leader of another party to attempt to form a cabinet having the confidence of the House, or he may dissolve the House and call for a new election.

Legislation. Bills originate in either house, except finance bills, which may originate only in the House of Commons. The Senate may reject a finance bill but not amend it. Most bills are initiated by the House. While the position of a senator is a highly privileged one, senators have never played a political role comparable to that of the members of the House of Commons and are seldom offered seats in the cabinet.

Courts. Judges in Canada are appointed and paid by the federal government to hold office for life or during good behavior. The supreme court of Canada receives appeals from the provincial courts and questions may be referred to it by the governor-general in council. A ruling may thereby be obtained on the constitutionality of any law without the delay and expense of litigation. Judgments of the supreme court are final. Policing powers throughout the entire nation are in the hands of the Royal Canadian Mounted Police.

Provincial Governments. The powers of provincial governments have already been noted. Each of the nine provinces has its own parliament and administration. With the exception of Quebec, the legislature consists of a single chamber. A lieutenant governor, appointed by the governor-general, represents the federal union, but actual government is in the hands of a premier and provincial ministers responsible to the provincial parliament.

CENTRAL AFRICAN REPUBLIC

This country was organized by France as a territory in 1894 and became an independent republic in 1960, remaining within the French Community. Legislative power resides in a 50-member Assembly, which is elected by universal suffrage for a 5-year term. The Assembly elects the president, likewise for a 5-year term. The president selects the cabinet, whose members are responsible to him.

CEYLON

Ceylon's government is a parliamentary democracy on the British model under a constitution adopted in 1946. It had previously been a colony of Great Britain; an agreement in 1956 provided for withdrawal of the last British facilities by 1962. It remained within the British Commonwealth. It has a Parliament consisting of a Senate with 30 members and a House of Representatives with about 151 members. Administration is in the hands of a cabinet of ministers headed by a prime minister and responsible to Parliament. There is also a governor-general whose office is symbolical rather than functional. Local administration is presided over by an agent of the central government in each of 22 districts.

Ceylon has an agreement with Great Britain which provides that, in foreign affairs generally, the two governments will conform to the principles and practices observed by other members of the Commonwealth and that Ceylon will reciprocate with Great Britain the obligations and benefits flowing from valid international agreements which apply to Ceylon.

CHAD

Chad was part of French Equatorial Africa until 1960, when it became an independent republic, remaining within the French Community. Under its constitution of 1962, there is a single legislative body, the National Assembly, which is elected for 5 years by universal suffrage from a national list. The president is elected for a 7-year term by an electoral college consisting of members of the Assembly and municipal, community, and tribal officers. He requires a two-thirds majority on the first ballot, a majority on the second, and a plurality on the third. Assisted by a cabinet, he may introduce into the Assembly bills which take precedence over others; in bills under consideration he may make amendments which require a two-thirds vote to override; and he may submit to referenda bills sent to him for promulgation. If the presidency becomes vacant before the 7-year term is up, a new president is chosen. If the Assembly, by two-thirds majority, votes lack of confidence in the government, the president may dissolve the Assembly or replace the cabinet.

CHILE

The republic of Chile arose from the Spanish captaincy-general of the same name. On September 18, 1810, the inhabitants of Chile deposed the Spanish authorities and created a provisional government. Spanish arms exerted themselves to retain this province and it was not until 1818 that Chile became free. A dictatorship under General O'Higgins lasted until 1826.

The Chilean constitution of May 25, 1833, was long the oldest constitution in force in South America. For decades a stable and effective government was maintained through the active participation in politics of an aristocratic class strongly united by family associations. In more recent years, the country adopted a new constitution which came into effect in 1925, substantially altering the form of government and tending to vest more power in the president of the republic. This chief executive is elected by direct popular vote for a term of 6 years but is ineligible for immediate re-election. He has veto power, but a vetoed bill becomes law if repassed by a two-thirds vote of both houses. He may name a vice president temporarily. The heads of departments form a cabinet, appointed by the president and directly responsible to him, although they have the right of speaking in the Congress.

The Congress comprises a Senate and a Chamber of Deputies. The Senate consists of 45 members representing groups of provinces, each group electing 5 for a term of 8 years; one-half of the body is renewed each 4 years. The Chamber of Deputies consists of 147 members elected by departments or groups of departments under a system of proportional representation. All registered literate citizens of 21 years or more have the right to vote.

An unusual power, that of passing upon the ability of the president, senators, and deputies to exercise office, is entrusted to a special body called the *Tribunal Calificador*, which consists of 5 members, 1 each from past presidents and vice presidents of the deputies and senate, 2 from members of the supreme court, and 1 from the judges of the court of appeal.

The judiciary comprises a national high court of justice, 8 courts of appeal, departmental courts of first instance, and minor district courts. Justices of the supreme court are appointed from names proposed by the council of state and hold office during good behavior.

The internal administration is centralized. The republic is divided into provinces governed by *intendentes* appointed by the president. The provinces are divided into departments under governors, and each department into subdelegations. In the municipal districts there are popularly elected councils.

CHINA

Politically there are two Chinas—Mainland China, calling itself a people's republic, and the National Republic of China, occupying the island of Formosa (Taiwan).

China is the oldest political society in the world. The last imperial dynasty ruled from 1644 to 1911. Its emperors followed a policy of isolation from the rest of the world. They governed from Peking through a bureaucracy recruited through a competitive examination system, the governor of each province, while having wide powers, being subject to transfer or demotion at the word of the emperor. Within each province, authority was confided principally to direct magistrates, beneath whom the ancient social and family-oriented life of town and farming village functioned with a minimum of interference and with a maximum of individual freedom. Society was essentially democratic, there being no aristocracy beyond a few Manchu nobles and no privileged class except educated officialdom open to all. Caste was nonexistent.

This society was ill prepared to cope with a world in which isolation was no longer possible. The inexorable pressure of traders backed by governments with radically superior weapons forced concession of territories. The ferment of western ideas undermined the traditional bases of Chinese society. The dynasty fell and was succeeded in 1912 by a republic unable to function in the ensuing chaos created by rival "war lords," who were provincial governors maneuvering for power. In 1928, under the leadership of Chiang Kai-shek, the *Kuomintang* ("Nationalist party") established a government at Nanking. It was essentially a party government, in which the central executive committee of the party appointed the members of five councils to carry on the government. Three of these councils administered respectively the executive, legislative, and judicial functions. A fourth determined qualifications for holding public office, and the fifth exercised powers of impeachment and auditing. The head of the party was the president of the republic and commander of the army.

Russian trained Communists had controlled the party until Chiang Kai-shek expelled them by a bloody purge in 1927. But they continued to oppose the government, which was beset also by Japanese aggression before and during World War II. The Communists, under the leadership of Mao Tse-Tung, obtained control of 5 northern provinces and, by dint of arms and promises of economic reforms, succeeded by 1949 in driving the nationalist government to Formosa, where its independence was protected by the United States.

Communist China. Under a constitution adopted in 1954, the National People's Congress is the highest organ of state authority. It is composed of deputies elected for a 4-year term by provinces (one deputy for each 800,000 population), by cities directly under federal authority (one for each 100,000), by national minorities (150 deputies), by the armed forces (60 deputies), and by overseas Chinese (30 deputies). It has a permanent standing committee, which convenes the Congress, conducts elections, interprets the laws, adopts decrees, and supervises the work of the government, or state council. The highest judicial organ is the supreme people's court. The people's procurator-general's office has the responsibility of seeing that the laws are strictly observed by government institutions and officials. All judges serve for 4-year terms. The Congress may be regarded as the democratic trappings, since real power resides in the party, the head of which is the president of the republic. The constitution of the party is secret, but control over the personnel and action of the various governmental bodies is complete.

The constitution provides for state ownership of the means of production but recognizes also cooperative ownership by workers, individual ownership, and capitalist ownership, the latter two being temporary until absorbed by collective or co-operative ownership.

Nationalist China. Like that of Communist China, the government of Nationalist China is a one-party system. The president, elected for a 6 year term, is the head of the party. There are also a vice president and a prime minister. The government claims rule not merely over the island of Formosa, to which its effective authority is confined, but over all of China, whereas Communist China considers Formosa as one of its provinces. The administration of island affairs is in the hands of a governor, whereas the national government controls the army.

Nationalist China, unlike Communist China, encourages private ownership of property on a wide basis. Its program for developing small independent farms stands out as a conspicuous success and resulted in rapid increase in food production. The government invests directly in the development of industry.

COLOMBIA

Upon the revolt of Spanish America from Spain, a republic was formed by the union of the "viceroyalty" of New Granada, the "captaincy-general" of Venezuela, and the "presidency" of Quito. This united state was called Great Colombia, and a government was formed, based upon a constitution adopted in 1821. Venezuela withdrew from this state in 1829, forming a separate republic, and Ecuador seceded in 1830. The remaining territory reorganized as the Republic of New Granada, with a constitution adopted February 29, 1832. A new constitution was formed in 1843 and another in 1853. The constitution of 1858 transformed the former centralized government into a federal form, composed of 8 states, styled the "Granadan Confederation."

Colombia remained a federal republic modeled upon that of the United States, with a corresponding measure of independent authority accorded to the 8 states of which it was composed, until the revolution of 1885. This brought about a new centralized government designated by the constitution of August 4, 1886, as "The Republic of Colombia." This act is the basis of the present fundamental law. By this constitution, the independence of the states was suppressed and they were transformed into "departments," with governors appointed by the president of the republic. The state of Panama protested against this suppression of its sovereignty, which action later became a ground for the justification of secession. Colombia is an example of a state (New Zealand being a second) which, having experimented with the federal principle, returned to centralized government. In the case of Colombia, it may be said that federation was not based, like that of the United States or Switzerland, upon a former independence of political units.

Balanced Parties. From 1953 to 1962, the government was controlled by the army. Thereafter the constitution of 1886 was reinstated with important modifications effective until 1974. While there is universal suffrage, the elections are so arranged that members of each of the two legislative bodies are equally divided between the Liberal party and the Conservative party. Presidents belonging to each of these parties must alternate in office.

The House of Representatives consists of one member for each 90,000 inhabitants or a major fraction thereof. The Senate has one member for each 190,000 inhabitants or a major fraction thereof. Each department elects an equal number of members of each party with an alternate for each member. If the rule respecting population results in an odd number of members from a department, one more is added. The terms are for 4 years. Senators are limited to those who have held certain high offices, university professors of 5 years' standing, and members of a profession requiring a university degree. While members of both houses may introduce bills, they are prepared by a council of state, members of which are chosen by Congress from lists submitted by the president.

The president, elected for a 4-year term, appoints a cabinet, equally divided between the two parties. It is the channel of communication between him and Congress. The cabinet may introduce legislation and advise him on approving or objecting to legislative acts. The president has a limited veto; he must promulgate a law repassed over his objection by both houses. The president appoints the governors of the departments (provinces). There is no vice president, but each two years Congress elects a "designate" who assumes the duties of the president in the event of the latter's "absolute default." Such designate must belong to the same political party as the president.

Other provisions, all inserted into the constitution of 1886 in later years, include the following: (1) Women shall have the same political rights as men, the minimum voting age for both being 21; the right to strike, except against the government, is guaranteed subject to regulatory laws; public aid is a function of the state; at least 10 per cent of the general budget of expenditures must be used for the support of public education.

Each of the 17 departments in which Colombia is divided is headed by a governor appointed by the central government and responsible to it. Each has also an elective assembly with power to regulate elementary and secondary education and charitable establishments, to regulate and encourage industry, and to deal with matters of land settlement, roads, and canals. Each elective assembly can create or abolish municipalities. The mayor of each municipality is the agent of the governor of the department. By this system of executive control, power is exerted in a highly centralized form with little participation by the individual citizen.

CONGO (BRAZZAVILLE)

This country, becoming independent of France in 1958 but adhering to the French Community, established a republican form of government. Under a constitution of 1963, a National Assembly is elected by universal suffrage for a 5-year term. A president, eligible for 2 terms of 5 years, is chosen by an electoral college comprising members of the Assembly and regional and local legislative bodies. If the supreme court declares the presidency vacant, the president of the Assembly performs his function until a new incumbent is chosen. The president appoints the ministers and may introduce bills into the Assembly, which bills have priority over others. He promulgates laws of which he approves within 15 days but may return them for reconsideration, in which case they require a two-thirds majority for enactment. He may also submit them to a popular referendum.

CONGO (LEOPOLDVILLE)

Formerly a Belgian colony, Congo was granted independence in 1960 under a constitution of the parliamentary type, like that of Belgium. The elected head of state was unable to establish his authority. The army expelled its Belgian officers and terrorized the country. The rich copper-mining province of Katanga declared its independence. The United Nations sent a force of 20,000 African and Asian nationals to restore order.

In 1964, a new constitution was adopted giving the republic a strong presidential type of government. The president is chosen for a 5-year term by an electoral college consisting of members of the national and provincial legislatures and delegates from Leopoldville, the capital. In the first two ballots, an absolute majority is required to elect; in the third, a plurality is sufficient. The president may succeed himself once. He has a limited right of veto, which may be overridden by a two-thirds vote in each of the two houses of the legislature. The president appoints and may remove the prime minister and up to 15 other ministers, who together are designated as the central government. Their selection must be approved by the Chamber of Deputies. He invests governors of the provinces with authority to represent him in the provinces. He may introduce laws into the legislature, and members of the central government may amend any bill.

The legislature consists of the Chamber of Deputies and the Senate, members of both being elected for 5-year terms. Deputies are elected by universal suffrage, one for each unit of 100,000 inhabitants. Senators are elected by provincial assemblies and Leopoldville, 6 by each, 1 from each province being a tribal chief. Members of the legislature must attend at least three-fourths of the sessions. The constitution provides for a constitutional court of 12 members with exclusive power to decide constitutional questions, the court to be set up within 12 years after adoption of the constitution.

COSTA RICA

The population consists largely of descendants of white colonists. The present constitution, adopted in 1949, is a revision of the earlier constitution of 1871.

The legislative power is confided to a single body called the Legislative Assembly composed of deputies chosen for 4 years in the proportion of one for each 25,214 inhabitants. Voting is compulsory for all men under 70. All citizens are entitled to vote, the minimum age being 18 for married men and teachers, 20 for other men, and 21 for women. Deputies may not serve for consecutive terms. The state pays electoral expenses of political parties up to 2 per cent of the national budget. The Assembly meets annually, on May 1, for a session of 60 days and may be called in extra session by the executive. In addition to possessing national legislative authority, the Assembly appoints the justices of the supreme court, whose terms are for 8 years but are automatically renewed unless the Assembly decides otherwise by a two-thirds majority. The Assembly, moreover, may hear charges against the president and may order his trial before the supreme court of justice. It ratifies all treaties and conventions and is specifically empowered, by a three-fourths vote confirmed by a special constitutional assembly elected for that purpose, to grant a concession for an interoceanic canal.

During the recess of the Assembly, a "permanent commission" of five deputies continues in session, with the powers of interpreting laws in case of doubt, of preparing and putting in order unfinished business, of suspending the constitutional guarantees, and, at the request of the executive power, of passing urgent decrees. It may also be consulted by the executive on matters of importance.

The president and two vice presidents are elected for 4-year terms by universal suffrage. The candidate with the highest number of votes is elected, provided he polls at least 40% of the vote. Otherwise a second election is held. The president appoints his ministers and, through them, may introduce bills in the Assembly. He has a limited right of veto, which may be overridden by a two-thirds vote of the Assembly.

The territory of Costa Rica is divided for administration into provinces, cantons, and districts. In each province are a governor, appointed by the president, and his agent. In the chief town of each canton is a municipal council with powers fixed by law. Under this somewhat conservative constitution, Costa Rica has enjoyed political stability.

CUBA

Cuba was the last of the Spanish dependencies in the western hemisphere to become independent and the only one in whose independence the United States played a role. By the treaty of Paris in 1898, Spain relinquished sovereignty over Cuba, then occupied by American forces, and the United States expressed its resolution to leave Cuba to the political control of the Cubans. Nevertheless, the United States, by Act of Congress, attached strings to Cuba's independence. (See *Platt Amendment.*)

A new constitution was adopted in 1940 but was suspended several times by action of dictators, most recently by Batista in 1952 and Castro in 1956. Castro assumed the position of premier and promulgated a fundamental law, approved in 1959, under which the country was to be governed by the constitution of 1940 with modifications for rule by a de facto government. Under the de facto government, rule is by decree issued by the premier. By such decrees, a program of collectivization was put into effect. Property of foreign corporations was confiscated, cattle and tobacco land was nationalized, and sugar and other agricultural land was turned over to co-operatives. Banks and industrial enterprises were nationalized. The Communist party was outlawed in 1954, but its legal status was restored in 1959. Russian, Chinese, and other advisers were invited to assist in the collective reorganization, but the installation of Russian missiles was prevented by American threat of atomic war against Russia in 1962. The Organization of American States in 1964 voted compulsory economic sanctions against Cuba and for strengthening defenses against Cuban export of subversive activities to other American countries.

The constitution of 1940, although in abeyance, remains formally as the framework of government.

The executive power is entrusted to a president, chosen for 4 years by electoral votes based on the popular vote in each province. He may not be reelected for 8 years after his term expires. A vice president is similarly elected.

Congress comprises two houses—a Senate of 9 members from each province and a House of Representatives chosen from the provinces on a basis of 1 for each 35,000 or major fraction of its inhabitants. Senators are chosen for 8 years and representatives for 4; one-third of the Senate and one-half of the House retire each two years. Ministers are appointed by the president but are responsible to both houses of Congress. If a bill which they have introduced is defeated, the cabinet is not required to resign. But a vote of no confidence by either house requires the resignation of one or more ministers. The president has a limited right of veto, a two-thirds vote of each house sufficing to override the veto.

All citizens over 20 may vote in congressional and presidential elections. Citizens have the right of initiating bills in Congress on petition of 10,000 voters. Increments in the value of real estate due to acts of the state are recapturable by the state.

The republic is divided into six provinces: Pinar del Rio, La Habana, Matanzas, Las Villas, Camaguey, and El Oriente. Each province has a governor elected for 4 years and a provincial council made up of elected mayors of cities in the province.

CYPRUS

This republic, formerly a British crown colony, became independent in 1960 under an agreement among Great Britain, Greece, and Turkey following years of bloody terrorism as one party favored union with Greece while the Turkish minority (about 20 per cent) opposed. The constitution reflects this division, Greek Christians versus Turkish Moslems.

It provides that the president shall be a Greek and the vice president a Turk. Legislative power is exercised by the House of Representatives, whose 50 members must be 35 Greeks and 15 Turks. This body, however, has no jurisdiction over matters of religion, education, and other communal affairs. Such matters are dealt with by two separate bodies —a Greek communal chamber and a Turkish communal chamber. The members of the former are elected by Greek communes, and those of the latter by Turkish communes. Each commune determines how many representatives it will send. Public service employees must be in the approximate proportion of 70 Greek to 30 Turkish at all levels. An attempt to amend the constitution in 1963 was resisted by the Turkish Cypriots and led to hostilities and intervention by the United Nations. Cyprus is a member of the British Commonwealth.

CZECHOSLOVAKIA

Czechoslovakia became an independent republic in 1918 upon the dismemberment of Austria-Hungary. Germany absorbed it in 1938-39. It was restored to independence in 1945 with close political and economic ties to Russia, with whose help Communist party members seized control of the government in 1948. A popular democratic constitution was adopted. In 1960 this was replaced by a new constitution on the Russian model declaring the country a socialist republic. It is described as a

unitary state of two Slav nations, the Czechs and the Slovaks, possessing equal rights.

There is a National Assembly with 300 members elected for 4-year terms on a single list supplied by the National Front (Communist) party. The governing body, however, is the Presidium, or Communist Party politburo, of 9 full members and 3 candidate members. These include the president, who is also the first secretary of the party, and the prime minister. Both of these officers are elected by the Presidium, which governs by issuance of decrees. In addition to the National Assembly, there is an elected Slovak National Council, whose jurisdiction is limited to regional economic and cultural matters.

DAHOMEY

The Republic of Dahomey, formerly a French dependency, was established in 1960, remaining within the French Community. It is ruled by a president, a vice president, and an Assembly of 70 members, all elected for 5-year terms. At the end of 5 years, a 5-man provisional government takes over, headed by the president of the supreme court. Its duty is to see that a new government is elected within 30 days.

The president has a limited right of veto; he must promulgate bills within 15 days unless he sends them back for reconsideration, a two-thirds majority of the Assembly being required to override the veto.

Dahomey is unusual in making its vice president the chief executive officer, who, with a cabinet of his choice, is responsible for execution of the laws and of legal decisions, for which purpose he has control of the army and the police. Measures taken by the vice president may be questioned by the Assembly, which may modify them by resolution on a two-thirds vote. If the vice president disregards the resolution, it is referred to the president, who may refer it to a popular referendum.

DENMARK

The three Scandanavian countries have, at periods in their history, been united. In 1381 Denmark and Norway united under a common sovereign, separating in 1814.

Denmark is a limited monarchy. The present constitution, which is a modern version of the constitution of 1849, was signed June 5, 1953. By its terms the legislative power is vested jointly in the king and Parliament. The executive power is held by the king. He appoints the prime minister and presides over the cabinet, which handles new bills and important measures. Parliament consists of a single chamber composed of 179 members, 135 of whom are elected by proportional representation. An additional 10 seats are divided among the various political parties to equalize the representation. The Faroe Islands and Greenland, which have equal status with other parts of the kingdom, have 2 representatives each. Parliament is elected for 4 years and meets annually, but may be dissolved earlier by the king. Suffrage is universal; the voting age is 21.

The king can neither make war nor sign peace treaties without the consent of Parliament. Under certain circumstances the constitution permits the transfer of some sovereign powers to international organizations, if approved by five-sixths of the Parliament members or a plebiscite majority. Since 1953, women may succeed to the Danish throne.

There is a supreme court at Copenhagen, with a chief justice and 14 associates. The established church is the Evangelical Lutheran Church, of which the king must be a member. While the great majority of the people are members of this church, its officers have no part in politics and dissenters have complete religious freedom.

Denmark is divided into 22 counties, each of which is subdivided into districts, and the districts are divided into parishes. Each urban municipality has a mayor and council.

DOMINICAN REPUBLIC

This country, sometimes called Santo Domingo, occupies the eastern two-thirds of the West Indian island of Haiti. This island, discovered by Columbus in 1492, was the first seat of empire of Spain in the New World. That part of the island occupied by the Dominican Republic has remained Spanish in language and in culture; the western end is occupied by the French-speaking republic of Haiti. The Dominican Republic's period of independence dates back to 1844, but its history has been one of recurrent dictatorships, bankruptcy, and periodic financial and military intervention by the United States. After the assassination of the dictator Trujillo in 1961 and subsequent return to constitutional rule, a new constitution was adopted and was proclaimed April 29, 1963.

The constitution has a bill of rights more liberal than that of the United States. The president and vice president are elected for a 4-year term by direct vote of all citizens over 18 years of age. The legislature consists of the Senate and the Chamber of Deputies. The Senate of 26 members is elected for 4-year terms by direct popular vote, one senator from each province and the federal district. The deputies are elected by popular vote for 4-year terms, one for each 50,000 inhabitants. The president appoints and may remove ministers of his cabinet. He has a power of veto, which may be overridden by a simple majority in each house. There is a supreme court, whose 9 members are chosen by the Senate. It is empowered to make final decision on the constitutionality of laws.

The new constitution was suspended in 1965, when an insurgent group sought to seize power. The United States intervened to keep order and forestall a possible Communist takeover, its troops subsequently being replaced by a force sent by the Organization of American States.

ECUADOR

The government is a centralized republic, which became independent in 1830. Under the constitution of 1946, the president is elected by direct popular vote but cannot succeed himself. A vice president is elected at the same time. The president has a limited power of veto; bills of which he disapproves may be enacted by a two-thirds majority of Congress meeting in joint session.

Congress consists of a Chamber of Deputies elected for 2 years and a Senate elected for 4 years. In addition to 35 senators elected from provinces, there are 12 functional senators chosen by special groups, such as the press, education, agriculture, industry, and labor. The Chamber of Deputies consists of one deputy for each 50,000 inhabitants or major fraction thereof elected by universal suffrage for a 2-year term. Voting is compulsory for men and optional for women. The minimum age is 18 years. Legislative measures may be initiated by 3 or more legislators, the president, the supreme court, the legislative committee, or the national economic council. The legislative committee consists of the dean of the Law School of the Central University and one member chosen by each house, the president, and the supreme court.

Joint sessions of Congress play an unusual role in Ecuador. Only in joint session may Congress enact the budget, propose amendments to the constitution, accept or reject bills submitted by the legislative committee, elect judges to the supreme court, override a presidential veto, and resolve disagreements over bills passed by each chamber. A majority of each chamber must be present in the joint session, and all its decisions require a two-thirds majority. Failing the two-thirds majority, the matter is brought up again at the next session and, if action still cannot be taken, is submitted at the succeeding session, when it may be disposed of by majority vote. Action is taken by individual

houses in other matters, including the interpretation of laws, the imposition of taxes, and approval or rejection of proposals to amend the constitution.

The president is assisted by ministers of state, whom he appoints. If any of them is censured by Congress, he is disqualified and may not be reappointed for the 2 following years or in the same presidential term.

The 20 provinces are administered by governors appointed by the president. They also have elective councils. The municipalities are governed by locally elected councils, which, in the case of provincial capitals, are presided over by a popularly elected mayor.

EGYPT

See *United Arab Republic.*

EIRE

Previous to 1920, Ireland was a part of the United Kingdom, with representation in the Parliament at Westminster, and was administered by a government at Dublin Castle, presided over by the lord lieutenant of Ireland. The bestowal of "home rule," provided in an act of Parliament of 1914, was prevented by the attitude of the northern or Ulster population, which opposed a united, autonomous government in which it would be a religious minority.

World War I suspended the solution of the Irish question, but it saw the culmination of the separatist movement in the "Easter Rebellion" of April 1916 in Dublin. The passage of the Government of Ireland act of December 23, 1920, provided for two local parliaments and two administrations, one for Northern Ireland, comprising the 6 counties of Antrim, Armagh, Down, Fermanagh, Londonderry, and Tyrone, and one for the rest of the country, Southern Ireland, including 26 counties.

This act was acceptable to the Ulster "Unionists," but in the South the Sinn Fein, or Irish Republican party, which predominated over the nationalists or home rule advocates, rejected the act. Ireland, outside of "Northern Ireland," became the Irish Free State in 1922. It was renamed Eire under a constitution adopted by referendum in 1937.

The new charter of government sets up a republic with no organic link with Great Britain. Sovereignty is vested in the people beneath the Holy Trinity. Irish territory is defined as the whole of Ireland. Two official languages are established, Irish and English, the name of the country in the former tongue being Eire.

The president is elected for a 7-year term by direct vote of the people under a proportional representation plan. He must be an Irish citizen at least 35 years of age. Candidates for the presidency, except former presidents, must be nominated by at least 20 members of Parliament (*Oireachtas*) or by not less than four county councils.

Legislature. The legislature consists of 2 houses, the Assembly (Dail) and Senate (Seanad), which meet annually for a maximum term of 7 years. The Senate consists of 60 members, 11 nominated by the prime minister, 6 elected by the universities, and the remaining 43 elected from 5 panels of candidates representing the following vocations: art and literature; agriculture and allied interests; labor, whether organized or not; industry, including banking and finance; and public administration and social services. Membership of the Assembly is fixed by law from time to time subject to a rule that there shall be 1 member for each 20,000 to 30,000 of the population but at least 3 members from each constituency.

The president is assisted by a cabinet closer to the British than to the American type. Its 7 to 15 members must have been elected to Parliament, and Parliament selects the prime minister, who is head of the cabinet. The prime minister selects the other members, of whom the vice prime minister and those in charge of the department of finance must be members of the Assembly.

A fourth governmental body, known as the council of state, is provided, its function being to give advice to the president. Members include the prime minister, the vice prime minister, chief justice, president of high court, chairman of the Senate, ex-presidents, past incumbents of the first 3 of the posts named, and a maximum of 7 other members appointed by the president.

Two kinds of courts are established. The high court accepts trial cases; the supreme court hears cases on appeal. The supreme court is empowered also to pass on the constitutionality of laws. The number of its members is fixed by Parliament.

Criminal cases, except those involving minor offenses, are tried by a judge and a jury of 12 whose verdict must be unanimous. In civil jury cases, it is sufficient if nine members agree.

The president may, but is not required to, dissolve the Assembly if the prime minister loses his majority in the house. He may convene either house on the advice of the council of state. His messages to the people must receive the prior approval of his cabinet. His signature is required before a bill passed by Parliament becomes law. He is commander of the army.

There is no vice president. If the president is incapacitated or absent from the country, his duties are taken over by a commission consisting of the president of the high court, the prime minister, and the chairman of the Senate.

The constitution forbids divorce. It provides for free, but not compulsory, education. A natural right to private property is declared to exist, which, however, is to be regulated according to social justice. The constitution may be amended by act of Parliament ratified in a popular referendum.

The last constitutional link with Britain was severed by the Republic of Ireland Act of 1948, which repealed the law permitting the king of England to sign the credentials of Irish foreign representatives. It came into effect April 18, 1949, on which day—Easter Monday—the Republic of Ireland was officially proclaimed.

ETHIOPIA

This ancient kingdom in northeast Africa succeeded in resisting colonization by Europeans although from 1936 until 1941 it was a victim of Italian conquest. After World War II the former Italian colony of Eritrea was added to Ethiopia and gave it an outlet on the sea.

The government of Ethiopia is basically feudal, but a constitution was granted by the emperor in 1931. Restored after the liberation, and amended on the annexation of Eritrea and in 1955, the constitution provides for a bicameral legislature but leaves the emperor large powers. The legislature consists of the Senate and the Chamber of Deputies. Senators, not more than 125 in number, are chosen by the emperor from among dignitaries who have long served the empire as princes, ministers, judges, or army leaders. Deputies, chosen before 1955 by the dignitaries and by the local chiefs, became elective by universal suffrage after that year. Its membership is 250. The chambers must be convened annually for 6-month sessions. The emperor may legislate by decree between sessions, but the decrees must be ratified by the legislature to continue to be valid. Laws passed by the legislature require the emperor's signature. If he disapproves of a bill, he may submit a compromise to both chambers. If the compromise fails to pass both chambers, he may select the view of one chamber or adjourn the matter. The emperor selects the ministers, who however have a degree of responsibility to the legislature.

FINLAND

Finland, formerly a province of Russia, became independent in 1917, first as a kingdom. In 1919, a republic was established.

According to the constitution of 1919, government belongs to the people, who are represented by a Parliament of 200 members elected for 4-year terms by universal suffrage with proportional representation. Voters must be over 21 years of age. The executive power is vested in a president, who is chosen for a term of 6 years by an electoral college elected by the citizens. The president supervises the administration, conducts foreign relations, and is commander in chief of the army. Foreign treaties, as well as the decision of peace and war, require the ratification of the Chamber. The president may initiate legislation and may dissolve the Chamber; he exercises the pardoning power and presides over the council of state, or cabinet of ministers, when present. He has a suspensive veto on legislation, during which suspensive period the president may request the counsel of the supreme court or of the supreme administrative court. If a measure is then not approved, it may become a law only after its re-enactment without alteration by a newly elected Chamber.

While these provisions would seem to create a strong and independent president of the American type, other provisions indicate a disposition to establish a parliamentary responsibility. The constitution provides that the decisions of the president, except for supervising administration and for directing the "arraignment of ministers," must be countersigned by a minister; that ministers must decline counter signature if the president's action is contrary to the fundamental law; and that the council of ministers must enjoy the confidence of the Chamber.

The supreme court is established by the constitution; trial courts, by legislation. A supreme administrative court, which is a tribunal of last resort on questions of administrative law, is established by the constitution. Both the supreme court and the supreme administrative court have the right to address the president on the subject of necessary legislation.

While the president is intrusted with the enforcement of laws, a novel office seems to have been created in the election of a "solicitor" by the Chamber of Representatives. He supervises the enforcement of laws in court and other proceedings. In county district courts, the jurors are 12 farmers owning property, but the judge decides the case unless the jurors are unanimously opposed, in which event their decision prevails.

FRANCE

As compared with the British government and the American government, the government of France since the Revolution has undergone many fundamental changes. Its present government, established in 1958, is known as the Fifth Republic. Republican government was first established in the wake of the revolution of 1791, but the monarchical idea died hard; an emperor and several kings succeeded. The Second Republic was established in 1848 when Louis Philippe abdicated. The Third Republic, established in 1871 after the deposition of Napoleon III, lasted until after World War II. It was succeeded by the Fourth Republic in 1947 and finally by the Fifth Republic in 1958.

The comparative instability of government in France may be explained in part by the fact that France failed to achieve national unity until many centuries after England was first unified under its Saxon kings. Hence there was not such a long experience of popular rights slowly acquired and jealously guarded. Revolutions were more violent; parties were unable to compromise to achieve national ends; the country feared to entrust large powers to a president. Under the Third Republic in its later years and under the Fourth Republic, parties in the legislature grew so numerous that it became more and more difficult to form a stable administration. The Fifth Republic was formed because the government was paralyzed in the face of an army revolt over a war in Algeria. The ministry called on Charles De Gaulle to take the helm. He consented on condition that he be given a free hand for a stated period and be allowed to carry to the voters his proposal for a new constitution. His new constitution was adopted by over 80 per cent of the voters in France and its overseas dependencies in a referendum held September 28, 1958.

Administration. Much that is fundamental in French government is contained in earlier laws which have survived constitutional changes. Particularly is this the case with administrative laws, which have undergone little change since their enactment under Napoleon in 1800.

For administrative purposes, France is divided into districts called "departments," 90 in number. The departments are arbitrary divisions, approximately equal in area and in population and have no relation to the historic provinces, such as Normandy, Picardy, Champagne, or Gascony, which the French Revolution erased as political subdivisions. The departments are all named after physical features, such as rivers and mountains.

Each department is subdivided, for convenience of administration, into two or more *arrondissements*. In each department and in each arrondissement a town is designated as the seat of administration and is called the "chief place." In each chief place is a public building, the seat of local government, called the "prefecture" or "subprefecture."

The Prefect. The entire public administration, national and local, within the department, is in charge of a trained official called the prefect, who is appointed and directed by the minister of the interior and who is never a native of the department whose affairs he directs. The prefect reports, not alone to the minister of the interior, but to the other ministers of the government whose local interests he superintends. In the arrondissements, subprefects assist the prefect. To further aid and counsel this important official, there is the prefectural council, composed of 3 or 4 trained functionaries who, presided over by the prefect, constitute an administrative court to hear complaints against public actions, to adjust taxation, to examine departmental and communal budgets, and to settle questions of jurisdiction.

General Council. To supply a measure of local representation, there is a departmental assembly, or local legislature, called the "general council," which consists of from 17 to 67 members, according to the size of the department. This council is elected by the people of the department for a term of 6 years, one-half elected each 3 years. The general council meets at least twice a year, its most important tasks being to examine the departmental budget and the rates, and to audit the economic conduct of the prefectural government. Within the arrondissements is a lesser territorial subdivision, the "canton," which has no administrative significance but is the jurisdiction of the justice of the peace and is an election district for the general council.

Communes. The entire territory of France is comprised in municipal organizations called "communes," the number exceeding 36,000. They vary greatly in size and in population. All, except Paris, are governed under a single brief code, the municipal law of 1884. Each commune has a municipal council composed of from 10 to 36 members, elected by universal suffrage for 4 years by "general ticket," and a mayor elected by the municipal council, who may be assisted by one or more aides called "adjoints." All serve without pay. The position of

mayor is highly honorable, has been filled by many statesmen of distinction, and is sometimes held by one trusted individual for many years.

The mayor has large powers, not only as a local official, but also as the agent of the national government for all its interests within the commune. He controls the local police and, like the prefect above him, may issue police ordinances covering a wide field. For the enforcement of laws and for the maintenance of public order, he is responsible, not to the government or the inhabitants of the commune, but to the prefect of the department. Against excessive or illegal actions of the mayor, appeal may be had to the prefectural council and from that court an appeal is made to the highest administrative court, the council of state at Paris.

The Council of State. This body, historically a heritage from the "ancient regime" but reformed by Napoleon, in recent decades has developed as the supreme administrative court into a regulatory organ of administration of the first importance. Its decisions form a legal corpus known as the administrative law. It is the capstone of a system of centralized administration which has been found equally serviceable under empire, monarchy, or republic.

The Executive. The Fifth Republic, unlike its predecessors, gives the president very wide powers. He is elected for a term of 7 years. The constitution originally provided that he should be chosen by an electoral college of national and local representatives totaling about 80,000. In 1962, however, the constitution was amended to provide for direct universal suffrage in presidential elections. Overseas departments and territories may participate but not, as originally, states which are bound to France merely as members of the French Community. Campaigning is strictly regulated by national and local electoral control commissions. Campaigns may begin only after the official list of candidates is published and must cease on the Friday before the Sunday on which the election is held. Two hours of radio and of television time is allotted to each candidate in an order determined by lot. The display of posters is likewise strictly regulated. If no candidate receives a majority of the votes on the first election day, a second election is held on a Sunday following shortly thereafter. Those candidates who wish may withdraw, and the two others who received the highest number of votes on the first election day are placed on the ballot.

The president has exclusive powers and powers shared with the prime minister. In his own right, he chooses the prime minister, dissolves the Assembly, may address the Assembly (but not the nation without the prime minister's consent), may request opinions as to constitutionality from the constitutional council, 3 of whose 9 members he appoints, and assumes emergency powers in a crisis. He may also veto laws by withholding his assent. Although the prime minister and other ministers, chosen by him, are responsible to Parliament, they may not be members of Parliament. The president can compel their acceptance by Parliament by threatening to dissolve the Assembly. He presides over the council of ministers, on whose advice he issues orders either pursuant to law or in fields excluded from the competency of the legislature.

The Legislature. Parliament comprises two houses—the National Assembly and the Senate. The National Assembly is elected by universal suffrage of all citizens over 21. Elections are held on two successive Sundays. In the first balloting, a majority of all votes cast is necessary to election; in the second, a plurality suffices. The membership is 552, elected for 5-year terms, which may be reduced if the Assembly is dissolved earlier.

The Senate is composed of 307 members elected indirectly by universal suffrage for 9-year terms, one-third being renewed each 3 years. They are chosen by an electoral college composed of municipal councilmen and a smaller number of specially elected deputies under a system favoring small city and rural areas. The total electoral college numbers about 120,000.

Bills may originate in either house or in the president's council of ministers. The budget and money bills may originate only in the council, all of whose bills have precedence in that they may not be amended. No assemblyman or senator may introduce a bill which increases or decreases budgeted expenditures. If the budget is not voted with a prescribed limit, the president may put it into effect by decree. If a bill passed by one house is defeated by the other, it may again be taken up by the first house and sent to the second. If no agreement can be reached, the prime minister may refer it to a joint committee, whose bill is again submitted to both houses. If again defeated, the president may ask the Assembly to cast the deciding vote. Treaties must be ratified by the Assembly, and their provisions may override domestic laws.

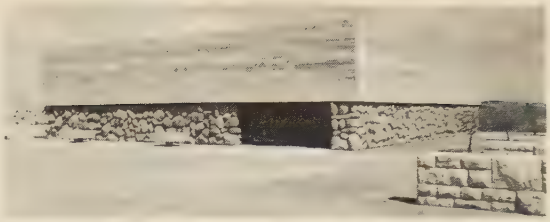
The constitution defines two fields of rule making —one reserved to Parliament and the other to the president, with the residual powers exercised by the president through executive orders. Hence disputes may arise whether a measure falls within the reserved powers of Parliament or whether it does not and therefore may be the subject of an executive order. A constitutional council is set up to determine such disputes and other matters of constitutionality. It consists of former presidents and 9 appointed members—3 by the president and 3 by each of the two houses. It may be required to give an opinion within a month on questions submitted by the president, the prime minister, or the chairman of the Assembly or the Senate.

The French Community. In the referendum for adoption of the constitution of 1958, it was participated in, not only by metropolitan France, but by all French dependencies. French dependencies were permitted, in the same referendum, to choose among three options: (a) to retain their present status, (b) to become overseas departments of France, and (c) to become autonomous member states of the French Community. One state, Guinea, voted not to accept the constitution and became automatically independent. Twelve states voted to be members of the Community. Although this entailed French citizenship, French control of foreign policy, defense, and money, and appointment of a head of state by Paris, each state adopted its own constitution modeled in general on that of France.

In 1960, the constitution of 1958 was amended so as to provide for complete independence of the states. Membership in the Community then became a matter of negotiation between France and the newly independent state. Some made such agreement before admission to the United Nations; most of them after admission. All of them concluded special agreements with France covering trade and economic assistance. Their relationship to France became analogous to that between Great Britain and the other members of the British Commonwealth.

GABON

This republic was proclaimed in 1960. A president is the chief executive officer, chosen for a 7-year term by universal suffrage. An absolute majority is requisite, by means of a run-off election if necessary. The president names a vice president, to whom he may delegate most powers and who serves temporarily in case of the president's incapacity or death in office. Legislative power is vested primarily in a unicameral National Assembly, whose members are elected for 5-year terms by universal suffrage. The president, however, may also initiate legislation to be passed by the Assembly. He has a limited power of veto.



Located in the capital city of Jerusalem, Israel, Yad Vashem (Memorial Shrine) is dedicated to the memory of the Nazi victims of the world.

Left A store house in Rotorua, New Zealand, reserved for the food eaten by the native priests (tohunga) of the Maori people, is a striking example of the intricate wood carving for which these people are noted.

New Zealand Consulate General

Above Community life for a people who live over water is shown in this typical village of the Manus tribe in the Admiralty Islands. Since all necessities of life depend upon their skill in fishing, they trade fish for both vegetable food, and wood for their homes and canoes.

Right The Buddha of Wat Doi Suteb, Chiengmai, Thailand, is made of brick stucco and is heavily gilded. The approach to the wat (temple) is through columns of pines festooned with orchids. Thailand has about 16,000 temples.

FOREIGN HIGHLIGHTS

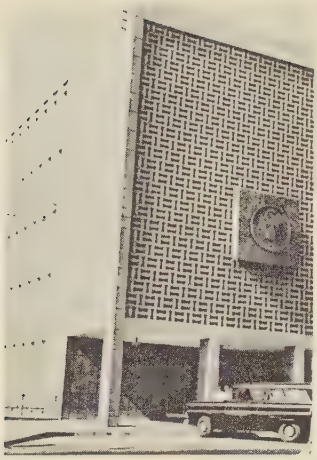
Left Residents and tourists alike enjoy outstanding plays and light operas presented at the beautiful O'Keefe Centre for the Performing Arts in Toronto, Canada.

Below left The Palace and the meticulously sculptured Gardens at Queluz, Portugal make this a popular sight-seeing spot for tourists.

Photo *Sni-Yan*

Below Cape Town, a vigorous modern city, reflects the wealth of South Africa's valuable exports—gold and wool. Shown here is Heerengracht, one of the city's main thoroughfares.

Photo *SATOUR*



Above Like numerous other cities, London's expansion program includes many modern buildings as shown on both banks of the Thames.

Left The American Embassy in Tel-Aviv, Israel, is one of the most modern buildings in that city.

Below left In Hamilton, the Colonial Parliament Building here is where Bermuda's laws are made.

Below Midan al Tahrir in Cairo, Egypt. British troops were once stationed near here. When they left, it received its name, which means "Liberation Square."

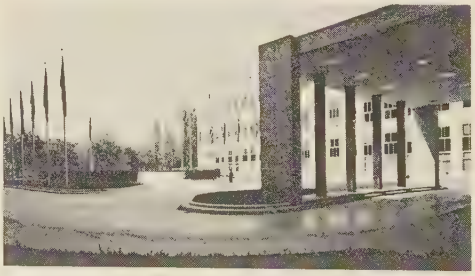
UAR Tourist Office

Below The lower house of the Thailand Government meets in this marble Temple in Bangkok, Thailand.

CAPITAL CITIES OF THE WORLD

Below NATO Headquarters, Paris, shows the flags of member nations.

French Gov't Tourist Office



The Secretariat Buildings in New Delhi, India, with a portion of the Council Chamber at the right.

GAMBIA

Gambia is a small republic of western Africa which became an independent member of the British Commonwealth in 1965. Parliament has 32 popularly elected members, 4 chiefs elected by chiefs in assemblies, and a speaker and deputy speaker appointed by the governor-general.

GERMANY

No country in modern times has had such a long tortured governmental evolution as has Germany. No important country is still faced with so many governmental problems not yet soluble.

First, Germany was not even a political entity until 1871, when Prince Bismarck created a monarchical state under the leadership of Prussia, with a strong militaristic bent. Defeated in World War I, Germany turned to a democracy and operated under a constitution framed at Weimar in 1919. This constitution was not proof against subversion by Hitler, who converted the government into a personal dictatorship. Precipitating Germany into World War II, Hitler in effect delivered his country into the hands of victors, who, dividing in the hour of victory, cut his country into two parts under two governmental systems of opposite and conflicting character. There are now a West Germany under a democratic constitution and an East Germany under a Communist regime.

The Germany of 1871 was made up of 25 states: 4 kingdoms, Prussia, Bavaria, Saxony, and Württemberg; 18 lesser principalities, grand duchies, and mark-graviates; and 3 "free cities," Hamburg, Lubeck, and Bremen, survivors of the old "Hanseatic League" of German trading cities. The states retained their own interior administration, generally monarchical, except in the free cities.

First German Constitution. Under the first constitution, the federal government comprised a legislature consisting, first, of an elective body, the *Reichstag*, or Imperial Diet, of 397 members chosen by popular election on the basis of universal manhood suffrage.

The upper house was a unique institution, the heritage of earlier German diets, and was called the *Bundesrat*, or "Federal Council." It was composed of 61 representatives of the federated states, of which Prussia had 17. These members were the appointees of the governments represented and were usually high ranking members of these governments, under whose instructions they acted. The Bundesrat had predominant powers. It initiated practically all legislation, and no bill could be considered by the Reichstag without the consent of the Bundesrat. It took cognizance of the failure of any state to execute imperial laws and could sanction the employment of armed force to coerce a state into obedience. It was presided over by the imperial chancellor, who was the head of the national administration and controlled all its political departments. This official was the personal choice of the German emperor and was responsible to him alone.

The imperial chancellor was usually prime minister of Prussia as well and head of the government of that predominant state. Bismarck established the principle that other imperial ministers, foreign affairs, finance, war, navy, etc., were responsible to the chancellor and must report to the emperor through him. The emperor was the king of Prussia.

The Weimar Constitution. Germany's defeat in 1918 brought about the emperor's abdication and the disappearance of the monarchies in all the states. Each state held a constitutional convention and adopted a democratic constitution. Germany became a union of republics. This form of state government was a requirement under the federal constitution of Weimar.

The new German constitution established a universal, equal, direct, and secret franchise of male and female voters and a system of proportional representation. All states acquired popularly elected diets or assemblies. The conduct of government was intrusted to a commission or "cabinet" of ministers. The chairman of this body bore the title of "president" or "premier."

The Reichstag, or popular legislative chamber, was elected on most liberal suffrage conditions. The former Bundersrat reappeared as an imperial senate, the *Reichsrat*, in which the states were represented roughly in proportion to population. The "cabinet," composed of the chancellor and of ministers, required the support of the Reichstag. The constitution guaranteed equality before the law; freedom of religion, of speech, and of the press; and abolished all class privileges of whatever kind.

The president of the empire was elected by the whole German people for a term of 7 years. He had the unusual power of ordering a referendum of laws which did not command his approval or of proposed laws on which the chambers disagreed. While most executive acts had to be performed through ministers responsible to the Reichstag, the president commanded the armed forces of the Reich and might declare martial law or a "state of siege." Finally, he might dissolve the Reichstag and order a new election. The president might be removed from office by vote of the people on proposal of the national legislature.

Nazi Rule. On March 23, 1933, the principal provisions of the Weimar constitution were set aside by vote of the Reichstag, which entrusted complete dictatorial powers to Adolph Hitler, leader of a new National Socialist party, abbreviated as Nazi. Hitler immediately placed governors in control of the individual states and empowered them to appoint state premiers who were to pick their own cabinets. The cabinets were made independent of the state legislatures, being responsible solely to the national dictator. These legislatures were later dissolved.

All law-making activities were centered in a cabinet of 16 members headed by Hitler, who adopted the title of *Führer* ("Leader") and Chancellor. His office carried with it supreme authority, or "leadership," in the army, all civil offices, and party activities. The cabinet promulgated laws and could alter the constitution.

Hitler created what he called a totalitarian state, in which all labor unions were dissolved and factory councils representing employers, workers, and the party took their place. Farmers were forbidden to mortgage or sell their land; they could get credit only from the state. Labor battalions of youth under government control were organized. Education was "unified" by seeing to it that teachers and textbooks were in accord with the party doctrine. An attempt was made to unify the churches under state direction, with an infusion of Teutonic mythology. A ministry of propaganda was organized to create and lead public opinion. Anti-Semitic laws discriminated against the Jews, who were almost eliminated from Germany by mass murder.

Division of Germany. When Germany surrendered unconditionally in World War II, there was no government with which the victorious powers could deal. The country was divided into four zones of military government and occupation. Russia occupied Eastern Germany to the upper Elbe; the United States, the south, including most of Bavaria and Württemberg, Hesse, and Hesse-Nassau; Great Britain, the northeastern section, including the Ruhr, Hamburg, and Bremen; and France, an area along the upper Rhine. Berlin was occupied by the four powers jointly, and the four Allied commanders in chief formed a control council with supreme authority.

Russia systematically blocked action in the control council, which broke up by 1948. In the zones controlled by the United States, Great Britain, and France, German states drafted a constitution which

could be valid within the framework of the occupation statute. It was adopted by a German parliamentary council on May 8, 1949, and was promulgated as the constitution of the German Federal Republic.

The Russians meanwhile set up a state in their zone of control, and their administrative functions were transferred in 1950 to the provisional government of the German Democratic Republic.

Berlin was similarly divided, two separate municipalities being formed. East Berlin was part of East Germany, and West Berlin, although cut off from West Germany by 70 miles of intervening East German territory, was claimed as part of West Germany.

German Federal Republic. The constitution, promulgated and approved by voters in the Western occupation zone in 1949, became effective March 15, 1955. A convention was signed with the Western allies by which West Germany would have full authority over its internal and external affairs, with reservations relating to stationing armed forces in Germany and also to the status of Berlin and to questions relating to unification and the final peace settlement.

The constitution provides that it applies to Berlin and is to be put into force in the Eastern zone upon the latter's accession. While freedom of speech, press, and organization is guaranteed, this freedom is limited so as to exclude the enemies of a free, democratic basic order.

The legislature consists of a Federal Diet (*Bundestag*) and a Federal Council (*Bundesrat*). Members of the Diet are elected for a 4-year term by universal suffrage. The Council consists of members of the governments of the constituent republics, each sending at least 3 but as many as 5 if the population is over 6,000,000.

A president is chosen for a 5-year term by an electoral college consisting of members of the Diet and an equal number elected by the diets of the constituent republics. The president can succeed himself only once. The president nominates a chancellor who must be elected by the Diet, and the chancellor selects ministers for appointment by the president. The Diet may elect a new chancellor, an act which is equivalent to a vote of no confidence in the incumbent chancellor, and the president must appoint the new chancellor. If the chancellor proposes a vote of confidence and this is defeated, the president may, on the chancellor's proposal, dissolve the Diet unless a new chancellor has been elected within 21 days.

Bills may be introduced into the Diet by individual members or by members of the cabinet. Bills introduced by the latter may be on the cabinet's initiative or they may be bills passed by the Council and turned over to the cabinet to send to the Diet with cabinet recommendations. Bills passed by the Diet go to the Council, which may veto but not amend them. This veto may be overridden by the Diet—a simple majority veto by a majority vote and a two-thirds majority veto by a two-thirds vote. The president has no veto power. But appeal may be made against a bill to a federal constitutional court, whose members are appointed half by the Diet and half by the Council. Members of these bodies may not be appointed to the court.

The president may be impeached for willful violation of the law on a two-thirds vote of either legislative body. Trial is before the federal constitutional court. The place of the president, however, in the German constitutional scheme, is inferior to that of the chancellor, who speaks as head of the government.

West Germany is divided into 11 states (*Länder*), each of which has a government parallel to that of the federal republic. The states include the western section of the city of Berlin.

German Democratic Republic. The constitution of East Germany was promulgated in 1950. Russian occupation forces withdrew in 1954. The constitution makes it a crime to boycott democratic organizations and to manifest religious or racial hatreds. Estates of over 100 hectares are forbidden, such estates being dissolved and redistributed without compensation. Private monopolistic organizations aiming at increase of profits by control of prices, production, and markets are prohibited.

The supreme legislative body is the People's Chamber, its 400 members being elected for 4-year terms by universal suffrage of those over 18 years of age. Candidates are limited to those nominated by the Communist party. The Chamber may be dissolved before the end of its term on its own resolution, by referendum, or on a vote of no confidence. Under an amendment of 1960, the Chamber elects, not a presidium headed by a president, as before, but a council of state, consisting of a chairman, 6 deputy chairmen, 16 members, and a secretary. The council is authorized to issue decrees with the force of laws and to interpret the laws.

The Chamber elects also a cabinet, headed by a prime minister, one of whom is charged with the duty of economic planning, in which he has the assistance of the economic council. The real power, however, lies with the politburo of the Communist party, which consists of 14 full members and 9 candidate members. Its secretary is the key man in the government.

GHANA

Ghana was formerly under British rule as the Gold Coast colony and trusteed territory of Togoland. It was granted independence in 1957 and, in 1960, became a republic within the British Commonwealth. The constitution provides for a Parliament of 114 members elected for 5-year terms, including 10 women specially elected. A cabinet of 8 members, chosen by the president from Parliament and responsible to it, assists the president. Presidents are chosen for 5-year terms under the constitution, but Parliament voted in 1962 to extend the term of the first president, Kwame Nkrumah, for life. A constitutional convention in 1964 affirmed Ghana as a one-party state. An agreement of 1958 with Guinea and one of 1960 with Mali envisage adoption of a common currency and foreign policy.

GREAT BRITAIN

The United Kingdom of Great Britain and Northern Ireland adopted its present title in 1920, when southern Ireland (Eire) was separated from the kingdom. Northern Ireland is represented in the British Parliament as an integral part of the kingdom and it also has its own local government under a governor and parliament.

Great Britain is the oldest political society in Europe and the oldest kingdom in the world, if one excepts the 11-year interruption of the Cromwellian period. When one of the feudal lords of France, William of Normandy, conquered England in 1066, it was already a unified monarchy. Wales was conquered in 1283 and incorporated in the kingdom about 1500. The thrones of England and Scotland were combined in 1707 by the Act of Union, when their parliaments were combined into a single legislature.

Great Britain was the cradle of democracy in the modern world. There, over a period of 800 years, a struggle between ruler and people resulted in the representative institutions which have given it the title of mother of parliaments. This long political experience enabled it to adapt itself to social and economic changes without the bloody revolutions such as France and Russia passed through. Unlike practically all other countries Great Britain does not have a formal constitution. Its frame of government is based on acts of Parliament passed in the course of many centuries.

Seat of Government. Adjoining the ancient city of London is Westminster, which was chosen as a residence by the Norman kings and is the seat of British government. Here are "Whitehall Street" and "Downing Street," with the residence of the prime minister; Westminster Hall and Abbey; and the modern houses of Parliament. The British sovereign lives at Buckingham palace or other royal residences, or at Windsor castle on the Thames, 21 miles from London. From this latter ancient residence of British sovereigns, Edward VII adopted in 1917 the family name of House of Windsor.

The British Monarchy. The monarchy, which was firmly established on a national basis by William the Conqueror and by his successors, attained its greatest power and influence under the Tudors, Henry VII, Henry VIII, and Queen Elizabeth I; but their successors, the Stuart kings, aiming at an absolutism attained elsewhere in European kingdoms, were summarily checked by Parliament, which beheaded Charles I and expelled James II.

The long conflict between king and Parliament for state control resulted in the complete supremacy of Parliament and the reduction of the sovereign to a symbol of national loyalty and to a position of simple influence. "The king rules but does not govern." All crown powers are exercised in his name by ministers who are no longer his choice but who are a committee of members of Parliament, dependent upon the House of Commons for continuance of office.

Ministers. There are some 43 high officials known as ministers, selected by the prime minister, the actual leader of the majority in the Commons. The chief ministers are the lord president of the council and minister for science; the lord chancellor, who presides over the House of Lords and over the supreme court of judicature and is a general minister of justice; the chancellor of the exchequer, who is the financial minister; 4 secretaries of state—first, foreign affairs, home affairs, and commonwealth relations and colonies; the first lord of the admiralty; the president of the boards of trade; the ministers of defense, transport, education, health, labor, and agriculture and fisheries; the secretary for Scotland; and the attorney-general. Several offices—lord president of the privy council, the first lord of the treasury, lord of the privy seal, and the chancellor of the Duchy of Lancaster—have become sinecures; they are usually taken by the prime minister and by members left free of administrative duties, or "without portfolio."

Of these ministers, a minor group constitutes, with the prime minister, the "cabinet." The cabinet determines policies, settles the budget and financial schemes for submission to Commons, institutes practically all legislation, and takes responsibility at all times before Parliament for the conduct of government. A refusal of the House of Commons to follow the cabinet's lead or to enact its measures results either in the immediate resignation of the ministry or in "an appeal to the country," that is, the dissolution of the Commons and an election of a new House.

Parliamentary Government. This historically established organization for conducting the government has given to the world the widely imitated institution of "parliamentary," "responsible," or "ministerial" government, as distinguished from "presidential government" wherein the chief executive has a tenure independent of the legislative or parliamentary body.

The British Parliament consists of the House of Lords and of the House of Commons. The members of the Commons are elected for a term of 5 years or until a dissolution of the House. A member need not, and seldom does, reside in his "constituency." Members of Commons receive an annual compensation of £1750. The House of Lords has a membership of about 910 and includes the archbishops of Canterbury and York; bishops of the English Church; and "peers" created by the sovereign on recommendation of the prime minister, comprising, in order of rank, dukes, marquises, earls, barons, and "life peers."

Down to 1911, the Lords had a legislative position comparable with the Commons, except in initiation of financial legislation. Its opposition to legislation demanded by the Commons could be overcome only by the threat to create enough new peers favorable to the law to "swamp the Lords." In 1832, this threat was effectual in securing the passage of the "Reform act" and was used in 1911 to pass the "Parliament act" whereby the supremacy of the Commons is recognized. Under this act, if the Commons passes an act in three successive sessions within an interval of not less than two years, it may become a law without the consent of the Lords. No "money bill" may be denied assent by the Lords, and the "speaker" of the Commons is the final judge of whether or not any certain act is a money bill. The king must give assent to every bill of Parliament. To refuse would be an unconstitutional act; in fact, it would be an act of revolution.

Sovereignty. The "King, Lords, and Commons" legally have complete sovereign powers; no political act is beyond their competence. They can legally alter, in any particular, the constitution of Great Britain and her dependencies. Until the passage of the Statute of Westminster in 1931, they had the theoretical right to legislate for the self-governing dominions also.

The constitution of Great Britain consists of a great number of separate acts, as well as of established practices which can be altered only by Parliament itself. These acts have never been codified or reduced to a single charter, and in this sense the British constitution is "unwritten." Since it can be changed by Parliament itself, it is spoken of as "flexible" as distinguished from "rigid" or "written" constitutions.

Previously to 1832, suffrage in Great Britain was restricted to the aristocratic and land-owning class. By the "Reform acts" of 1832, 1867, and 1884, it was successively extended, and, by the "Representation of the People act" of 1918, full manhood suffrage was realized, and the vote was given to women 30 years of age. By the "Equal Franchise act" of 1928, women were admitted to complete equal suffrage with men. The voting age is 21, with residential qualifications. Voting has for many years been carefully protected by a Corrupt Practices act. Thus, under the forms of a monarchy, Great Britain, now almost the last remaining kingly government of consequence, has become in fact one of the most democratic of countries. The families of the nobility, however, continue to exercise a leadership and an influence found today in few other countries.

Local Government. For purposes of local government, England and Wales are divided into 62 "administrative counties" and 87 county boroughs. Northern Ireland is divided into 6 administrative counties and 2 boroughs. County government is ordered by the Local Government act of 1888, which provides elective councils to supervise local government and to appoint the county officials. Its chief responsibilities are for local communications, education, asylums, and police. In Scotland, local government is the responsibility of the Scottish development department, set up in 1962.

English boroughs or towns before 1835 were close corporations, governed largely in the interests of a narrow body of "freeholders." By the Municipal Corporations act of that year, a systematic and more liberal form of city government was introduced, whereby the borough council became the city administration. This body acts through committees and employs city officials who, while relatively few in number, are chosen for experience and qualifications. The most unusual of these is the

"clerk." While conforming to a general type, the powers of boroughs are expressly given by charters or by acts of Parliament, and the latter body is constantly importuned to extend the functions of boroughs. Nearly all so-called "private bills" are of this character.

The "mayor" of an English town is in no sense the head of its administration. The office, usually held for one year, is important in a social and a civic sense, and frequently imposes upon the occupant considerable expenditure for entertainment and for representation of the borough.

London. The government of London must be described separately. At its center is the ancient "City of London," once surrounded by walls embracing about a square mile east of Charing Cross. This is still an "unreformed" English borough, governed by a close corporation of "councilmen" and "aldermen." The "lord mayor of London" is the presiding head; he resides in "Mansion House" and is an important civic figure in British life. Surrounding the city is the county of London, made up of 28 boroughs with district governments; but the London County council, created in 1888, has definite general powers over the whole area. The "Metropolitan Police Area" includes London county and extends over adjacent territory for nearly 700 square miles. To the metropolitan police is entrusted the public order of this central part of England. This highly trained force, with its headquarters at New Scotland Yard, is directly under the home secretary of Great Britain.

GREECE

Greece is a constitutional monarchy governed under a constitution adopted in 1952, which designates it as a crowned democracy. Since modern Greece shook off the yoke of the Ottoman Empire in 1821, its government has passed through a number of phases: a republic in 1827–32; an absolute monarchy 1832–43; a constitutional monarchy 1843–64; a crowned democracy with a unicameral legislature 1864–1924; a republic again 1924–35; and a monarchy from 1935. From 1936 to 1941 Greece was ruled as a corporate state under a monarchical form. It was overrun by the Germans in World War II and, after liberation, was threatened by a Communist take-over, which was averted by British and American influence.

Legislative power is in the hands of a Chamber of Deputies, from 150 to 300 in number, elected by direct, universal ballot for 4-year terms. This Assembly may be dissolved earlier. In case of dissolution, a new Assembly must be elected within 45 days. Bills may be introduced by deputies or by members of the cabinet, the latter, who are also eligible to be delegates, being appointed by the king. Bills which are passed must be signed by the king in order to become law but may be in effect vetoed by his failure to sign them within 2 months after a legislative session. The Assembly has final authority to determine whether a law is constitutional. While the Assembly is in recess, a king may legislate on urgent matters with the concurrence of one-fifth of the delegates appointed at the beginning of each session of the Assembly. Upon reconvening of the Assembly, reconsideration of such interim legislative acts has priority. The Assembly may vote lack of confidence in a minister or the cabinet and this may result in dissolution of the Assembly. Ministers also may be impeached before a panel of members chosen by lot from certain members of the Judiciary. No bill to increase budgetary expenditures may be introduced without a report from the general accounting office on how the increase is to be met.

The king must be a member of the Greek Orthodox Church, although there is freedom of worship for other religions. Succession is by primogeniture with preference going to males. If a successor to the throne is under 18 when the sovereign dies, the queen mother acts as regent in the interim. If no successor exists under the above rules, the king may appoint a successor with the consent of the Assembly convoked for the purpose and approving by a two-thirds majority.

Members of the supreme court are appointed by the king for life. There is also an administrative court of 21 members appointed for life known as the council of state. Its functions include invalidation of acts of administrative authorities when shown to infringe laws.

GUATEMALA

Like Mexico, Guatemala is a country with a large Indian population, living in highland villages. The people preserve their native speech and much of their own character in spite of their profession of Christianity. The presence of this illiterate, laborious, and militant element has influenced its history and institutions.

The constitution of 1956 extends the suffrage to all men and all literate women, the minimum age being 18. Voting is compulsory for the literate and optional for the illiterate.

Legislative power is vested in Congress, to which is sent approximately one deputy for every 50,000 inhabitants, chosen for a 4-year term. The Communist party may not participate, and relatives of the president may not be members. Congress may, by a vote of lack of confidence, force the resignation of up to three ministers.

The executive power is in the hands of a president elected for a 6-year term. A president may not be re-elected within 12 years after the expiration of his term. At any attempt to violate this clause, the people may legally rebel. There is no vice president, but Congress elects two presidents designate, who succeed to the presidency in the event of its being vacant. Congress determines when the president is disabled for continuing in office. The president appoints the ministers. He has veto power, but his veto may be overruled by a two-thirds vote.

For local government the country is divided into 22 departments, each governed by a corporation consisting of a mayor, trustees, and councilmen, all elected by popular vote.

Political parties have a status under the constitution when legally organized and registered, but those advocating communism or other totalitarian systems are prohibited. Discrimination is forbidden based on race, color, sex, religion, birth, economic or social position, or political opinion. Any person alleging that his constitutional rights are being infringed by an authority of the state may invoke a special judicial procedure known as *emparo*.

Indians constitute about 60 per cent of the population. They have been freed from their former liability to compulsory labor. The 1956 constitution establishes a 48-hour workweek, minimum wages, overtime pay, paid holidays, paid vacations, dismissal pay, and paid maternity leave.

GUINEA

The former French Guinea decided in a referendum in 1958 to separate itself from the French Community and later the same year proclaimed itself an independent "democratic, secular, and social republic." A National Assembly, whose members are elected by universal suffrage on a national list for a 5-year term, has sole and unlimited power to legislate. The president is popularly elected for a 7-year term. He names the cabinet from Assembly members, and they are responsible to him, but he is responsible to the Assembly and must promulgate all laws passed by it. He has no power of veto.

The constitution provides for the limitation or renunciation of sovereignty in the interest of African unity, and steps in this direction were made with conclusion of agreements with Ghana (1958) and Mali (1960) looking toward merging their defense, foreign policy, currency, and cultural programs.

HAITI

Originally a French colony, Haiti became independent after a bloody revolt of the Negro slaves (1791–1803). The whites were exterminated or expelled, and in 1804 a Negro state was set up under the aboriginal name of Haiti.

The constitution and laws of the government purported to construct a republic after the French model. In practice, however, the government for more than a century was a military despotism in the hands of the president.

The constitution of 1964 provides for a single-chamber legislature of 58 deputies known as the Legislative Chamber. Its members are elected for 6-year terms by majority vote in "primary assemblies." They may be re-elected indefinitely. This body meets also as the National Assembly for certain purposes, such as declaration of war, consideration of treaties, revision of the constitution, and as a high court. The Chamber may be dissolved by the president in case of serious disagreement with him. New elections are then held.

The president is elected by direct suffrage. He alone has the power to introduce money bills in the Chamber. He has a limited veto, which can be overridden by a two-thirds majority. If he fails to approve a bill before the Chamber adjourns, the bill retains its status when the next session begins. He is assisted by a cabinet responsible to him alone, although the members may appear in the legislature to support measures of the president. He appoints the justices of the supreme court, who have a life tenure in office. Local government is carried on by communal councils chosen for 6-year terms.

HONDURAS

Honduras revolted against Spain with the other Central American provinces in 1824. In 1838 Honduras adopted its own constitution which has been repeatedly revised. The present constitution was adopted in 1957.

The legislature of Honduras consists of a single chamber of 58 deputies, one for each 30,000 inhabitants. They are elected by universal suffrage for a 6-year term and may not be re-elected. In the recesses of Congress a committee transacts routine or emergency business. The president, with 3 presidential designates, is elected for a 6-year term, one of the designates being chosen by lot to fill a vacancy in the presidency. The president may not succeed himself. He has the power of veto, which may be overridden by a two-thirds vote of Congress. The president administers the government through a council of 9 or more ministers.

HUNGARY

The Hungarian Republic of Workers and Working Peasants is the designation adopted in 1949 by the Communist government of Hungary, which was set up under Russian pressure after World War II. The country had been established as an independent nation after World War I. It was ruled as a regency for a vacant monarchy until World War II, when, having joined with Germany, it shared in the debacle of the axis and was occupied by Russian troops. A rebellion in 1956 was crushed with Russian help, leaving the government unchanged in form but with a perceptibly wider latitude under its Russian tutelage.

The governing party is known as the Hungarian Socialist Workers' Party. The first secretary of the party is also the prime minister and effective ruler of the state. Parliament consists of about 340 deputies, all nominated by the party and elected for 4-year terms. A presidential council exercises legislative power between sessions of Parliament and can annul legislation if deemed unconstitutional or detrimental to the working people. As is the custom in Communist governments, however, such bodies are under the control of the politburo of the party, whose president is usually the first secretary of the party. Parliament normally gives a unanimous assent to measures which the politburo proposes through the prime minister and first secretary of the party.

Although the constitution recognizes the right of private property if it does not violate the public interest, the chief means of production are in the hands of the state and of party-controlled cooperatives.

ICELAND

From 930 to 1264, Iceland was an independent republic. It was joined to Norway in 1264 and with Norway came under the rule of Danish kings in 1381. It so remained until December 1, 1918. By the act of Union of November 30, 1918, it was recognized as a sovereign state in personal union with Denmark through the monarch. This act was to expire in 1943, and Icelandic opinion was against its renewal. On the invasion of Denmark by the Germans, Iceland was occupied by British troops, who later were replaced by Americans. On May 17, 1941, Iceland declared its complete autonomy under an elected regent. Formal separation from Denmark took place June 17, 1944.

The present constitution of Iceland was adopted on May 18, 1920, but was radically amended in 1934 and 1944. The executive power is exercised in Iceland by a president, elected for a 4-year term. He is assisted by a cabinet appointed by him but responsible also to the legislature, or *Althing*, which can impeach cabinet members before a special tribunal for parliamentary impeachment, the *Landsdomur*. The Althing consists of 2 chambers with a total of 60 members elected by proportional representation for 4-year terms. Upon assembling, it selects 20 members for the upper house, while the remaining 20 form the lower house. The two sit together to vote on bills approved by one House and disapproved by the other, a two-thirds majority being required for affirmative action. Budget bills form an exception, a majority being sufficient for adoption. Ministers have free access to either chamber but vote only in that chamber of which they are members.

The president has no direct veto power. If he disapproves a bill, it nevertheless becomes law but must be submitted to a referendum, the outcome of which determines whether it continues as a law or is struck down.

The president's tenure of office may be cut short by a plebiscite held pursuant to a resolution approved by a three-fourths majority of the Althing. In the period between the resolution and the plebiscite, presidential powers are performed as though the presidency were vacant by a committee of the prime minister, speaker of the united Althing, and the chief justice of the supreme court. If the plebiscite rejects the resolution, the Althing must be dissolved and a new election held.

INDIA

India became an independent democratic republic in 1950 after having been part of a colony of Great Britain for nearly a century and of a British dominion from 1947. In 1947, the former British colony of India was divided into India and Pakistan, the former being largely Hindu in religion and the latter mainly Moslem. Each remained a member of the British Commonwealth.

India is a union of 16 states and 9 union territories. Each state is administered by an official appointed by the president of the Union, known as a governor for each state and as an administrator for each territory. The president of India is elected for a 5-year term by an electoral college consisting of all the elected members of the Union legislature and of the state legislatures. He may be re-elected. There is also a vice president, who presides over

the upper house of the two-chamber legislature, or Parliament. He is elected for a 5-year term by the two houses in joint session. He assumes presidential powers if the president is unable to act by reason of illness, absence, or other causes.

The legislature consists of the Council of States and the House of the People. The Council of States is a permanent body, not subject to dissolution. Its members, limited to 250, are chosen partly by the elected members of the state legislatures; about one-tenth are appointed by the president. One-third of the membership is renewed each two years. The House consists of not more than 500 members, nearly all elected by universal suffrage from territorial constituencies in the states; it has up to 20 members to represent the territories and a few appointed by the president. Their term is 5 years unless the House is dissolved earlier.

The president is assisted by a cabinet, or council of ministers, all of whom must be members of either house of legislature, failing which for any consecutive 6 months they must resign. The cabinet is responsible to Parliament.

Legislation. Money bills must originate in the House. They are submitted to the Council, which may add recommendations but may not amend the bill. On resubmission to the House, they are approved with or without modification based on recommendations of the Council. If the Council disagrees with all or part of any other bill or holds it more than 6 months without action, both houses meet in joint session, and a majority vote completes the legislative action prior to submission to the president. He may approve or return it to the House for reconsideration or incorporation of suggested amendments. If the House insists on the original bill, the president must sign it into law.

State legislatures consist of 2 houses in 10 states and 1 house in the remaining 6 states. They cannot be dissolved. The constitution specifies 97 subjects on which the Union alone may legislate, 66 subjects on which the state may legislate, and 47 subjects on which both may legislate, with Union laws taking precedence. The Union may also legislate on subjects within state jurisdiction if they become of national importance. The concurrent list includes economic and social planning, and labor and price control.

The supreme court decides questions of constitutionality and may render declaratory judgments on such questions submitted by the president. Members are appointed by the president on advice of the cabinet. All courts are part of the Union judiciary and enforce both Union and state laws.

Municipalities and rural areas are governed by boards or committees elected by universal suffrage. Under state sanction, they impose taxes and spend money for local purposes, including sanitation, and primary and secondary education.

INDONESIA

Before Indonesia was recognized as an independent republic in 1949, it had been a colonial empire under the Netherlands since 1809 after nearly 200 years of prior rule by the Dutch East India Company. In World War II, it was conquered by Japan, upon whose defeat in 1945 the territory was formally restored to the Netherlands. However, a nationalistic uprising in Java, Madura, and Sumatra took over those islands from the Japanese. The Indonesian republic was proclaimed with Sukarno as president. Hostilities with the Dutch continued intermittently until 1949, when the Netherlands transferred sovereignty to Indonesia. A constitution adopted that year was superseded in 1950 by another, which Sukarno abrogated by decree in 1959 in order to reinstate the original revolutionary constitution of 1945. By so doing, he made himself practically dictator. In 1963 he was elected president for life.

The constitution of 1945 provides for six organs:

(1) The People's Congress, which is declared to represent the entire nation. To it is entrusted establishment of national policy and the election of the president. It meets once each 5 years. As to its membership, manner of selection, and term of office, the constitution is silent.

(2) The executive consists of the president and vice president, who serve for 5-year terms and may be re-elected. The president is assisted by a council of ministers chosen by himself and responsible to him alone. He is commander in chief of the army. He is invested also with legislative power, but his legislative measures must be ratified by the legislature. The president has an absolute veto over measures passed by the legislature. He may legislate by decree in an emergency, subject to later ratification.

(3) The unicameral legislature, known as Council of Representatives, which assembles once a year. It is appointed in part by local administrations or functional groups and partly by members representing political parties. However, the president issued a decree in 1960 enabling him to control political parties and, on recommendation of the supreme court, to dissolve them.

(4) A supreme advisory council, or council of state, which has the duty of advising the president on his request and may also submit proposals to him.

(5) The supreme court, which is independent of the government. The constitution is silent on how justices are appointed and on their tenure of office. Different codes of law govern Indonesians, Europeans, and foreign Orientals.

(6) The state controlling council, which accounts for public funds. It is independent of the legislature but makes recommendations to it.

Although not mentioned in the constitution, two other state organs have been established, namely:

(1) A national planning council responsible for drawing up plans for material and spiritual development;

(2) A national front consisting of the entire population to stimulate the potential toward completion of the Indonesian revolution.

IRAN

This Moslem constitutional monarchy was formerly known as Persia, which has a long history as a powerful state both in ancient times and for some centuries in the Christian era. In the past it was able to dominate adjacent territory in periods of strength and yet was open to invasion from northern steppes and western plains in times of weakness. Its modern history is a record of decay, at least until the discovery of extensive oil deposits there in the 20th century. This and its location next to the Soviet Union gave it a certain key importance in the national rivalries and the emergent independence of the Arab nations.

Prior to 1906, Iran was an absolute monarchy. A constitution granted by the shah, or king, in that year, with subsequent amendments, provided for a National Consultative Assembly of 200 members elected for a 4-year term. It provided also for a Senate of 60 members, half appointed by the king and half elected. They must be "well-informed, discerning, devout, and respected." The Senate was constituted for the first time in 1950. The king may dissolve either or both houses at any time.

The Assembly must include 20 doctors of theology, who act as a committee to veto any bill that contravenes the "holy principles of Islam." Moreover, newspapers may be punished for articles contrary to the fundamental principles of the state. The king, through his chosen ministers, may introduce bills in the Assembly which have precedence over other bills, the latter requiring as sponsors 15

assemblymen. In considering such bills, if they affect the jurisdiction of the king's ministers, the Assembly must allow the ministers to enter the debate. If they pass, the minister must either accept them or convince the Assembly that he should not. Ministers must be dismissed if a majority of the Assembly so votes. A bill introduced by a minister may be presented again if it is defeated. Over bills which pass both houses, the king has a limited veto, which may be overridden by a two-thirds majority. If there is disagreement between the houses over a bill, a conference committee of an equal number from both houses may work out a compromise to be resubmitted to both houses. In case of further disagreement, the king may follow the decision of the Assembly in accepting or rejecting the compromise.

The constitution may be amended by this procedure: If each house by a two-thirds vote proposes a change and the king consents, the proposal is submitted to an elected constituent assembly with the same number of members as the total of both houses. The proposal requires approval by a two-thirds majority and approval by the king.

The country is divided into 10 administrative provinces, 2 special provinces, and the city of Teheran, each under a governor-general. Provinces are divided into counties, each under a governor. The counties are divided into districts and groups of villages, each with its governing official. All the above officials are appointed by the central government. Individual villages, however, have a head man chosen locally.

IRAQ

Freed from Turkish rule during World War I, Iraq was assigned as a mandate to Great Britain by the League of Nations and continued as such until 1922. Britain then recognized it as an independent state and concluded with it a treaty of protection. A constituent assembly in 1924 enacted an organic law establishing a limited monarchy and a responsible government. In 1958 an army group overthrew the monarchy and, in an interim constitution, declared Iraq to be an independent, sovereign, Islamic republic but forming an integral part of the Arab nation. Another military revolution terminated the adherence of Iraq to the Arab Federation. The rulers promulgated in 1964 a new interim constitution, which was to be superseded by a permanent republican constitution within three years.

The 1964 constitution provides in effect for a military dictatorship or oligarchy. The manner of choosing the president is not defined, but, in the event his office becomes vacant, his successor must be a member of the national council of the revolutionary command, a body which is not defined in the constitution. The successor is elected in a joint session of the members of this body, the cabinet, and the national defense council, another body not defined by the constitution. The president appoints the prime minister and other members of the cabinet and, with them, lays down the general policy of the state. Both the president and members of the cabinet must be of Iraqui parents from a family resident in Iraq since 1900 A.D., of Ottoman citizenship, and, if married, must have wives with Arab parents and grandparents.

Under a constitutional amendment announced by the prime minister in late 1964, a Consultative Assembly was set up, the members being appointed by a "republican decree" to represent the provinces in proportion to population, one member for each 70,000 to 100,000 inhabitants. The cabinet ministers are *ex officio* members. Its function is to draw up a permanent constitution and to take part in legislation in the interim.

IRELAND

See *Eire, Great Britain.*

ISRAEL

The republic of Israel came into existence on May 14, 1948, when the British mandate over Palestine given by the League of Nations in 1922 was relinquished. The United Nations set up boundaries between Israel and its Arabic neighbors, a move which touched off a war in which the Arabic states tried to conquer Israel, but the latter defeated them and enlarged its territory beyond the limits set by the United Nations.

Israel, like Great Britain, has no written constitution. Its frame of government follows the British model in making the legislature supreme, the president having no more power than the British monarch, but the British system is extensively modified by "basic laws," which are expected eventually to form the basis of a written constitution.

The one-chamber legislature, known as the *Knesset*, adopted the name and size of the Jewish governing body of about 2000 years earlier. Members are elected for a 4-year term, which may be cut short by dissolution voted by the Knesset itself. They are elected by universal suffrage of inhabitants over 18 on a nation-wide system rather than by local constituencies. The method of election is unique. Each political party nominates candidates in a priority determined by the party. Voters cast ballots for a party, not a candidate. The number of members of each party seated in the legislature is determined by the proportion of the total vote cast for that party. Thus, if a party is entitled to seat 15 members, the 15 party candidates having the highest priority are seated. Under this sytsem, it is not expected that any one party will have a clear majority; hence the government is a coalition of parties.

The president is elected by the Knesset for a 5-year term by majority vote and may be removed by a three-fourths vote. He has no veto power but is required to sign all bills adopted. It is his function to select the prime minister, usually the leader of the party with the largest representation in the legislature. The prime minister chooses his cabinet, which may include non-members of the legislature. The latter may sit in the Knesset but without the right to vote. If the cabinet resigns or is, in effect, ousted by a vote of no confidence, the legislature is then required to dissolve itself, and a new election is held.

Civil and religious judges are appointed by the president on the recommendation of a nominating committee. There is no provision for courts to pass on the constitutionality of acts, but merely on their legality. Apart from statutes, Israeli law is based on English common law, Hebraic law, and Moslem law, the last being due to the fact that the country was ruled by Moslems for over 1200 years. The courts are required to accord complete procedural equality of the citizen and the government.

Local government is exercised by municipal corporations, local councils, and regional councils, members of which are popularly elected for 4-year terms. They operate under by-laws and with revenue sources approved by the minister of the interior.

A fundamental law provides that every Jew is entitled to come to Israel as an immigrant.

ITALY

Italy, now a republic, was once the center of the Western world's political authority under the Roman Empire and again the religious center of Western civilization in the religious union of the Roman Catholic Church. For centuries it was broken into fragments and subjected to foreign domination. It became a unity as a modern state only in 1861, when the king of Sardinia was proclaimed "king of Italy" by the first Italian Parliament. The remainders of the provinces of Mantua and Venetia were added in 1866. In 1870 Rome was entered by Italian troops, the last remnant of

the papal states was incorporated in the kingdom, and the "temporal power" of the pope was suppressed.

The Monarchy and Fascism. Under the monarchy the Italian constitution was the fundamental law granted March 4, 1848, to the Kingdom of Sardinia. Around this nucleus Italy was united, and it was adopted as the constitution of the new kingdom. This constitution vested executive power in the sovereign, who was to exercise it through ministers responsible to him. Legislative power resided in the king and a two-chamber legislature.

Under the leadership of Benito Mussolini, the Fascist party seized the government on October 22, 1922. Its emblem was an axe in a bundle of rods (fasci) carried by the attendants of the Roman dictators. The king accepted Mussolini as prime minister, and the government was gradually transformed. The constitution was not repealed, but much was added.

The dominant feature of the government was the control by the Fascist party. No other was tolerated. It numbered about 5 per cent of the population. The Fascist Grand Council named by the leader (*Il Duce*) might choose his successor. The prime minister and his cabinet issued decrees and executed them. The only other law-making body was the National Council of Corporations. The former Parliament remained but without power.

With the fall of Mussolini the Fascist party was abolished. The king resumed his functions, which, after the taking of Rome, he delegated to Prince Humbert as lieutenant general of the kingdom. The Allied Military Government for Occupied Territory followed the advance of the armies and gradually transferred control to Humbert and his council of ministers, assisted after September 1945 by a Consultative National Assembly. By the end of the year his authority extended over nearly all Italy.

The Republic. Meantime republican feeling was growing. A popular vote, June 2–3, 1946, showed that the north wished a republic and the south preferred to retain the monarchy, but the majority was for the republic. Victor Emmanuel had abdicated on May 9 and retired to Egypt, and King Humbert II and his family now left Italy. A constituent convention drew up a constitution which came into effect in 1948.

The constitution describes Italy as a "democratic republic founded on work." At the head of the government is a president elected by a joint session of the two houses of Parliament, to whom are added 3 delegates from each region. He must receive a two-thirds majority, but after three ballots a majority may elect. His term is 7 years, and he must be 50 years old. He has power to dissolve Parliament, except during the last 6 months of his term. There is no vice president. The speaker of the Senate serves in the event of temporary disability of the president. If the office becomes vacant, the speaker of the Chamber of Deputies orders a new presidential election.

Parliament is made up of the Chamber of Deputies and the Senate. The deputies, one for each 80,000 inhabitants, are elected by direct universal vote and serve 5 years. The senators are elected for 6 years from the regions, one for each 200,000 people, but at least 6 from each region except Aosta, which has one. Besides these, the president, who is himself a senator for life, can appoint 5 life senators from men eminent in science or arts.

The president appoints the prime minister and, on the latter's recommendation, other cabinet ministers. They need not be members of Parliament. The cabinet and prime minister can be forced out of office only by a direct vote of lack of confidence, not by a mere defeat of their measures.

Bills may be introduced by members of Parliament, by members of the cabinet on the president's authorization, by councils of the regions, and by popular referendum on a bill proposed by at least 50,000 voters. A bill approved by both houses goes to the president for approval. If he disapproves, the bill is sent back to Parliament. If it is again passed by both houses, it becomes law.

Italy has the usual system of local and higher courts and courts of appeal. The constitution creates a constitutional court with power to pass upon the constitutionality of laws, decide cases between regions, and try impeachment cases.

Administratively, the country is divided into 19 regions, some of them, as Sicily and Sardinia, partly autonomous; each has a council and executive. The regions are subdivided into provinces, and the provinces are divided into communes, each with its own elective councils. The national Parliament may dissolve the regional councils on specified grounds and arrange for new elections. Laws passed by regional councils must be approved by the president of the republic, who may refer it to the constitutional court for validity or to Parliament on questions of policy.

Roman Catholicism is the state religion, but other religions are tolerated. Civil marriage is allowed, and divorces may be granted. The House of Savoy and its descendants are excluded. Titles of nobility are no longer recognized, but those granted before 1922 may be used as part of the name.

The constitution may be amended by proposals passed by both houses of Parliament and passed again in 2 successive sessions at intervals of not less than 3 months. Thereafter the proposal must be again approved by an absolute majority of all members in each house. The republican form of government is not subject to amendment.

Relations with the Pope. The occupation of the city of Rome by Italian troops in 1870 and the making of this city the capital of the Kingdom of Italy suppressed the temporal powers of the pope. The papacy was unreconciled to this loss. Improved relations between the "Vatican" and "Quirinal," effected by the Fascist administration, led to the signing, on February 11, 1929, of 3 treaties whereby the Italian government recognized the full independent sovereignty of the pope over the City of the Vatican. The pope appoints bishops and archbishops if unobjectionable to Italy politically.

Italia Irredenta. The unification of Italy, 1861–70, did not succeed in uniting to the kingdom the entire population subject to Austria. Considerable territory remained "unredeemed." Italy entered World War I with the object of securing these territories under guarantees from the Allies through a treaty signed at London in 1915 with Great Britain, France, and Russia. The political situation was altered at the end of the war by the disintegration of the Austro-Hungarian Empire and by the demands of the kingdom of Yugoslavia. As a result Italy secured only some strategic points on the Dalmation coast. After World War II, by the treaty of 1947, Italy lost to Yugoslavia all its territory east of the Adriatic. Trieste, with its surrounding territory, was made a free port under the jurisdiction of the United Nations but subsequently with jurisdiction divided between Italy and Yugoslavia. Italy's frontier with France was "rectified," and the Dodecanese Islands were ceded to Greece.

Former Colonies. Before World War II Italy had a considerable colonial empire in Africa. The first acquisitions, in 1885, were Eritrea, on the Red Sea, and Italian Somaliland, on the Indian Ocean. Italian Libya, on the Mediterranean Sea, was taken from Turkey by conquest in 1911. Italian Somaliland was enlarged by the cession of a part of Kenya by Great Britain in 1924. Ethiopia was conquered and annexed in 1936. Albania was annexed in April 1939. Ethiopia was liberated by the British in 1941. Albania had driven out the Germans and set up a provisional government by the end of 1944, and in 1946 was proclaimed a republic. Eritrea was federated with Ethiopia in 1952.

IVORY COAST

Formerly a French territory, Ivory Coast voted in 1958 to become independent and remain outside the French Community. Under a constitution adopted in 1960, it declared itself a republic. It has a National Assembly of about 65 members elected by universal suffrage for a 5-year term from a one-party slate. There is a popularly elected president, who also serves for 5 years. He is the chief executive officer and may initiate legislation in the Assembly. In the event of his death in office, the president of the Assembly names a successor from that body. Laws become effective 15 days after transmittal to the president, who, however, may within the period return them to the Assembly for reconsideration or submit them to a referendum of the people.

JAMAICA

Jamaica, independent since 1962 and a member of the British Commonwealth, is a constitutional democracy with a government modeled on that of Great Britain. Parliament consists of a governor-general as representative of the sovereign, a Senate of 21 members, and House of Representatives of 45 to 60 members.

The House of Representatives is elected by universal suffrage for a 5-year term. The leader of the majority party is prime minister. Members of the Senate are appointed by the governor-general, 13 on the advice of the prime minister and 8 on the advice of the leader of the opposition. The governor-general has powers of veto, in which he may be advised by a privy council of six members whom he selects, two being present or former office holders.

JAPAN

According to Japanese records, Japan is an ancient monarchy, dating from the emperor Jimmu Tenno (B.C. 660). In the 16th century, when foreign intercourse began through the Dutch and the Portuguese, Japanese civilization had acquired its characteristic forms. Government was organized in a feudal system. The territory was divided among great lords, *daimyos*, possessing military retainers, *samurai*, and owing allegiance to the emperor at Kyoto but virtually independent and frequently at war with one another. Actual central power was exercised in the emperor's name by a succession of rulers called the shoguns. By one of these, in the early part of the 17th century, foreign intercourse, which at first had been welcomed, was prohibited and Japan remained closed to the outside world until the arrival of the American naval mission under Commodore Perry in 1853.

The "opening" of Japan was followed by the overthrow of the "shogunate," the restoration of the emperor, and the introduction in 1868 of a new period of progress called the era of Meiji or enlightenment. From that began a process of "Westernization" by means of which Japan transformed itself from feudalism to modern industrialism without such bloody revolutions as occurred when France, Russia, and China passed through a similar transformation.

A constitutional movement followed upon the "restoration." The feudal daimyos surrendered their powers; experiment began with quasi representative institutions. A constitution was promulgated in 1889, and in 1890 the first Imperial Diet, or representative legislature, convened.

The Meiji Constitution. By this constitution the emperor was sovereign, of divine descent, his person sacred. He both governed and legislated. He was apt to be guided by a small body of councilors, the *Gen Ro*, elder statesmen, who had no constitutional status but very great influence.

The Diet was composed of a House of Peers and a House of Representatives. The peerage was reorganized with European grades and titles. A law of 1925 diminished the number of peers in the upper branch and admitted a number of commoners selected by the emperor. At the same time, universal manhood suffrage was introduced. The lower house was elected for 4-year terms.

In theory, government was by a responsible ministry, but the Diet could not control the budget, the ministers of war and navy must be officers in service, and the privy council, an elderly and conservative body, could effectively oppose the ministry. This central government showed German influence. The local government was rather on the French model, with prefectures, districts, and towns governed by appointed officers, and controlled from above. Finally, the industrial revolution had created a group of influential families, the *Zaibatsu*, who controlled the economic life of Japan and influenced its politics.

Rise and Fall of the Empire. A long period of imperial expansion followed in the course of which Japan acquired Formosa, Korea, the southern half of Sakhalin, Port Arthur, and, as mandates after World War I, the former German Pacific islands north of the equator. In 1931, Japan seized Manchuria and conquered much of China. She began World War II by challenging the United States as a world power and quickly overran British, Dutch, French, and American dependencies in southeast Asia, proposing to organize them into a "co-prosperity sphere." Then came defeat, loss of the empire, and a new form of government.

The New Constitution. Under the terms of surrender in August 1945, Japan was allowed to retain her emperor but without his claim to divine authority. A constitution adopted in 1948 declares that the "emperor shall be the symbol of the state and of the unity of the people, deriving his position from the will of the people with whom resides sovereign power." All his governmental powers must be exercised on the advice and approval of the Diet, over whose acts he has no power of veto. In this respect, he resembles the British monarch. The Shintu religion is disestablished.

Testimony to Japan's reversal of its military past is the unique provision of the constitution by which Japan renounces war and forbids the maintenance of land, sea, and air forces. This is to be understood in the light of the umbrella which the strength of the United States held for her protection in the post-war period.

The sole lawmaking body is the bicameral Diet. The House of Representatives is elected by universal suffrage for 4 years, unless sooner dissolved. The House of Councilors is elected for 6 years, one-half retiring every 3 years. Laws require the consent of both houses, but the lower house may overrule the upper by a two-thirds vote. The prime minister is chosen by the Diet. He and a majority of his colleagues must be members. The cabinet is responsible to the House of Representatives. If it loses their confidence it must resign, or dissolve the House and order new elections.

The supreme judicial body is the supreme court. Judges of the supreme court are appointed by the cabinet and must, on their appointment and every 10 years thereafter, receive popular approval. The independence of judges is guaranteed, but they may be impeached. The supreme court may pass on the constitutionality of a law. The Diet alone may levy taxes and make appropriations. Local public entities elect their own assemblies and generally manage their own affairs.

The constitution guarantees civil rights, including freedom of speech, religion, assembly, collective bargaining, and academic teaching. Marriage is to be based on equal rights of the sexes in property rights, domicile, and divorce.

The constitution can be amended by a two-thirds vote of each house of the Diet and must be ratified by popular vote.

JORDAN

The kingdom of Jordan, formerly a part of the British mandated territory of Palestine, became independent under a treaty with Britain in 1946. For a brief period in 1958, it formed with Iraq, an Arab federation that lapsed after a revolution in Iraq.

Under the constitution of 1952, it is designated as the Hashamite Kingdom of Jordan. The king has an unusually large measure of control over the government. He appoints the 30 members of the upper house of Parliament, known as the Council of Notables, and designates its president. They serve for 8-year terms. He appoints the prime minister and other ministers and may dismiss them. He may dissolve the lower house—Council of Representatives—and thereby bring about another election, this 60-member body being elected by male suffrage. The new Council must be elected and hold its first meeting within 4 months of the dissolution. His veto of bills may be overridden by a two-thirds majority of each house. He appoints and may dismiss judges. The constitution may be amended by two-thirds vote in each house but cannot become effective without the king's signature.

KENYA

The former British East Africa, Kenya became independent in 1963 under an interim charter of 1963. At the end of 1964, the government declared itself a republic within the British Commonwealth. Legislative power resides in Parliament, consisting of a Senate and a House of Representatives. The Senate has 41 members elected by universal suffrage from districts for a term of 6 years. The members of the House of Representatives are popularly elected in part, from 110 to 130 constituencies, and these members choose other members, numbering 10 per cent of those popularly elected.

The president, who must be a member of the House of Representatives, is chosen by the elected members of the House, candidates to which must have declared their choice among presidential candidates as a condition of being placed on the ballot. If a majority vote for president cannot be obtained, the House is dissolved and a new election is held. The president may participate in proceedings in the Senate but may not vote there. He chooses ministers from both houses and appoints a vice president from ministers who are elected members of the House. Bills introduced into Parliament require his prior consent. On a vote of no confidence, a new election of House and president must be held.

KOREA

Korea was a kingdom from 668 A.D. until it was annexed by Japan in 1910. It was freed in 1945 by Russian and American forces, who divided it for military convenience at the 38th parallel of latitude. The United Nations held an election in 1948, which was boycotted in North Korea, subject to Russian occupation.

South Korea. The South Koreans, in 1948, adopted a republican constitution in which the elected president ruled without a cabinet. North Korea invaded the country in 1950, but was driven back by forces of the United Nations, chiefly American and South Korean troops.

In 1960, the constitution was revised to provide for a cabinet system on the British model. This was overthrown in 1962 by a military coup, and the next year a third constitution was adopted. It provides for a National Assembly of 175 members and a popularly-elected president with wide powers.

North Korea. The Russians organized elections in 1948, purportedly for the entire country of Korea, to choose the Supreme People's Assembly. It adopted a constitution of a Russian type setting up the Democratic People's Republic of Korea. Real power lay with the politburo of the Korean Workers' Party of 85 members chosen from and by the central committee of the party.

KUWAIT

Prior to 1961, this oil-rich monarchy was under the protection of Great Britain. A constitution was proclaimed in 1963 under which a National Assembly of 50 members was set up. Kuwait joined the Arab League in 1961. The ruler acts as prime minister, and most of the cabinet posts are filled by members of his family.

LAOS

Formerly a part of French Indo-China, Laos was erected into an independent state in 1949 as a constitutional monarchy. It has a National Assembly, whose members are elected for 5-year terms. The king has authority to dissolve the Assembly. From the outset of its independent career, Laos was torn by civil strife between groups with Communist backing, anti-Communist groups, and neutralists. A 14-nation conference in Geneva signed an agreement in 1962 guaranteeing the neutrality and independence of Laos, but disorders continued.

LEBANON

The republic of Lebanon was for 20 years after World War I a mandated territory of France. In 1944, powers formerly exercised by France were transferred to the Lebanese government.

The Lebanese constitution is an amended form of the constitution granted in 1926 by the French government. Religious rivalry affects the form of government in that the president must be a Maronite Christian, the prime minister a Sunni Moslem, and the speaker of the legislature a Shia Moslem. The president is elected by the Chamber of Deputies for a 6-year term and may be re-elected only after the lapse of 6 years. At the same session, a vice president is also elected.

The Chamber of Deputies consists of 99 members elected by universal suffrage for 6-year terms unless the Chamber is dissolved earlier. It meets twice a year on designated dates, but special sessions may be called by the president and must be called at the request of an absolute majority of the delegates. The president as well as delegates may introduce bills. The president appoints the prime minister and other ministers. In the event that the presidency is vacant, the cabinet exercises presidential powers until a successor is elected. The president's power of veto is limited in that a bill of which he disapproves will become law if passed a second time by an absolute majority of all delegates. He has greater power, however, in blocking a proposed amendment of the constitution. An amendment may be proposed by the Chamber and sent to the cabinet. If the latter disapproves, the Chamber must repass the proposal by a three-fourths majority. The president may then either accept the amendment or dissolve the Chamber. If the new legislature insists on the amendment, the president has the same limited right of veto as over ordinary laws. The chamber elects from its members 7 delegates as justices of the supreme court, in which 8 other members are the highest ranking magistrates.

LIBERIA

This republic on the west coast of Africa was founded July 26, 1847. In 1822, American and European colonization societies established a settlement to provide a permanent home for freed slaves. They administered it until the constitution of 1847 was adopted. The country is still governed under this constitution, with a few amendments, although the actual government is far from extending throughout the entire country, the vast majority of the population continuing under tribal rule.

Liberia is almost alone among modern countries in requiring ownership of real property as a qualification for voting. For the hinterland, possession of a hut is sufficient. The constitution in general is modeled on that of the United States. The presi-

dent and a vice president are elected directly by popular vote of qualified adults, men and women, for an 8-year term initially and may be re-elected for 4-year terms. The president has a limited right of veto over bills passed by Congress, which can be overridden by a two-thirds vote of each house. The constitution authorizes removing from office those in authority who become oppressors, but the manner of doing so is not prescribed. The president is assisted by a cabinet chosen with the advice and consent of the Senate.

Congress consists of (1) a Senate of 10 members elected for 6-year terms, but 3 or 4 of the members must run for re-election each 2 years and (2) a House of 39 members elected for 4-year terms. Two senators are elected from each county, while the number of congressmen elected from each county is roughly proportional to its population except that each of the three provinces in the hinterland is entitled to one only.

LIBYA

The kingdom of Libya comprises the former Italian colony of Libya. For centuries it was under the rule of the Ottoman Empire until the Italians occupied it in 1911. In World War II, the administration of Libya was taken over by Britain and France, the British controlling the provinces of Tripolitania and Cyrenaica, the French that of the Fezzan. In 1949 the United Nations decided that Libya should become a sovereign country by 1952. A constitution was adopted, and, on December 24, 1951, King Idris I, who had been recognized in 1949 as Amir of Cyrenaica, proclaimed the country's independence.

The present constitution provides for a hereditary monarch with a representative form of government. At first a federation of 3 provinces, the government was centralized in 1963, its 10 departments being administered by commissioners. The two-chamber Parliament consists of the Senate and the House of Representatives. The Senate has 24 members at least 40 years of age appointed by the king. Members are appointed for 8 years, with half the membership appointed every 4 years. The deputies in the House of Representatives are elected by adult suffrage on a population basis, one for each 20,000 inhabitants or major fraction thereof. They serve 4-year terms unless the House is dissolved earlier and must be at least 30 years of age. Bills may be initiated by the king or members of either house, except that the Senate has no initiative in regard to the budget. Government is conducted by a cabinet of ministers, the prime minister being chosen by the king, who appoints the other ministers on the recommendation of the prime minister. Ministers may be members of Parliament but need not be. The cabinet must resign in the event of a vote of non-confidence, in which case the king dissolves the house and a new election is held. The king may veto laws, but the veto may be overridden by a two-thirds vote of each house. If not so overridden, the vetoed bill may become law if repassed at the next session by a simple majority. The members of the supreme court are appointed by the king to hold office until they reach the age of 65.

LIECHTENSTEIN

This Alpine principality of 65 square miles is a hereditary monarchy, succession being in the male line only. There is a Diet of 15 members, elected by universal suffrage. Voting is direct and election is by proportional representation. An administrator for the state is appointed by the prince. There is a high court.

From 1867 to 1918, the principality was dependent on Austria, but the Diet proclaimed the complete independence of the state in 1918. Nevertheless, by treaty of 1920, Switzerland took over its diplomatic representation and administration of its postal and telegraph systems. In 1923, it was incorporated in the Swiss customs union.

LUXEMBOURG

This constitutional monarchy, known as a grand duchy, bordering on France, Belgium, and Germany, was given its rank as a principality by the Congress of Vienna in 1815. By the Treaty of London (1867), it was neutralized and its integrity and its independence were guaranteed. But, having been invaded and occupied by German armies in 1914, it abandoned neutrality and aligned its policies with Belgium.

The monarchy is heritable by either male or female heir. The present constitution is that of 1868 with later amendments. In 1919, universal suffrage was introduced with proportional representation of parties in the legislature.

The unicameral legislature, the Chamber of Deputies, consists of about 55 members elected for 5-year terms, barring prior dissolution of the Chamber. The grand duke has no veto power over bills, but he may dissolve the Chamber. He is assisted by a cabinet of members appointed by him, who may not be members of the Chamber. They may, however, introduce bills in behalf of the grand duke and may be called into attendance by the deputies. The grand duke is assisted also by a council of 21 members appointed by him for life. The legislature may also call on the council for advice on legislation. Local government is by popularly elected community councils headed by a mayor appointed by the grand duke. In order to amend the constitution, it is necessary for the Chamber to so resolve, whereupon it is dissolved, and a new Chamber is elected. This body, with at least three-fourths of its members present, must uphold the proposal by a two-thirds vote in order to make it valid.

MALAGASY

This former French protectorate of Madagascar was granted independence in 1960 and remained by plebiscite within the French Community. It has a National Assembly of 107 members elected by universal suffrage for a 5-year term and a Senate of 51 members chosen for staggered terms by representatives of groups—two-thirds regional and one-third social and economic. The president is chosen for a 7-year term by an electoral college comprising members of the Assembly, the Senate, and of provincial councils and delegates from local assemblies. He can initiate legislation. He is required to promulgate laws passed but may send them back for reconsideration. He has the power to appoint a vice president. He also chooses the prime minister and cabinet, who are responsible to him but must be replaced if the assembly votes no confidence in them. If the new cabinet fails in obtaining a vote of confidence, the Assembly is dissolved. If the new Assembly votes no confidence in the cabinet, the president must be replaced.

MALAWI

Prior to 1963, Malawi was a British protectorate. Initially a parliamentary democracy under a governor general, it decided to become a republic in 1966. It remained a member of the British Commonwealth. The legislature is unicameral, a National Assembly consisting of 53 members elected from 3 special-roll constituencies consisting of previously enrolled Europeans only and 50 from general-roll constituencies, which include all other adult citizens, male and female. Members must be able to speak English, they must vacate their seats if they leave the political party they represented on election. The chief executive appoints the prime minister, who selects the other members of the cabinet from the Assembly. A vote of no confidence requires selection of a different prime minister or dissolution of the Assembly. The chief executive alone, through his cabinet, may introduce money bills into the Assembly. He has the right to veto any bill. He appoints members of the supreme court on advice of the prime minister.

MALAYSIA

A "federal constitutional monarchy" formed from 14 former British dependencies. Nine of them had become independent in 1957 as the Federation of Malaya, each being ruled by a hereditary sultan. To this federation were added two former British Straits Settlements (Penang and Malacca) and the former British colonies of Singapore, Sarawak, and North Borneo. Singapore withdrew in 1965, claiming independence. The official religion is Moslem.

Under a constitution adopted in 1963, the "monarch," known as the supreme head of the federation, and a deputy to act in his absence are chosen for 5-year terms by a conference of rulers, consisting of the heads of the federated states. He, with the deputy, must be a head of a state and on election relinquishes his rule over the state, except that part of it relating to religious matters. The conference of rulers is empowered to veto certain types of laws, chiefly religious. When augmented by the premier and other rulers and ministers, it also advises on public policy.

Parliament consists of a Senate and House of Representatives. The Senate consists of 2 members elected by each state legislative assembly and 22 appointed by the federal head of state for their distinction and their capability of speaking for minorities and the aborigines. The term of office is 6 years. Parliament may, by majority vote, provide for election of all senators by popular vote. The Senate is not subject to dissolution. The House consists of members elected by universal balloting from the different states roughly in proportion to their population.

Bills, originating in either house, must usually pass both houses before going to the supreme head of state for approval. However, money bills to which the Senate objects may, if repassed by the House, by-pass the Senate. Other bills disapproved by the Senate also may be sent to the supreme head of state for his signature if repassed at the following session of the House. There is no provision for enacting into law a bill which the supreme head of state does not sign.

The supreme head of state appoints the prime minister, who is responsible to the House, and also the other ministers on the prime minister's recommendation. If the prime minister loses support of the majority in the House, he must request that the supreme head of state dissolve the House; if the latter refuses, he must resign, whereupon an attempt is made to form a new cabinet. The constitution may be amended by a two-thirds majority of all members in both houses of Parliament. Constitutionality of laws may be litigated in the courts, but the government must be permitted to intervene.

The states are governed by their heads and elective legislative assemblies. The constitution specifies the fields in which the federation and the states may legislate. When Parliament considers laws affecting specific localities, it must consult a national council for local government, made up of one member representing each state and 10 to represent the federal government.

MALI

Formerly French Sudan, Mali became an independent republic in 1958 as the Sudanese Republic, adhering to the French Community. It changed its name to Mali in 1960 and left the French Community. Under a constitution adopted in 1960, Mali has a unicameral legislature, the National Assembly of 70 members elected by universal suffrage for a 5-year term.

The president of the republic is elected by the National Assembly after the Assembly's president has nominated a candidate and the candidate has presented his program to the Assembly. If elected, his term lasts throughout the term of the Assembly unless cut short by a no-confidence vote. A second no-confidence vote within two years entails dissolution of the Assembly and a new election. The president appoints his ministers, who need not be members of the Assembly. He has the right also to propose measures for the Assembly, to insist on priority for them, and to disallow amendments not previously approved by him. If he disapproves of a bill already passed, he may send it back for mandatory reconsideration; if he still disapproves, he may seek a vote of confidence, which, if granted, automatically vetoes the measure.

In 1961, Mali joined with Ghana and Guinea in an agreement envisaging unification of their currency, foreign affairs, and national defense.

MAURITANIA

A former French territory which became an independent Islamic republic in 1960, electing to remain within the French Community. The president, who must be of the Islamic faith, is elected by universal suffrage for a 5-year term, as are also members of the National Assembly. The president as well as assemblymen can initiate bills in the legislature. He appoints the ministers. He can exercise a suspensive veto of bills by sending them back for reconsideration within 15 days but otherwise must promulgate them.

MEXICO

Mexico is a federal republic with a constitution modeled on that of the United States but with a number of modifications directed toward avoidance of abuses in its history since its independence from Spain in 1821. Rivalry between imperial and republican proponents took the form of frequent civil war until the adoption of a liberal republican constitution in 1857, which was temporarily in eclipse during 1864–67, an emperor, Maximilian, having been imposed by French power. Mexico's liberator, Diaz, held the presidency continuously from 1876 to 1911, when he was overthrown. A new constitution was adopted in 1917 designed to prevent a long rule, such as that of Diaz, and to break up the landed aristocracy upon whose power Diaz depended. Advanced features of social reform also were introduced by the country's fundamental law.

The national government is entrusted to a president and a bicameral legislature—Senate and House of Representatives. The Senate consists of 60 members, 2 from each of the 29 states and the federal district, elected by universal suffrage for 6-year terms. The House consists of one deputy for each 170,000 inhabitants. Deputies are chosen for 3-year terms. No member of Congress may succeed himself. Bills may originate from either house and also from the president and from state legislatures. The president may veto a bill but the veto may be overridden by a two-thirds vote of both houses. Suffrage may be exercised by all citizens who have an honest means of livelihood and who are over 18 if married and over 21 if unmarried.

The president is elected by universal suffrage for a 6-year term. If the office becomes vacant in the first 2 years, Congress elects an interim president and calls a new election for a president to complete the term. A vacancy in the last 4 years is filled by a new president elected by Congress for the balance of the term. The president has sole discretion in the choice and dismissal of his cabinet. In no case may a president serve more than one term.

There is a supreme court of 27 members appointed by the president and subject to Senate approval within 10 days, failing which they are considered approved.

Ownership of land is restricted to Mexican citizens or to foreigners only if they agree to be bound therein as citizens. No commercial company may own rural real estate. Electric power may be developed and distributed only by the federal gov-

ernment. Religious institutions are forbidden to own land.

A labor code, incorporated in the constitution, provides for minimum wages, equal wages for equal work, profit sharing, double time for overtime work, a restricted right of strike or lockout, and compulsory arbitration.

MONACO

A tiny principate which, except for a small strip of Mediterranean coast, is entirely surrounded by French territory. The state is the private possession of the prince, and was governed autocratically until January 7, 1911, when a constitution was granted. This constitution was suspended in 1959 by the prince and was replaced in 1962 by another which recognizes the hereditary monarchy, although the reigning prince renounced his "divine right" to rule. A legislature of two houses is provided—the National Council of 18 members and the Communal Council of 16 members, both elected by universal suffrage. The constitution can be amended only with the approval of the National Council. The supreme tribunal is the custodian of fundamental liberties.

Representation on a popular basis is accorded to Monaco, La Condamine, and Monte Carlo, the three "communes" which comprise the principate. Public revenue and the income of the prince are derived almost entirely from the concessions to gambling establishments.

MOROCCO

Prior to 1956, what is now the constitutional monarchy of Morocco was, from 1912, divided into a French protectorate and a British protectorate, the area of Tangiers being from 1923 an international zone. The ruler was a sultan. Its independence was recognized in 1956, and the sultan, Mohammed V, changed his title to king. While retaining the supreme religious authority which was his as sultan, he planned to share his political authority under a constitution framed by himself. His son, Hassan II, submitted a constitution to referendum by universal suffrage in 1962, and it was approved by an overwhelming majority.

The crown descends in the male line. The king appoints the prime minister and other members of the cabinet and may dismiss them. He presides over meetings of the cabinet, the supreme court, and the supreme council for national reconstruction and planning. The legislature consists of a Chamber of Representatives and a Chamber of Councilors. Representatives are elected by universal suffrage for a 4-year term. Councilors are elected for a 6-year term, one-half renewable each 3 years, by an indirect method. Two-thirds are chosen by an electoral college consisting of town, provincial, and county councils; the remaining third are elected by chambers of commerce, industry, arts and crafts, and delegates from labor unions. Only members of the electoral college, chambers of commerce, or unions are eligible. The king, through his ministers, may propose bills for the legislature which have priority over other bills. If the legislature fails by the end of the year to pass the budget proposed by the cabinet, it is considered adopted as originally proposed. If a bill proposed by the cabinet is rejected by the representatives, it may still be introduced into the Chamber of Councilors. If a bill is voted down by both chambers, the cabinet may reintroduce it into the Chamber of Representatives; if it receives a two-thirds vote of approval, the king makes the final decision on its validity. The representatives may compel resignation of the cabinet by a vote of no confidence or of censure passed by a "wide majority."

If the king disapproves of a measure passed by the legislature and the legislature refuses to meet his wishes in reconsidering it, he may submit it for final acceptance or rejection to a popular referendum. If it is accepted, the Chamber of Representatives is dissolved and a new election is held.

Constitutional amendments, which originate from the prime minister or the legislature, must be approved by a "wide majority" of each chamber and then submitted to a referendum. The institutions of the monarchy and of the Islamic religion are not subject to constitutional amendment.

NEPAL

This Hindu constitutional monarchy owes its long history of independence largely to its rugged terrain in the Himalaya mountains between China and India. Prior to 1951, the king was a puppet, and the country was ruled arbitrarily by a hereditary prime minister belonging to the Rama family. In that year, the power of this family was broken and the king established his authority. He proclaimed a constitution in 1951 under which there was an elected Congress and a cabinet. In 1959, the king dissolved Congress and assumed sole leadership. Three years later, he promulgated a new constitution, which, however, he may revoke in an emergency.

The constitution of 1962 provides for a National Congress, partly indirectly elected and partly appointed. There are 90 elected members, their electors being zonal congressmen elected by district congressmen, who in turn are elected by village and town congresses, recognized as the basic units of democracy. Appointed members of the National Congress comprise 19 representatives of professional organizations and university graduates, and royal nominees not exceeding 19 per cent of the elected members. Executive power rests with the king and his ministers, whom he chooses from the National Congress.

NETHERLANDS

The Dutch nation arose in the 16th century by the revolt of the provinces of the "low countries" against Spain. In 1579, the provinces of Holland, Zealand, Utrecht, Gelderland, Groningen, Friesland, and Overyssel joined to form the "United Netherlands" under the prince of Orange as governor, or *stadthouder*. The remaining provinces were resubjected to Spanish authority and experienced a different fortune. In 1830, they united to form the present kingdom of Belgium.

In 1815, the Netherlands was reconstituted as a sovereign state and was raised by action of the "great powers" to the rank of a kingdom. The constitution was promulgated in 1814, was revised in 1815 after the addition of the Belgian provinces, in 1840 after their secession, in 1848, and 10 times thereafter. In 1917 an electoral reform act provided for universal suffrage and for proportional representation.

The royal succession is the direct male line of descent from Prince William of Orange. In default of male heirs, the female heir becomes queen.

The legislative body is known as the States General and comprises a First Chamber of 75 members elected by the provincial legislatures for a term of 6 years, one-half retiring each 3 years, and of a Second Chamber of 150 members, chosen for 4 years by citizens of both sexes above 23 years of age on a system of proportional representation. Voting is compulsory. Both men and women of the age of 25 are eligible for election to the States General. Initiation of laws is restricted to the government and to the Second Chamber, the First Chamber having power only to approve or to reject but not to amend. The sovereign may dissolve either or both chambers, in which case a new election must take place within 40 days and the first session be held within 3 months.

Government is conducted by the sovereign and by a council of ministers, one of whom is appointed president of the council. There is also a "state council" of 14 members, appointed by the sovereign. The sovereign presides over this council, which has

consultative participation in both legislative and executive matters.

The Provinces. The 11 provinces of which the Netherlands is composed are North Brabant, Guelders, South Holland, North Holland, Zealand, Utrecht, Friesland, Overyssel, Groningen, Drenthe, and Limburg. They have a large autonomy and (subject to the veto of the sovereign) a local legislative power which is exercised through assemblies, "the provincial states," chosen for 4 years by the same electors as choose the national second chamber. These bodies meet twice annually, and in the intervals between sessions they are represented by permanent commissions, or "deputed states," of 6 members, who administer the affairs of the provinces and oversee the execution of the laws. A commissioner appointed by the sovereign presides over both the provincial states and the deputed states, and in the latter body has a deciding vote.

The Dutch "communes," or municipal corporations, number over 1100 and are governed by councils chosen by the same electors, residents in the commune, as choose the national Second Chamber. The by-laws of the council are subject to the veto of the sovereign. The municipal budgets and all proposals to alienate municipal property must receive the approval of the provincial states.

A further central control is exercised through the mayor, who is a state as well as a municipal officer. The police are under his authority, and he has a suspensive veto on resolutions of the council for 30 days, during which time the provincial states must be advised. The municipal executive power is intrusted to the mayor and to a commission of aldermen, 2 to 4 in number, elected by the council. This commission is a body analogous to the "college of echevins" of the Belgian commune.

Dutch civil and criminal law is based on the Roman law and reflects its principles. Trial by jury is unknown. There are a high court of the Netherlands (court of cassation), 5 courts of appeal, 19 district tribunals, and 62 cantonal courts. The cantonal courts deal with minor offenses and have one judge each. All judges, 3 in number for appeal and district courts and 5 for the high court, are appointed by the sovereign for life. They can be removed only by a decision of the high court. There are also juvenile courts, presided over by one judge unless the penalty may be 6 months or more of imprisonment, in which case there are 3 judges.

Colonies. Previous to World War II, the Netherlands possessed a vast colonial empire, the acquisition of which dated from the 17th century. But in 1965 its overseas territories included only Surinam, or Dutch Guiana, on the northeast coast of South America and the Netherlands Antilles in the Caribbean Sea, comprising two groups of three small islands each, about 500 miles apart.

Surinam is part of the United Kingdom of the Netherlands. In 1950 it acquired local self-government. It is administered by a governor appointed by the sovereign in Europe, a ministry of 9 ministers, and a legislative council of 36 members elected by universal suffrage for a 4-year term.

Similarly, the Netherlands Antilles is constitutionally the equal of the Netherlands and Surinam, the Dutch sovereign being represented by a governor. The latter is assisted by a cabinet responsible to the legislature of 22 members elected for a 4-year term by universal suffrage. The country consists of the Windward Islands (Curaçao, Aruba, and Bonaire) and the Leeward Islands (St. Eustatius, Saba, and part of St. Martin). Each island has control of its own affairs, but in the common interest sends elective representatives to the *Staten* (legislature). The governor has charge of the colony's external affairs, while the executive power in general internal matters is vested in the cabinet responsible to the legislature.

NEW ZEALAND

This constitutional monarchy was from 1840 until 1852 a British colony. In the latter year it was granted responsible government. As a self-governing dominion it formed part of the British Empire and later the British Commonwealth of Nations, as the latter organization was defined in the British Statute of Westminster Act of 1931. Nevertheless, New Zealand was slow in accepting its role as an independent country within the Commonwealth. It adopted this Act in 1947.

New Zealand does not have a formal constitution. Its mode of government rests on ordinary laws which may be repealed as such, with the exception of 6, which by their terms can be repealed only by a three-fourths majority. Of these 6, 3 relate to the formation of electoral districts, one provides for a secret ballot, one fixes the term of Parliament at 3 years, and the last fixes voting age at 21. Women were first permitted to vote in 1893.

The monarch of New Zealand is the British monarch, who, when not in New Zealand, functions through a governor-general appointed by the British crown on the advice of its New Zealand ministers. The governor-general is assisted by an executive council, a body consisting of the prime minister and 14 other cabinet members. He is not necessarily bound by its advice but, if he disagrees, refers the matter promptly to the crown. Parliament consists of the governor-general and the General Assembly of 80 members elected by universal suffrage for a 3-year term unless dissolved earlier. Four members must be of the Maori race from Maori election districts. Members of the cabinet must be members of the majority party in the Assembly. Orders-in-council (executive orders) are issued by the executive council pursuant to or in conformity with laws, but the Assembly acts as a watchdog over them through a statutes revision committee, which is charged with the duty of calling the Assembly's attention to orders which appear to trespass on individual liberties, to make unexpected use of statutory authority, or to require clarification. The Assembly may bring about the resignation of the cabinet by passing a resolution of no confidence or rejecting a vital proposal of the government, but this does not necessarily entail dissolution of the Assembly, this being in the discretion of the governor-general.

In addition to the hierarchy of regular courts, New Zealand has a court of arbitration concerned with awards and general orders governing wage determinations and employment in industry.

NICARAGUA

Under the constitution of 1962, the legislative power is vested in a Congress consisting of (1) a Senate of 16 members chosen for 6 years, of ex-presidents who sit for life, and of defeated presidential candidates, who sit for one term; and (2) of a Chamber of Deputies elected for 6 years by universal suffrage. In each house the majority party is assigned two-thirds of the seats and the minority party one-third. Voting is compulsory. Suffrage is possessed by all persons over 21 years of age, literate married persons over 18, and college graduates under 18. Bills may be initiated only in the Chamber, by deputies and the president. If the Senate disapproves or amends a bill by a two-thirds majority and the Chamber disagrees, the bill is rejected. If the Senate's disapproval falls short of a two-thirds majority, the Chamber may validate it by a two-thirds majority. The president has a limited right of veto, which may be overridden by a two-thirds majority of Congress in joint session.

The president is popularly elected for a term of 4 years and is ineligible to succeed himself. There is no vice president; in the event of a vacancy in the presidency, Congress elects a person to fill it.

By the Bryan-Chamorro treaty of 1916, the

United States obtained, by payment of $3,000,000, exclusive rights to build in Nicaraguan territory an inter-oceanic canal, with a naval base on Fonseca Bay and a leasehold of the Corn Islands.

NIGER

The republic of the Niger, formerly a part of French West Africa, became independent in 1960. It voted to adhere to the French Community. The president is elected by direct universal suffrage for a 5-year term. Legislative power is vested in a National Assembly of about 60 members, likewise elected by direct universal suffrage for a 5-year term unless earlier dissolved. The president is assisted by a cabinet, headed by a prime minister, which is responsible to the Assembly. In the event that the Assembly passes a motion of censure by a two-thirds majority or rejects a vote of confidence by an absolute majority, the cabinet is required to resign and the president dissolves the Assembly, whereupon a new election is held.

NIGERIA

Nigeria became independent in 1960 after more than half a century of British rule. It is a republican federation of 4 regions—Northern, Western, and Eastern Nigeria and the federal territory of Lagos. Each region has its own bicameral legislature, consisting of a nominated house of chiefs and an elected house of assembly, with a prime minister and 17 ministers.

The federal Parliament consists of a Senate of 44 members nominated from the 4 regions and a House of Representatives of 312 members elected by adult suffrage in Eastern and Western Nigeria and male adult suffrage in Northern Nigeria. The Senate is presided over by the president, who is elected in a joint session of Senate and House. It has power to review bills sent to it by the House of Representatives and may initiate any bill not dealing with money. The executive is a council of 27 federal ministers under the prime minister. The constitution gives the regional legislature jurisdiction over social services, local taxation, and government, and regional roads and development. The federal government controls defense, currency, railways, trunk roads, and other matters of national import.

NORWAY

By the Conference of Vienna, 1814, Norway was united to Sweden under the sovereignty of the Swedish king. The union was personal in the monarch, each country retaining its own nationality, government, and laws. On June 7, 1905, Norway declared this union dissolved, and an accord to this effect was signed with Sweden in October 1905. Public opinion in Norway, to a certain extent, inclined toward a republic; but reasons of policy appear to have prevailed over the naturally democratic instincts of the Norwegians, and, by a plebiscite, the throne was offered to Prince Carl of Denmark, who took the title of Haakon VII. The constitution of Norway is that which has existed since May 17, 1814, with a number of amendments. The executive power resides in the king, who acts through ministers responsible to the Norwegian Parliament. Before 1913, the king had a qualified veto over legislation. In that year it was made suspensive, that is, a measure passed by three successive Parliaments formed by separate elections becomes law without the royal assent.

The national legislature, called the *Storthing*, is elected by universal suffrage of all Norwegians over 21 years of age. The election of the Storthing, which numbers 150 members, takes place every fourth year, is direct, and according to proportional representation. Upon assembling, each Storthing divides itself into two bodies, one called the *Lagthing*, composed of one-fourth of the membership. The remainder form the *Odelsthing*. These two bodies ordinarily act as separate houses; but, in the case of disagreement, they meet in a joint session and a final decision is reached by a majority of two-thirds of the voters. An amendment to the constitution in 1913 gave to ministers the right to sit in the Storthing, but without a vote.

For local government, the country is divided into 20 districts; 2 of them, the cities of Oslo and Bergen, are urban, and 18 of them are rural counties, or *fylker*. The chief executive, or *fylkesmann*, is appointed by the crown. Districts are governed by elective councils with a membership of from 13 to 85, while the administration is conducted by an administration council chosen from among the representatives. In local government, women with property qualifications gained the vote and the right to representation in 1901. In 1910, their suffrage became the same as that of men.

Justice is administered by 106 district courts with 5 higher tribunals and a supreme court, all of which handle both civil and criminal cases. Criminal cases may be tried with or without a jury.

Dependencies. These include the Spitzbergen Archipelago, acquired in 1920, and Jan Mayen Island in the Arctic Ocean; Bouvet and Peter I. islands, in the Antarctic; and a section of the Antarctic continent southeast of the Falkland Islands, ownership of which was claimed in January 1939.

PAKISTAN

This Islamic republic was, before 1947, a part of the British Dominion of India. In 1956 it became an independent republic within the British Commonwealth. It was separated from India, being primarily Islamic in religion whereas India was primarily Hindu. Exchange of populations followed the separation to reduce the religious minorities in the two countries. Pakistan is in two parts, East and West, divided by 1000 miles of Indian territory. The constitution, adopted by referendum in 1960, guarantees freedom of religion, but forbids any law repugnant to Islam.

The president must be a Moslem of at least 35 years of age. He is elected for a 5-year term by an electoral college consisting of representatives elected by each of 80,000 territorial units, half from each province. Suffrage is universal. The president appoints ministers and may remove them. He also appoints members of the supreme court. The president may be removed for willful violation of the constitution or gross misconduct by a three-fourths majority vote of the National Assembly, a procedure which disqualifies him for 10 years from re-election to the presidency. If fewer than half the assemblymen vote for removal, these assemblymen who sought his dismissal forfeit their membership in the Assembly. The president's term may be cut short also if he dissolves the Assembly, his term expiring 120 days after the dissolution. He may be re-elected unless he has continuously held office for over 8 years, but this disqualification may be set aside by a joint session of national and provincial assemblies.

The National Assembly consists of 150 members elected for 5-year terms, half from each province. Three members from each province must be women. The elections are, like those for the president, indirect, the electors being chosen from territorial units grouped into constituencies. Bills passed are sent to the president for his signature. If he withholds assent, they are returned to the Assembly; if it repasses the bill by a two-thirds majority, the president may then submit it to a referendum in the electoral college. The president may convoke the Assembly at any time and also dissolve it, unless it has been convoked by the speaker on petition of one-third of the members, in which case the speaker only can dissolve it.

Each province is headed by a governor appointed by the president and has a legislature of 155 members elected for 5-year terms. In case of disagreement between a governor and a provincial assembly, the matter is settled by the National Assembly.

PALESTINE

See *Israel, Jordan.*

PANAMA

The republic of Panama owes its independence to the United States. From 1821 until 1903, it was a part of Colombia. When the latter country rejected a proposed treaty with the United States for construction of a canal across the Panama isthmus within Colombian territory, the department of Panama declared its independence and was recognized 10 days later by the United States, which guaranteed the independence and internal order of the new republic of Panama. This guarantee was part of a treaty providing for construction of the Panama Canal and payment to Panama of a lump sum and later annuities. The annuity was originally $250,000 but was increased to $430,000 in 1936 and to $1,930,000 in 1955.

At Panaman request, the United States in 1936 withdrew its guarantee of independence. The original treaty excluded Panama from exercise of any sovereign rights in the Canal Zone, but, on the theory that this did not extinguish theoretical sovereignty, it was agreed that the Panaman flag might be displayed along with the American flag in areas under civilian control. An incident involving the tearing down of the American flag sparked a demand in 1962 for renegotiation of the treaty between Panama and the United States.

Colombia protested the action of the United States in supporting the independence of Panama in 1903 and refused recognition of Panama until 1914, when it agreed to extend recognition only if the United States paid it $25,000,000. A treaty so providing was ratified by the United States Senate in 1921, and diplomatic relations between Colombia and Panama were established in 1924.

The first constitution of the republic was adopted February 13, 1904. It was replaced in 1946 by the present constitution, which provides for a legislature known as the National Assembly. This body is elected for 4 years on the basis of one member for every 15,000 inhabitants. It meets annually on the first day of October.

The executive power is entrusted to a president, who is chosen by direct universal suffrage for a term of 6 years and is ineligible for the following 2 terms. The Assembly chooses also 2 vice presidents. The president nominates and is assisted by a cabinet of 7 members, who may attend the Assembly but without the right to vote. The republic is divided into 7 provinces, each of which is under an elected governor.

The laws dating from the period of union with Colombia were replaced in 1917 by new civil and criminal codes. Under these codes, capital punishment is prohibited. Foreigners are prohibited from mingling in politics and may be ejected from the country for criticism of public offices or institutions. The laws relating to mining, industry, and exploitation of land are favorable to foreign investment and enterprise.

PARAGUAY

The republic of Paraguay, like Bolivia, is an inland country, possessing no seaboard on the South American coast. The country was settled by Jesuit missionaries to the Indians. Paraguay was included within the Spanish viceroyalty of La Plata, organized in 1776, but, on the revolt of Argentina, Paraguay declared for separate independence, August 10, 1811. The revolutionary government was established under two "consuls," but it rapidly dissolved into a typical dictatorship, which continued until 1870. Under the last period of dictatorship, Paraguay was involved in sanguinary struggles with Brazil, Argentina, and Uruguay, which were ruinous to the country in loss of life and territory.

The constitution promulgated November 25, 1870, completely reorganized the government. It remained nominally in force until 1936, when a military clique seized the government. A new constitution of strongly authoritarian tendency was adopted by plebiscite in August 1940.

By this constitution the executive power is entrusted to a president chosen for a term of 5 years by popular vote. He may be once re-elected; a vacancy is filled by the Assembly. The president is commander in chief of the army and navy and is chief administrator of the state. With the approval of the council of state he may declare war, make peace, negotiate treaties, and admit or exclude papal rescripts. He has a cabinet of not less than 5 ministers, and all his measures must be countersigned by a responsible minister.

The Council of State includes the ministers, with the archbishop of Asuncion, the rector of the national university, and other members appointed by the president on a corporate basis.

The legislative power is vested in an Assembly, whose members are chosen by direct popular vote on the basis of one for each 25,000 inhabitants. They serve for 5 years. In some matters the Assembly may initiate legislation; in others, it acts on the recommendations of the executive, who needs only to inform the Assembly of his policies before carrying them out. The president may veto any measure. The Assembly meets annually, but may be summoned in extraordinary session by the president. During the recess of the Assembly, the president and cabinet may issue decrees having the force of law. Suffrage extends to all citizens, including women, who are over 18 years of age. Voting is compulsory.

At the head of the judicial system is a supreme court of three justices, appointed by the president and council. A tribunal of accounts deals with questions of administrative law. Below these are courts of appeal, civil and criminal, and local courts. These are appointed by the president with the approval of the supreme court.

The constitution contains no provisions as to local government; but by law the country is divided into two sections, the eastern, "Oriente" (east of the Paraguay River), and the western, "Occidente" (west of the Paraguay River). Oriente is divided into 12 departments; Occidente is divided into 3 military districts. The state religion is declared to be Roman Catholic; other religions, however, are tolerated.

The constitution provides that the state may control the economic life of the people, even to the extent of forced migrations of population. Private property is recognized, but its use may be regulated. The press is under strict censorship.

PERSIA

See *Iran.*

PERU

The republic of Peru arose from the vice-royalty of Peru, which in the Spanish colonial period was considered the ranking kingdom of the New World. Here Spanish prestige and authority were more strongly entrenched than elsewhere, and it was not until 1821 that, by the combined assistance of the armies of Bolivar and of San Martin, with forces from Argentina and Chile, Spanish authority was overthrown.

Peru became an independent republic July 28, 1821. The present constitution of Peru went into effect on April 9, 1933. Political disturbances in 1936 led to a suspension of constitutional government, with Benavides as dictator, until November 14, 1939. Then a constitutional regime was restored but with amendments which tended to increase the power of the executive.

The executive authority is in the president, elected directly by universal suffrage for a 6-year term. He must receive a majority of the votes, such majority being at least one-third of the valid votes. Otherwise, Congress chooses the president from the top 3 candidates. Two vice presidents are elected at the same time and by the same method. The president is ineligible to succeed himself, and anyone who proposes such re-election is barred from public office. Ex-presidents sit as senators for the first term. The cabinet ministers, known as the council of ministers, through whom the president discharges the executive functions, are selected by the president and hold office at his pleasure. The constitution provides that a minister may participate in congressional debates and may not continue in office if either house expresses a loss of confidence. Members of either house may accept posts in the cabinet, but their privileges as congressmen are suspended as long as they occupy their executive offices.

The legislative power is vested in a Congress, composed of a Senate of 53 members and a Chamber of Deputies of 184 members, all elected for 6-year terms. Suffrage is confined to literate citizens over 21 if single and over 18 if married. It is compulsory for those under 60.

In the event of disagreement on a bill between the Senate and Chamber, the bill is sent back to the house where it originated. If the latter refuses to accept the amendments, "Congress shall decide" between the two versions. Congress has power to interpret the laws. It chooses the members of the supreme court from 10 candidates nominated by the president.

The constitution provides that the state shall protect the Roman Catholic Apostolic religion. Relations between the church and the state are fixed by treaty. Priests may not be members of Congress or elected to the presidency. The constitution can be amended by vote of Congress in 2 different legislative sessions, in each of which sessions a majority of all members in each house must be recorded in favor of the amendment.

For interior and local administration, the country is divided into departments governed by popularly elected councils. One of the functions of these councils is to give an account to the supreme court of shortcomings committed by members of the judiciary.

PHILIPPINES

The Philippine republic came into existence on July 4, 1946. The Philippine Islands were a colony of Spain from 1565 to 1898, when they became a dependency of the United States. In 1934, the United States Congress passed an act providing for an agreement with the Philippines that they should receive independence after a 10-year transitional period with the status of a commonwealth. The Philippine people approved the agreement by plebiscite the same year. The 10-year period expired in 1944, but full independence was delayed until after the end of World War II.

The Philippine constitution, first adopted in 1935, is modeled on that of the United States. The president, with the vice president, is elected for a 4-year term and may be re-elected once. Suffrage is universal for all citizens over 21 who can read or write English, Spanish, or a native tongue. The president is assisted by a cabinet consisting of 11 departmental secretaries and 9 other secretaries of cabinet rank, all chosen by the president.

Congress consists of a Senate of 24 members elected at large for a 6-year term, one-third retiring each 2 years. The House of Representatives consists of a maximum of 120 members elected from the 56 provinces and apportioned according to the population of the provinces. In order to become law, a bill must pass both houses and be signed by the president. The latter has a limited right of veto, but it may be overridden by a two-thirds vote of each house. Money bills originate in the House, but the president may veto individual items, subject to the power of Congress to override the veto.

There is a supreme court consisting of the chief justice and 11 associate justices, all of whom are appointed by the president with the consent of the commission on appointments. The latter is a body consisting of 12 elected from each house by its members on the basis of proportional representation of political parties. The supreme court may declare laws or treaties unconstitutional if at least 8 members concur in the judgment.

Each province elects a governor, vice governor, and a 3-man provincial board. The constitution declares that natural resources, other than agricultural land, belong to the republic and may not be alienated. Leases are limited to 25 years, renewable for another 25 years. By agreement in 1948, expiring in 1974, American citizens as well as Philippine citizens may be granted such leases. The government granted leases to the United States of numerous military, naval, and air bases for a 99-year period.

POLAND

The People's Republic of Poland was set up in 1947 under effective Russian control. During World War II, Poland was conquered by Germany, and a government in exile was recognized by Great Britain and the United States. When the German army was driven out by Russia, the latter set up and recognized a committee of national liberation. These were merged after the war, and an election was held while the Russians still occupied the country. The Communist party was swept into power, and it promptly set up a Communist-type government.

The present constitution, adopted in 1952, offers the unusual example of a republic without a president, his place being taken by a council of state.

The constitution declares that Poland is a people's democracy based on an alliance between the working class and the working peasants. The highest organ of state authority is the *Seym*, whose members are elected by universal suffrage for 4-year terms, one member for each 60,000 inhabitants. In practice, the candidates are selected by the Communist party, one candidate for each seat. It passes laws and exercises control over other organs of the state and adopts the national economic plans.

The Seym chooses a council of ministers, whose duty it is to guide the work of the Seym, present the economic plans, and also to insure the execution of laws and protection of public order. The members may be removed by the Seym and, between sessions, by the council of state.

The executive power lies, as already stated, with the council of state, the members of which are elected by the Seym from among its members. They consist of a president, 4 vice presidents, a secretary, and 9 other members. The council of state lays down universally binding interpretations of the laws and may issue decrees having the force of law when the Seym is not in session. It has treaty-making powers and the power to proclaim martial law or military mobilization. It also exercises ultimate control over the local people's councils.

People's councils are elected in towns, districts, and other minor subdivisions of the country, those in smaller subdivisions being subject to those in the larger subdivision of which they are parts. Each people's council acts through a presidium. Their function is to insure the maintenance of public order and watch over the observance of the people's rule of law. In other words, they form the mechanism by which the authority of the state makes itself felt.

There is a supreme court whose judges are appointed for 5-year terms by the council of state.

PORTUGAL

Portugal, a recognized state since the 12th century, was a monarchy until 1910. Owing to a revolution in that year, the king fled from the country, and, on October 5, 1910, the republic was proclaimed under a provisional government. A republican constitution was adopted August 20, 1911. A radical revision of it was promulgated on May 28, 1932, and ratified by popular vote on March 19, 1933.

The new constitution is intended to provide for a corporate state under a dictatorship. Legislative power is vested in a Parliament of one chamber, called the National Assembly, but the members of this Parliament are all of one party. It consists of 90 members elected for 4 years by the people and by trade corporations. The president is elected for 7 years by direct vote. He must be at least 35 years of age. A privy council of 10 men assists him and he appoints the ministers, who are responsible to him. Suffrage is granted to male citizens able to read and write or taxpayers and to female citizens having at least a secondary school education. A corporative chamber, made up of appointed representatives of economic groups, considers and reports upon all bills before they are submitted to the Assembly.

The judicial system comprises a supreme court at Lisbon, three courts of appeal at Lisbon, Coimbra, and Oporto, and courts of first instance in 157 judicial districts with 48 municipal courts.

Portuguese Colonization. In the 15th century, Portugal led Europe in the field of exploration and colonization. Her fleets explored the coasts of Africa, established forts and depots of trade, and thence extended Portuguese colonial power to the Indian Ocean, Malaysia, China, and Formosa.

After a brief period of brilliant enterprise, decline set in; the Portuguese colonial possessions of today are mere vestiges of a once vast empire. In 1951, their status was changed from colonies to overseas territories, each having a governor and administrative autonomy. All Africans were given Portuguese citizenship. Customs duties were abolished in 1961 to create a "national economic unity." The overseas territories include the Cape Verde and Madeira islands, Angola and Mozambique in Africa, and a few smaller dependencies in Asia and Melanesia. Portugal thus set its face resolutely against the policy followed by Britain, France, the Netherlands, and Belgium of granting full independencies to its colonies. The small overseas territory of Goa was conquered by India in 1961.

RHODESIA

Formerly the British dependency of Southern Rhodesia in southeastern Africa, Rhodesia in 1965 unilaterally declared its independence of Great Britain. It has a relatively large minority (3 per cent) of white inhabitants, and they control the government. The government refused to accept a constitution negotiated with Great Britain that would guarantee eventual participation of the Negro inhabitants in the government in proportion to their numbers. The Legislative Assembly consists of 65 members, of whom 50 are elected by white inhabitants and 15 only may be elected by the Negro inhabitants. Rhodesia's declaration of independence was not immediately recognized by other nations, many of which threatened Rhodesia with an economic boycott.

RUMANIA

Rumania is a people's republic, after having been a monarchy from the time of its liberation from Turkish rule in 1877 until 1947. Russia occupied Rumania in 1944. In the election of 1946, the Communist party won control of the government and drew up a draft constitution on Soviet lines. Most of the industries were immediately nationalized, and no move was made without Russian consent. A new constitution was adopted in 1952, which affirms the role of the Rumanian Workers' Party as the "leading political force."

The constitution declares that Rumania is a people's republic of working people of town and country. It sets forth a foreign policy of alliance with the Soviet Union. Power of the people is said to be exercised through the Grand National Assembly and the people's councils, the latter being called the political foundation of the republic. Social ownership of the means of production is decreed, either in the form of state property or in the form of co-operative-collective property. The land, it is stated, belongs to those who till it. Private property is recognized only in the form of a plot of land and household on a collective farm, a small shop where the owner alone works, or a sector of residual capitalism scheduled for eventual liquidation.

The legislative power resides in the Grand National Assembly elected for a 4-year term of universal suffrage, one deputy for each 40,000 inhabitants. The Assembly has the power to amend the constitution. It establishes national economic plans. Its laws become effective when signed by the president and secretary of its guiding body, known as a presidium. There is no direct veto power. However, the presidium, accountable to the Assembly, has very wide powers, which extend to interpreting the laws, annulling orders of the executive department on the ground of non-conformity with the law, appointing the military commander in chief, ratifying treaties, and ordering mobilization. The presidium consists of a president, 2 vice presidents, a secretary, and 13 members.

The Assembly appoints also the highest executive organ of the state, namely, the council of ministers. This body is accountable to the Assembly if in session; otherwise to the presidium. It adopts measures to carry out the economic plans and to maintain public order, directs the organization and raising of the military forces, and gives guidance in foreign relations.

Local government is by people's councils, in which the deputies are elected for 2-year terms in the various towns and other local subdivisions. Each council elects an executive committee, which is responsible both to it and to the executive committee of the council superior to it. In this way, through a hierarchy of people's councils, the authority of the central government makes itself felt in every community.

RUSSIA

The vast territorial extent of Russia, amounting to one-seventh of the land surface of the globe, combines with the strength of the Russian people, more numerous than any other white nation, to make it one of the greatest political factors in the world. The Russian stock excels in physical vitality and in intellectual vigor, but was held for centuries in an oppressed state, illiterate and without freedom of opportunity.

Imperial Russia. For centuries, and even within the present century, the government was despotic. The emperor, or czar, bore the title of "autocrat of all the Russias." Legislation was by imperial decree, or *ukaz*. The imperial power was administered by a great bureaucracy, established by Peter the Great and divided into a hierarchy of classes, at the top of which ministers and political competitors contended for the favor of the court and for position and power. Corruption and inefficiency, at times moderated by a strong-willed ruler or by the abilities of a talented minister, permeated the organization.

Constitutional progress was contending with bureaucracy and reaction when World War I broke out in 1914. In a gesture of liberality, the czar in 1905 granted a constitution which set up an elective

body, the Duma, but it was powerless to affect national policy. Meanwhile revolutionary pressure grew underground, led by embittered exiles waiting for an opportunity to overthrow the government.

The Revolution. The opportunity came during World War I, in which Russian defeats led to the rise of a liberal government set up by the Duma in 1917. The czar abdicated. But this government was overthrown shortly by a more radical party bearing the standard of dictatorship of the proletariat. It announced that Russia thereafter would be governed as a socialist state with the government owning the means of production. Under the ruthless leadership of Lenin, Russia thus established the first Communist government. It was based on the gospel of Karl Marx, a German who lived in England to write his famous *Das Kapital*. This work purported to show that, under capitalism, the rulers appropriated the fruit of the labor of the ruled and that the latter could enjoy what they had produced only by overthrowing the system and substituting their own dictatorship. So began the world's most bloody revolution.

Looked at in the perspective of half a century, it would appear that Russia, an economically backward nation which had scarcely shared at all in the industrial and technological revolution, had taken this costly step to catch up quickly. Its economic success was striking. After World War II, it towered militarily over all other countries of the world except the United States. From the standpoint of government, it perfected the one-party system by which a constitution ostensibly providing democratic control could be operated by a party subject to autocratic control.

Constitution of 1920. A government, federal in form, was established with the definite purpose and hope of adding to the union as new states such countries as should establish "dictatorships of the proletariat." It was known as the Union of Soviet Socialist Republics (U.S.S.R.) and consisted at first of 5 separate republics. These were later increased to 16.

A Supreme Soviet (Council) of the U.S.S.R. was set up to legislate for the country, representatives being chosen by local "soviets." Class enemies were disfranchised, including those employing others for profit and all monks and priests. Moreover, the basis of representation gave five times as much weight to each city voter as to a rural voter. Control of the machinery of government was assured through party discipline, the decisions of greatest importance usually being made first in party councils and later ratified by elective assemblies, both in the U.S.S.R. and in the constituent republics. A uniform system of secret courts and of espionage served also to make control absolute in the hands of the ruler. This control was used to wipe out the remains of feudalism and capitalism and to replacing them by a system of production for use rather than for private profit. After a period of trial and error, the picture which emerged was somewhat as follows:

A supreme economic council determines what probably can be produced by industries of national importance, taking into account both raw materials, labor, and demand, as well as national welfare. The task of production is then allotted among plants, which are operated by corporations owned by the government. Wages and prices are fixed with a view to having consumption balance production. Profit and loss are absorbed by the government. A somewhat similar pattern is followed for industries of regional or local importance, the smaller political divisions operating them at their own risk and for their own profit. These industries are integrated with national plans through control of credit.

Constitution of 1936. Ostensibly on the assumption that the Russian people had become accustomed to the new system and would continue to operate it, a democratic constitution was announced in 1936, based on universal, secret suffrage.

Corresponding to a Congress there is a Supreme Soviet, consisting of two chambers—the Soviet of the Union and the Soviet of Nationalities. The Soviet of the Union is popularly elected, one deputy to each 300,000 of the population. The Soviet of Nationalities, like the United States Senate, is intended to give equal representation to separate states irrespective of their population. Each state, or "union republic," sends 25 deputies, each "autonomous republic" sends 11, each "autonomous province" sends 5, and each national area sends 1. The deputies to the Council of Nationalities are directly elected by the voters within these constituencies. Both chambers have equal legislative rights. In case of failure to reach agreement on a bill after reconciliation efforts of an interchamber committee and resubmission to the chambers, the Supreme Council must be dissolved and a new election must be held. The term of office is 4 years.

The two chambers in joint session elect a presidium of 33 members, including a president, 16 vice presidents, a secretary, and 15 members. This body is declared responsible to the Supreme Soviet, but it has very broad powers. It issues decrees, convenes the Supreme Soviet, interprets the laws, and may annul as invalid orders of the highest executive body, the council of ministers. The council of ministers is appointed also by the Supreme Soviet. It exercises the function, not only of administration, but the economic planning on which ultimately the strength and development of the country depend.

The supreme court justices are elected by the Supreme Council for 4-year terms. Other judges are elected by the people for 3-year terms.

Individual republics have similar forms of government. Federal law is paramount in all cases of conflict of authority.

Behind and parallel to the constitutional government is the organization of the Communist party, the real seat of power, whose supreme organ is the Soviet Union Party Congress. This body, made up of delegates from provincial congresses, elects the central executive committee, which in turn elects a secretariat of 5 members. One of these, the general secretary, is the real head of the party. This Secretariat controls legislation and foreign policy, though the formal action is taken by the state administration, all of whose organs are headed and controlled by party members. Party discipline is rigorously enforced.

Property Rights. These are of three kinds—public, co-operative, and private. Means of industrial production and most property necessary to public services are owned by the government, either federal, state, or local. These include the bulk of the dwelling houses in cities and industrial localities. Means of agricultural production and property used in providing certain services in common are owned by co-operatives. Individuals may own property provided it is not used to exploit the labor of others. Trading for profit is forbidden. Individual houses and lots, household equipment, and other personal property fall within the permissible limits of individual ownership.

Bill of Rights. Citizens are guaranteed the right of remunerative work, of reasonable leisure, of education, and of support and medical care when unable to work. Guaranteed also is freedom of conscience, of speech, of the press, of assembly, of street processions, and of organization. Unlawful search, seizure, and arrest are forbidden. Women are given equal status with men. On all alike rest the duties of performing social obligations, safeguarding public property, and serving in the armed forces of the republic. Asylum is provided for foreigners persecuted for defending workers' interests, for their scientific activity, or for their struggle for national liberation.

The constitution may be amended by a two-thirds vote of both chambers of the Supreme Soviet.

Foreign Relations. At the beginning of the Soviet regime, Russia practically declared war upon all governments adhering to the capitalistic system. As an instrument of propaganda, the "Third International" was established at Moscow in the spring of 1919. Propagandists were sent abroad through the countries of Europe, America, and Asia. After China established a Communist government in 1949 and subsequently challenged Russia's leadership in the Communist party, the effect of such propaganda weakened—partly because of the rivalry and partly because of the practical demonstration in other nations that the fruits of labor can be distributed broadly without autocratic control by government. Russia's growing economic well-being finally asserted its influence for preferring peace.

RWANDA

Rwanda was established as an independent republic in 1962 from part of a former trusteed territory of Belgium. A legislative council formed in 1961 declared the government a republic following a referendum in which a majority voted to abolish the monarchy. It has a 44-member Assembly elected by universal suffrage for a 4-year term and a president similarly chosen for 4 years. The president names the vice president with the Assembly's consent. He may introduce legislation into the Assembly. He may also send back to the Assembly for reconsideration a measure of which he disapproves; if the Assembly repasses it, the measure becomes law.

SALVADOR

Salvador became an independent republic in 1839, when the Central American Federation was dissolved. A constitution first proclaimed in 1824 was repeatedly modified. In 1945 the constitution of 1886, repealed in 1939, was reinstated with some alterations. This constitution was replaced in 1950 by a new one which, in turn, was succeeded by the constitution of 1962. There is universal suffrage for election of a single-chamber legislature whose members are elected for 2-year terms, one member for each 38,000 inhabitants. The president is popularly elected for a 5-year term and may not succeed himself. He is assisted by a cabinet of 10 ministers, who are responsible to him.

Following the Bryan-Chamorro treaty of 1916, by which Nicaragua ceded to the United States the right to a naval station in Nicaraguan territory fronting on the Gulf of Fonseca, Salvador united with the republic of Honduras in opposing in the Central American court of justice the right of Nicaragua to cede a naval base on a body of water formed by territory of all three republics. The court upheld the complaint and directed Nicaragua to cancel its treaty. Nicaragua refused to recognize this decision. The United States, however, did not take advantage of the rights conferred by Nicaragua.

SAUDI ARABIA

This kingdom embracing almost the entire Arabian peninsula was formally established in 1926, when Ibn Saud, sultan of the Nejd, conquered Hejaz and joined these two mid-peninsular territories.

Government takes the form of a feudal autocracy although a constitution was issued in 1926 and subsequently amended. The religious law of Islam is the common law of the kingdom. It is administered by religious courts. The constitution provided also for setting up a consultative Legislative Assembly and municipal councils consisting of tribal officials and notables nominated or approved by the king. In 1958, a so-called cabinet system was instituted but the king retained the power to name the members.

SENEGAL

Senegal became an independent republic in 1960, having chosen in 1958 to sever its ties with France, its former ruler, but to remain within the French Community. It has a president and a National Assembly of 60 members elected by universal suffrage for 4-year terms. The president is assisted by ministers and secretaries of state, who are chosen by him and may not be members of the Assembly. The president may introduce bills in the Assembly. He promulgates laws within 15 days after passage unless he sends them back for reconsideration, in which case they require a three-fifths majority. He may also submit them to the supreme court to rule on their constitutionality and may submit them to a referendum after consulting the supreme court and the president of the Assembly. In case of impeachment, the president may name his successor, failing which the president of the Assembly fills the office until a new election is held.

SIAM

See *Thailand*.

SIERRA LEONE

This parliamentary democracy became independent in 1961 after 174 years of British rule and was admitted into the British Commonwealth. The head of state is a governor-general appointed by the British Crown. He has full veto power over bills passed by the single-chamber legislature, known as the House of Representatives. The governor-general appoints the prime minister, the member of the House judged most likely to have the support of the majority of members, and, with the latter's advice, he appoints the other cabinet ministers. The membership of the House consists of one "paramount chief" from each of the 12 electoral districts and 62 other members elected by universal suffrage from these districts. All must be able to speak English. The cabinet is responsible to the House and advises the governor-general. If the House passes a no-confidence vote in the prime minister, the governor-general dissolves the House, and a new election is held. Decisions of the supreme court may be appealed to the British government.

SOMALIA

A republic formed in 1960 through the union of territories formerly under the control of Great Britain and Italy. Its legal system is based on Islamic law, and the president must be of the Islamic faith. It has a National Assembly elected by universal suffrage for a 5-year term. The Assembly elects the president of the republic by a two-thirds vote for a term of 6 years. The president in turn appoints a prime minister and cabinet, who must obtain a vote of confidence from the Assembly within 30 days. A vote of no confidence brings dissolution of the Assembly and a new election. Laws are promulgated by the president with the approval of the prime minister and cabinet.

SOUTH AFRICA

The republic of South Africa was reconstituted in 1961 from the Union of South Africa, formed in 1910 as a federation of the former self-governing British colonies of Cape of Good Hope, Natal, Transvaal, and Orange Free State. The Union had been a member of the British Commonwealth with a British-appointed governor-general prior to 1961 but withdrew because of the hostility of other members over the Union's policy of segregation of whites and blacks. The republican constitution is essentially the prior constitution with a few amendments, principally to substitute a state president for a governor-general.

The state president is chosen by an electoral college consisting of the members of the Senate and the House of Assembly. His term of office is 7 years, and he may not be re-elected unless the electoral college expressly decides that he may. The legislature may also remove him from office for misconduct or inefficiency, his duties in the meantime being performed by the president of the Senate. The state

president selects the prime minister and other ministers to form a cabinet not to exceed 18 members, all of whom must be members of Parliament or become such within 3 months of appointment. The state president must summon Parliament into session at least once a year.

The House of Assembly consists of 160 members, who must be white, elected for maximum 5-year terms. Of these, 150 are directly elected from the 4 provinces by white registered voters; 6 are elected by registered voters of the mandated territory of South West Africa, and 4 are elected to represent electoral divisions of colored voters in the Cape province. The Senate consists of 54 members, who must be white, serving for 5-year terms unless the legislature is dissolved earlier. Of these, 43 are elected from the provinces by white registered citizens and 11 are nominated by the state president, 2 from each province, 2 for South West Africa, and 1 for the colored voters in the Cape province. At least 1 of the senators nominated from each province must be thoroughly acquainted with the interests of the colored people in his province.

Money bills must originate in the House; they may not go beyond recommendations of the state president; and they may not be amended in the Senate. The courts do not have power to pass on the constitutionality of laws. On the contrary, Parliament may change the constitution by a simple law, except that the provision making English and Dutch the official languages may be amended only by a two-thirds vote of both houses in joint session. The House can override a negative vote of the Senate by passing the same bill in two successive sessions and sending it to the state president. It does not appear that the state president has the power of veto. He may, however, return to the legislature a bill with suggested amendments, which the legislature may consider. On the other hand, he may dissolve Parliament at his discretion.

Each province is governed by an administrator named by the state president for 5 years and a provincial council elected on the same basis as the national legislature. Measures passed by the provinces are subject to veto by the state president.

South African government is based on the principle that the white population and the colored population should have separate territory and separate government. To the Bantu tribes in a separate territory, Transkei, a limited system of self-government was granted in 1963. A one-house legislature is set up, with 60 tribal chiefs and 45 members elected by Bantu citizens, either resident in Transkei or resident in other parts of South Africa. Whites may not be citizens of Transkei. Citizens registered at the first election numbered over a million, with about three-fourths living in Transkei. The legislature elects a prime minister, who is head of the government. The legislature's term is 5 years, but it may be dissolved by the state president of South Africa. Similar self-governing territories within the republic were envisioned for other tribal groups.

Friction over this form of segregation is due largely to the fact that the colored population must live in proximity with the white population throughout most of South Africa if the colored population is to participate in the economic development of the country. The system, however, excludes the colored residents from political rights in South Africa proper. The conflict hung like a cloud over the future of the country.

SPAIN

The kingdom of Spain was formed in the latter part of the 15th century by the union of a number of monarchies and by conquest of the southern part of the peninsula from the Moors. Under Charles V and Philip II, the ancient rights of these kingdoms and certain representative institutions which they possessed were suppressed and the basis for absolute monarchy was laid.

The modern constitutional history of Spain begins in 1808; it was followed by a period of civil conflict between liberal and reactionary forces, within which period Spain for a brief time, 1873–74, was a republic. The Bourbon family, under Alfonso XII, was restored at the beginning of 1875. This dynasty ruled until April 14, 1931, when King Alfonso XIII was driven from the throne. Spain was proclaimed a republic, a constituent Cortes was elected on June 28, and a new constitution was adopted on December 9 of the same year.

Republican Constitution. The Constitution of 1931 provided for a democratic republic, with separation of church and state.

Legislative power was exercised by a single-chamber Cortes, its members elected by universal suffrage on the basis of proportional representation for a 4-year term. In case of a dissolution at the expiration of the term, new elections must be held within 60 days. Laws might also be passed, on the petition of 15 per cent of the electors, by the initiative and referendum.

The president was elected for a 6-year term. He could not succeed himself and might be dismissed by the Cortes.

Corporate State. In 1936, by a coalition of leftist parties, the Cortes removed the incumbent president and elected a successor. Rightist parties organized a rebellion under the leadership of Gen. Francisco Franco, who, after 3 years of civil war, established a Fascist-type dictatorship with himself as chief of state and head of the Falangist party. In 1947, Franco announced that Spain would become a monarchy with him as head of state assisted by a regency council and that, on his death, a king or regent should be nominated by a two-thirds vote of the regency council and approved by a two-thirds vote of the Cortes. Embodied in a law of succession, this proposal was ratified in a popular referendum by an overwhelming majority.

The Falangist party is ruled by a national council of about 100 members. The government is controlled by this party and by a political junta presided over by the chief executive.

The constitution of 1942 provides for a 441-member legislature, or Cortes, which is not elected but is composed of the following, chosen by party consent: 18 cabinet ministers, 103 members of the national council of the party, 3 heads of judiciary bodies (state council, supreme court, military court), 142 representatives of national syndicates (business organizations), 102 heads of municipalities, 12 heads of universities, 6 heads of academies and institutes, 7 professional representatives, and 50 others who have rendered signal service in church, army, or society. The constitution may be amended only by popular referendum.

Roman Catholicism is established as the State religion. The clergy are supported by state salaries, and the church and the national government cooperate in matters of common interest.

In local government, municipalities manage their affairs through councils elected by heads of families. Each province has a sole administrator.

Of Spain's once vast colonial empire, there remain only small vestiges, all in Africa. The Canary and Balearic islands are treated administratively as a part of Spain. A protectorate over part of Morocco was relinquished to the kingdom of Morocco in 1956. The colonial empire, however, left the impress of Spanish institutions over wide areas, particularly in the Americas, where the close association of church and state and the authoritarian attitudes inherited from Spain still vie for democratic ideas in Latin America after 150 years of political independence.

SUDAN

Having obtained independence in 1956 from the British-Egyptian condominium previously controlling it, Sudan operated under a provisional republican constitution until 1958. In that year, the army seized power, and constitutional control was vested in the supreme council of the armed forces. The commander in chief served as prime minister. The constitution did not provide for a president in the usual sense. Executive power was in the hands of a supreme commission of 5 members appointed by the legislature, each member being president in rotation for one month. The supreme court also was given a wide role. It appointed cabinet officers on the advice of the prime minister. It also was given the power, subject to later ratification, to legislate when the House and Senate were not in session.

SWEDEN

Sweden has long been the seat of constitutional system. The representative legislature *Riksdag* came into existence in the 16th century. Between 1680 and 1718, however, during the period of Sweden's prominence as a military power, the monarch became well-nigh absolute. This was followed by a period of legislative dominance.

The present constitution was adopted in 1809. The amending process is simple. The passage of an amendment by the Riksdag in two successive sessions, with the approval of the monarch, is sufficient to enact. Minor changes have been frequent.

The king has certain independent powers. He is commander in chief of the land and naval forces. In foreign affairs, including the declaration of war and the conclusion of peace, he must advise with ministers, but is responsible for the decision. The ministers, while nominally responsible to the Riksdag for all acts of government, have also a real responsibility to the king, who has a large influence in affairs of state. On the other hand, the ministers have little administrative responsibility, this lying chiefly with central boards for various spheres of activity. They are often asked for advice by the King-in-Council, that is, by the king and his ministers.

Since World War I, the general progress in democracy has affected the Swedish constitutional system. Ministers have resigned as the result of their disagreement with the Riksdag, and, by a constitutional change, a foreign affairs committee of the Riksdag, with which the government consults on international affairs, is elected each year. The Riksdag is bicameral: the First Chamber consists of 151 members elected for an 8-year term by the provincial assemblies and electors of 6 towns not represented in these assemblies, one-eighth being renewed each year; the Second Chamber of 232 members is elected for 4 years by direct vote of Swedish citizens. The suffrage extends to all citizens 21 years of age, both men and women. Proportional representation prevails in elections for both chambers. The Second Chamber is elected from 24 constituencies, the number from each depending on the population.

The kingdom is divided into 24 administrative provinces or counties, in which the administration is confided to a governor in Stockholm and prefects elsewhere, appointed by the crown; but each province has a legislative assembly whose members are elected directly by voters on the principle of proportional representation. Absentee voting is permitted; a husband may carry his wife's sealed ballot to the polls, and a wife, that of her husband. Soldiers, seamen, fishermen, and employees of railroads, ports, customs, and pilot services may vote by post. There is an optional referendum, or plebiscite, which may be ordered on important matters if the government and the Riksdag concur in believing it advisable.

The supreme court of Sweden has a constitutional status, while courts of appeal and district courts of first instance are organized by laws. The supreme court is authorized to render an interpretation of the law, if requested by the government. The important constitutional position of the king is again indicated by his right to attend the sessions of the supreme court and to cast two votes in all decisions. If the question is one of interpretation, his two votes may be recorded in his absence.

The society of Sweden is appreciably less democratic than that of Norway, and the ancient nobility, while no longer possessing privileges or political rights, continues to have a recognized social position.

SWITZERLAND

The "Swiss Confederacy" is the oldest republic of Europe and the first European state to adopt a federal form of government adapted from the American plan. This country is also the originator of several widely adopted democratic institutions and is an example of how peoples of different race (French, German, and Italian), of different speech, and of different religious belief may form a completely harmonized nation. The unifying forces seem to have been the influence of an Alpine habitat and a common devotion to principles of freedom—what has been nobly expressed as "the fusing power of free institutions."

The country is composed of states or "cantons." Alliances and unions between certain of these small states date from the 13th century; but it was not until 1848 that the existing union, under a true federal form of government, was achieved. This constitution was revised in 1874 and was added to by several later amendments. The central government is complete and adequate, and certain of its powers are exercised directly upon the people and upon the territory of the whole country. The cantons, however, are protected in free exercise of their local jurisdictions by the constitution. Sovereignty undoubtedly resides in the whole nation; the union is thus a federation and not a confederacy, as its official title might imply. In some respects, the Federal government's powers are more extensive than those of the United States, extending to operation of railroads, telegraph, and telephone, as well as to customs, post offices, coinage, etc. It may legislate in the field of the common law and on atomic energy matters. Religious freedom is guaranteed, but prohibition may be imposed on orders considered dangerous to the state or which interfere with religious peace. Under this head, the Jesuit order is banned.

The national legislative power is conferred on the Federal Assembly, which consists of two chambers. The upper house, like the American Senate, represents the separate states and is called the Council of States. It is composed of 44 members, 2 from each canton. The mode of their election, their term of service, and their remuneration are left to the cantons. The more popular house, or National Council, consists of about 200 deputies chosen by direct vote, one for each 22,000 of the population. Members of the National Council are paid from the federal treasury. Their term is 4 years. Every male Swiss 20 years of age is entitled to vote unless excluded by legislation of his canton.

Referendum and Initiative. Switzerland has made fuller experiment of direct or popular legislation than has any other country. There is a national "referendum" of federal legislation, which is (a) obligatory for all amendments to the constitution and (b) optional upon petition of 30,000 voters or upon the demand of 8 cantons on more important acts of legislation. Perhaps the most striking instance of the exercise of this right was the proposal to enter the League of Nations, which was submitted to the voters in May 1920 and approved by a popular vote of 414,000 to 322,000. Switzerland did not apply for membership in the United Nations. An initiative procedure for amendments of the constitution on petition of 50,000 voters was adopted in 1891.

Commission Executive. Strong democratic prejudices prevented the makers of the Swiss constitution from entrusting the executive power to a single person like the American president. In place of a presidency or a ministry, there exists a commission of 7 members, who are chosen by the Federal Assembly for a 3-year term and are usually reelected if competent. This commission is called the Federal Council. It is responsible to the Assembly for its conduct of affairs, and its dispositions may be overruled. Besides administering, it prepares legislative acts to be submitted to the Assembly. Each member is charged with the administration of a separate department—political (foreign affairs), interior, justice and police, military, finance and customs, national economy, and posts and railways. However, responsibility is collegiate, and matters of importance are considered "in commission."

Each year the Federal Assembly designates one member of the federal council to serve as "Swiss president." He becomes thereby the representative of the state at home and abroad and oversees the conduct of the business of the executive commission. He is ineligible for re-election for a consecutive term. A vice president is elected at the same time as the president and, by custom, succeeds to the chief office. While this institution of "commission executive" might be inapplicable to republics differently situated, its practice has commended itself to the Swiss nation.

There is a federal court. The judges and their alternates are appointed for a 6-year term by the Assembly. This court decides cases of conflict of jurisdiction between federal and cantonal authorities, cases between cantons, and private complaints based on violation of constitutional or treaty rights. It also has jurisdiction in certain cases between the federation and individuals.

Cantonal Government. The 22 cantons differ interestingly in the form in which their democratic character is politically exhibited. Five are small mountain states and are genuine democracies. There is no representative legislature, but laws are enacted by a popular assembly, even meeting by custom in the open field.

The other cantons have local unicameral legislatures usually called the grand council or the cantonal council. All but one of these cantons (Freiburg) has either the obligatory or optional referendum. In all cantons the executive power is entrusted to a commission of 5 or 7 members known as the administrative council or the small council. At the head of each commission is a president and a vice president.

The larger cantons are divided into administrative districts or are organized in communes. Each canton has its own judicial system, comprising justices of the peace, district courts, and a superior court. There may be also special courts of commerce and industrial courts, on which sit representatives of employers and workmen. Within the jurisdiction of the cantons are such matters as poor relief, public health, labor protection, agricultural improvement, primary schools, maintenance of religious worship, citizenship, and naturalization. Proportional representation is established in several of the larger cantons.

Switzerland is a country of guaranteed neutrality by action of the "great powers" in 1815, and neutrality as well as independence is enjoined by the Swiss constitution. This status does not limit the republic in taking measures to safeguard its security, and the Swiss, always a people of high military spirit, are completely organized in a citizen army. Military training is compulsory, beginning in schools and continuing through the most vigorous years of manhood. At the age of 20, all young men receive a period of from 65 to 90 days of intensive training, and for the 12 succeeding years remain in the "line" with repeated brief periods of training and annual inspection. Thence they pass into the reserve, or *Landwehr*, and, after 8 years, into the *Landsturm*. Rifle practice is a national sport.

Switzerland has for centuries extended asylum to political and religious exiles, and is the home of a number of international associations, including the Red Cross Society and the Postal Union. The League of Nations had its seat in Geneva.

SYRIA

The Syrian republic was formerly a province of the Turkish Empire and, from 1920 until its independence in 1943, was a French mandate under the League of Nations. While under the mandate Syria set up a republican form of government with a unicameral legislature of 69 members elected for 4-year terms. The legislature elected a president.

In 1958, Syria and Egypt joined to form the United Arab Republic as a hoped-for nucleus of a federation of all Arab states. Three years later, the government was overthrown by force of arms, and the union with Egypt was dissolved. In 1964, a provisional constitution was adopted which, while republican in form, operated as an oligarchy. At the head of the government is a presidential council, consisting of the president of the republic, the vice president, and three members chosen by the National Council from among its members. The presidential council appoints ministers, of whom the prime minister must be a member of the National Council. The ministers deliberate on bills, decrees, budgets, and policies. The constitution may be amended on proposal of the presidential council or one-fourth of the members of the National Council and becomes effective after approval by a two-thirds vote of the latter.

TANZANIA

Tanzania is a federation formed in 1964 from Tanganyika and Zanzibar, each part having a republican form of government. Tanganyika emerged from colonial status under Britain in 1961 and in 1962 became a republic, remaining in the British Commonwealth. Zanzibar became independent of Britain in 1963 under a monarchy, which was overthrown in 1964 to become a people's republic. Within the federation, the president of Tanganyika serves as president of Tanzania, while the vice presidency is filled by the president of Zanzibar. Initially both officers owed their positions to their military support. Tanganyika has a National Assembly of 81 members, of whom 71 are elected and 10 are nominated. The vice president of Tanganyika performs the function of a prime minister. Zanzibar has a National Assembly consisting of a speaker and 31 elected members.

THAILAND

This monarchy of southeastern Asia was an unlimited autocracy until 1932. In that year, a revolutionary group seized the government and invited the king to rule as a constitutional monarch. A deliberative and legislative Assembly was provided, consisting of 70 members, of whom half were elective and half nominated. After 10 years, the whole body was to be elected by universal suffrage. This constitution had a brief and stormy history. It was superseded by a new constitution in 1946, which lasted a little over a year. A military revolution of 1947 led to extensive revisions in 1949. The army again took control in 1951 and restored the constitution of 1932, which lasted until 1958.

In 1959, an interim constitution was established by decree. Its principal feature is establishment of a constituent assembly of 240 members appointed by the king to draft a permanent constitution, the governing of the country meanwhile being carried on by a council of ministers appointed by the king.

For purposes of local government, Thailand is divided into 71 provinces, each under control of a governor. The province is divided into districts, communes, and villages administered by locally elected officials.

TOGO

Togo became an independent republic in 1960. It was a German colony from 1894 until World War I, after which it was a trusteed territory. The United Nations relinquished its trusteeship in 1958 after the people had voted, in 1956, to join the French Community as an independent republic.

The constitution, adopted in 1963, established a strongly centralized government. A president and a vice president are elected for 5-year terms by direct universal suffrage and may be re-elected once. A single-chamber legislature, the National Assembly, is elected likewise for a 5-year term. Bills and amendments to bills may be introduced by the president and may take precedence over those introduced by delegates. When passed, a bill goes to the president, who, if he disagrees with it or any of its provisions, may refer it to the supreme court for a ruling on constitutionality and submit it to a popular referendum as to its desirability. Matters not specifically defined as subjects for legislation may be regulated by presidential decree.

The president appoints and removes members of the cabinet, one member of which must be the vice president. They may participate in legislative debates. In the event of a vote of censure against the government, the president may replace one or more cabinet members, or he may dissolve the Assembly, in which case his own tenure of office terminates and a new election is held.

TRINIDAD AND TOBAGO

This constitutional parliamentary democracy was granted independence from Great Britain in 1962, remaining a member of the British Commonwealth. Its constitution provides for a House of Representatives of 30 elected members and a Senate of 24 appointed members—13 appointed on the advice of the premier, 4 on the advice of the leader of the opposition in the House of Representatives, and 7 from religious, economic, and social bodies considered important by the premier. The appointments are made by the governor-general.

By lease and treaty, the United States holds a naval base and an air base on the promontory of Chaguaramas. The right to hold them expires in 1977.

TUNISIA

Tunisia, a former French protectorate, declared itself a republic in 1957. Under a constitution adopted in 1959, the president, who must be a third-generation Tunisian of Islamic faith, is elected by universal suffrage for a five-year term. A National Assembly of 90 members is similarly elected at the same time, under a one-party system. The president may introduce into the Assembly bills which have precedence over other bills. He must promulgate within 15 days measures passed by the Assembly but may send them back for reconsideration, in which case they require a two-thirds majority. He names the ministers who assist him in governing. He may succeed himself three times. Amendments to the constitution may be proposed by the president or one-third of the Assembly and require a two-thirds majority of the Assembly to be adopted. None may alter the republican nature of the state.

TURKEY

The republic of Turkey was established in 1924. The country is what remained of the former Turkish Empire with capital at Istanbul, then known as Constantinople, itself the heir of the Moslem power which, beginning in the 8th century, extended its sway over all the Near-East, northern Africa, and southeastern Europe. Its language and religion are still dominant from Pakistan to Morocco. The Turkish Empire was on the losing side in World War I. Thereafter its ruler, the sultan, was deposed by a nationalist leader Kemal Pasha, and a constitution was adopted in 1921 which vested both legislative and executive power in a Grand National Assembly. Three years later the country was declared a republic. In 1960, the army under a national union committee overthrew the government and submitted to a referendum a new constitution, which was adopted July 9, 1961.

The sovereign power is vested in the Grand National Assembly, which is composed of a National Assembly and a Senate. The National Assembly consists of 450 members elected for 4-year terms by all citizens, women as well as men, over 23 years of of age. The Assembly may decide to hold new elections before the end of the 4-year term. The Senate is composed of 150 members elected by universal suffrage, 15 members appointed by the president of the republic, and *ex officio* members, including past presidents and the members of the national unity committee. Except for *ex officio* members the term of office is 6 years, one-third being elected every second year.

The president is elected for a 7-year term by the Grand National Assembly from among its members sitting in joint session. A two-thirds majority is required to elect on the first two ballots, thereafter a simple majority is sufficient. The president must be over 40 years of age and have received a higher education. He may be re-elected.

The president appoints from members of the Grand National Assembly a prime minister, who recommends other ministers to be appointed by the president from that body or from those eligible to be elected to it. The ministers present the governmental program to each chamber and may ask for a vote of confidence in the Assembly. If a ministry is unseated within 18 months by a vote of lack of confidence and thereafter incurs a third such vote, the prime minister may ask the president to dissolve the assembly and call for a new election, the ministers meanwhile being replaced by new, provisional appointees. The president may veto a bill, but its re-enactment by both chambers gives the measure the force of law.

UGANDA

This republic became independent of British rule in 1962 and was admitted to the British Commonwealth. The constitution originally provided for a governor-general, but in 1963 it was amended by substituting a president to hold the chief executive office, thereby making the country a republic. The president is assisted by a prime minister and cabinet of ministers. The unicameral legislature, known as the National Assembly, consists of a speaker, 82 directly elected members, 9 specially elected members, and the attorney-general. There is a federal relationship between the government and 4 districts, which are kingdoms with native rulers. Each ruler has ministers and an assembly consisting of tribal chiefs and elected members.

UNION OF SOCIALIST SOVIET REPUBLICS

See *Russia*.

UNITED ARAB REPUBLIC (EGYPT)

The modern independence of Egypt dates from 1922, when Great Britain recognized the sovereignty of her former protectorate but retained certain defense rights and control of the Suez Canal. Under a treaty of alliance in 1936, these rights were to be relinquished in 1956, but Egypt abrogated the treaty in 1951. Egypt was ruled as a limited monarchy from 1923 until 1952, when a military uprising compelled the king to abdicate, and a republic was declared in 1953. In 1956, under the leadership of Nasser, a republican constitution was adopted by referendum, with Nasser as the first president. Later that year he seized the Suez Canal. The Sudan, over which Egypt had shared control with the British, became independent the same year.

In 1958, Nasser negotiated with Syria and Yemen the formation of the United Arab Republic as a single country. Syria withdrew in 1961, and the

union with Yemen terminated the same year, but Egypt retained as its official name the United Arab Republic. A new interim constitution was issued in 1964 to preserve the "socialist democratic state."

Under this constitution, a National Assembly is elected for a 5-year term by public secret ballot. One-half the members must be workers or farmers. Up to 10 may be appointed by the president. The Assembly may not modify the budget presented to it except by consent of the cabinet.

The president is nominated by the National Assembly, and the nominee's name is submitted to the electorate in a referendum. If he receives a majority of the votes, he is declared president for a 6-year term; otherwise a new nominee is submitted. The president may appoint one or more vice presidents and may also remove them. He appoints the prime minister and other ministers who form the government, that is, the cabinet, which is the supreme executive and administrative organ of the state. The cabinet may submit bills to the General Assembly. Bills, when passed, are subject to a limited veto by the president in that repassage with a two-thirds majority in the Assembly overrides the veto. The Assembly may pass a vote of no confidence in the cabinet or any minister, in which case the prime minister or an individual minister so affected must submit his resignation to the president. It is not stipulated that the president must accept the resignation. He may, however, dissolve the Assembly and call for new elections.

The constitution declares that Islam is the religion of the state and the socialist system is its economic foundation. Private property is permitted within an overall framework of state ownership and cooperative ownership, provided there is no "exploitation." The constitution may be amended on proposal of one-third of the members of the General Assembly if the proposal receives a two-thirds majority.

UNITED KINGDOM

See *Great Britain.*

UPPER VOLTA

Upper Volta was established as an independent republic in 1960, remaining within the French Community. It had been made a separate colony by France in 1919, carved out of the colonies of Upper Senegal and Niger, which had been established in 1904. In 1932, its territory was divided between Ivory Coast, Sudan, and Niger, but in 1947 it was reconstituted as it had been before 1932.

Upper Volta is governed by a president with a government council of 12 ministers and a National Assembly consisting of 70 members.

URUGUAY

The republic of Uruguay became independent of Spanish and Portuguese claims in 1828. Its first constitution, in 1830, provided a centralized form of republican government, which was replaced in 1919 by a constitution designed to avoid dictatorship. Borrowing an idea from the former government of Venice, the constitution divided executive power between a president elected by the people and an administrative council also elected by the people, but for different terms. A new constitution, adopted in 1951, abolished the presidency entirely, and all executive power was vested in a 9-man bipartisan National Council, whose members are chosen for a term of 4 years. The party polling most votes gets 6 representatives; the next one, 3. Councilors may not succeed themselves. The presidency of the Council is rotated yearly among representatives of the majority party. The Council appoints a cabinet of 9 ministers who are also responsible to the legislature and must resign upon a vote of censure.

The legislature itself consists of two houses—a Senate of 31 members elected at large for 4-year terms and a Chamber of Representatives, consisting of 99 members chosen by districts for 4-year terms. The seats in both houses are allotted by proportional representation. Bills may originate in either house or from the National Council. The latter body has the power of veto, which, however, may be overridden by a two-thirds vote of the two houses in joint session. The legislature appoints, by a two-thirds majority, the 5 members of the supreme court, who serve 10-year terms and may not be reappointed until after 5 years. The supreme court tries violators of the constitution, as well as ruling on the constitutionality of laws. The right of labor to organize and strike is recognized. Suffrage for those over 18 is universal and compulsory, failure to vote being punishable by a fine. The church and state are separated.

Autonomous local government is granted to the departments, 19 in number, each of which is governed by a council of from 3 to 7 members elected for 3-year terms by direct popular vote. Departments impose and collect their own taxes, control their expenditures, and administer their own public services.

VATICAN CITY

For a period of nearly 1000 years, the papacy, or Holy See, held temporal possessions over which it exercised despotic political control. The process of unification of the Kingdom of Italy by 1870 gradually absorbed these territories, including Rome. The Pope retired into the Vatican Palace. A unilateral settlement with compensation made by Italy was declined by the pope and his successors until 1929, when Italy recognized the sovereignty of Vatican City and the papacy accepted compensation for the loss of its former territories. The pope is chosen on the death of his predecessor by the Sacred College of Cardinals. Two-thirds majority is necessary for election. He has unrestricted executive, legislative, and judicial authority over his 109-acre state, which is pledged to political neutrality between governments.

VENEZUELA

Venezuela, together with the territory comprising the republics of Colombia and Ecuador, was freed from Spain by the revolutionary operations of Simon Bolivar, "the liberator," in 1821. In 1829, Venezuela seceded from the republic of Colombia and formed a separate republic to include the territory of the former "captaincy-general" of Venezuela. Its first constitution was proclaimed by a convention at Valencia, September 1830.

Under the constitution adopted in 1961, the executive authority is vested in a president chosen by direct popular vote for a 5-year term. He may not serve an additional term until 10 years after his first term. He exercises his powers in conjunction with cabinet members through whom he acts.

The legislative authority is vested in a Congress composed of a Senate and a Chamber of Deputies. Two senators are popularly elected from each of the 20 states and the federal district for 5-year terms, and ex-presidents also serve as senators. Deputies are popularly elected from districts none of which may have more than one per cent of the population. The term is 5 years. Suffrage is universal and compulsory for all citizens over 18. There is proportional representation of political parties.

Bills may be introduced into either house by legislative committees, by any three or more legislators, by the president, and by 20,000 or more voters. If a bill passed by one house is amended by the other, the differences are resolved in joint session. If the president disapproves of a bill, it may be passed over his veto by a two-thirds vote in joint session. If his objection is on constitutional grounds, the bill is submitted to the supreme court, whose decision must be made within 10 days. Members of the supreme court are chosen by Congress for 9-year terms, one-third being renewed each 3 years.

Bills relating to treaties may originate only in the Senate; those relating to expenditures and taxation may originate only in the Chamber of Deputies. The latter body may pass votes of censure against members of the cabinet and, by a two-thirds majority, may determine whether the vote requires resignation of the minister.

Amendments to the constitution may be proposed by one-fourth of the deputies, senators, or state legislative assemblies; if approved by Congress, the amendment is submitted to the state assemblies, two-thirds of which must approve to make the amendment valid. General reform of the constitution must be validated by a popular referendum.

Venezuela is composed of 20 states, 2 territories, and a federal district. They are autonomous, politically equal, and exercise residual powers not assigned to the federal government. Each has a president, legislature, and a system of courts.

VIET-NAM

Viet-Nam is part of former French Indo-China. The French were defeated by troops under Communist leadership in 1954, at which time an agreement was reached at Geneva dividing control of the country. The northern part was under Communist control, while the southern portion was controlled by an anti-Communist party. The agreement called for a general election in 1956 in all Viet-Nam to determine its governmental status. The election was not held. Guerilla warfare broke out. When the French left, the United States lent support to the government of South Viet-Nam.

In North Viet-Nam, a Chinese type Communist government was set up in 1960 calling itself a people's democracy. It has a National Assembly of 362 deputies with 4-year terms, of whom 56 represent national minorities. The assembly elects the president.

In South Viet-Nam, a republican constitution was adopted in 1956 vesting executive power in a president and legislative power in a unicameral National Assembly, both elected by universal suffrage and secret ballot. In 1961, the president was granted emergency powers to combat Communist encroachment. Two years later he was overthrown by a military group and the constitution was in abeyance as the country was plagued by civil disorder and an undeclared war with North Viet-Nam. The United States support of the country began with military advisers, but, as the Communist efforts with Chinese aid were stepped up, troops were poured in and engaged in warfare on a large scale by 1965.

YEMEN

Yemen was formerly part of the ancient kingdom of Sheba. It remained a monarchy until 1962, when a military group took possession of the government and declared Yemen a republic. The constitution, designated as the first interim constitution, provided for a president, who was the commander in chief and prime minister, a presidential council, and an executive council responsible to the president and his council, these to direct the government until a National Assembly could be elected. Chieftains with royalist sympathies refused to submit to the republican regime, and in 1964 a new constitution placed executive power in the hands of a prime minister and 19 other ministers.

YUGOSLAVIA

The federal people's republic became independent in 1918 as the Kingdom of the Serbs, Croats, and Slovenes. In October 1929 its name was changed to the Kingdom of Yugoslavia. It was constituted from territories taken in World War I from Austria-Hungary and Bulgaria. Germany conquered it in World War II but did not succeed in subduing the "partisans" led by Tito. The latter, with Russian assistance, abolished the monarchy and set up a Communist-type government.

The Federal People's Republic of Yugoslavia consists of the people's republics of Serbia, Macedonia, Croatia, Bosnia-Herzegovina, Slovenia, and Montenegro, with the autonomous region of Kosovo-Metchiya (both included in Serbia).

The first constitution was proclaimed January 31, 1946, by the Presidium. This constitution was extensively amended by a fundamental law of 1953, which confines the power of amendment to the People's Assembly, three-fifths majority in each council being required. The constitution affirms social ownership of the means of production, self-government by the producers in the economy, and self-government by the working people in local political subdivisions.

The lawmaking body is the People's Assembly, consisting of the Federal Council and the Council of Producers, each elected for a 4-year term. The Federal Council consists of (a) directly elected deputies, one for each 60,000 inhabitants, and (b) 70 deputies chosen by councils of constituent republics. The latter may act independently as a "Council in Nationalities" in matters of constitutional changes or economic plans. The Council of Producers consists of one delegate for every 70,000 of producers' population. Delegates represent workers and office employees in industry, mining, forestry, construction, transport, commerce, public accommodation, communal activities, and handicrafts. Deputies must continue to be producers in their own group or lose their mandate.

The president is elected by the People's Assembly in a joint session from among its members, his term, like theirs, being 4 years, but he may be removed before the end of his term. Similarly elected are 30 to 45 members of a federal executive council, which, with the president, form the executive branch of the government. The president presides over the executive council but is not bound by its decisions, which he may refer to the People's Assembly. The executive council submits the budget and economic plans to the People's Assembly. The executive has no veto over legislation.

Any measure on which the two chambers of the legislature agree is regarded as a valid law. Interpretation of the law rests with a permanent commission of the People's Assembly. If the two chambers disagree over a bill, a joint committee of the two work out a compromise which, if not finally accepted, may entail dissolution of the Assembly. The matter, however, like all other bills, may be submitted to a popular referendum. The Assembly appoints and may remove judges of the supreme court.

Each republic has its own constitution, modeled on that of the Federal Republic. All powers not delegated to the Federal Republic are reserved to the individual republics, but the list of delegations is very comprehensive. Local government is administered by people's committees and executive committees in districts and towns. The supreme courts of the federal republics are elected by the people's assemblies.

ZAMBIA

The Republic of Zambia was formed in 1964 from the former British protectorate of Northern Rhodesia after the latter had acquired independence from the Federation of Rhodesia and Nyasaland. This federation, formed in 1953, was dissolved in 1963; it had included also Malawi (formerly Nyasaland) and Southern Rhodesia. Zambia remained a member of the British Commonwealth. Zambia is one of the world's leading producers of copper but is handicapped by being landlocked.

Under its constitution of 1963, Zambia has a Legislative Assembly of 75 members elected by universal suffrage for a 5-year term. The first president was appointed by the Legislative Assembly but his successors are elected by the people for a 5-year term. The president appoints a vice president, who is the leader of the government in the National Assembly.

POLITICAL TERMS AND INSTITUTIONS

THE study of the governments of the world today is facilitated by the scientific definition of political ideas and by increasingly accurate descriptions of forms of political organization. An acquaintance with these general conceptions and facts is necessary to comprehension of any nation's history and government. This dictionary presents, with brief and authoritative treatment, a large number of the most important of such institutions and terms. They are discussed in respect to their general forms and meanings and also with regard to particular developments and usages in different countries. Significant features of American political life are given especial attention.

This section therefore has a threefold value. It supplies a convenient reference dictionary of political terms. Further, it supplements the articles upon the history and the governments of the world, adding more complete treatment of special topics than could be given in those articles. Finally, it furnishes a valuable means for comparative study of political ideas and practices prevailing in different countries.

Absolutism. A form of government in which the supreme power of the state is vested in a person who rules unlimited by constitutional laws.

Admiralty (*ăd'mĭ-răl-tĭ*). The branch of the law which treats of civil and criminal cases arising on the high seas. In the United States, admiralty jurisdiction is vested by the Constitution in Federal courts.

In England, admiralty denotes that department of the government which has jurisdiction over the naval forces and over all merchant vessels flying the British flag.

Air Zone. Air space above the territory and waters of belligerents. In international law, air zone is regarded as a field for military combat.

Alderman. A member of a municipal body, either popularly elected or "co-opted," that is, added by choice of the municipal council.

Allegiance. Obligation of obedience and loyalty on the part of a citizen toward his country. An alien is under obligation of temporary and partial allegiance to a country in which he is a resident, and thereby is bound to obey its laws and answer the summons of its duly constituted authorities. The term is also used broadly to designate the relation of loyalty and support which one has assumed toward any institution, party, movement, or leader.

Ambassador. See *Diplomatic Representation.*

American's Creed. See *Creed, The American's.*

Amnesty (*ăm'nĕs-tĭ*). An act of government granting exemption from criminal prosecution and punishment. It often extends to a class or group. It differs from pardon in being granted before rather than after conviction.

Anarchism. A social doctrine which advocates the abolition of all governmental authority, to the end that the individual may be free to realize his desires and aspirations without legal restraint.

Apportionment. See *Representation.*

Appropriation. Restriction to a specific purpose of money voted by a legislative body. In England traces can be found as early as the Fourteenth century, but it did not become the established practice until the Seventeenth. In the United States it is prescribed by the Constitution (Art. I, sec. 9). Historically it has been an important means of controlling the executive.

Arbitration. A method of settling disputes between nations by referring the matters in question to an arbitral authority for decision. Sometimes this authority is an individual, as the head of a state; at other times it is a board, a court, or a special arbitral tribunal. International practice of arbitration has been much advocated in America.

Among important arbitrations to which the United States has been a party are the Geneva Award, 1872, which settled American claims upon Great Britain; the Venezuela Boundary Dispute of 1897; and the Bering Sea Arbitration of 1893. The United States has treaties providing for arbitration with many states. See *Hague Tribunal.*

Arbitration of Industrial Disputes. Continued struggle between employers and employees in the development of modern industry has occasioned repeated resort to arbitration to settle labor disputes and to terminate deadlocks, injurious not only to those concerned but to the public as well. Many states have established public boards of industrial arbitration without providing for compulsory resort to them.

In New Zealand, and later in New South Wales and in West Australia, laws have been passed compelling submission of industrial disputes to arbitration and providing state arbitral machinery.

In the state of Kansas, a compulsory arbitration act was passed in 1920, and a court of arbitration was created. This legislation was upheld by the state courts; but, in June 1923, the United States supreme court decided that the power accorded this court to fix wages is in conflict with the 14th amendment and is therefore unconstitutional.

Aristocracy. A term used by the Greek philosopher, Aristotle, to denote government by the best qualified. He recognized the tendency of such a form to degenerate into government by the corrupt or the wealthy, to which debased type he applied the name "oligarchy." Aristotle contrasted aristocracy with "monarchy" on the one hand and with "democracy" on the other, and since his time these have remained fundamental political conceptions.

The term "aristocracy" is applied also to the nobility and gentry of states with monarchical institutions, and so, by analogy, to those people who assume superior qualities or social standing.

Army of the United States. See *National Defense.*

Attainder. The extinction, by an act of a legislative body, of all civil rights of a person, and his sentence to death, without hearing or other judicial process. The Parliament of England passed many such acts, particularly during the 15th and 16th centuries. Bills of attainder are expressly prohibited by the Constitution of the United States and by most of the state constitutions.

Bills of "pains and penalties" of the British Parliament resembled bills of attainder, but they imposed lesser punishment than death.

Autocracy. A form of government in which political power is absolute and unlimited. This form of monarchy reached its greatest pretensions in Europe in the 18th century. It generally disappeared in the 19th century. Among the great European powers, Russia was the last to adhere to it, and the title of "Autocrat of all the Russias" was held by the czar until the abdication of 1917.

Ballot. See *Voting.*

Belligerency (*bĕ-lĭj'ĕr-ĕn-sĭ*). The status whereby regularly organized fighting forces become entitled to the protection of the laws and usages of war. The Hague Convention of 1899, which codified international rules of warfare, provided that troops, to be entitled to these privileges, must be part of the military organization of a recognized "belligerent"; must be commanded by properly commissioned officers; must wear distinctive uniform; must carry arms openly and not be guilty themselves of conduct contrary to the usages of war among civilized nations. Among recognized rights of belligerents are: the right of surrender and of capture rather than death upon the field; trial by court-martial before execution, and humane treatment as prisoners of war.

Belligerency is an official recognition withheld from mere rebels or insurgents, who may be treated without regard to the laws and usages of nations.

Bicameral (*bī-kăm'ĕr-ăl*) **System.** That form of legislature which consists of two separate chambers or houses, the concurrence of both ordinarily being essential to the enactment of legislation. A one-chamber legislature is known as a *unicameral* system. The bicameral system is found in the United States in both Federal and all state governments, with the exception of Nebraska. More than half the national legislatures in Europe are bicameral, the remainder being unicameral. In state, provincial, and local government, single chambers are the rule in Mexico and Canada.

The bicameral system is traced to the influence of the English bicameral Parliament, which, for reasons that were accidental rather than deliberate, early organized into a House of Lords and a House of Commons.

In the American state, the bicameral Congress harmonized the conflicting purposes of the framers of the Constitution, the Senate representing the states, with equal representation, and the House of Representatives, the nation, on the basis of population.

Elsewhere than in federal government, the two-chamber legislature is usually justified merely as a check upon hasty, ill-considered legislation.

Bill of Rights. An English act of Parliament of 1689, entitled "an act declaring the rights and liberties of the subject, and settling the succession to the crown." After reciting the abdication of James II and the vacancy of the crown, the act declares the ancient rights and liberties of Englishmen: (1) that it is illegal for the king to attempt to suspend laws without the consent of Parliament; (2) that levies of taxes without grant of Parliament are illegal;

(3) that subjects have the right freely to petition the king; (4) that the raising or keeping of a standing army within the kingdom in time of peace, unless it be with the consent of Parliament, is against the law; (5) that Protestant subjects may bear arms suitable for their defense and as allowed by law; (6) that the elections of members of Parliament shall be free; (7) that freedom of speech and debate or of proceedings in Parliament shall not be impeached or questioned outside of Parliament; (8) that excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted; (9) that a person accused of crime shall be entitled to a trial by impartial jurors; (10) that grants of the fines and forfeitures of accused persons before conviction are illegal; and (11) that Parliament shall be frequently convened.

These so-called "rights of Englishmen" expressed in definite form those limitations upon the royal prerogative to which Englishmen believed they were entitled under the customs and common law of the realm. Next to Magna Charta, the Bill of Rights of 1689 is regarded as the most important constitutional document in English history. The accession of William and Mary was made dependent upon its recognition. From this fundamental statement, similar bills have been framed in the course of constitutional development in many countries.

The American colonists held to the principle of these limitations upon the power of the crown, and their revolution rested in part upon the alleged violation of them. The first ten amendments of the Federal Constitution constitute the so-called "American bill of rights," several repeating the language of the English law. (See *Constitution of the United States.*) Similar constitutional guarantees have been incorporated in the constitutions of every American state.

In 1789, the French National Assembly adopted the famous "Declaration of the Rights of Man and of the Citizen" which, more theoretical than its English predecessor, has enjoyed scarcely less influence in the progress of revolution against autocratic government.

Bloc. A French word, meaning "mass" or "group," somewhat recently introduced into political parlance, to mean an association of legislative members or of political workers of different parties, formed to support a certain measure or ministry.

One of the most famous of such combinations was the so-called "Blue-Black bloc," a union of Conservatives (blues) and Clericals (blacks) in the German Reichstag, especially between 1894 and 1907, in which latter year a new bloc was created, that of the Conservatives and the Liberals.

The term has been introduced into American politics through the union of members of Congress pursuing certain agrarian policies in what is called the "agricultural bloc."

Blockade. The closing or blocking of entrance to the ports of a belligerent country by hostile naval forces to shut out neutral commerce and to prevent the entrance of supplies or re-enforcements. A blockade, to be valid in international law, must be officially declared by a belligerent against the ports of another belligerent; must be officially called to the attention of neutral powers; and must be effective.

During World War I, the British, by their naval control, practiced a blockade upon German ports by proclamation rather than by the close patrol of war vessels. This system was extended to ships bound for the ports of neutral countries contiguous to the central European powers, or with which they were able to maintain communication.

Bolshevism (*bŏl'shĕ-vĭz'm*). A term derived from the Russian *bolshestvo*, meaning "majority"; hence bolshevik, plural, bolsheviki. Bolshevism is the radical extreme of Marxian socialism. It accepts the doctrine of Karl Marx, that an irreconcilable antagonism exists between the propertied class, or bourgeois, and the propertyless workers, or proletariat. It invites as inevitable and necessary the "class war," the object of which is the destruction of all classes except the proletariat, in whose interest and by whom future society will be organized with a view to production for use rather than for private profit.

Bolshevists differ from more moderate socialists by the literal interpretation they give to Marx's phrases. By the "class war," they mean actual warfare. They repudiate peaceful measures, especially parliamentary action, and advocate and employ violence for the immediate and complete attainment of the "revolution." They hold the political achievements of the last century and a half—political freedom, representative government, etc.—to be deceptive and illusory "bourgeois triumphs" inimical to the proletariat, since they have strengthened and extended the power of the propertied class.

The philosophy of Karl Marx, which was essentially "determinist," taught that the evolution of capitalistic society into communism is inevitable, through the process of the rich becoming richer and fewer in number, while the poor become poorer and more numerous. This irresistible development would go on until the overwhelming mass of mankind would be reduced to the class of proletarians, when capitalism would be "mature" and incapable of resisting its "capture" by the propertyless.

Envisioned as steps in the process were the organization of workers into unions, teaching them to act in concert, and periodic social distress arising from economic depressions. The Marxian analysis of capitalism held that the urge for profitable markets would precipitate "imperialist" wars, and that the resulting disorganization would lend opportunities for the proletariat to seize power. With each nation refashioned on a socialist pattern, Marx held, a world federation of co-operating republics would be possible.

Bolshevist Policy in Russia. The collapse of Russia in 1917 afforded the Bolshevists an opportunity to seize the power of the state, to destroy the opposition ("counter-revolutionists"), and to establish a communistic society on a gigantic, national scale. (See *Russia.*) The form of government set up to replace the constitutional and representative system was that of "soviets" (committees of propertyless workmen and soldiers) to which soviets or councils all power was attributed. (See *Soviet.*) All property was seized; all trading or commerce was penalized; all persons became the operatives or fellow laborers of the soviet state, which assigned to each individual or to his group its definite task and fixed the output or production required. An elaborate system of accounting and of control of industry was created. Severe penalties were visited upon recalcitrant bodies of laborers and upon peasant communities which failed to deliver the required production to the Soviet state.

The plan came near to being wrecked by the refusal of peasants to part with their produce. For a time the government compromised with a system of private profit. Then in 1927 began a ruthless effort to collectivize farming. State farms and co-operative farms were organized, many of them of enormous size, and the most improved types of machinery were used to work them. Private property was permitted to the extent of allowing each farmer to own enough land and animals to supply his own needs.

Other compromises with a rigorous communism were made by permitting different pay for different types of work and allowing individuals to accumulate property as long as this was not accomplished by using the labor of others to make profit. Five-year plans of national development were undertaken and carried through with a success that made Russia a rival of other great industrial states. The nation continued to advance economically throughout the great depression which plagued the rest of the world in the years following 1929.

Relation to Other Nations. The attitude of the Bolshevists at first was to expect a world-revolution within a short time. To bring this about they organized the "Third International" at Moscow in March 1919. Briefly successful Bolshevist revolutions were effected in several German states and in Hungary. These movements were ruthlessly suppressed. Definitely anti-Communist governments were set up in Italy and later in Germany. Meanwhile the attitude of Bolshevists toward the world revolution was modified. Aggressive propaganda was gradually discarded and peace abroad was cultivated. Instead of struggling for revolution directly, the government proposed to demonstrate in Russia the advantages of organizing economic life not for private profit but for public welfare.

This policy was changed in 1939, when Soviet Russia, in alliance with Germany, absorbed the Baltic states. After World War II the expansion continued, with the reappearance of the Comintern as the Cominform, and the capture by the Communists (the term now used) of the governments of countries bordering on Russia in Europe and Asia, and the organization of Communist parties, directed from Moscow, in other countries.

Bonus. Money paid in addition to a stated compensation. A bonus system, while common in private employment, is rare in public service and usually is adopted only when a sudden rise in prices recommends a temporary increase of government pay.

In the United States the term was used after World War I to describe payments by the national and state governments to former soldiers, as "adjusted compensation." Under the national measure, passed in 1924, over President Coolidge's veto, about four billion dollars was paid. After World War II most states granted bonuses to veterans.

Boodle. Money used in bribing public officials or in improperly influencing elections. The term also signifies plunder, or wealth improperly secured by officials through abuse of public office. It is said that the word "boodle" is derived from a Dutch colonial term meaning estate or inheritance.

Boss System. A term used in the United States to describe the method by which professional politicians, or "bosses," control nominations and elections to public office, and secretly direct the policy and conduct of government, particularly in states and municipalities.

The boss exercises power through a well organized "machine" of partisan workers who seek petty public office in exchange for services at primaries and elections. He frequently controls the candidates, whom his machinery elects, in their exercise of office. Thus the boss system has been aptly termed "invisible government."

The boss system has had its greatest development in the United States where frequency of elections and the number of elective officials overtax the interest of the average citizen.

Direct primaries, the initiative, the referendum, and the recall have been tried as methods of taking from the professional politician his pernicious power.

Bounty. A grant of land or money by the government to private individuals to reward services or encourage activities deemed of public benefit.

After the Civil War, large bounties in public land were given to the transcontinental railway companies to encourage the rapid extension of their lines and to hasten the development of the West.

Bounties frequently take the form of subsidies to owners of private merchant vessels, a flourishing merchant marine being regarded as a needed naval auxiliary in time of war.

Valuable bounties of land or money have often been given to induce enlistment in the military forces of a country, or to reward military service in time of war.

Brainwashing. The compulsory substitution of one body of political principles by another body through indoctrination or oppression, especially mental torture.

Budget. A detailed statement of the estimated expenditures and revenues for the ensuing fiscal period, submitted to the legislature by an officer responsible for the financial administration of the government. In England, where the budget system has been most completely developed, the chancellor of the exchequer prepares the budget showing the receipts from every source and the expenditures of each department for the year then expiring, together with estimated expenditures for the coming year, and a scheme of taxation for meeting such expenditures.

In the United States, satisfactory budget systems have come much later. American legislatures were long reluctant to let the executive branch of the government propose how moneys should be raised and spent. In 1921, Congress enacted a budget law whereby a director of the budget prepares, under the direction of the president, a budget for submission to Congress. California, New York, and many other states have entrusted similar powers to their governors. In 1933-34, the United States began the practice of dividing the budget into two parts, one showing estimates of current expenditures and income, the other, of sums chargeable to capital or other extraordinary outlays.

Absence of a budget results in waste, duplication of expense, and extravagance in appropriations. From the same cause follows lack of businesslike correlation between the raising and expending of revenues, and the absence of a definite responsibility for the financial administration of the government. See *Logrolling*.

Bureaucracy (*bû-rŏ'krà-sĭ*). Government by an elaborate system of administrative departments and officials, the lower functionaries subordinate in all matters to the higher. A bureaucracy generally tends to become unwieldy and laborious in its operation, through the absence of discretion in any but the higher officials. This produces "red tape" or over-systematization. Bureaucracy may exhibit also a tendency to disregard individual rights and to engage in arbitrary acts, but its most frequently charged defects are its rigidity, conservatism, and spirit of routine.

Cabinet Government. The form of government such as that of Great Britain, which is composed of a group of ministers, collectively called the "cabinet." Usually members of the cabinet are chosen from the leaders of the majority party of the Parliament or legislative body, and they are collectively responsible to that majority for the general policies and conduct of the government. As a rule, each member is the head of an administrative department.

Under systems of parliamentary government, the cabinet retains office only so long as it commands the support of the legislature.

Where there is more than one chamber in the national legislature, the dominant chamber, as the House of Commons in England or the Chamber of Deputies in France, is the one upon whose support the cabinet rests. Upon an adverse vote of that chamber on a material matter, the cabinet resigns. See page 1432a.

Cabinet government, which is called also "parliamentary" or "responsible" government, differs fundamentally from "presidential" government as found in the United States. Here the president is the actual executive head. The cabinet is responsible, not to Congress, but to him. The president is responsible to the nation for his policies and his administration. Members of his cabinet are merely his advisers and subordinates. See page 1404a.

Throughout Europe and in the British "dominions," cabinet government, responsible to a Parliament, has become nearly universal, but, almost without exception, the republics of the western hemisphere have followed the example of the United States, choosing their executives for a fixed term and making them independent of congressional direction.

Campaign, Political. Organized effort by a political party or group to secure the election of a particular candidate or list of candidates to political office. In the United States, formerly, the political campaign was marked by spectacular parades, campaign songs and slogans, immense gatherings of enthusiastic throngs, and by other devices calculated to arouse partisan interest and enthusiasm. More recently, however, political campaigns have been carried on principally by printed appeals, particularly through the medium of the daily newspaper.

In most American states, "direct primaries" or nominations by "primary elections" have taken the place of local and state nominating conventions. This has reduced party influence in political campaigns and has made them largely personal. It has at the same time doubled the effort necessary to secure election, as a candidate must compete at the polls twice, once for the nomination of his party and again for election to office. This system necessitates a large appeal to voters through the mails, by the circulation of personal appeals and "campaign literature," and has had the result of introducing a large element of expense not previously known.

Caucus. A meeting or conference of members of a political party or group to determine upon the candidate or policy to be supported in an election or other political contest. The term is American and is said to be derived from the Indian "kaw-kaw-was," meaning to counsel or confer.

A person entering a caucus is usually held to be honorably bound to accept the decision of the caucus, even though it be adverse to himself or to his views. He may, however, refuse to "caucus" with other members of his party or affiliation, thereby preserving independence of action and choice.

Census. An official enumeration of the population of a country, sometimes including also a tabulation of its industries and resources. In the Western world, the census is of Roman origin. In the time of Augustus, it was extended to the whole empire. The modern system, directed by the government, originated in Sweden in the 17th century. It was then adopted by France. No census was taken in Great Britain until 1800. Modern census-taking, however, may be considered to have originated in the United States. The Constitution provides that a national census shall be taken every ten years. The original purpose was to provide a basis for the periodical reapportionment of members of the House of Representatives, but the scope of the census has been extended to include the securing of data upon racial, religious, social, and economic conditions.

Charter. A grant from a sovereign or other superior authority to an individual, a company, or a territorial division, authorizing the exercise of certain functions or the enjoyment of certain privileges. In England, the crown often granted special charters to authorize individuals to exercise powers of government. Thus charters were granted to the proprietors who established colonies in America. Other colonies received direct charters from the crown empowering the people of the colonies to organize colonial governments. Similar "chartered companies" were created for extending British rule in Africa.

In the United States, charters may be granted for the creation of either public corporations or private corporations. The charter of a public or municipal corporation is today generally in the form of an act of the legislature, pursuant to which the corporation is organized, and which prescribes its form of organization and the powers which it may exercise. As a result, in England and America, municipalities have only such powers as are specifically enumerated in their charters or are bestowed by general laws. Incorporation is extensively used in the United States to create departments of government to carry on specific enterprises, the government owning all the stock. Examples are the Port Authority of New York and the Tennessee Valley Authority.

In the case of private corporations, it was the practice until about 1860 for legislatures to pass special acts for each private corporation created, and an act constituted the charter of the company in precisely the same manner as in the case of the public or municipal corporation. However, with the growth of the corporate form of business organization, the need of a special enactment for each private corporation burdened legislatures with private bills and led to political abuses. As a result, constitutional or legislative provisions were adopted in nearly all states, providing for the organization of private corporations under general incorporation laws.

Child Labor Legislation. See *Social Legislation.*

Chinese Exclusion. See *Immigration Legislation.*

Citizenship. The relation of an individual to his state, by which he owes obedience and loyalty, and in turn receives protection. The term as now used does not necessarily include the possession of political rights. Thus minors and women are citizens regardless of their right to vote.

In the United States, there is generally a dual citizenship: that of the nation and that of the particular state of which one is a resident. By express provision of the 14th amendment, as well as by the common law, any person born in the United States, of American parentage or of alien parents temporarily resident in the United States and therefore subject to its jurisdiction, is a citizen of the United States. Persons born of American parents on the high seas, or while such parents are temporarily resident abroad, are also citizens by birth. Children of diplomatic representatives of the United States, temporarily resident in a foreign land, are likewise citizens.

Citizenship in two different countries at the same time is technically possible and frequently occurs. Thus the laws of some countries provide that a citizen by birth ever continues to be a citizen of that country and cannot divest himself of allegiance. If such an individual becomes natural ized in another country, both his native country and the country of naturalization may then claim from him the duties of citizenship. Whether he is to be regarded as a citizen of one country or of the other may depend upon whether the question arises within the territory of the old citizenship or the new. See *Naturalization.*

City Government. Frequently spoken of as "municipal government." Legally, a city is an agent created by government for a definite local area, primarily for the satisfaction of local needs. In European countries generally, outside of Great Britain, and in some non-European countries, city government is also the agent of the state for the local administration of national affairs, and the chief executive of the city is responsible not only to the city government for the conduct of its interests, but also to the national government, whose agent he is. See *France.*

Municipal Authority. In Europe, city governments seldom enjoy autonomy or complete "home rule" but are subjected to supervision from higher branches of administration. This supervision usually applies to such matters as approval of municipal budgets, the granting of franchises and particularly to the exercise of the police power wherein the city is regarded as an agent of the state, discharging state functions. In Great Britain, and to an even larger degree in the United States, city governments are autonomous, free to vote moneys, incur indebtedness, grant public franchises, and engage in municipal undertakings without superior administrative sanction or direction. It is a fundamental principle, however, of British and also of American law that a city government has no inherent or "implied powers" but can legally undertake only those activities enumerated in its charter or sanctioned by general laws. (See *Charter.*) In Great Britain, city government powers are altered or enlarged by acts of Parliament in what are called "private bills."

In Great Britain and in the United States, the courts may be invoked to restrain a city government from undertaking activities not specifically granted by law. In the countries of continental Europe, the range of the activities of municipalities is not exactly fixed by law; but a city, subject to superior administrative approval, is presumed to be competent to assume any undertaking for the better satisfaction of local needs.

In the United States and likewise in Great Britain, city government is usually confined to urban areas where the population is sufficiently dense to require that service which cities are organized to supply. The public needs of rural regions are taken care of by county government, the jurisdiction of which extends also over the cities. This leads to a certain duplication of public service within American cities, and, in a few instances, notably San Francisco, California, it has led to the creation of a special combined "city and county government."

State Control. In the United States, originally, state legislatures possessed complete power over city governments and could alter their charters at any time or subject them to special laws and administration. Abuse of this legislative power led to constitutional limitations upon state legislatures, forbidding them to pass special laws affecting municipalities. Furthermore, in a number of American states the freeholders or citizens of a city are permitted to frame and to adopt a special charter embodying their own choice of the principles of municipal government, and this charter, when ratified by the legislature, becomes the legal basis of city government.

City Planning. The orderly laying out of a city into industrial, mercantile, and residential sections, and the organization of its streets, parks, and public buildings, so as to obtain the maximum of convenience, health, and beauty.

The Roman cities were laid out on the "checkerboard plan" with streets at right angles and with a central square or plaza on which the principal public buildings fronted. During the Middle Ages such orderly layouts largely disappeared in much of Europe as cities were destroyed or decayed and a primary objective became defense against outside enemies. Protective walls were more important than convenient streets and sanitation.

Although the Roman system had survived in Spain and was followed in Spanish cities in the New World, it was not until the 18th and 19th centuries that advanced principles of city planning were adopted elsewhere. Philadelphia was laid out on the checkerboard plan. Later, in Europe, the central portions of Vienna and Paris were reconstructed at great expense to achieve impressive beauty, and wide boulevards replaced the ancient walls. In Paris, avenues radiating from central plazas provided vistas and shortened diagonal travel distances. Washington, D.C., was laid out on this plan with broad streets and beautiful parks.

By the mid-20th century, motor-car traffic and parking problems compelled drastic modifications in the large cities. Resort was had to roads passing above and below the street level with complicated ramps and interchanges, a system in which Stockholm and Los Angeles led the way. One interchange in Stockholm accommodates traffic on five different levels. In some cities, reconstructed after their destruction in World War II, certain central areas are reserved for pedestrians. See *Zoning Ordinances.*

Civic Center. The more important buildings of a municipality grouped together within an area conveniently accessible from all parts of the city form a civic center. By such grouping, an impressive architectural scheme is made possible and the transaction of public business is facilitated. See *City Planning.*

Civil Rights and Liberties. Civil rights are those explicitly conferred upon the citizens, subjects, or residents of a state by positive law, the enjoyment of such rights being secured by action of the state itself. Political rights, likewise conferred by law, are normally confined to citizens and include voting in public elections, holding office, serving on juries, etc. So-called "natural rights" are purely theoretical and have interest for the political scientist mainly because of their influence on revolutionary or reform movements or after they have been converted into civil rights embodied in positive law.

Growth of Modern Rights. As a matter of fact, civil rights as they exist in the Western world have been defined mainly by actual struggles of governed peoples for greater freedom against arbitrary authority, and they represent practical achievements in this direction. (See *Bill of Rights.*) The original home of most civil rights recognized in modern law was England; thence these liberties were carried to America by English colonists and there received an expansion and an emphasis through the American Revolution. From the United States these ideas were carried to France and there, by the French Revolution, were restated in the form in which they have been communicated to most peoples of the world.

Civil Liberty in America. American protection of civil rights was first incorporated in the Constitution in 1791 by amendments I to IX. After the Civil War, amendments XIII and XIV were adopted, the first in 1865 abolishing slavery and the second in 1868. The latter affirmed citizenship of all persons born in the United States and forbade states to make laws abridging the privileges or immunities of citizens. The purpose of these amendments was to erase the discriminatory after-effects of slavery, but this purpose was far from being realized.

Nearly a hundred years later, the Civil Rights Act of 1964 was adopted with the broad purpose of preventing political and economic discrimination based on race, color, religion, sex, or national origin. Article XIX (1920) had forbidden political discrimination based on sex. The new law widened this protection and extended protection also to religious and national-origin minorities. Specifically, discrimination was forbidden in registration and voting rights, in administration of government-financed projects, in employment, in schools, and in establishments serving the public, such as restaurants.

Enforcement is by the courts through civil suits by individuals, in which suits the government may intervene. The act sets up a Civil Rights Commission to investigate discriminatory practices and a Community Relations Service to assist in solving problems of discrimination. It undercuts discriminatory literacy tests by states for registration to vote by providing, among other things, that completion of the sixth grade is presumption of literacy.

Constitutional Protection. The United States has undoubtedly given a wider legal protection, particularly to the rights of property, than has any other country of the world. The Constitution, furthermore, has made these rights inviolable, not only by executive officers, but even by Congress or by legislatures. This condition has come

about through the supremacy of constitutional law over national or state legislation and through the practice of the courts, and particularly of the supreme court of the United States, in refusing to enforce statutes judged to be at variance with the Constitution. A vast body of judicial decisions defining and protecting civil rights has been developed by the courts of the United States and of the states.

Civil Service. This term includes, in its broadest sense, all positions under the government, Federal, state, and municipal, outside of the army and navy. Commonly, however, it is limited to administrative or executive positions, particularly to those that are appointed and are protected by legal safeguards against demotion or dismissal.

Beginning with the inauguration of President Jackson in 1829, for many decades the public service in the United States suffered from the carrying out of certain so-called "democratic" theories of government. The first of these was that public administration was not an expert function, but could be fitly discharged by any citizen, even though inexperienced and untrained. The second was the theory of "rotation in office," which demanded the frequent transfer of public position from one individual to another, on the theory that the right to hold office should be enjoyed by the largest possible number of citizens. It was further supposed that continuous employment led to neglect, indifference, and discourtesy on the part of public officials.

Civil Service Reform. These generally accepted political views, to which was added also the theory of "spoils" (See *Spoils System.*), long deprived American government of an efficient body of public servants and resulted in a loss of efficiency and in the corruption of politics. An office-seeking class grew up, whose purpose was to control politics, national and state, for the purpose of securing office and using its power for private advantage. This experience, while discreditable to American politics, nevertheless prevented the development in this country of an overbearing or autocratic official class. (See *Bureaucracy.*) After the Civil War, active effort was begun to secure "civil service reform," or the placing of employment under the national government upon a "merit basis," open to all candidates, irrespective of party or religious affiliation. This movement was emphasized by the deplorable assassination in 1881 of President Garfield by a disappointed office seeker.

The act of 1883 grouped Federal employees into three classes: (1) classified or competitive; (2) unclassified; (3) excepted and noncompetitive. The classified or competitive positions were to be filled by examinations under the direction of a "civil service commission" of three members appointed by the president with the approval of the Senate. Preference was given to persons "honorably discharged from military or naval service by reason of disability, wounds, or sickness incurred in the line of duty." Furthermore, a person holding a position in the competitive or classified civil service could not be dismissed without first being notified of the charges against him and given an opportunity to reply in writing. Since the enactment of this law, the class of competitive positions has steadily increased, and the proportion of unclassified and noncompetitive positions has diminished. Statutes similar to the act of Congress have been adopted in certain states, and similar provisions have been made by numerous cities.

Classified. Confidential government information which for reasons of national security cannot be divulged except to authorized persons.

Closure (*klō'zhûr*) **Rule.** A method used in parliamentary bodies to close debate upon a bill or proposal, by moving "the previous question." The motion is made "that the question be now put"; and, in the event that this motion carries, the matter under discussion is immediately put to vote, without further debate. The term has its origin in the *clôture* (*klō'tür'*) of the French Parliament.

In the British House of Commons, a modified form of the closure was adopted in 1882. The United States Senate is one of the few great legislative bodies which long refused to incorporate the closure in its rules of procedure. A minority in that body, by occupying the floor in continuous discussion and maneuvering, was, and still is, able to delay the passage of a bill until the emergency disappears, or the session comes to a close. This procedure is called "filibustering." In March 1917, the Senate adopted a closure rule, which somewhat controls filibustering. On the other hand, the absence of the closure rule prevents the majority from imposing a "gag rule" on the minority and permits a freedom of debate.

Coalition. An alliance of persons, parties, or states. The term coalition has been used repeatedly in European history to designate a league of states for offensive or defensive purposes.

Its more common use at the present time refers to the union of parties and to a government built upon such a coalition. The necessity for "coalition governments" arises in many countries through the fact that in their legislatures there are a number of parties or groups, and no one party possesses sufficient strength to form a government that will command the support of a majority of the legislature; hence an alliance or coalition of party elements is indispensable to the formation of a government.

During the World Wars, in order to present a united front for the prosecution of the war and to utilize, without distinction of party, the best statesmanship available, in most of the belligerent countries a party truce was declared and a coalition government was formed.

Cold War. A conflict between nations which does not involve the use of armed forces in combat, but is conducted by means of political and economic pressure and propaganda; a war of nerves.

Collectivism. A theory of economic and social organization in which all "productive capital" would belong to the community, and the share of each individual would be determined by the value or social utility of his contribution to the social income. Collectivism is practically synonymous with the generally accepted concept of socialism. See *Socialism* and *Bolshevism.*

Commission Government. A type of administration widely used in Great Britain and in America, whereby executive and sometimes legislative and judicial or quasi judicial functions are intrusted to a number of individuals forming a board or "college." The theory of commission government is that responsibility for all decisions and directive action rests in the group, not in any one individual, and that all members of the group are officials with expert knowledge, presumably giving their entire time to the service of the office. In these respects, commissions differ from boards, which, in the United States, are frequently used as the legal governing bodies of institutions and are composed of laymen managing the public business through an executive appointed by and responsible to the board. Where, as frequently happens, a commission is given an ordinance or legislative power or the power of judicial review, such government represents an abandonment of the popular theory of "separation of powers."

Well-known types of commission government in England are the admiralty lords, who administer the British navy, and formerly the lords of the treasury, although this commission has now become obsolete and its functions are exclusively exercised by another official, the chancellor of the exchequer. In the United States, the Interstate Commerce Commission, the Civil Service Commission, and public utility commissions in several states represent commission government. One of the most notable instances was the Philippine commission of 1900-1907, which was vested, first by the president and subsequently by Congress, with the powers of governing and legislating for the Philippine Islands. In 1901, following the flood which destroyed the city of Galveston, Texas, the government of that municipality was intrusted to a commission of five citizens. The success of this experiment led to the general adoption in the United States of the so-called "commission plan of city government." See *Commission Form of Government*, page 1418c.

At times, in British and in American practice, an executive office ordinarily consigned to a single minister or public official may be intrusted to a group, in which case the office is said to be "placed in commission." Such a body created for one single purpose, either temporary or permanent, is in English practice described as an "*ad hoc* commission."

Common Law. The body of rules, principles, and forms of judicial proceedings which, while not enacted in statutes, have been immemorially recognized and enforced by the courts of England and by the courts of those countries which inherited their systems of jurisprudence from England. Thus it is distinguished from "statute law" or enactments of Parliament or state legislatures.

The common law is frequently used to mean English law, as distinguished from Roman or "civil law," which was revived and put into force on the continent of Europe at the beginning of the Renaissance period. In England, by reason of the king's courts, the common law at that time was making such progress as successfully to hold the field against the Roman law revival.

In some American states, only those principles and rules of the common law which were recognized before the 4th year of James I, when Virginia was settled, are regarded as having been carried over to this country; but in most states the common law, together with certain fundamental statutes, as it existed at the time of the American Revolution, is regarded as forming a part of the law of such states.

Communism (*kŏm'ú-nĭz'm*). A system of social and economic organization in which property is owned by the state or group, to be shared in common or to be distributed among members of the community equally or in proportion to their respective needs. In communism, there is practically a complete abolition of the notion of private property; the property of each is truly the property of all. Thus communism goes much further than either collectivism or socialism, which proposes to bring all "productive capital," such as land, factories, mines, and railways, under public ownership. See *Bolshevism.*

Communism as thus described has been tried by small communities in Europe and America, but with little permanent success. The term has now become appropriated to the Bolshevist Marxian Socialism as developed in Soviet Russia by Lenin, Trotsky, and Stalin, and the political parties affiliated with it in other countries. See *Bolshevism.*

Concert of Powers. An understanding between the major European states for the enforcement of treaty provisions, for the maintenance of peace, for the control of minor states and peoples within the European system, and for the solution of Near Eastern problems. The concert may be said to have arisen about 1828. The "Great Powers" whose agreement gave force to its decisions were, at the time of its origin, Great Britain, France, Russia, Austria, and Prussia.

The concert was broken in 1854 by the Crimean war, and again in 1871. The most imposing exhibition of the concert was the Congress of Berlin of 1878, which composed the affairs of the Balkans and the Ottoman empire, reaffirming the sovereignty of Turkey in European possessions. Its arrangements gave Europe peace for an entire generation, and were not broken until 1908, when Austria-Hungary annexed Bosnia and Herzegovina. The concert was destroyed by the outbreak of World War I in 1914.

Congressional Record. The Constitution, Article I, Section 5, states, "Each house shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may, in their judgment, require secrecy." The proceedings of the House and Senate are published daily when Congress is in session in the *Congressional Record,* which each member is permitted to send free to fifty persons.

Conscription. The compulsory enrollment of citizens or inhabitants of a country for filling its military forces. Also called "the draft" or "compulsory military service."

While compulsory military service is of ancient date, the French Revolution initiated the plan of commanding the entire man power of the nation for national defense. The National Assembly in 1792 decreed the *levée en masse.* While this hurried assembling of untrained men proved ineffective, it led to the practice of vast drafts upon the able-bodied men of the nation for the Napoleonic wars.

European Systems. The system of compulsory training of all able-bodied young men originated in Prussia, after the overwhelming defeat of that country by Napoleon in 1806. Napoleon limited the standing army of Prussia to a force numerically ineffective. Prussia met this condition by the brief but thorough training of this limited number of men and by their prompt retirement into a reserve, which could be "mobilized" or called to the colors at any crisis and would thereby many times augment the limited standing army. Out of this incident have come the modern systems of compulsory training which, before the World Wars, had been adopted by most European countries and Japan.

In Germany, the system was carried out in the most thorough way. Theoretically, all men were trained for appropriate duty in time of war and were classified into several categories: those undergoing active training; those in a first reserve, to be immediately mobilized on the threat of war, each man joining an assigned battalion or other unit; a *landswehr,* or second reserve, of older and less active men; and finally a *landsturm,* composed of men in middle life no longer judged capable of front line duty, but serviceable for duty on lines of communication, for garrison duty, and for home guards. Great Britain had at times practiced unsystematic "impressment" of men for the army and navy, depending generally on voluntary enlistment. World War I forced her to the Conscription act of 1916. Peacetime conscription was begun in May 1939, and there was rigorous conscription in World War II.

American Conscription. The United States has three times resorted to conscription and involuntary enlistment. During the Civil War, the Northern states, in 1862, the Southern states earlier, adopted compulsory enlistment. On the entrance of the United States into World War I in April 1917, a selective draft act was passed by Congress which required the enrollment for military duty of all men between 21 and 31, the act being subsequently extended to include all men between 18 and 45. From these a selective draft was made for active service. September 16, 1940, the Selective Training and Service Act authorized the first peacetime draft in American history. It provided for the induction of males between 21 and 36 to be trained for one year for national defense in the Western hemisphere. By later enactment the time and area of service were extended. Men from 20 (later 18) to 65 were required to register, and men up to 45 were liable to induction, except certain officials and clergymen. But men in certain key industries, men with dependents, or physically disabled, might be deferred. Provision was made for conscientious objectors. The selection was made by local boards on the basis of a lottery conducted after the first registration, and contested cases might be taken to appeal boards. Provision was made for dependents of men inducted. In June 1948 the Selective Service act was revived.

Conservation. The term applied to the policy of government regulation of the use and development of the natural resources of the country so as to prevent their rapid and wasteful exhaustion by private ownership. Conservation further aims to provide a systematic development of such resources in the interests of the general public and for the benefit of later generations. See *Public Lands Policy.*

Constitution. A constitution is a fundamental or "organic law," upon which the government of a nation rests. To be theoretically complete, a constitution should provide a structure of government; an enumeration of civil rights and liberties (See *Civil Rights and Liberties.*); and a provision for its own amendment. The amending provision has special significance, since it may be assumed to disclose the sovereign power within the state; for that power which is above the constitution, and which may alter or repeal it, may fairly be regarded as the "legal sovereign."

The modern practice of adopting "written" or "rigid" constitutions as a basis for national or state government is of American origin and is one of the political achievements of this country which has been generally borrowed the world over. The earliest constitutions of this typical form were those adopted by the American states, when, by the Declaration of Independence in 1776, they ceased to be colonies of Great Britain. These were followed in 1789 by the Constitution of the United States. (See *Constitution of the U. S.,* page 1395.) Nearly every government in the world today rests upon a written constitution, either granted by a monarch or framed by a national convention.

Great Britain has what is called an "unwritten constitution," in that a large part of it is not in written or statute form, but is a matter of practice. Furthermore, the various statutes underlying the government of the realm have never been codified or unified in a single document; also, it is a fundamental principle of the English constitution that it can be changed in any respect by a simple act of Parliament. In this sense, no act of Parliament is more fundamental or organic than any other. (See page 1432d.) This character gives to the British constitution a flexibility not possessed by that of the United States.

The period of active constitution-making in Europe began with the French Revolution, when numerous constitutions were devised, many of them on highly theoretical lines, and a number successively put into operation. From Europe, the revolutionary movement passed back to the Spanish colonies of America, where an active process of constitution-making arose, greatly influenced by the constitutional forms of the United States.

Following the revolution of 1848, European countries generally attained constitutions or fundamental laws limiting monarchical power and increasing the political participation of the people. A new and extremely active period of constitution-making followed the end of World War I in 1918, when many new states came into existence and when older constitutions were subjected to radical revision.

Consul. A representative of a government in a foreign country, particularly for commercial purposes and for the aid and protection of its citizens abroad. The duties of a consul include the making of reports on commercial conditions in the country to which he is assigned, various services in connection with the landing of vessels at foreign ports, the relief and protection of citizens of his country in times of distress or disturbance, and other duties, even including those of a diplomatic character in the absence of an ambassador or a minister.

For the judicial functions exercised by consuls, see *Extraterritoriality.*

Contraband. Primarily, articles sent from a neutral to a belligerent country in time of war for military and naval use. Under generally recognized laws of war, such merchandise may be seized and confiscated if taken upon the high seas or within enemy territory. Ordinarily, confiscation follows the judgment of a prize court, in which the neutral owner may have the right to appear and to defend his title and interest. Formerly, the list of articles generally recognized as contraband was limited, and embraced mainly arms and military supplies. World War I, however, so completely engaged the entire resources of the belligerent nations that it led to a great expansion of the list of contraband goods. At present it would be difficult to say what is not contraband in time of war.

Convention, Political. A gathering of party adherents or delegates for the purpose of selecting candidates for public office, for declaring their body of political principles or "platform," and for organizing party administration.

Political conventions were a relatively late development of American democracy. In the early decades of the Union, candidates were nominated in various ways, a caucus of members of the same party in Congress usually choosing the national candidates. After 1832, the national political convention became the accepted method of nominating candidates for president and vice president.

In the states, it was formerly the universal practice to hold not only state conventions for nominating candidates

for state offices, but county conventions and local primaries. The place of these conventions in American political life has been greatly reduced in recent years by primary election laws. The national party convention, however, meeting once in four years, shortly preceding the presidential election, continues to be a political institution of first importance, although almost entirely unrecognized by Federal laws. Each party, by its own rules, determines how delegates shall be chosen and how the business of the conventions shall be conducted. Election as a delegate to a national convention is an eagerly sought distinction, and, preceding and during the days of their meeting, such conventions overshadow other matters of national interest. The greater part of the time during which a national convention meets is usually devoted to the nomination of, and the successive ballotings for, candidates for the presidency and the vice presidency. This is accomplished by a majority vote of all delegates present. The Democratic party adopted this rule in 1936 after having, since the party's origin in 1832, required a two-thirds vote for nomination.

Besides nominating its presidential candidates, the convention adopts a party platform and, before adjournment, chooses the national committee, made up of one representative from the party organization in each state. The national committee has great power over the organization in the period between conventions and can usually influence in a measure the proceedings of the following convention.

Corporate State. A term applied to such governments as those established by the Fascists in Italy and the Nazi party in Germany. Totalitarian is sometimes used as a synonym. The idea behind the word is that the nation consists of one class, or body (Latin *corpus*, "body"), and not two classes, the workers and exploiters, as the Marxian Socialists contend. Implied in the word also is the absence of political parties, all those except the ruling one being suppressed.

Corrupt Practices Legislation. The extension of the democratic franchise has induced nearly all countries to adopt laws safeguarding voting at primaries and elections. In the United States, these laws frequently prohibit contributions by corporations to political campaign funds. Other laws limit the expenditures of the candidates.

Court Martial. See *Military Law*.

Creed, The American's. Written by William Tyler Page, Clerk of the U. S. House of Representatives, in 1917, and adopted and promulgated by the Government's Committee on Publication. Accepted by the House of Representatives, on behalf of the American people, April 3, 1918.

"I believe in the United States of America, as a government of the people, by the people, for the people; whose just powers are derived from the consent of the governed; a democracy in a republic; a sovereign Nation of many sovereign States; a perfect union, one and inseparable, established upon those principles of freedom, equality, justice and humanity for which American patriots sacrificed their lives and fortunes.

"I therefore believe it is my duty to my country to love it; to support its Constitution; to obey its laws; to respect its flag; and to defend it against all enemies."

De Facto Government. A government which is actually exercising governing power in a particular territory, irrespective of its legal authority. *De facto* government is distinguished from *de jure* government, the latter being a government which exists by legal right or by international recognition.

Democracy. Democracy signifies popular government. It has been happily defined in Lincoln's phrase, "government of the people, by the people, and for the people." It is distinguished from monarchy, in which the head of the state is a king or prince, and from aristocracy, or government by a privileged or superior group.

None of tnese words is used with entire consistency or exactness in political writings. By democracy is sometimes meant direct popular government rather than government by chosen representatives, and a distinction is then drawn between a democracy and a republic. Few of the new countries established as republics after World War II were democracies.

The word democracy is used also to indicate not only a government which is immediately or ultimately controlled by popular opinion or by the majority of the people, but also one in which society is distinguished by an absence of privileged and aristocratic classes. The theory of democracy rests upon an assertion of the worth of the ordinary man and woman and upon a confidence in the good judgment and moral rectitude of common people; upon the belief that if unwise or wrong action prevails for a time, in the long run the common sense of the bulk of society will recognize and correct the evil. Democracy further rests upon the conviction that the interests of all classes are better served when they are politically controlled by all classes rather than by a single class, even though it be superior in intelligence. Democracy is likewise of value for its educative effect, intelligence and prudence being developed by the sense of responsibility and by sharing political control.

Diplomatic Representation. Diplomacy is the art and the practice of international negotiation. In the early history of Europe, such negotiations were intrusted to special heralds, ambassadors, or missions. The system of keeping diplomatic representatives resident in the important countries with which they had friendly relations was first practiced by the Italian city-states and particularly by Venice.

Such representatives are of different ranks; by the Treaty of Aix la Chapelle, 1818, they were classified in the following four grades: (1) ambassadors, including papal legates and *nuncios*; (2) envoys extraordinary and ministers accredited directly to the sovereign; (3) ministers resident; (4) chargés d'affaires. The first three grades are accredited to the head of the state; the fourth, to the minister having charge of foreign relations. Consuls, when charged with a diplomatic mission, rank with the chargés d'affaires.

Embassies. "Embassies" are established between nations whose mutual interests are of importance; elsewhere the diplomatic office is usually a "legation."

In 1964 the United States had embassies to 106 countries. These states, also maintaining embassies at Washington, were as follows: Afghanistan, Algeria, Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Burma, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Ceylon, Chad, Chile, Nationalist China, Colombia, Congo (Brazzaville), Congo (Leopoldville), Costa Rica, Cyprus, Czechoslovakia, Dahomey, Denmark, Dominican Republic, Ecuador, Eire, Egypt (United Arab Republic), Ethiopia, Finland, France, Gabon, Germany (West), Ghana, Great Britain, Greece, Guatemala, Guinea, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Korea (South), Kuwait, Laos, Lebanon, Liberia, Libya, Luxembourg, Malagasy, Malaysia, Mali, Mauritania, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Russia, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Somalia, South Africa, Spain, Sudan, Sweden, Switzerland, Syria, Tanganyika and Zanzibar, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Upper Volta, Uruguay, Venezuela, Viet-Nam (South), Yemen, Yugoslavia. Ministers were accredited to Bulgaria and Rumania. No diplomatic ties were maintained with Communist China, Cuba, East Germany, North Korea, or North Viet-Nam.

The terms "embassy" and "legation" are used also for the residence or buildings of the minister and the staff. The official residence of an ambassador is known as an "embassy;" that of a minister, as a "legation." It is customary for countries to own such buildings.

Diplomatic Credentials and Privileges. A diplomatic agent is usually accompanied by an official suite which may include counselors, secretaries, attachés from the army or navy, commercial attachés, interpreters, etc. A diplomatic representative carries a recommendation called a "letter of credence" and also, usually, a "letter of instructions" conferring full powers for the closing and the signing of a treaty, and a special passport. On arrival in the country to which he is accredited, he is accorded an official reception by the head of the state, if he is ranking in one of the first three classifications, and by the foreign minister if he is a chargé d'affaires.

A diplomatic representative is accorded certain immunities and privileges which extend to the members of the household and suite. These include inviolability of his person and residence,—an assault committed upon him is an injury to his nation and must be correspondingly compensated for (See *Extraterritoriality.*);—exemption from local jurisdiction; and exemption from the payment of taxes upon his personal property or official residence. From the immunity of a diplomatic representative has arisen the "right of asylum" or of taking shelter in a legation.

It is a general principle that a diplomatic representative must be acceptable to the state to which he is sent, or, if his conduct becomes objectionable, that he may be sent home. This is usually done by the formality of furnishing passports. (See *Persona Non Grata.*) Diplomatic relationship is always terminated on the outbreak of war, and it may also be broken off as a protest threatening war.

The act of accrediting a diplomatic representative to a government is equivalent to recognition of that government, so that, where recognition is withheld, countries intrust the preservation of their interests to a representative of lower grade than an ambassador or minister or to a personal representative. See *Personal Representative.*

Direct Legislation. A term used to describe the enactment of law by popular vote rather than by representative legislative bodies. Direct legislation has been frequently practiced by local communities, from the Greek cities down to New England town meetings. In certain of the Swiss cantons, it still exists in the form of popular meetings for legislative enactments. It was in Switzerland also that the modern method of direct legislation by organized balloting arose. Thence, in the form of the popular proposal of laws (initiative) and the popular ratification or rejection of laws

(referendum), the institutions of direct legislation have spread to other countries and particularly to the United States.

In another form, however, direct legislation in America is older than in Switzerland, that is, in the direct vote of the people upon constitutional or organic laws, which originated in Massachusetts in 1780.

Due Process of Law. The Federal Constitution, in both the 5th and 14th amendments, and all state constitutions, contain provisions protecting the individual against the deprivation of "life, liberty, or property without due process of law."

The due process clause of the 5th amendment operates as a limitation upon the action of the Federal government only. But the similar provision, which was added to the Constitution by the 14th amendment in 1869, expressly protects every American citizen against the unlawful infringement of his life, liberty, or property by the action of any state. The latter provision of the Federal Constitution, although originally intended as a means of safeguarding the independent status of the Negro, has been construed by the courts as operating to the benefit of every citizen of the United States whatever his race or color. This clause has been the basis upon which the supreme court of the United States has declared unconstitutional numerous acts of state legislatures, particularly laws limiting freedom of contract.

Fundamentally, due process of law is merely that judicial procedure "which hears before it condemns, which proceeds upon inquiry, and renders judgment only after trial." As developed by the courts, however, the phrase has come to have a broader significance. It appears to signify the protection under the law of every individual against arbitrary and unreasonable acts of the executive and legislative branches of the government.

Elder Statesman. A retired statesman who because of his experience in public affairs is sometimes called upon to give unofficial advice on current issues, especially to government officials.

Electors, Presidential. The framers of the Constitution of the United States believed that the direct popular election of the president was both impractical and undesirable. They therefore provided for an indirect election of the president and the vice president by special electors, who were intended to be a select body of individuals possessing a broader acquaintance with men and a better understanding of national issues than the ordinary voter. The Constitution provides that each state shall appoint "in such manner as the legislature thereof may direct" a number of electors equal to the state's quota of senators and representatives in Congress.

The electors chosen in the manner provided by each state legislature were thereafter to meet in their respective states and to cast their ballots for two persons. Since the adoption of the 12th amendment, in 1804, each elector is required to designate his choice for president and for vice president. Electors meet in each state on the first Monday after the second Wednesday in December to cast their ballots. The vote thus taken is transmitted to the president of the Senate, who, on January 6 in the presence of both houses of Congress, opens the certificates and counts the ballots from all states.

The choice of the president and the vice president by electors as thus provided has become a mere form. Since 1800, the electors have exercised no individual judgment, but have followed the dictates of the parties to which they have belonged. Electors are expected, as a matter of course, to cast their ballots for the regular party nominees although they are not legally required to do so. A vote for a particular elector is in effect a vote for the party's nominees. In some states, however, the names of the party nominees with or without electors' names appear on the ballot.

Embargo. An order or act of a country, prohibiting vessels or merchandise from leaving its ports. The purpose of an embargo, ordinarily, is to injure another country by depriving it of its usual commerce. Where the embargo applies only to the vessels or goods of a country's own citizens, it is a "civil embargo." Where the prohibition applies also to the vessels of a foreign state against whom the embargo is particularly directed, it is a "hostile embargo." Where the embargo applies to the vessels and goods of all nations found within the ports of a country, it is an "international embargo."

Eminent Domain. The pre-eminent right of the sovereign to all of the property within its jurisdiction, by virtue of which it may appropriate any of such property, howsoever owned, to public uses. A limitation upon this right, fixed or implied in all constitutional governments and expressly incorporated in the Constitution of the United States and in the constitutions of all of the states, is that private property shall not be taken for public use without compensation.

Among the public uses for which the power of eminent domain is most frequently exercised are the creation of streets, parks, forts, docks, and public buildings. The right may be delegated by the state to public service corporations, such as railroads, telephone and telegraph companies, or corporations serving the public with water, gas, electricity, and similar utilities, which are regarded as quasi governmental functions.

Expatriation. See *Naturalization*.

Export Tax. The Constitution of the United States (Article I, Section 9) provides that "no tax or duty shall be laid upon articles exported from any state." This limitation upon the Federal government does not deprive it of the power of declaring an embargo or of otherwise regulating exports, nor does it deprive Congress of the power of imposing a tax on income derived from exports. Trade between the United States and its insular possessions, such as the Philippines, the Hawaiian islands, and Puerto Rico, has been held not to be foreign commerce; but a tax laid by Congress upon such trade is not prohibited by this section of the Constitution.

The Constitution (Article I, Section 10) also prohibits the states from levying any duties on exports or imports, except such as are necessary for the execution of its inspection laws, and then only subject to the control of Congress. The effect of this provision has been to deter the states entirely from such legislation and to maintain complete free trade between states of the Union.

Ex Post Facto Law. Retroactive legislation which makes punishable an act which was lawful when committed or imposes for an unlawful act a more severe punishment than was provided by law at the time the act was committed, or otherwise retroactively affects, to his material disadvantage, the position of one accused of a crime.

The Constitution of the United States forbids both the Federal government and the governments of the states from passing any *ex post facto* legislation.

Extradition. The surrender of a fugitive from justice by one country or state to the authorities of another Nearly all civilized countries have entered into treaties with one another providing for the extradition of persons who have committed specified crimes in one country and have then fled to another. Common limitations in these treaties are that the duty of a nation to surrender such a fugitive shall not extend to its own citizens and that persons extradited shall be tried only for the crime specified in the request for extradition. A further limitation which the United States has inserted in its treaties is that it shall not be compelled to give up persons charged with political offenses.

Extradition between nations is effected by a request of the state or foreign office of one nation upon the state or foreign office of the other. The Constitution of the United States contains an express provision requiring every state to extradite, upon demand of another state, any fugitive from justice. (Article IV, Section 2). In extradition among the states of the Union, there are no limitations with respect to the character of the crime or the citizenship of the person whose extradition may be sought. A requisition signed by the governor of the state from which the accused has fled is addressed to the governor of the state in which the accused is found, and, if honored by the latter, the person is surrendered. Not infrequently, however, a governor refuses to surrender an alleged fugitive from justice, on the ground that he will not receive a fair trial in the state where he is indicted. And, although the Constitution is mandatory with respect to delivering up offenders to sister states, the supreme court has refused to compel the extradition of a fugitive whose surrender a governor has denied.

Extraterritoriality (*ĕks'trə-tĕr'ĭ-tō'rĭ-ăl'ĭ-tĭ*). An immunity from its general jurisdiction granted by a state to the representatives or subjects of another state within its own territory. Such immunity extends, by the practices of international law, to sovereigns sojourning in an official capacity in a foreign country. The sovereign and his retinue are exempted from civil and criminal jurisdiction and from police and administrative regulations, as well as from the payment of taxes and from the performance of other duties imposed upon ordinary residents. A similar exemption is accorded by all nations to the diplomatic representatives of other states accredited to them. (See *Diplomatic Representation*.) Any foreign army within the territorial limits of a state, with that state's permission, is free from its jurisdiction, and, when a foreign vessel of war, without inconvenience to a state, enters or remains within its maritime jurisdiction, the vessel and the crew are ordinarily accorded an immunity from local jurisdiction.

Extraterritoriality may have, furthermore, a much wider scope. It was customary for European nations, in negotiating treaties of commerce with Oriental countries and in arranging for the residence of their citizens within these countries, to obtain for their citizens rights of extraterritoriality. By these treaties, foreign citizens are triable, not by the courts of the country in which they reside and travel, but by courts of their own government, usually of a consular character.

In Japan, the right of consular jurisdiction, with other privileges for American citizens, was obtained in the

treaty negotiated by Commodore Perry in 1858. This action was followed by similar concessions to other Western nations. Following the reorganization of Japan, that country zealously sought the abolition of these extraterritorial rights, which were properly considered prejudicial to her sovereignty, and, after the modernization of her courts and codes of law, extraterritoriality was relinquished by all foreign states from July 1899. Similar rights existed in China, where the United States in 1906 created the "United States Court of China," with jurisdiction over its own nationals. Great Britain had a similar court, established in 1865. In 1943 these countries relinquished their extraterritorial rights by treaties, and Sweden and Belgium took similar action.

Favored Nation Clause. A provision found in treaties between practically all modern countries. It assures to the citizens of a foreign state all such privileges within the territory of another state as may at any time be accorded to the citizens of the "most favored nation."

Favorite Son. A person who is politically popular in a particular locality, large or small. Local candidates who have the backing of their state delegations at presidential nominating conventions are known as favorite sons. The vote for them is usually complimentary, but there is always the hope that in case of a deadlock the favorite son will be chosen.

Federalism. A system of government wherein the political powers of the state are constitutionally distributed between the national government and the local governments of member units which are called "states," "provinces," "cantons," etc. Federal government is distinguished from "unitary" or "centralized" government. In centralized government, the whole authority is vested in the central or national structure; local governments have no constitutional independence or autonomy, but are vested with functions by act of the central government itself and are subordinate to the central government.

The term federal refers to the government, not to the "state." It is politically incorrect to speak of a "federal state," or of a "divided sovereignty" in the state, since sovereignty, by its philosophical conception, is divisible.

A federal government or a "federation" differs from a "confederacy" or a "confederation" in that it is actually the government of a sovereign state, whereas a confederation is a union of states in which sovereignty or state independence resides in the member states themselves The one is a "perfect union;" the other, a league. In a confederation, the member states reserve the power of withdrawing from the union, and their consent must be implied or assumed to actions taken by the confederate government. A federal government is an "indissoluble union" which can be disrupted only by successful rebellion or revolution. The authority of the government in a federation is direct upon the citizens of all member units, and allegiance is primarily to the federal union and secondarily to the member units.

The United States of America is the first federation in the modern sense. Its success is attested by its long history and by the development of other federations, largely inspired by the American Union. See *Argentina, Australia, Brazil, Canada, Mexico, Switzerland, Union of South Africa, Venezuela.*

A federal government usually arises out of the union of previously independent states or governments and the creation of a new national government through this union. The act of union preserves as separate local governments the unit members of which have merged. Usually the powers bestowed upon the federal government are specified and enumerated, all others being reserved to the states or provinces. In the case of the Canadian federation, however, the reverse principle holds, where the provinces have enumerated powers.

The federal principle has been applied also in countries having elements with strong local attachments and presenting differences of type. The chief example is Russia, where autonomy was granted to diverse regions, yet without sacrificing central authority over national policies.

Fellow Traveler. Originally a person who, though not actually a member of the Communist party, was in sympathy with its principles and willing to co-operate with it.

Filibuster. One who engages in an unlawful military expedition into a foreign country. The word is derived from the Spanish *filibustero* which, besides connoting a "freebooter," is used also as a term of contempt for a seditious plotter.

In parliamentary slang, "filibuster" is used to designate measures employed to prolong debate and to prevent a vote. See *Closure Rule.*

Franchise Tax. A tax either upon the privilege or franchise granted by a state to a corporation empowering it to act as a legal body, or upon a special franchise granted to a public-service corporation permitting the use of the public streets or other public places for the business of the corporation.

States cannot impose a tax upon the general franchise of a corporation created by the Federal government. Nor can any state impose upon a corporation, organized under the laws of another state, a tax which is calculated upon the entire capital stock of the corporation, the courts holding that this constitutes an attempt to tax property not within the jurisdiction of the state.

Franking Privilege. A privilege possessed by members of Congress, as well as by members of other branches of the Federal government, of sending official mail free of charge.

Free City. The early states of the Mediterranean and Ægean seas were "city-states." Political life was confined to the urban community; the surrounding land, usually of limited extent, was subordinate and tributary to the city. Such were the ancient Greek states, and such in the beginning was Rome. The development of medieval commerce and manufacture again brought the city to the front, and the Italian cities, such as Venice, Florence, and Genoa, became free and independent states. In the north, the Flemish and Baltic cities, and also those of the Rhineland, attained comparable freedom of government, although nominally each was under the sovereignty of some greater political authority.

These free cities frequently leagued together in a confederacy or "hanse," for mutual protection and defense of commercial rights. The most famous of these associations was the Baltic or Teutonic Hanse, under the head of Lubeck. The development of nationalities broke up these leagues and brought the free cities under national authority. Three,—Lübeck, Bremen, and Hamburg,—retained their freedom as members of the second German Empire. The Treaty of Versailles created two free cities, Danzig and Fiume. Fiume was absorbed by Italy in 1924; Danzig by Germany in 1939. In January 1937, Hamburg became "Hansa City, Hamburg," and Lübeck was annexed to Prussia. See *Hanseatic League* and *Venice and the Hanse.*

Freedom of Contract. Political and economic thought at the close of the 18th century and at the beginning of the 19th century favored the complete freedom of the individual, both to employ labor and to accept employment, without interference from the state or coercive influence of other individuals. Economic teaching held that attempts on the part of public authority to limit industrial or commercial competition interfered with the law of supply and demand and violated fundamental personal rights.

Changed industrial relations and the sufferings and abuses arising from unrestrained competition have revealed the necessity of considerable limitation of the so-called right to freedom of contract. This right, although specifically protected by the United States Constitution, has always been regarded as subject to the "police power"—the regulation or limitation of actions in the interest of the public health, safety, and morals. Much of the social legislation of the 20th century, limiting hours of labor, prescribing working conditions, and fixing minimum wages, has met with the objection that it infringes freedom of contract. In most instances, such legislation has been upheld by the supreme court of the United States as within the police power of the states or the commerce power of the nation.

The conception of the police power has undergone marked extension, and the once unchallenged right to sell one's labor in the dearest market or to hire at wages and terms that take no care for the safety, health, or comfort of the employed has been greatly abridged. Freedom of contract between employer and employed has further been restricted by the growth of labor unions and by the practice of collective bargaining. See *Social Legislation.*

Freedom of Religion. The first amendment to the United States Constitution and similar provisions in state constitutions guarantee freedom of worship as a fundamental right. This right, however, does not permit the individual to engage in practices which are regarded as inimical to the health, morals, or safety of the state.

Thus bigamy may be made a crime and may be punished as such, even though plural marriage be a tenet of a particular faith. A person is not excused from compulsory military service because his religious faith forbids bearing arms. A state may make it a crime for a parent to refuse to obtain medical attention for a child because of religious conviction that bodily ills can be cured only by religion.

Freedom of Speech. Freedom of speech and of the press was one of the established rights of Englishmen; it was transported to America by English colonists and is protected by the United States Constitution.

This right in ordinary times extends to the free criticism of the government itself, and even to advocacy of revolution. Justice Holmes, in the case of *Abrams* vs. *United States*, said:

"We should be eternally vigilant against attempts to check the expression of opinions that we loathe and believe to be fraught with death, unless they so imminently threaten immediate interference with the lawful and pressing

purposes of the law that immediate check is required to save the country."

Picketing and use of handbills in labor disputes have been protected by the supreme court as an exercise of the right of free speech.

The right, however, is not without limitation. Criticism that unduly hinders the government in the performance of its proper functions has been held by the same jurist to be illegal and punishable. "The question in every case is whether the words used are used in such circumstances and are of such a nature as to create a clear and present danger that they will bring about the substantive evils that Congress has a right to prevent. It is a question of proximity and degree. When a nation is at war, many things that might be said in time of peace are such a hindrance to its effort that their utterance will not be endured so long as men fight, and that no court could regard them as protected by any constitutional right." (*Schenck* vs. *United States*).

The historical origin of this guarantee was as one of the moral and legal weapons used in the fight against absolute monarchy. Subsequent events have shown that the right can be maintained only when the existing social and political order is firmly established and felt to be in no danger. For this reason transition stages between contrasting regimes are marked by the suppression of this right.

Free Port. An area at a gateway of foreign trade which a government permits to remain outside tariff walls. Goods may be brought there from abroad without payment of duty, this being levied only when the commodities pass from the free port to other parts of the country.

Advantages include the possibility of avoiding tariff payments in processing materials brought from abroad into commodities to be sold abroad. Free ports make possible also displays of foreign merchandise for inspection of importers, without payment of tariff duty.

The United States Congress in 1933 authorized the establishment of free ports. The first to be set up was in Staten Island at New York, N. Y., where an area of 78 acres is devoted to the purpose.

Free Trade. See *Tariff*.

Functional Representation. A plan for representation in political bodies, based upon occupational or class groups rather than upon territorial units or electoral districts. Functional representation is an old institution, and parliamentary development sprang from the assembling of representatives of the different classes of medieval society. These representatives at first sat in separate bodies and deliberated and voted apart. Constitutional development in western Europe, however, has tended to draw these classes together into single chambers and to obliterate occupational divisions.

In the United States, parties have been composed of people of all walks of life. Neighborhood interests and local and sectional attachments have been the potent influences in stirring people to political activity.

As government has become more and more closely associated with economic controls, however, voters have tended to divide according to their economic interests. This explains the rise of labor parties, Socialist parties, agricultural blocs, and similar political groups that speak for economic classes. The tendency has increased in democratic countries since World War I, but actual elections continue on a local basis, with few exceptions.

The most extreme form of functional representation was found in Fascist Italy, where 22 separate councils combined in the National Council of Corporations each represented workers and employers in one division of industry. Legislation by this body, however, related mainly to industrial questions.

Fusion. A coalition or combination of political parties or groups for the purpose of defeating another party or group; e.g., of Republicans and independent Democrats in New York City against Tammany Hall or of Republicans and Democrats against socialist candidates.

Geopolitics. The application of the study of geographical influences to the determination of political objectives. Based on the geographic studies of Ratzel in Germany and Mackinder in England, it was applied in its German form *Geopolitik* by Haushofer to justify German expansion and to indicate the political and military strategy dictated by geography. It teaches that space and the contents of space determine everything. A central idea is that of the "Heartland" (eastern Europe) and the advantage over maritime empires given its possessors by improvements in air and land transportation.

Gerrymander (*gĕr'ĭ-măn'dĕr*). A form of political sharp practice, whereby electoral districts are so laid out that the party in power will possess a majority of votes in as many of them as possible.

The practice has produced districts of very eccentric appearance, one of which, attributed to Governor Gerry of Massachusetts in 1812, being likened to a salamander, was wittily dubbed a "gerrymander"; hence the name.

Government Ownership. This term is usually applied in America to the acquisition and operation, by a state or municipality, of public utilities, such as railroads, street railways or bus lines, telephone and telegraph systems, and gas, water, and electric companies.

The impetus toward public acquisition of such properties usually comes from the belief that companies having a monopoly interest in them are charging excessive rates. Public control of rates is frequently difficult because involving long and expensive litigation. Commissions set up to regulate rates are often felt to adopt a neutral attitude instead of being spokesmen for consumers. In many cases also there is the added fact that the local company is controlled and managed by a holding company subject to the authority of a different state.

A new influence toward public ownership of power properties was introduced in 1933, when the Tennessee Valley Authority was set up as a government corporation. Its policy is to sell power to municipalities owning their own distribution systems and to take measures insuring efficient operation of those systems. Such projects were declared "yardsticks" of power costs. The government lent money at low rates also to many local authorities to build or purchase their own facilities for generation and distribution of power. See *Municipal Ownership*.

Habeas Corpus, Writ of. In English and in American law, a writ issued by a court of justice, commanding the person to whom the writ is directed to bring before the court the body of a person detained or in custody. Failure to appear with the person of a prisoner places an officer in "contempt of court" and makes him liable to the summary imposition, by the court, of fine or other punishment. The court, once the prisoner is brought into its presence, determines whether he is being legally held and may, after due examination, set him at liberty, release him upon bail, or recommit him to prison.

The writ of habeas corpus is an ancient one in English law, antedating Magna Charta. It had the constant support of Parliament against efforts of English kings to set it aside, and was strengthened by repeated legislative acts. It was brought to America by English colonists.

The Constitution of the United States (Article I, Section IX, Par. 2) provides that "the privilege of the writ of habeas corpus shall not be suspended unless, when in cases of rebellion or invasion, the public safety may require it." The weight of learned opinion holds that the suspension of the right must be accomplished by act of Congress; but President Lincoln, during the Civil War, by executive action suspended the privilege over extensive territory. His act was subsequently ratified by Congress. See *Habeas Corpus Act*.

The constitutions of all American states contain provisions safeguarding the privilege of habeas corpus, analogous to the provision of the Federal Constitution. A state court cannot issue a habeas corpus for the discharge of a person held in the custody of the Federal government. Four states—Mass., N. H., R. I., and S. C.—provide in their constitutions that the privilege of the writ may be suspended by the state legislature. (See *Martial Law*.) The writ of habeas corpus has been carried wherever the common law has been established.

Hague Peace Conferences. Two international conferences of modern states have been held that are known by the place of their assembly, the city of The Hague, which is the capital of the Netherlands. The first was proposed by Czar Nicholas II of Russia, and met in 1899 on the invitation of the czar and the queen of the Netherlands. In a circular note of August 12, 1898, issued by the Russian government, the objects of the conference were suggested to be "the maintenance of general peace and a possible reduction of excessive armaments." Twenty-seven states took part in this conference.

Results of First Conference. The deliberations of this conference resulted in three "conventions," three "declarations," and six "resolutions." The first convention was for "pacific settlement of international disputes." This provided for a permanent court of arbitration at The Hague, a permanent administrative council, made up of the diplomatic representatives of the signatory powers to The Hague, and an international bureau, acting under the direction of this council. The second convention dealt provisionally with the laws and customs of warfare on land. The third convention sought to adapt maritime warfare to the principles expressed in the Geneva Convention of August 24, 1864. The declarations sought to prohibit, for a period of five years, the use of projectiles or explosives discharged from balloons; the use of asphyxiating or poisonous gases; and the use of expanding or "dumdum" bullets in warfare.

The second conference was first proposed by President Roosevelt in 1904, but his proposal was withdrawn in order to allow the czar of Russia the privilege of calling the second conference as he had called the first. This met from June 15 to October 18, 1907. The following states, to the number of 44, were represented: Argentine Republic, Austria-

Hungary, Belgium, Bolivia, Brazil, Bulgaria, Chile, China, Colombia, Cuba, Denmark, Dominican Republic, Ecuador, France, Germany, Great Britain, Greece, Guatemala, Haiti, Iran, Italy, Japan, Luxemburg, Mexico, Montenegro, Netherlands, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Rumania, Russia, Salvador, Serbia, Siam, Spain, Sweden, Switzerland, Turkey, United States, Uruguay, Venezuela. It will be observed that, with the exception of two Central American states, Costa Rica and Honduras, the two African states of Ethiopia and Liberia, and the Central Asian monarchy of Afghanistan, the representation included practically all states then recognized as independent. Delegates from Korea, which by the Treaty of Portsmouth had recently passed under the control of Japan, failed to secure seats.

Acts of the Second Conference. This conference adopted a series of conventions, the first providing means for the peaceful settlement of international disputes and altering in certain respects the measures proposed by the first conference. The second limited the employment of force for the recovery of duties due from the citizens of one country to the citizens of another, and the third defined the procedure for the opening of hostilities in the event of war; and ten conventions which in a measure modified the laws of war on land and at sea. These conventions and declarations were only in part ratified by the participating nations, different countries excepting from the ratification of different measures.

Inasmuch as it was not contemplated that they would become effective between belligerents unless all belligerents were ratifying parties, the rules which sought to regularize the conditions of war and to mitigate its severities were completely disregarded in the World War. This was particularly noticeable in the case of the conventions forbidding bombardment of unfortified towns by naval forces, the laying of automatic submarine contact mines, the discharge of explosives from air vessels, the use of poisonous gases, and the respect for private property in warfare.

However, the war department of the United States, following this conference, revised its regulations governing the conduct of its armies in the field so as to include the provisions of the Hague Conference, thereby presumably making incumbent upon the officers and men of its own forces compliance with many of these principles. The extreme measures followed by all belligerents in the World War and the development of a public opinion that the severities of warfare cannot be softened without a prolongation of the struggle have probably rendered inapplicable the measures of the Hague Conference in this field.

Hague Tribunal. A standing court of arbitration created by the first Hague Peace Conference. Such a tribunal was proposed at the conference by the representative of the British government. The government of the United States had also specifically instructed its delegates to labor for such a court. In a convention signed at this conference, the nations agreed "to use their best efforts to ensure the pacific settlement of international differences" and, with this object in view, to undertake the organization of a "permanent court of arbitration." By the plan then devised, each signatory state nominates four jurists for a six-year period. These jurists constitute a panel, from which judges may be selected to sit in arbitration.

The first case to be tried before this tribunal was one submitted by the United States and Mexico for the adjustment of a contention that followed the settlement of the Mexican war and was known as the "Pious Fund of the Californias." The award was made October 14, 1902, and was accepted by both governments. Three other awards were made by the Hague Tribunal, before the meeting of the second Hague Conference in 1907. This latter conference made some changes in the organization of the court and provided an alternative procedure called "arbitration by summary procedure." Between 1907 and 1914, twelve cases were submitted to the Hague Tribunal.

The agreements establishing the Hague Tribunal and the system of arbitration thereunder are still in force, at least between nations that have not been at war, and the Permanent Court of Arbitration continues to have a separate existence from the International Court of Justice, also located at The Hague, which in 1945 superseded the World Court which was set up by the League of Nations after World War I.

Home Rule. Local self-government or the administration of home or local affairs in a part of a state by the people of that section. In British history, the phrase refers particularly to autonomous government for Ireland. In American politics, it is used mainly to express municipal autonomy, granted either by placing constitutional limitations upon state legislatures in favor of municipal governments or by a system of authorizing the citizens of a municipality to frame their own charter of government.

Immigration Legislation. Laws designed to exclude, limit, or select immigrants entering one country from a foreign country.

The power of a state to deny admission of a foreigner to its territory is an undoubted right under international law, and has been exercised in all times. Complete exclusion of foreigners and denial of free intercourse with foreign nations has, however, been treated as an act of unfriendly or hostile character, and against it nations have applied forceful methods. In this manner the foreign exclusion policy imposed upon China by the Manchu Dynasty was broken through by European nations, even at the cost of war; and in 1854 the United States, by a naval demonstration under Commodore Perry, coerced the government of Japan into abandoning its policy of nonintercourse with foreigners, which had been in force for nearly 250 years. In 1904 the British sent an armed mission into the "forbidden land" of Tibet and compelled the government at Lassa to modify its exclusion policy.

These instances, however, in no way affect the political principle that a state possesses unlimited power, except as modified by treaty, to decide what classes of foreigners shall become immigrants and settlers. Serious diplomatic difficulties, however, may arise, as, for example, between the United States and Japan, when immigration legislation is not uniform with respect to all races and nations.

Immigration to America. The extraordinary migrations of peoples from Europe and Asia to the Americas, Australasia, and Africa during the last hundred years, not as colonists but as immigrants to countries already politically established, is one of the noticeable and far-reaching phenomena of the present economic age. The United States, as the country which has received these immigrants in greatest numbers, has experienced the greatest perplexity over the problems they create.

Immigration into the United States has passed through several phases. Previously to 1880 the immigration was almost exclusively from peoples of northern Europe, whence the original settlers of the United States had come. After that date, immigration from northern Europe declined, and that from southern Europe and from Russia rapidly increased. This so-called "new immigration" produced a change in the American attitude toward unlimited immigration. Until World War I, the immigration laws were designed only to exclude certain undesirable classes, including feeble-minded, insane, epileptics, sufferers from certain contagious or loathsome diseases, paupers, criminals, prostitutes, polygamists, anarchists, and those convicted of, or admitting, crimes or misdemeanors "involving moral turpitude." The importation of labor under contract was also forbidden. See *Displaced Persons*.

Restriction of Asiatic Immigration. In addition, Asiatic immigration had been restricted, first, by the Chinese Exclusion act of 1882, re-enacted in 1892 and in 1902, whereby all immigration from China, except students, merchants, and a few other classes, was forbidden. In December 1943, the exclusion law was repealed, and Chinese were placed on the same footing as other immigrants. After 1900, when Japanese immigration into California became notable, an exclusion league was organized in that state and agitation was commenced to secure legislation forbidding the admission of Japanese. In 1907, when an immigration bill restricting the admission of Japanese and Korean laborers was introduced into Congress, the president secured in its place Congressional authority to suspend Japanese and Korean labor immigration coming from our insular possessions or from Canada or from Mexico. An agreement was made between the president of the United States and the government of Japan—the so-called "gentlemen's agreement"—whereby the latter government undertook to limit, by the refusal of passports, the entrance of laborers into the United States.

General Limitation of Immigration. In 1924 the United States Congress passed an act which reduced annual immigration to 2% of the number of foreign residents in 1890. A minimum of 100 was accorded to each country. This law was replaced in 1965 by a measure phasing out the quota system by July 1, 1968. It provides for a total permissible immigration of 120,000 yearly from independent countries of the western hemisphere and 170,000 from all other countries, but not over 20,000 from any one country. Preference is given to members of professions or those having special talents or education. In addition, immediate relatives of citizens may be admitted without limit, these including minor unmarried children, spouses, and parents. There are additional special categories, such as political refugees. No previous law had limited immigration from the western hemisphere.

In Australia and in New Zealand, legislation against the admission of Oriental peoples has been more drastic than in the United States, and includes even subjects of the British Commonwealth, if natives of Asia. In Canada, restrictive immigration laws against Asiatic populations have been checked only by the influence of the British government. A "gentlemen's agreement," like that between the United States and Japan, restricts the movement of Japanese into Canada.

Impeachment. A form of criminal procedure, involving charges and trial, by a legislative body against those in high office. Impeachment differs from attainder in being a judicial, not a legislative, measure. It originated in England through the bringing of charges by the House of Commons against oppressive acts of officials of the crown. The House of Lords, as the highest judicial body of England, judged the complaints pressed by the Commons. The right of the Commons to impeach whomsoever it will, has been recognized, though the practice has fallen into disuse in Great Britain for more than a century, the system of responsibility of ministers to the House of Commons having made impeachment unnecessary.

The earliest instances are the impeachment of Lord Latimer in 1376 and of Pole, earl of Suffolk, in 1386. The last British impeachments were those of Warren Hastings, 1788–1795, and Lord Melville, 1806.

The institution of impeachment was adopted by the framers of the United States Constitution, which provides that the president, the vice president, and all civil officers of the United States shall be removed from office "on impeachment for and conviction of treason, bribery, and other high crimes and misdemeanors." The penalty upon conviction, however, is confined to removal from office and to disqualification to hold any office of honor, profit, or trust under the United States.

Impeachment charges are brought by the House of Representatives and are tried by the Senate. If the president of the United States is impeached, the chief justice of the United States supreme court presides at the trial; otherwise, the vice president presides. A two-thirds vote of the Senate is necessary for conviction. There have been nine cases of impeachment of Federal officials and three convictions. The most famous impeachment trial was that of President Johnson in 1868, which failed of conviction by one vote.

Members of Congress are not subject to impeachment, but they may be expelled from either chamber by a two-thirds vote of its members. Impeachment of state officials is provided for in most state constitutions, the procedure being modeled upon the Federal system. In 1913 a governor of New York was impeached and was convicted on the charge of misappropriating campaign funds. In this case, the crime was committed before election to office.

Outside of Great Britain and the United States, impeachment is provided for by the constitutions of many countries which have based the institution upon British and American experience.

Inauguration Day. The day when a chief executive of a nation, state, or city assumes office.

The Continental Congress, upon the ratification of the Constitution of the United States in 1788, provided that states should choose presidential electors on the first Wednesday in January 1789; that these should choose the first president and the first vice president on the first Wednesday in February; and that the new Congress should assemble in New York on the first Wednesday in March. The first Wednesday in March was the 4th, and, although President Washington was not inaugurated until April 30, the date March 4th, following a presidential election, continued to be inauguration day until changed in 1933 by the 20th Amendment to January 20th.

Industrial Court. See *Arbitration of Industrial Disputes.*

Initiative of Laws. A procedure whereby proposals of law may originate in the petition of private citizens. This measure is frequently associated with another procedure, the referendum of laws, but, as stated elsewhere, it differs from the referendum in being a radical device.

Before the adoption of the popular initiative, projects of law came from two recognized sources: (1) In countries having parliamentary or cabinet governments, they usually are initiated by ministers; and in the United States, where presidential government exists, they may originate in "executive measures" recommended to the attention of Congress by the president or to state legislatures by governors. (2) Measures arise in the legislatures themselves, either by the action of single members or by the work of committees or commissions. Under the operation of the popular initiative, a project of law may be originated by anyone, and, a sufficient number of petitioners in behalf of the measure having been obtained, the proposal goes either to the legislature under an obligation to pass upon it, or directly to the popular judgment as expressed in a general election. The second practice is the one common in the United States.

Among the objections to the popular initiative are the following: It affords opportunity for the proposal of eccentric legislation. It frequently encumbers the electoral ballot with an undue number of complicated and doubtful measures which confuse and embarrass the electoral mind. Where there is indifference or inertia of the voters, it may lead to the enactment of laws by minorities of the voting population. As a procedure, it affords no opportunity for the improvement of a bill by discussion preceding enactment, a most important parliamentary step in the proper shaping of legislation. In American states, where the practice exists of recognizing the popular enactment as superior to the legislative will, it imposes additional impediments upon legislatures and tends to bring into doubt and confusion the constitutional laws of the state.

The popular initiative was adopted by the American people from the example of Switzerland and exists by constitutional provision in 19 American states. See *Referendum and Initiative of Laws.*

Injunction, Writ of. The name for a judicial process under English law, whereby a party is "enjoined" or commanded by the court to refrain from doing some particular thing described in the writ. While injunction is properly a restraining order, it may be used to prevent persons from interrupting the normal continuance of things, as the flow of water or the movement of trains.

In the United States, the writ is issued both by Federal and by state courts. It has been issued at the instance of the president, to prevent organized obstruction of interstate commerce and, particularly, of the movement and delivery of mail. It has been used frequently in recent years to prevent labor unions and other organizations, when on strike, from interfering with the property and interests of employers. Leaders of such organizations, disobeying the writ, have been arrested by order of the court and have been severely punished for contempt of court. Laws attacked as unconstitutional have frequently been enjoined from enforcement by lower courts so as to be nullified in their effect until ruled on by the supreme court.

A rising tide of criticism against the use of writs of injunction has resulted in two types of restrictions in their use by Federal courts. In 1932, an act was passed by Congress forbidding issuance of injunctions in labor disputes except under carefully defined conditions, such as actual evidence of prospective damage. In 1937, Congress forbade injunctions against the Government on the ground of a law's unconstitutionality unless issued by a three-judge court, one member being a justice of the circuit court of appeals. Direct and expeditious appeal to the supreme court was provided when such an injunction was issued.

International Labor Organization. A permanent body, set up in 1919 under the Treaty of Versailles, which represents the chief nations and which exists to promote the adoption of labor legislation. Recommendations, requiring a two-thirds vote for adoption, take the form chiefly of draft conventions. Delegates of member nations are required to bring the proposed conventions, or treaties, before bodies of their own countries competent to conclude treaties. If ratified, the treaties become binding between the ratifying nations.

Delegates from each nation number four, all appointed by the government. Two represent the government, one represents employers, and one speaks for organized labor. Member nations of the League of Nations automatically are members of the body and other nations may join. The United States, by action of Congress in 1935, became affiliated as the 62nd member. Delegates convene yearly for decisions on agenda prepared by the International Labor Office, a committee of 32 delegates of the Organization. Limitation of work hours and measures for the protection of women and children from exploitation have been among the conventions ratified by many nations.

Interstate Commerce. The Constitution of the United States empowers the Federal government to regulate commerce "with foreign nations and among the several states." It also forbids states to impose specified burdens on the commerce of other states. These provisions, as interpreted by the supreme court, are the foundation of Congressional power to rule economic activities in the United States.

The court has interpreted commerce to include interstate transportation and communication. It has also extended the definition of commerce to mean all that directly affects commerce between states, thereby enlarging Federal authority to cover many intra-state railroad rates, business practices, and price fixing that impede the interstate shipment of goods.

For many years Congress was unable to regulate manufacture and production generally, these processes being held to be wholly intra-state. By the Jones and Laughlin decision on April 11, 1937, however, the supreme court ruled that practices which threatened to interrupt production destined for interstate commerce were subject to federal control.

Intervention. The interference by one state in the affairs of another sovereign state by force or by the threat of force. Even when hostilities are avoided, intervention can with difficulty be distinguished from an act of war, since it is the coercion by one nation of the will of another by acts of violence or by menace of violence. Except where a right of intervention has been conceded by one state to another during the existence of certain crises, as is the case with certain Latin-American countries and the United

States, it is difficult to find "legal" justification for the numerous acts of intervention with which the history of states is filled. Justification must be based upon political or moral grounds, among which the most important are: to ward off imminent danger to the intervening state or to its citizens; to end a condition of violence, anarchy, or oppression, repellent to the instincts of humanity; to preserve a balance of power and to prevent the aggrandizement of the influence of a rival state. This last ground of intervention in the past has been the frequent occasion of European wars.

Modern instances of intervention, on one or another of the above grounds, are the allied intervention in China, 1900, to rescue, from the Boxers, legations and nationals under siege; the intervention of the United States to end Spanish rule and warfare in Cuba in 1898; American intervention in Cuba in 1906 in compliance with the terms of the Platt amendment (See *Cuba*); and further American interventions in Santo Domingo, Haiti, Nicaragua, Panama, and Mexico.

Intervention in the past has been so frequently employed upon trivial and unjustifiable pretexts that a doctrine of "nonintervention" has developed, particularly associated with the name of the English Liberal, Richard Cobden, 1804–1865. Cobden's political platform was "free trade and no intervention." Noninterventionists hold that the sanctity of a state is so great and the right of a people to settle their internal affairs so sacred that intervention can never be justified on any grounds whatever, and that for one state to employ force against another to end revolution, misrule, or violations of the rights of its own nationals, is without possible moral justification.

Such extreme views are at the basis of the "anti-imperialistic" movement in the United States, which found political expression in the platform of the Democratic party in 1900, when imperialism was declared to be the "paramount issue." The recent trend of American policy has been to avoid intervention. The Platt amendment was abrogated in 1934. The purpose in part was to establish confidence, throughout the New World, in the pacific intentions of the United States and so to pave the way toward international agreements for the restriction of warfare.

It is difficult at times to distinguish intervention from an undeclared war. The operations which led to Japan's taking of Manchuria from China in 1931 and Italy's conquest of Ethiopia in 1935-36 began as drastic forms of intervention. In neither case was there a declaration of war.

Lobbying. The practice of importuning legislators for the passage or defeat of pending legislation. Many large well-organized groups of the population which hope to obtain benefits, or fear disadvantages, from legislation maintain "contact men" or "legislative departments" for the purpose of influencing legislation.

Among the methods used are:

1. Cultivating members of Congress or state legislatures.

2. Observing and reporting to voters the action of individual legislators on the object sought by the lobby, the purpose being to add to, or detract from, the legislator's popular support. Legislators may or may not be questioned on their attitude in this process.

3. Creating an impression in the minds of the legislators that there is a large popular demand for the measures advocated. This may take the form of having large numbers of letters and telegrams sent to legislators, urging enactment of the measures. In other cases, "marches" on the capitol are organized.

The practice has been abused and has frequently been made the means of bribery and of corruption. To protect themselves, legislatures have enacted antilobby measures, such as prohibiting the presence of lobbyists on the floor of legislative halls, or in their anterooms. The Public Utility act of 1935 requires that all persons seeking to influence legislation on public utilities must register and report monthly on the interests for whom they are acting, the amount of money received for the purpose, and the manner in which it was spent.

Properly controlled, the practice of lobbying may be legitimate and may even prove an assistance to a legislature struggling with a mass of proposed legislation. The preferred procedure for advocates or opponents of bills is to appear before committees of the legislature and in open session to state their case and disclose the groups for whom they are speaking.

The term is derived from the word lobby, meaning a cloakroom or antechamber, wherein the so-called lobbyist is supposed to exert important influence upon the members of the legislature.

Logrolling. A system of bargaining among members of a legislative body, whereby one member, by giving his support to other members' measures, obtains the support of others for a measure in which he or his constituency is interested. Logrolling has been carried to its highest point in American legislatures, facilitated, as it is, by the practice of allowing members to introduce bills without limit. Logrolling is connected especially with "pork barrel" legislation, or with bills appropriating moneys for local improvements and for interests without reference to state or national policy. See *Pork Barrel*.

Majority. A number greater than half of a total number. In deliberative bodies or elections, a number greater than half the votes cast, or, in another sense, the excess of that greater number over the remainder of the total. The term "majority" is sometimes loosely used to designate the number of votes received by a candidate, or by one of several candidates, in excess of the vote of his nearest competitor; but this relation is properly termed a "plurality."

An "absolute majority" means, in common usage, the number greater than half of all voting, or of all present whether or not voting, or of those entitled to vote.

Marine Corps. Marines, or, as they are sometimes popularly called, "soldiers of the sea," are a military organization serving under the navy department. In the United States, they constitute a distinct corps under the secretary of the navy. Originally they were introduced into the British navy to enforce discipline over the sailors. Their employment, however, has been continued for other reasons. Marines are favored in the United States navy because of their extreme serviceability for guard duty and ceremonies aboard ships, for the defense of naval property ashore, and as landing parties from war vessels for the protection of life and property in foreign countries in times of disturbance.

They have been used especially by the United States government in foreign intervention. Forming a part of the navy and transported aboard warships, they exceed all other land forces in mobility, while their frequent employment for police or protective duty makes their use on foreign soil less likely to be misconstrued as an act of war than would the landing of elements of a regular army. Marines are equipped, drilled, and tactically employed as infantry. When with elements of the United States army, they are under the command of the ranking officer, whether army or marine.

Martial (*mär'shăl*) **Law.** Martial law must be distinguished from "military law" and "military government." While the statement is often made that "martial law has been declared" in some city or district in the United States, this does not mean the substitution of military for civil authority, which, under the American system of constitutional guarantees, cannot take place except during an actual state of war. The phrase does not correspond to what is elsewhere called "suspending constitutional guarantees" or "declaring a state of siege." In these latter cases, civil government is actually suspended, and civil authority gives place to military.

In the United States the activity of troops, either state or national, in time of civil disturbance, means no more than that the military forces have been called into action to uphold the authority of the president or of the governor of the state and to enforce his orders. Government remains civil, but acts through military organization because the ordinary administration is unable to cope with the situation. The employment of troops is not to wage war but to keep peace. In preserving life and property, troops may resist violence, even to the point of taking life, but their responsibility in such cases is not different from that of civil officers. Arrests may be made, but as measures of precaution, not for the infliction of punishment by military courts.

Undoubtedly, a state of domestic insurrection may be so serious as to justify strong measures by troops, but the authority for their employment remains with the civil head. Civil courts are not superseded nor is civil law abrogated unless action to suspend the guarantees of civil liberty is taken by Congress, or by the legislature of a state, as is permitted in a few state constitutions.

Mayor. The chief executive of a British or an American city, corresponding to the French "maire" or the German "burgomaster." See *France* and *Germany*.

In addition to administrative powers, the mayor in certain countries possesses the authority of a local magistrate; and in continental states generally he has a legislative or "ordinance" power. Outside of British and American states, he is almost invariably an agent of the national government as well as the head of municipal administration.

In Great Britain, the mayor is the presiding officer of the city council and possesses no greater legislative authority than any member. He is the official representative of the municipality and as such occupies a position of high honorary and social distinction. In the United States, under the older and more customary form of municipal government, the mayor has a veto over the legislation of the council and may have extraordinary power in budget matters. See *City Government*.

Merit System. The appointment of persons to positions in the civil service of the city, state, or nation for reasons of fitness shown in competitive examinations, rather than as a means of payment for political services to the party in power.

Military Government. Government, in either domestic or foreign territory, under army or navy commanders.

Under the constitutional system of the United States, military government is set up by order of the president as commander in chief of the army and navy of the United States. The president may prescribe such administration for domestic territory in rebellion, for foreign territory occupied in time of war by the forces of the United States, or for territory recently acquired by conquest or treaty. The president may also set up military government within or over foreign territory in which the United States has intervened, with army or navy force.

Subject to the president's authority, such government may employ the widest types of administration, may pass laws, and may create courts. While normally resorted to in time of war or during hostilities, such government may continue after peace has been secured and is legal until altered by act of Congress.

Over territory outside of the Union, such government is not limited by the prohibitions of the Constitution. Trial by jury need not be established. In such a case, to use a popular expression, "the Constitution does not follow the flag."

In the cases of Guam and American Samoa, Congress has never legislated, and government continues to be exercised by naval officers under the authority of the president.

Military Law. Military law must be distinguished from martial law. As this term is used in England and in America, it means those laws and regulations which apply to soldiers and sailors, assure the discipline of armies and fleets, and are enforced not by civil courts, but by military tribunals, or "courts-martial."

In the United States, on the outbreak of the Revolutionary War, the Continental Congress issued a series of rules modeled upon English regulations, which were reissued September 30, 1776, and have been frequently revised. This code is known as the "Articles of War." They prescribe a series of offenses and infractions of discipline to which military officers and men are subject and which may be visited by various penalties, including death for certain offenses in time of war. A person becomes subject to military law upon accepting an appointment or commission or upon enlisting in, or being called or drafted into, the army or navy. He is ordinarily free from this jurisdiction upon discharge or upon the termination of his commission or appointment.

Liability to military law in no way lessens the liability of a soldier or sailor to the civil and the criminal law of the nation or state. It simply subjects him to a double jurisdiction, one as a citizen, the other as a soldier or sailor. Being thus subject, he may be tried twice and punished twice, that is, by both civil and military authority, without constitutionally being placed twice in jeopardy for the same offense.

Military law is usually enforced through military courts or "courts-martial." These consist of boards of officers, convened, by order of the president or a military commander, for the trial of such cases as may be submitted to them. The sentences of these courts have no effect until they are approved by the authority convening the court, or by the president of the United States.

A "summary court" consists of a single officer for the trial of minor infractions of soldierly behavior, punishment being limited to penalties not greater than one month's confinement or detention, loss of two-thirds of one month's pay, or both.

A "general court-martial" consists of a board of officers, not less than five in number, of rank appropriate to the rank of the accused, if an officer. It possesses jurisdiction over every offense triable under the Articles of War, and has power to impose a sentence of dishonorable dismissal, or of death.

Modus Vivendi (*mō'dŭs vĭ-vĕn'dī*). A temporary arrangement between the governments of two countries, pending the settlement of relations by a formal treaty.

Monarchy. That form of government in which, actually or theoretically, political authority is vested in a single ruler who represents the sovereign power of the state. The head of a monarchy bears the title of "king," "prince," or, in certain cases, "emperor," or the equivalent of these words in the language of the country.

Monarchy is intimately connected with the principles of "divine right" and those of "legitimacy," the latter theory maintaining that royal power can be derived only by legitimate succession from a previous ruler through blood or recognized connection. In the legitimist conception, there is at a given time only one person in the world lawfully entitled to any given throne, and the right of this person cannot be affected or taken away by Parliament, popular will, or revolution.

Legitimate monarchy is to be distinguished from the "imperialist" conception, in which a Cæsar or a Napoleon rises to a position of monarchical authority by military triumphs and by the devotion of the people or of the army. In this institution, the right to rule is derived from the unprecedented services of an individual to the nation, rather than from legitim te succession or through the claim of divine ordination.

There may further be distinguished the seizure of supreme power by a civil or a military leader and its maintenance by the ruthless suppression of opponents. Such were the "tyrants" of the Greek city-states, the "despots" of Italian cities, and the "dictators" of Spanish America.

Limitation of Monarchy. While, in theory, monarchy is an absolute power of government, practically all monarchies tend to become, or have become, limited or constitutional. In the first place, monarchies are usually limited by the presence of a nobility who may contend with the king, as the English nobles did with King John at Runnymede. Corporations arise, such as the medieval towns, which secure concessions of rights, subsequently to be tenaciously defended against royal prerogative. The religious power or organization enters, usually supporting the pretensions of the monarchy, but frequently opposing it in defense of its own sacred position.

In Europe, monarchy attained its highest pretensions in the 18th century, when the "benevolent despots" of France, Spain, Austria, Prussia, and Russia claimed and nearly succeeded in exercising unlimited power. In England, these same claims had been defeated in the 17th century by the English revolution and by the strength of the British aristocracy. These circumstances gave rise to British constitutional monarchy. The French Revolution largely destroyed popular support of unlimited monarchy and brought into force the conception of government resting upon popular will. Throughout the 19th century, however, monarchy played a leading part in European governments. It rose again in esteem, partly through the success of the British system of parliamentary government and the exercise of all crown powers by ministers responsible to a representative body, and partly through the achievements of monarchical government in unifying Italy and Germany. After 1871, for an entire generation, republican government in Europe appeared to make little progress except in France and in Switzerland.

World War I swept away many monarchical governments, and republicanism appeared dominant; but economic and political unrest produced in many countries dictatorships hardly to be distinguished from monarchy in fact. In 1949, the monarchical governments of Europe were Great Britain, Greece, Belgium, Norway, Sweden, Denmark, the Netherlands, Luxembourg, Monaco, and Liechtenstein.

Monopoly. This is the right, or the power, so to dominate the market for a commodity that a higher price may be exacted than would prevail under free competition.

Since the monopolies granted by kings under royal charters, the leading forms have been: patent rights; local franchises for public utility companies; and more or less informal combinations of producers. The first two forms are provided for by law as being in the public interest. The third is a defense that has arisen more or less spontaneously against destructive competition. Opinion differs regarding its advantages to the public.

Trust. This term is used popularly to describe industrial combinations, whether they operate through private agreements, mergers, acquisition of competing concerns by a holding company, influence over policy by investment banks, interlocking directorates, or numerous other devices. Their power lies partly in their ability to supply a large proportion of the market and to make it difficult for new producers to obtain credit or materials so as to enter the market. The advantage to their sponsors lies in the ability to prevent demoralization of prices through competition, production normally being cut when demand falls off. Their danger from the consumers' viewpoint is that they have the power to increase prices above a reasonable level. A more recent criticism is that, by holding up some prices when others, lacking such support, are being readjusted to lower levels in a depression, they choke off demand in certain fields and so prevent a speedy return of the idle to employment.

From a social viewpoint, benefits of "trusts," or concentration of control in industry, include low cost production through large buying power, and economies in selling, financing, standardization, and management. Dangers include lack of flexibility, possibilities of withholding from buyers the benefits of economies brought about, and the concentration of power in hands not responsive to considerations of public interest.

Anti-trust Laws. The Sherman act of 1890, the first of these statutes in the United States, prohibited all combinations in restraint of interstate and foreign trade. The supreme court interpreted this law to prohibit "unreasonable" restraint of trade and made the illegality of a combination depend on the proportion of the industry it represented.

The Clayton act of 1914 legalized certain activities of trade associations outlawed under the earlier act and

forbade acquisition of the shares of one company by another if a tendency toward monopoly resulted. Acquisition of assets, however, was not forbidden. A federal trade commission was established in the same year to investigate and prosecute unfair competition.

These laws did not prevent concentration of industrial control from marching steadily on. The government temporarily changed its attitude in 1933 and permitted combinations in the form of "codes" under the National Recovery Act, industries being required in return to increase wage rates and abstain from opposing the organization of employees. After the supreme court declared this act unconstitutional, administrative policy returned to a stricter enforcement of antitrust laws.

Monroe Doctrine. An important declaration of policy made by President Monroe in a message to Congress, December 2, 1823, in which the president declared "that the American continents, by the free and independent condition which they have assumed and maintained, are henceforth not to be considered as subjects for future colonization by any European powers." The message called attention to what the president considered to be the difference between the political system of the monarchies of Europe and that of America, and stated that any attempt on the part of these European monarchies to extend their system to any portion of the western hemisphere would be regarded as dangerous to the peace and safety of the United States.

The doctrine, at the time, accomplished its purpose of warning the Holy Alliance, composed of European powers, from intervening to overthrow the independence of the newly arisen Spanish American republics, and it has since been repeatedly appealed to by successive presidents, though not until 1896 was it formally noticed by Congress. Following the "Venezuela incident" of that year, in which the American government interfered to stop what it regarded as encroachments of the British government upon territorial rights of Venezuela, the policy was overwhelmingly endorsed by the American nation and by both the great political parties.

The Monroe Doctrine is not, as is sometimes supposed, a principle of international law. It is in fact directly opposed to a fundamental principle of international law; namely, that a state may dispose of its own territory to another state without hindrance, for the Monroe Doctrine would probably be invoked to prevent the cession of an American possession by a weak state to a stronger one. The Monroe Doctrine is simply an American policy, never directly admitted by European nations until it found mention, though not a satisfactory mention, in the Covenant of the League of Nations. As a policy, it accorded with a deep, though undefined, American resolution to liquidate the possessions of European states in the New World and to prevent the political issues of the Western continents from being determined at the capitals of Europe.

Under some presidents, this policy has approximated the claim of a protectorate over Latin-American countries and as such was deeply resented. Under Franklin D. Roosevelt's administration a new turn was given to it. In multilateral trade treaties negotiated in 1936-37 at Buenos Aires, he sought to make the Doctrine a policy of all American states, pledged to oppose aggression from outside and to minimize conflicts among themselves by prompt consultation when threats to peace arose.

Mugwump. A celebrated political cartoon picturing the independent voter as having his mug on one side of the fence and his wump on the other.

Municipal Ownership. The civic possession of certain properties, as streets, bridges, ferries, parks, and sewage systems, is well-nigh indispensable to urban life. Only in rare instances, and then to the prejudice of city life, are such necessities as these privately owned. In most cities, water supply is now municipally owned. Other public utilities, such as street railways and lighting systems, are either privately or municipally owned. In Europe, they are generally the property of the city and are operated by its employees. In the United States, more frequently, they are privately owned, but are controlled, with respect to service and rates, by their franchises, by ordinances of the city government, or by state public utility commissions.

The question of private ownership and operation of public utilities in cities has been one of the most important and the most perplexing problems of American government. A franchise for such a utility carries with it the creation of a virtual monopoly privilege and the right of eminent domain; it also presents, if unrestrained, the opportunity for maintaining extortionate rates for service. As such, it is a privilege that has been eagerly sought, bitterly contested for, and frequently corruptly acquired. See *Government Ownership*.

In the United States, municipal governments do not generally engage in several kinds of services, such as public pawnshops, municipal orchestras, opera houses, etc., which are common in Europe. In America, great attention has been given to parks and to public playgrounds. The scope of municipally owned activities can hardly be settled by any theoretical principles. In each country and in each community, it is a matter for practical decision.

National Convention. Since 1832, in the United States, candidates for president and vice president have been nominated at national conventions especially convened for that purpose once in four years.

The national convention is not the creature of the law. It is an extra-legal party meeting, and its membership, machinery, and procedure are determined by party rules.

The rules of the Democratic and Republican parties provide for the selection of two delegates from each congressional district, and for four delegates at large from each state. An amendment to the rules of the Republican party, which was passed in 1916, limits full representation in the national convention to those congressional districts having a Republican enrollment of at least 7500 voters. To the Republican party convention, delegates are chosen in the same manner as that in which congressmen are nominated in the several districts. The Democratic party leaves the method of selecting delegates to the party organization of each state.

Convention Procedure. The chairman of the national committee, who has been chosen at the preceding national convention, initiates the proceedings of the convention. He is succeeded by a temporary chairman chosen by the convention. The convention committees, the most important being the committee on credentials and the committee on rules, are then chosen, the delegation from each state choosing one member for each committee.

The report of the committee on credentials, affecting contested seats, is then presented to the convention as a whole, which either approves and adopts the report in its entirety, or votes upon each contested seat separately. In the Republican convention, under the ruling of Senator Root, in 1912, every person entered upon the temporary roll of the convention by the national committee, even though his own right to sit in the convention is contested, is eligible to vote with respect to the seating of any other contested delegate. See *Convention, Political*.

National Defense. This term is used to describe the established provisions of a state for protecting its rights and territory, particularly from foreign invasion or aggression. Some such provision has ever been regarded as indispensable for national existence and security. The preamble to the Constitution of the United States declares that one object of the Union is to "provide for the common defense."

The type of defense establishment varies greatly with different states, generally according to their size, their frontiers, their geographical security, their traditional friendships and enmities, and the aims of their foreign policies. The main reliance may be naval, as in the case of Great Britain, or, at an earlier date, of Holland; or it may be land forces. In the main, four types of armies have been relied upon by states for the attainment of their military policies: (1) professional armies; (2) mercenary troops; (3) "militia," or organizations of citizens trained in time of peace, and volunteer forces raised in case of emergency; (4) forces prepared by universal or general military training.

Professional Armies. The first, that of a professional army recruited voluntarily, was the general reliance of European states down to the French Revolution. Great Britain, throughout her history, has relied almost entirely upon professional armies, except where she has employed mercenary troops or has subsidized foreign troops in common wars. In the World War, an army conscription bill was not enacted by the British Parliament until 1916. A professional army may be brought to the highest state of proficiency, and, for a country possessing overseas responsibilities which have to be guarded, it is a well-nigh indispensable element in the national plan of defense.

Mercenary Armies. Mercenary armies have been employed in all times, and their use has frequently been notorious, as in the case of the mercenary bands that infested Italy in the 16th century, or in the employment of German troops by Great Britain against the American colonists in the Revolutionary War. Their use has been unsparingly condemned by practically every serious student of the art of politics or of war.

Volunteer Forces. The third, the method of volunteer forces raised in time of emergency, has been the traditional policy of the United States. Reliance upon hastily raised troops, while a congenial policy to a people little troubled by threat of war, has proved again and again in American history to be ineffective from a military standpoint, and frightfully wasteful of life and treasure. The highly technical character of modern warfare, the variety of war matériel, the extreme expenditure of munitions, and especially the need of trained officers to take command of levies of troops, have rendered obsolete and indefensible a reliance upon extemporized volunteer forces.

Universal Training. Some system of general training of all young men for military duties appears at once the most satisfactory, as it is the most just and the most democratic, of all plans of defense. It recognizes the duty of

protection of nation and civilization as a common duty, from which no man of suitable age or physique may properly be exempted. It imposes the hardships and sacrifices of warfare upon all classes of society alike, and puts at the disposal of a nation its full resource of man power without the demoralizing effects of discrimination and bounties. That such a policy is now endorsed by the American people is evidenced by the draft legislation of Congress of 1917 and by the National Defense act of 1916 and of 1920.

This latter legislation gives the country a policy of national defense and a prospective complement of forces adequate for any probable emergency. Under this act, the army of the United States is formed of three components: (1) the "regular army," a small standing body of professional soldiers whose duties are to man the coast defenses, garrison overseas possessions, care for the stores, ordnance, fortifications, camps, and other military property, supply a limited mobile body of troops as a first element for defense and, through its officer and noncommissioned officer personnel, furnish instruction to the national guard, organized reserves, reserve officers' training corps in colleges and schools, and citizens' training camps. (2) The second component is the "national guard," organized in such a manner that each state is charged with the responsibility of maintaining, in times of peace, certain units of citizen soldiers, which may be combined into a number of army divisions and corps. (3) Third, the "organized reserves," comprising officers and men of training, so developed as to form the "cadres" or skeleton structures of additional divisions, which, within a few months' time after a declaration of war, could be raised to full strength, armed, equipped, and trained for the field.

The National Guard. The national guard, with the regular army, constitutes the first line of defense and is to be so officered, equipped, and trained as to approximate, in its organization and performance of duty, the standards of the regular army. The national guard in each state is, moreover, under the orders of the governor of the state, and constitutes a constantly ready force at his command for the execution of the law and for the maintenance of public order. It may, by order of the president of the United States, be called into the Federal service to repel invasion, to suppress insurrection, or to enforce the laws of the Union.

Naturalization. A term given in law to the acquisition of citizenship in a country other than that in which one has been a citizen or a subject.

The act is necessarily voluntary on the part of the person acquiring naturalization, and must have the consent of the state in which citizenship is acquired. The consent of the state whose citizenship is renounced is not necessary to the act, and may even be refused. The act of severing citizenship is called "expatriation." It is a renunciation, by formal action, of the rights and obligations of citizenship therein. If the act of renunciation is not recognized by the state in which citizenship was formerly held, it may happen that two states may claim the same citizen or subject. See *Citizenship*.

American Naturalization. The United States has given great attention to naturalization of foreigners who seek permanent residence in this country. Prior to 1942, the procedure consisted of two steps—a declaration of intention to become a citizen filed two or more years after arrival and a petition for naturalization filed at least three years later. Moreover, citizenship was available only to members of the white and Negro races.

The law was extensively revised in 1942 to simplify procedure and for other purposes. All racial bars were removed. The same rules apply to men as to women. The essential requirements now are as follows:

1. The applicant must be at least 18 years of age and have had legal residence in the United States for at least five years. The residence period is reduced to three years for the wife or husband of a citizen.

2. He must apply to a federal court, signing the application in his own handwriting and (with certain exceptions for older people) be able to read, write, and speak words in ordinary use in the English language.

3. He must attest by two credible citizen witnesses that he has been, for the qualifying period, a person of good moral character, attached to the principles of the constitution, and well disposed to the good order and happiness of the United States. Naturalization is denied to anyone who, in the prior ten years, was a member of a subversive organization unless he was under 16 at the time or became a member under duress. Those excluded because of lack of good moral character include habitual drunkards, adulterers, polygamists, gamblers, violators of criminal law, those convicted of murder, those who have spent 180 days or more in prison, and those who gave false testimony to obtain a benefit under the immigration law.

4. He must demonstrate to the court's satisfaction a knowledge and understanding of the fundamentals of the history of the United States and of its principles and form of government.

When these tests are met, the applicant waits 30 days and then takes the oath of allegiance to the United States before the court and receives his "certificate of citizenship."

The oath of allegiance is as follows:

"I hereby declare, on oath, that I absolutely and entirely renounce and abjure all allegiance and fidelity to any foreign prince, potentate, state or sovereignty, of whom or which I have heretofore been a subject or citizen; that I will support and defend the Constitution and laws of the United States of America against all enemies, foreign and domestic; that I will bear arms on behalf of the United States when required by the law; that I will perform noncombatant service in the armed forces of the United States when required by the law; that I will perform work of national importance under civilian direction when required by the law, and that I take this obligation freely without any mental reservation or purpose of evasion; so help me God."

In many states the public school system now offers special instruction for aliens desiring to prepare for the citizenship examination, and the practice of making the oath of citizenship a formal ceremony is becoming common.

Neutrality. The status of a nation taking no belligerent part in a conflict between other nations, but preserving friendly relations with both or all.

By international law, citizens of a neutral nation may trade freely with a belligerent, even to the extent of furnishing arms and munitions. Such goods, however, may be seized as "contraband of war," and neutral merchant vessels are subject to "visit and search" by war vessels of the belligerent states to determine the presence of contraband in their cargoes.

A nation, to remain neutral, must be strictly impartial in the assistance which it or its citizens afford. It may not permit its territory to be used as a refuge for troops of belligerent nations, nor as a means of transit for them, nor for the recruiting of troops. Its ports may be used by the war vessels of belligerents only for a limited number of days, and that use is restricted to the making of repairs or to the securing of supplies indispensable to the continued voyage of the belligerent vessel. Similar obligations bind the neutral state with respect to the use of its territory for purposes of communication by telegraph, by cable, or by radio, and, while private citizens may freely sell their wares to a belligerent state, a nation may not dispose of its naval vessels or of war matériel to a belligerent during the actual period of the war, without violating neutrality.

A legislative attempt was made in 1935 to safeguard American neutrality in foreign wars by directing the president to forbid sales of arms or loans to warring nations and warning American citizens against trade and travel. In 1939 the law was changed to allow the sale of arms, to be paid for and transported by the purchaser ("cash and carry"). American citizens were forbidden to travel in belligerent countries or on their ships, or to extend credits to such countries. American ships also were forbidden to enter combat areas.

The neutrality of some states has been guaranteed by treaty. Examples are Belgium before World War I and Austria after World War II.

Nihilism (*nī'hĭ-lĭz'm*). A term given to Russian radicals who refused to recognize the validity of existing institutions, social, political, or religious. The word was first used in this sense by the novelist Turgéniev in his *Fathers and Sons*, published in 1862.

The movement, which at first centered in student communities, was highly rationalistic and materialistic. It regarded religion, family life, private property, and even public administration as obstacles to the free development of the individual and of rational society. The movement had philosophical points of contact with anarchism. The repressive action of the Russian bureaucracy led to acts of retaliation and terrorism by the Nihilists, the most sensational being the assassination of the czar Alexander II in 1881.

The word is frequently applied in the United States to all "terrorists," or to those who use the assassination of officials to intimidate the government.

Oligarchy (*ŏl'ĭ-gär'kĭ*). A government in which the power of the state is held by a few, as opposed to the many. It is distinguished from an aristocracy only as being a corrupt form. Of all forms of government—democratic, aristocratic, or monarchic—an oligarchy has generally been condemned as the worst, its members invariably being led to exercise their power in their own interest, unrestrained by such consideration as is felt by a king for his people, or by the traditional sentiments of honor and public responsibility that may characterize an aristocracy under the phrase, "noblesse oblige." Oligarchies have frequently been associated with the seizure of governments by violence, chicanery, fraud, or by monetary power.

Open Door Policy. The preservation of opportunity for foreign trade in a country, on a basis of fair and equal competition for all nations. Open door policy means also that, in the development of economically backward countries, all foreign nations shall have an equal opportunity to offer the services of their credit and their technical experts, and to obtain concessions for transportation construction or for mineral development upon equal terms. For the nation whose territory is being opened for commerce or exploitation, it means preservation of the right to purchase in the cheapest markets, to borrow money on most favorable terms, and to award contracts for internal development on the conditions that appear most advantageous, without coercion by foreign political authority. The principle of the "open door" is opposed to so-called "spheres of influence" or "spheres of interest."

The term "open door" seems to have been first used by Admiral Lord Charles Beresford in 1899. Secretary Hay adopted it in 1900 in stating the policy of the United States toward China in opposing the aggression of other nations, particularly Japan.

Open Town or **Open City.** A term applied to a city or town which has been formally declared undefended and open to the enemy. The approach to the town must be open, all troops withdrawn, and fortifications dismantled. Such a town may be occupied, but not bombarded nor destroyed. The immunity apparently does not extend to military installations such as arsenals within the town nor to railway yards, and other facilities in its suburbs. Paris, Manila, and Rome were declared open cities in World War II.

Pacifism (*pă's'ĭ-fĭz'm*). An attitude of convinced opposition to war. Pacifists vary in their programs from those who, like Tolstoy, teach a doctrine of pure non-resistance to those who, admitting the justice of defense for the individual and the nation, deplore and oppose all forms of preparation for national defense.

Most pacifists are temperamentally optimistic with regard to human nature and the willingness of nations to compromise. The weakness of this type of pacifism lies in the failure properly to appreciate that the forces of cupidity and inherited antipathy are very powerful in human society and that a sense of the rights of a people is rapidly impaired by a knowledge that it lacks the resolution to defend those rights.

Another school of pacifists takes the view that the profit system is the mainspring of aggressive warfare. Socialists, who advocate production for use instead of profit, claim an end of imperialistic wars as a central merit of their proposals. Likewise the guiding principle of actual and proposed legislation to ensure neutrality, as placed before the United States Congress, has been limitation of profits from war and from preparation for war.

Pair. When legislators who are opposed to each other on a particular measure agree that the vote of one shall cancel the other, it is called a pair, and neither votes. The agreement does not affect the result. It is usually resorted to when one or both has to be absent.

Pan-Americanism. A term produced by newspaper discussion of the international American Conference at Washington in 1889 and 1890. It is the doctrine that the states of the American hemisphere possess certain common interests and institutions not generally shared by the peoples of the Old World, and that these should be the basis of a common understanding and of common political and commercial actions among these American states. Such an idea is involved in the Monroe Doctrine. To give effect to the ideas, the first International American Conference met at the call of Secretary Blaine at Washington in 1889-90. Including one in 1937, eight such conferences have been held. A special one for discussion of peace machinery in the New World was called at Buenos Aires in 1936 at the instance of President Franklin D. Roosevelt.

American advocacy of the Monroe Doctrine has at times advanced the sense of Pan-American unity, and at other times has awakened in Central and South America a sense of irritation and of concern. A considerable body of writers exists in several countries of Spanish inheritance, who assert that the cultural affiliation of those countries is with Europe rather than with the United States.

Pardoning Power. The existence of an executive power of remitting the consequences of a conviction is an almost necessary provision of government. The power frequently is invoked to mitigate the severity of the law, to assume a responsibility which is beyond the competence of a court, to recognize an alteration in conditions taking place subsequent to conviction or in view of new evidence, or to recognize good behavior or reformation of character in a person who has endured a portion of his sentence. Under monarchical government, such power resides in the king, who is the fount both of grace and of justice. The development of constitutional government has transferred this authority to ministers, as to the home secretary in the British government.

In the United States, the pardoning power is constitutionally vested in the president, and, by state constitutions generally, though not invariably, in the governor. A pardoning power usually exists in the legislative branch unless, as frequently under the American system, it has been limited or denied by the Constitution.

Party Platform. A document issued by party leaders or by a party convention, setting forth the principles and the measures for which the party stands and upon which it purposes to make its appeal for the support of the electorate.

Party Whip. A member of a legislative chamber assigned by party leaders to the task of rounding up members of the party to insure their vote on important measures and to hold them in line with party policy. In the British House of Commons, the whips may act as tellers at a "division" of the chamber when important votes are taken. They have other responsible functions of keeping track of sentiment on public matters, of arranging patronage, and, in general, of promoting party solidarity.

It is customary in England for the whips of the party in power to be appointed to the ministerial offices of "junior lords of the treasury," which offices are now sinecures.

The term whip is often used in the United States to designate party leaders in Congress.

Passport. A certificate of identity granted by a government, authorizing the holder to leave the country he is in or to enter a foreign country, and requesting for him safe and free passage and all lawful aid and protection. Passports are issued by the foreign office of a government, or by its diplomatic agents resident abroad.

In the United States, passports may be obtained by applying to the "passport bureau" of the department of state. It is customary for passports to be "viséd" by the representative of the foreign country to which it is proposed to go, in order that any difficulties may be met and surmounted before departure from the home country.

Paternalism. A policy whereby the state assumes to enter into and to regulate the activities of individuals in their social and industrial life. The early part of the 20th century, and to a less degree the latter half of the 19th century, have been marked by an extension of the activities and functions of government, directly opposed to the policy of the 18th century in Europe, which was dominated by the doctrine of "laissez faire," or noninterference by the state. See *Social Legislation.*

Patronage. Places in the government employ at the disposal of persons elected to political office. The term is also broadly used to cover contracts, franchises, and other public favors turned over to preferred individuals or localities by those in power. See *Civil Service.*

Peonage (*pē'ŏn-âj*). A form of servitude in which a laborer is compelled against his will to remain in the service of his creditor or employer. Peonage arises out of a contract whereby a debtor undertakes to serve a creditor until a debt or an advance of money or goods is paid, or it may result from the operation of law upon mere nonpayment of a debt. The word is derived from the Mexican term "peon," in which country peonage is a long established institution.

Amendment XII to the Constitution, which prohibited "slavery or involuntary servitude except in punishment of crime," made peonage unlawful. Congress, by a law enacted March 2, 1867, further provided that "the holding of any person to service or labor known as peonage is abolished and forever prohibited in the territory of New Mexico or in any other territory of the United States." The law further made the holding of anyone in peonage punishable as a crime.

Personal Representative. Heads of governments have long followed the practice of sending special and often secret agents to secure information abroad and even to negotiate treaties with foreign states. Inasmuch as the Constitution of the United States requires the consent of the Senate to the appointment of ambassadors, other public ministers, and consuls, the conduct of official relations with a foreign government by a personal representative of the president, unconfirmed by the Senate, would seem to be of doubtful constitutionality, and the practice has met with criticism and congressional opposition. Nevertheless, on numerous occasions the president of the United States has dispatched personal representatives on diplomatic missions.

President Washington, in October 1789, sent Gouverneur Morris to England to negotiate a commercial treaty, without having his appointment confirmed by the Senate. Several hundred such representatives, in all, have been dispatched by different presidents. Well-known examples are the mission of Nicholas Trist to Mexico in 1847 to negotiate a treaty of peace; of James H. Blount to Hawaii in 1893 to end a revolutionary movement of Americans against the Hawaiian monarchy; of John Lind and several other representatives to Mexico; and of Edward M. House to Europe by President Wilson. Trist was authorized by President Polk practically to order the American army

and navy to cease active hostilities against Mexico. Blount was endowed by President Cleveland with "powers paramount" to those of the American minister at Hawaii. Lind was sent to force the retirement of President Huerta from the head of the Mexican government.

A survey of the instances in which personal representatives, rather than diplomatic agents confirmed in their appointments by the Senate, have been used by the presidents of the United States reveals the following purposes for which they have been employed: to make special reports on conditions prevailing in foreign countries; to reopen relations with countries with which diplomatic relations have been broken; to interfere in the internal affairs of countries disturbed by revolution; and to negotiate treaties.

The motives that have led to such appointments are the advantages of secrecy, of expedition, and of the opportunity of avoiding a compromising situation in case of failure. Against them may be directed all the arguments in favor of open diplomacy and the constitutional privilege of the Senate to participate in developing the foreign policy of the government and of confirming the appointment of agents through which the promises of the government are expressed and the obligations of the nation are created.

Persona Non Grata (*pĕr-sō'nà nŏn grā'tà*). A term applied to a diplomatic representative who is not acceptable personally to the government to which it is proposed to send him. All countries reserve the privilege of refusing to receive any representatives accredited to them who are thus unacceptable, or to cancel for cause acceptance of such envoys.

Pigeonholing. The laying aside of a bill or other matter by a legislative committee, presumptively for future consideration, but in fact with the intent of allowing the bill to die through failure to act upon it; also similar action by an executive, where such action is equivalent to a veto.

Plebiscite (*plĕb'ĭ-sĭt*). In ancient Rome, a "plebiscitum" was the enactment of a law by the assembly of the "plebs" or common people.

In modern politics, the term plebiscite is given to an expression of the popular will, taken in various forms and for various purposes, such as an alteration in the form of government, change of rulers, or the transfer of territory from one sovereignty to another. The last purpose is of great modern interest, because of numerous provisions, in the treaties of peace that followed the World War, for the holding of plebiscites to ascertain the preference of peoples for the sovereignty of one state or another.

This application of the principle of self-determination arose during the period of the French Revolution, when a plebiscite of the inhabitants of Avignon was taken before the transfer of that city and adjacent territory from the sovereignty of the pope to that of the French republic. The practice was soon abused and discredited.

The plebiscite again came into use in the period 1848 to 1870, especially in the process of the unification of Italy. A plebiscite of the inhabitants of Nice and Savoy accompanied their cession by Piedmont to France. In 1877 a plebiscite was taken of the inhabitants of the island of Saint-Barthelemy in the West Indies, before the transfer of that island from Sweden to France, and again upon the separation of Norway from Sweden in 1905.

The following plebiscites were provided for in the peace settlements following the World War: Allenstein and Marienwerder, districts in East Prussia; Eupen and Malmedy, small districts or "kreisen" on the border of Prussia and Belgium; Upper Silesia; Klagenfurt, lying between Austria and Serbia; Northern Schleswig; and the Saar Basin. These have all been held, resulting in the retention of Allenstein and of Marienwerder by Germany; the cession of Eupen and of Malmedy to Belgium; the division of Upper Silesia between Poland and Germany; and the retention of Klagenfurt by Austria. By a plebiscite the Saar, which was under French control for 15 years, was returned to Germany in 1935.

A plebiscite was provided also for the district of Teschen, in dispute between Poland and Czechoslovakia, but this was abandoned in favor of a diplomatic settlement ratified by the powers.

Plurality. The number of votes received by a successful candidate in excess of the number cast for the next highest candidate for the office. In the election of public officials, the law may be so framed that a plurality only may elect. In such a case, if there are more than two candidates, it may happen that a candidate is elected even though he fails to obtain a majority of the total number of votes cast. See *Majority.*

Police Power. A general term that expresses the fundamental power vested in every state to limit and to regulate the exercise of private rights in the interest of public health, public morals, public safety, and the general welfare of the community.

Under this power, it has been held that a state may absolutely prohibit the sale of intoxicating liquor (*Mugler* vs. *Kansas*) or of cigarettes (*Austin* vs. *Tennessee*), as intrinsically harmful to the health of the community. It has also been held to be within the scope of the police power of the state to prohibit the manufacture of a commodity, such as oleomargarine, which readily lends itself to fraud upon the public (*Powell* vs. *Pennsylvania*). Laws designed to prevent gambling, such as the prohibition of dealing in grain "futures" or the buying and the selling of stock on margins are also within the police power (*Booth* vs. *Illinois*; *Otis* vs. *Parker*).

Under the police power, a state, or, when properly authorized, a municipality, may prohibit within a particular locality the manufacture of bricks, the maintenance of livery stables, public laundries, billboards, public garages, coal yards, slaughterhouses, and the erection of buildings of more than a prescribed height, and may impose any other regulations which are reasonably calculated to secure the public welfare while not unreasonably interfering with the liberty of the individual.

Laws limiting the hours of labor for women and children, prescribing the conditions under which factories shall operate, laws regulating the relative rights of landlord and tenant, as well as those prescribing regulations for buildings used as tenements, are other instances of the exercise of police power. With the growing complexity of society and with the greater interdependence of individuals and classes, the theory of the police power has been extended far beyond the narrow confines to which it once was thought to be limited. Thus antitrust laws, although directly interfering with the liberty of contract, and statutes prohibiting the sale or use of trading stamps, have been upheld (*National Cotton Oil Company* vs. *Texas*; *Tanner* vs. *Little*). Zoning ordinances designed merely to promote the æsthetic interest and general welfare of the community are constitutional exercises of the police power (*Lincoln Trust Company* vs. *Williams Building Corporation*). But anti-littering ordinances and laws requiring licenses to distribute handbills or to make addresses at appropriate places on public property have been held beyond the police power because they violate freedom of press and speech.

In the last analysis, whether an act is within the police power of the state depends upon a judicial balancing of interests—that of the individual in the unlimited use of his property and the unrestrained pursuit of his own inclinations on the one hand, and that of the rest of the community and of the state on the other.

Populism. Term applied to the series of reforms advocated by the People's or Populist party in the United States. Chief among these reforms were the free coinage of silver at the ratio of 16 to 1, the creation of a national paper currency to replace the national bank notes, stringent government regulation of railroads and of monopolies, and a general policy of legislation directed against the alleged control of the government by financial interests.

Pork Barrel. A term applied in the United States to appropriation bills for Federal expenditures in various parts of the country. So termed because each congressman secures his "piece of bacon" to bring back to the "folks at home." See *Logrolling.*

Pourparler (*pōōr'pär'lā'*). An informal, preliminary conference of representatives of different groups, factions, or countries, looking to a formal agreement settling disputed questions between the parties.

Preferential Voting. See *Proportional Representation.*

Pressure Group. Advocates of a cause who bring pressure to bear on lawmakers by lobbying or other means to compel passage of legislation they favor. They also use propaganda to convert public opinion to their views to add to the pressure, or to bring about a change in public policy. See *Lobbying, Propaganda.*

Primary. A preliminary election, held by voters of a party to determine the party's candidates for office. When carried out by a legally prescribed election and as a substitute for local meetings or conventions, it is generally termed the "direct primary."

In the "nonpartisan primary," all aspirants to office, regardless of political affiliation, enter the primary election, and members of all parties are eligible to vote. The two candidates receiving the highest number of votes for any office are regarded as nominated, and these two then compete against each other in the final election.

Prime Minister. A term applied to the head of a ministry, particularly in Great Britain and in the dominions of the British Empire. He is called also "the premier." In France, he is legally termed "the president of the council of ministers."

Privileges and Immunities of Citizens. The 14th amendment to the Constitution of the United States provides that "No state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the

United States." These privileges and immunities are incidents of Federal citizenship. They include the right to protection of life, liberty, and property on the high seas and in foreign countries; the right peaceably to assemble and petition the Federal government for redress of grievances; the right of habeas corpus; the right to use the navigable waters of the United States; the right to hold office under the Federal government; and the rights secured to citizens of the United States by treaties with foreign nations.

Article IV, Sec. 2, of the Constitution provides that "Citizens of each state shall be entitled to all privileges and immunities of citizens in the several states." These rights include protection of life, liberty, and property under state law; the right to sue in the state courts; the right to engage in any lawful business; and the right to acquire and to devise or bequeath property. See *Civil Rights and Liberties*.

Prize Courts. Tribunals of a belligerent state, established for the purpose of adjudicating the title to property captured by its citizens on the high seas, and of examining the nationality of such property.

Prohibition. Governmental action which prohibits by law the manufacture and the sale of intoxicating liquors except for medicinal or sacramental uses. In the United States, the first state prohibition law was enacted in Maine in 1851. Between that date and 1920, nearly half of the states, at various times, enacted laws prohibiting or strictly limiting the manufacture and sale of liquor. The XVIII amendment to the United States constitution (in force January 16, 1920) made illegal the manufacture and sale of liquors containing more than one-half of one per cent of alcohol. The ensuing 13 years provided a working test of the policy. The prohibition, fairly effective at first, became less so as time went on. Bootlegging of liquor on an unprecedented scale diverted large sums of money to criminal elements of the population. These and other considerations led, in 1933, to the adoption of Amendment XXI to the Constitution, repealing the earlier one but giving Congress power to prevent transportation of liquor into states where its sale is illegal.

Propaganda. This term is used to describe any means of instilling or promoting ideas favorable to a cause or organization, particularly in the field of politics. Usually, this is accomplished by indirect or incidental means, as by suggestion, insinuation, or by more or less subtle appeals to prejudice. If the propaganda is sufficiently clever, the victim is led to think that he has arrived independently at impressions that have been introduced into his mind by someone else. Propaganda may be conveyed by news articles, plays, motion pictures, or even in conversation. The word itself has a respectable origin, in the sense of missionary work. Its evil repute comes from its political use in spreading half truths by illicit methods.

Proportional Representation. Any one of a variety of plans designed to give minority parties or groups representation in a legislative body, in proportion to the relative strength of each minority group as shown in elections; frequently called also "minority representation."

Such a plan was first tried on a national basis by Denmark in 1854 and was successfully adopted by Belgium in 1899.

History of the Movement. Proportional representation was discussed and advocated for both national and local elections for about 60 years preceding the World War, but, before 1914, it was adopted only for the choice of national representatives, by several smaller states, as Denmark in part, Belgium, Sweden, Bulgaria, Serbia, and Portugal.

During the World War, the system was adopted by Holland and was extended in Denmark. It appears in most of the post-War new constitutions: Germany, Austria, Czechoslovakia, Jugoslavia, Danzig, Greece, Poland, Esthonia, Latvia, Lithuania, and Bulgaria. France adopted it in 1919 but in 1927 returned to the uninominal system. In Switzerland, it was adopted nationally by an initiative proposal in 1918.

Plans in Use. Of the several plans, the following may be mentioned:

(1) The "limited vote" plan. Each constituency or district elects several representatives, but each voter therein casts a ballot for a number of candidates, less than the number of seats to be filled, giving his vote but once to any one candidate. A minority, by limiting its nominees, may be large enough to elect one or more candidates. This system was applied to certain constituencies in England in 1867 but was abolished in 1885.

(2) The "cumulative vote" plan. Each voter has as many votes as there are places to fill, but he may cast all his votes for one candidate or may distribute them between candidates, as he chooses. Here again, a minority party, by limiting its nominees, may elect. This device was used for election to the legislative council of Cape Colony before the Union of South Africa was formed. English school board elections also have used this system, and the state of Illinois employs it to elect its House of Representatives.

(3) The "single vote" plan. In each constituency, though there may be more than one place to fill, each voter is allowed to cast his ballot for one member only. Minorities, by this plan, may elect if they confine nominations to the number of candidates their voting strength represents. Japan has used this system since 1900, and her experience shows that quite close approximations to the results of more elaborate methods of proportional representation may be obtained.

(4) The "single transferable vote," known as the "Hare system." First used in Denmark in 1855 and adopted in 1909 by the Union of South Africa. Each voter indicates on the ballot his first, second, third, etc., choice. A "quota" determining the number of votes necessary for election is obtained by dividing the total number of votes by one more than the number of places to be filled and by adding one to this number. When all the first choices are counted, if a candidate is found to have the quota, he is elected. If there are surplus votes, they are transferred by various methods under various systems to other candidates as indicated by the ballot. The Hare system of preferential and proportional representation has been adopted in a few cities of the United States and Canada.

(5) The "list system." Lists of candidates are nominated by political organizations or groups of voters. Each voter has as many votes as there are places to be filled, but he may not "cumulate" them. The number of votes registered by a group or party is used to determine the number of elective candidates of the group. There are various ways of apportioning seats under this system, but the most widely copied is "the d'Hondt system" in Belgium, known from its originator. It may be made clear by illustration. Suppose an election for 5 seats, and 4 party lists obtain 24,000, 11,000, 9000, and 3000 votes, respectively. These figures are then divided by two, with results of 12,000, 5500, 4500, 1500; by three, with results of 8000, 3666+, 3000, 1000; if necessary by four, and so on. As there are 5 seats, the 5th largest of the figures thus obtained (in this case 8000) becomes the "quotient." By dividing the party votes by this quotient, we obtain the number of seats to which each party is entitled; namely, 3, 1, 1, and 0.

Protective Tariff. See *Tariff*.

Protectorate. A country or territory under the political control and protection of another. A protectorate invariably represents some restriction upon the foreign relations of the country, and may extend to complete control of them. Usually foreign authority is exercised also over the financial affairs and obligations of the protectorate. A nation claiming or exercising such protection becomes responsible to other nations for the protectorate's regard of international obligations, and the tendency is to go even further and admit responsibility for internal order and well-being. For examples of protectorates under the United States, see *Cuba*, *Panama*, *Santo Domingo*, *Haiti*, *Nicaragua*, *Liberia*.

Protocol (*prō'tō-kŏl*). A preliminary agreement between two or more countries, intended to form the basis of a more formal and complete treaty.

Public Lands Policy. Over two-thirds of the total area of the United States, including Alaska and consisting of over 1,800,000,000 acres, has at some time been the property of the nation. The development of this vast public domain into farms and homes, privately owned, has been one of the most important policies of the American government, and its carrying out has profoundly influenced the development of American society. Of this original domain, there remains about 400,000,000 acres, mostly arid or otherwise unfit for settlement. The rest has been distributed.

The Constitution gave to Congress the right to dispose of public lands, and under this power Congress has developed a public land policy, which, however, has taken several different forms. In the beginning it was believed that the sale of these lands would produce a considerable revenue and, among other common benefits, would extinguish the public debt. Accordingly, large tracts were sold to companies for subdivision and speculation. After 1800, small tracts were sold to settlers on credit. In 1820, a system of cash sale was adopted, the minimum price being reduced from $2.00 to $1.25 an acre. Public land was frequently occupied by settlers in advance of government surveys, and without negotiation with government agents. These settlers, known as "squatters," came to be recognized as having prior claims to the acquisition of lands which they had improved.

Homestead Policy. The policy of using the public domain to encourage national development received complete recognition in the "homestead law" of 1862. This act permitted any head of a family to secure 160 acres, or a quarter section of land, by residing on it for five years. Amendments changed the law so as to extend the privilege to any person 21 years of age or older who was a citizen or had declared his intention to become a citizen.

For homesteads in certain arid regions, Congress extended the acquirable tract to 320 acres, without the necessity of residing on the land. On other tracts, designated as "grazing lands," the law permitted the acquisition of 640 acres. An act passed in 1878, and in 1892 made applicable to all public lands, allowed the outright purchase of 160 acres of unappropriated nonmineral land unfit for cultivation but valuable for timber or stone, at a minimum price of $2.50 an acre.

Land Grants to States. The government has also granted public lands to states, to individuals, and to corporations, for specific purposes. Previously to 1850, one section out of each 36, within a state, was granted to it by the national government for support of education. Since 1850 the amount has been doubled. In 1860 the "Morrill act" granted each state an amount of land for the support of a college of agriculture and mechanic arts. This measure forms the basis of a large number of western state institutions. Extensive grants of land were made to the soldiers of the Revolutionary and Mexican wars, as compensation for their military service. To encourage the building of railways, particularly the transcontinental systems, Congress granted large areas of public land along the lines of these railways through undeveloped country, such grants amounting to more than 155 million acres.

Conservation. The "Desert Land act," as amended in 1891, enabled settlers to obtain 320 acres by bringing the land under irrigation within three years' time and expending not less than one dollar an acre for improvements. The government has undertaken also the reclamation of arid and swamp lands.

In recent years a new policy, called "conservation," has been defined, designed to preserve the remaining public domain from wasteful exploitation. Under this policy, the timber, the minerals, and the surface of the lands are disposed of separately, and water power sites have been withheld from entry.

Congress also granted authority to the president to withdraw the public domain from private acquisition and to create extensive reservations, either as "forest reservations" or as "national parks." Nearly 200 million acres are included in forest reservations in the West.

All unappropriated land was withdrawn from settlement by an executive order in 1935 signed by President Franklin D. Roosevelt. This move was in accord with recommendations of a national resources committee which the President had commissioned to report on the best use of land and other natural resources. Among the points made by the committee was the fact that much land unfit for cultivation was nevertheless being tilled. Farmers so engaged, who required public relief for their support, were given aid in acquiring better land elsewhere through the agency of a Federal resettlement administration. At the same time an extensive land-purchase program was carried out, the land so acquired being reforested or otherwise used as appeared desirable.

Public Ownership. See *Government Ownership, Municipal Ownership, Socialism.*

Punishments, Cruel and Unusual. The English Bill of Rights 1688 contained a provision, forbidding the infliction of "cruel and unusual punishments." This provision has been incorporated in the Constitution of the United States, in the 8th amendment, and in the constitution of nearly every American state.

"Cruel and unusual punishments" within these provisions are such punishments as are revolting to the civilized mind, or involve torture and lingering death. However, a punishment wholly disproportionate to the crime committed may, under some circumstances, constitute a "cruel and unusual punishment."

Recall. A process for removing an elective official from office before the expiration of his term. This method is entirely distinct from impeachment, as the latter is applicable only in case of gross malfeasance or breach of trust. The recall is initiated by a petition signed by a designated percentage of the electorate. Within a certain period after the filing of the petition, a recall election is held, in which the official against whom the recall is directed is compelled to contest for the office with one or more candidates who have been nominated to replace him.

Recall of Judicial Decisions. A process whereby the decision of a court declaring any law unconstitutional may be submitted to a popular referendum initiated by petition, and, in the event that the popular vote is favorable to the law, the court decision is disregarded and the law is enforced notwithstanding. The incorporation of such a provision in the United States Constitution would be tantamount to providing a special method of amendment by a mere majority vote.

Colorado is the only state where the recall of judicial decisions has been adopted, with specific limitations.

Reciprocity. An arrangement between two or more countries whereby each admits the exports of the other duty free, or at rates more favorable than those applied to similar importations from other countries.

Reciprocity provisions were incorporated in the American Tariff act of 1890. The method of making them effective was to empower the president to impose higher duties on certain imported articles if the foreign countries from which they came should appear to have imposed, upon products of the United States, duties which might be deemed to be "reciprocally unjust or unreasonable." See *Tariff.*

Red Tape. An expression signifying official formality and delay. It owes its origin to the red tape usually employed in tying up public documents. The phrase is said to have been first used in this sense by Lord Minto in 1775.

Referendum of Laws. (See also *Direct Legislation.*) A constitutional procedure whereby a measure enacted by a legislature may be subjected to the judgment of the people before becoming effective.

The referendum has been closely associated with the initiative of laws; but the two procedures differ in character, the referendum being conservative in its nature, and the initiative, radical. The referendum, as well as the initiative, in its modern use, has been most highly developed and employed by Switzerland, and it was from this country that the influence came which lead to the adoption of these procedures for ordinary legislation in American states.

The referendum may be "optional" or "obligatory." An optional referendum occurs when a legislature provides that a measure shall not become effective until approved by the voters of the jurisdiction affected. In this form, the referendum was common in the United States even before 1898, the year when the popular referendum of statutory laws was adopted by South Dakota, and was applied particularly in such matters as county division and creation of bonded indebtedness.

Under the obligatory use of the referendum, a law is suspended, usually for 90 days, to provide an opportunity for the voters to scrutinize the measure and by petition of a certain number, to compel its reference to popular judgment at a general election. There may be exception of certain law, called "emergency measures," such measures usually requiring for passage an extraordinary majority of votes in the legislature.

Besides the "popular" referendum of laws, recent constitutions have provided other means whereby legislation may be submitted to the judgment of the voters. In Sweden, by a recent constitutional enactment, there is a referendum of laws if the government and the national legislature concur in its submission.

The popular referendum has made no progress in the Latin American republics, but in some of these countries, according to an old practice, acts of the government are referred to the councils of the municipalities for approval.

There appears to be a growing practice to except certain measures of the legislature from the operation of the referendum. The constitution of the state of Massachusetts, the last American state to adopt the referendum, exempts from its operation a large group of subjects.

In the United States, 21 states have adopted the referendum in some form.

The referendum is a popular safeguard against hasty or corrupt action of legislatures. In the United States its adoption was distinctly encouraged by distrust of state legislatures. This dissatisfaction, at an earlier period of constitutional amendment, took the form of placing in the state constitutions a wide variety of limitations upon the legislative power. The substitution of the referendum for this precaution would seem to recommend the repeal of many existing constitutional limitations which now unduly limit and embarrass the work of state legislatures. See *Referendum and Initiative of Laws.*

Representation. This is the device by which a citizen participates in government by proxy through an elected representative. Representation is direct when the citizen may vote for the candidate; it is indirect when he helps elect a body which in turn may vote for the candidate.

Direct representation in most countries is arranged so that electorates for each candidate have approximately the same population; hence the vote in each electorate is considered to have the same weight. It is to preserve this principle that Congress reapportions Congressional districts after the taking of a census. This does not apply to the Senate, to which each state elects two senators regardless of the state's population.

In 1964, the Supreme Court ruled that the clause of the constitution guaranteeing equal protection of the law requires apportionment of both houses of bicameral state legislatures on a population basis. It held that the analogy of the United States Senate does not permit election of one state senator from each county regardless of population. This decision had the effect of ending a situation in which a disproportionate weight was given to rural districts as compared with urban districts.

Republic. A political community in which government is exercised, not by a monarch or hereditary rulers, but by and for all the people through their representatives. The term derives from the Latin words *res publica* ("commonwealth"), which was applied to Rome when the kings were expelled and elected officials were entrusted with the welfare of the state. Its use survived to describe Rome's government long after the emperors took over power from elected representatives.

The word has been applied to the aristocratic government of the medieval Italian cities. When the United States rid itself of the power of the British monarch, it followed the Roman example of calling itself a republic. Each non-monarchical government of France has so designated itself. The Latin American countries, after throwing off the yoke of Spain and Portugal, proclaimed themselves republics. The Communist governments of the 20th century without exception called themselves republics. The same is true of all the new states arising after World War II whenever they rid themselves of monarchical institutions.

It is obvious from the above that a republic is not necessarily a democracy, in which effective control is exercised by the majority of the people. Some political writers have tended to equate the two terms, and this fact has doubtless had an influence when newly independent countries chose political titles. Many of the Communist countries, in their excessive claims to popular sovereignty, call themselves republics.

A national monarch may be an impressive and useful symbol of strength, unity, and devotion, and, under such a guise, monarchy in all ages has appealed to popular admiration and has commanded intense devotion. The conception of a republic, in which the central personal leader is lacking or is transitory, undoubtedly calls for higher political development and is successful only by the display of higher popular political capacity.

Republicanism rejects not only kingship, but hereditary caste, class privileges, and hereditary distinctions. The price of this repudiation and of the refusal of these great rewards to political ambition is the frequent inability of republics to command and to keep in the public service the highest talent of the nation.

Residence. Legally, the place where one habitually resides or sleeps. Residence differs from "domicile" in that the latter term generally designates a more permanent attachment to a particular place, and includes the intention of remaining in that place indefinitely, while residence may connote a less permanent habitation. One may possess two residences, but he can have but one domicile, at any particular time. In the U.S., voting privileges and eligibility to office usually are limited to one place of residence.

Retroactive Legislation. A law made to apply to acts performed or to conditions existing prior to its enactment.

Revolution, Right of. The right of the people to revolt against the established government whenever that government becomes tyrannical or fails to afford public satisfaction.

This right was particularly asserted by such writers as Locke in England (1689), by Rousseau in France, and by Thomas Paine during the American Revolution. The Declaration of Independence, in which the ideas and even the language of Locke are used, is based on the assertion of this right.

The right of revolution is particularly opposed to the doctrine of legitimacy of royal rule or of "divine right."

Rider. A measure, the passage or executive approval of which seeming doubtful, is "tacked on" to a bill which is assured of passage, such as an appropriation bill, in order that the doubtful measure may "ride in" on the strength of the main bill.

This device is frequently effective in the Federal government of the United States because of the inability of the president to veto a part of a bill, without invalidating the whole. In many states, however, the governor is now given the power to veto part of a bill and to ratify the remainder.

Right and Left. In legislative bodies of continental European countries generally it is the fixed habit of the conservative groups and parties to seat themselves on the right hand of the president or speaker, and of the liberal or radical elements to seat themselves on the left. The terms have thus come to be used as indicative of conservative and radical position on political matters; and, with the differentiation of positions within the group, the expressions "extreme right" or "extreme left," etc., have come into vogue. Thus the socialist party, which is always a left group, is divided into "right and left wings" according to the moderate or the revolutionary character of the group. The term "center" is used for middle parties or groups.

Roll Call. If one-fifth of the members present of either house of Congress wishes a record of the yeas and nays on a particular measure, a roll call vote showing how each member voted must be taken and published in the *Congressional Record*.

Roorbach or **Roorback.** A libel, or falsehood of a defamatory nature, used for political ends. The word had its origin in the presidential election of 1844, when a forgery of this nature was published to the detriment of James K. Polk. It was supposed to be an extract from the *Travels of Baron Roorbach*, but was later traced to G. W. Featherstonhaugh's *Tour*, whence the malicious statement had been drawn by a newspaper writer, William Linn.

Sabotage (*să'bō'täzh'*). The wanton destruction of the property of employers by laborers, or the practice of various means to slow down or stop production, to damage machinery, to discourage employers, and to make capitalism unproductive. As a resort for the enforcement of labor demands, it is a substitute for the strike. As stated by an advocate, "it means to strike but stay on the pay roll." It is particularly advocated by the revolutionary element among the working class as a means to end private ownership of productive capital.

The modern practice of sabotage arose among the radical French labor circles known as "syndicalists" (See *Syndicalism.*), and the term is derived from the supposed practice of a French workingman of throwing his wooden shoe, *sabot*, into moving machinery, thereby causing wanton damage.

Sabotage, or the destruction of private property, began to be advocated and practiced in the United States about 1910, particularly by members of the "Industrial Workers of the World." (See *I.W.W.*) It was advocated also during the first years of World War I by sympathizers with Germany, as a means of stopping the production of munitions furnished to the Allies. During the World War and immediately thereafter, legislation, called "syndicalist laws," was passed by many American states, severely punishing the practice of sabotage and even making it a crime to advocate such doctrines.

Satellite. A country which is under the political and economic domination of a stronger power.

Scratching. The practice, by American voters, of marking out from a party ballot one or more of the regularly nominated candidates. It is the opposite of voting a "straight ticket."

Sectionalism. The advocacy of measures or policies designed to promote the interests of a particular section rather than the good of the country at large.

Self-Determination. The principle or proposal that every distinct people or nation ought to have the right to determine the question of its independence, its form of government, and its political destiny. The phrase appears to have originated in the "Manifesto to the Proletariat" adopted by the conference of antinationalist socialists, held at Zimmerwald, Switzerland, in September 1915. This manifesto summoned the propertyless workers of Europe to a battle for peace "without annexations or war indemnities." Neither whole nations nor separate sections of nations were to be forcibly incorporated into states. "The right of self-determination of peoples," it declares, "must be the indestructible foundation of the creation of national relations." The Zimmerwald conference was attended by Lenine and by other Russian socialists, and among the early declarations of the Bolshevik revolutionary government in Russia was a pronouncement for "no annexations, no indemnities, self-determination of peoples."

Stated in a broad way, this declaration would seem to be equivalent to the principle of "government with the consent of the governed." On some such understanding, the principle of self-determination was championed by President Wilson in his proposals for world peace, preceding the entry of the United States into the war, and particularly in his program presented to the Paris Peace Conference. In President Wilson's mind it was associated with a league to maintain the rights of peoples and with the probable reduction of certain great states into a number of minor sovereignties. In Paris the phrase became a shibboleth leading to demands by numerous peoples for national independence. Its practical result is seen in the dissolution of the Austro-Hungarian Empire and in the emergence of new states, such as Poland, Esthonia, Latvia, Lithuania, Czechoslovakia, and Ruthenia, and particularly in the declarations of independence of numerous small republics within the area of the former Russian Empire. The phrase also had great influence on political movements in Ireland, Egypt, Persia, the Ottoman empire, and elsewhere.

Difficulties of Application. In spite of the glamour attending a declaration seemingly so democratic, the principle is difficult of application and may even lead to political reaction. Much depends upon what constitutes a small nation or people with the presumptive right to separation and self-government. Peoples are not wholly independent, economically, politically, or morally, especially where they have previously been united under a common sovereignty. Dissociation inevitably carries with it the repudiation of certain obligations involving hardship,

injustice, and, almost inevitably, economic injury to all parties. Particularly has it led to the setting up of new economic barriers, where freedom of trade and movement formerly existed, to the stimulation of animosities, and to a particularism dangerous to political unity and stability. Political progress, according to one well established ideal, is toward the uniting of the human family into larger political units, with a consequent suppression of national prejudices, rivalries, and retaliations, either political or economic. The multiplication of small states, in this point of view, must be regarded as a backward step. For the great nations, particularly when composed of peoples presenting local differences, united under some form of federal government or empire, the principle is a disintegrating one, dangerous to their existence. Strictly applied, the right of self-determination would have justified the separation of the Southern Confederacy from the American Union, or the division of any state on grounds satisfactory to the seceding portion.

Senate. The upper legislative chamber in the Congress of the United States and in each of the 50 states of the Union except Nebraska; also a similar body with the same name in a number of other modern governments.

The happy agreement in the American constitutional convention to give to all the states equal representation in the Senate made possible the acceptance of the Federal Constitution. This feature has been successfully copied in the "senates" of other federal governments, including Canada, Australia, South Africa, Mexico, and Argentina, in the Union of Soviet Socialist Republics (Russia), and in the Swiss "Council of States."

In a large number of other governments, American and European, which are not federal, the upper chamber of the national legislature has been given the name of Senate. The list includes France, where in 1875 a Senate was added to the National Assembly; Belgium under the constitution of 1831; and, more recently, Italy and Cuba.

It is the general practice, following the American provision, to set a higher age qualification for eligibility to a senate, to fix a longer term than for the lower house, and to renew the senate by degrees, thus giving it a continuous life and a slowly altering membership. The net effect is believed to be to increase the conservative character of the government.

Senatorial Courtesy. A custom whereby the president, in making nominations to Federal offices, is expected to consult the United States senators from the state in which the vacancies exist before submitting nominations to the Senate for confirmation. Where the senators are of a different political party from the president, the custom is not applicable.

Separation of Powers. A principle of government which sharply separates the executive, legislative, and judicial branches of the government, confining each to its special sphere and making each independent of the other two.

The principle was enunciated by the French political writer Montesquieu in his *Spirit of the Laws*, and was, actually, a misapprehension of the British constitution as it existed in the 18th century. To the supposed separation of powers and the "checks" upon arbitrary action which it secured, Montesquieu attributed the security of English freedom.

The theory of Montesquieu was much regarded by the founders of independent government in America and by them the separation of powers was proclaimed as an indispensable element of free government. Many state constitutions endeavor specifically to apply it and to make it mandatory. The constitution of the state of Massachusetts, of 1780, declares: "In the government of this commonwealth the legislative department shall never exercise the executive and judicial powers or either of them; the executive shall never exercise the legislative and judicial powers or either of them; the judicial shall never exercise the legislative and executive powers or either of them, to the end that it may be a government of laws and not of men."

As a matter of fact, the precise principle never existed in England and has not been truly realized in the United States. The president and the state governors participate actively in legislative programs and exercise a veto over laws. Courts have been intrusted with numerous executive functions, and, by judicial interpretation, they expand or nullify legislation. In the commission type of government, the theory is entirely abandoned.

Serfdom. A status of personal servitude whereby the peasant is deemed bound to the soil upon which he is born, and is required to perform certain services and to give to his lord a certain proportion of the yield of the land. On the other hand, the peasant may legally be entitled to the protection of his lord and to certain assistance, and may have rights to his holding of which he may not arbitrarily be dispossessed.

Serfdom is closely connected with the institution of feudalism. It existed generally on the continent of Europe until the close of the 18th century. The French Revolution suppressed it in France and in other countries to which the Revolution extended. In Prussia it was ended by the edict of Stein in 1807. In Russia it continued until the emancipation of the serfs by the czar Alexander II in 1861. Until the reform of the landholding system in 1871, Japan had a feudal form of society, in which the status of the tiller of the soil resembled European serfdom. Its last traces in England disappeared in the reign of Queen Elizabeth.

Single Tax. A principle of taxation, advocated by Henry George in his work *Progress and Poverty*, published in 1879, whereby all increase in the value of land would be appropriated by the state as a substitute for other taxes. The principle rests upon the theory that the appreciation of value of unimproved land is an "unearned increment" due to the growth of society itself, and not to the exertions or investments of the owner. Thus the owner justly may be deprived of this increased value by land taxation sufficiently heavy to absorb it.

The theory has attracted less attention in the United States than in Great Britain, where vast private estates held in an unimproved condition invite the application of the doctrine. It has been sparingly applied in certain cities of the United States and Canada.

Smuggling. Illicit importing of goods into a country without submitting them to the customs authorities or paying legal import duties.

Social Contract. The theory that the state originates in a contract between individuals, whereby the freedom and the equality of the "state of nature" are surrendered for the advantages of state protection and authority.

The theory fills a large place in the history of political philosophy, particularly in the writings of Hobbes, Locke, and Rousseau. Thomas Jefferson and many of the political thinkers of the time of the American and French revolutions rested their governmental doctrines upon this theory of the origin of the state, and from it deduced their justification of the right of revolution, or of dissolving the social compact.

As a historical explanation of the origin of political society, the social contract theory is rejected by modern students of government.

Socialism. A social program whereby private ownership of land and of all other "productive capital" would be extinguished in favor of ownership by the state.

The present day orthodox theory of socialism is that expounded by Karl Marx, particularly in his work, *Capital*, published in 1872, although the essential ideas were expressed in the *Communist Manifesto* issued in 1848 by Marx and Engel.

The distinctive feature of Marxian Socialism is the doctrine that the socialist state will arise inevitably out of the evolution of modern industrialism. Marx predicted a progressive and inescapable concentration of the means of production in the hands of the few, until there would remain but a few capitalists, or bourgeois, on the one side and the rest of the community of propertyless workers, or proletariat, on the other. The so-called "middle class" would entirely disappear. When this stage had completely evolved, modern industrialism would be "mature," and revolution, either peaceful or bloody, would be inevitable. The masses would take from the capitalists control of the means of production and would operate them in the interest of the community. The socialist state would arrive.

Economic Crises. The chief impetus toward the transition is held to be economic crises, or depressions. Their recurrence is represented as inevitable under capitalism. From the Socialist point of view, these crises serve the double purpose of speeding up the concentration of "productive capital" in the hands of the few and creating active discontent in the involuntary idle. These results are expected to lead to a demand that society should plan its production so as to use the services of all who wish to work.

Half a century after the death of Karl Marx, Socialism passed from the realm of political theory to a testing laboratory, so to speak. That is to say, it was adopted by Russia. Its evolution there did not follow the sequence predicted by Marx, since capitalism was much less advanced there than in many other countries.

Socialism and the Nation. Orthodox socialism repudiates national allegiance in favor of loyalty to the "proletariat of all lands." It views the modern state as the buttress of capitalism and as the means for "imperialistic aggressions" in favor of the capitalist class. In the World War, while the socialist parties generally supported the governments of their respective countries, an extreme international wing in each belligerent state repudiated the war aims of its nation and even sought its defeat or overthrow. A so-called "Third International," with headquarters at Moscow, directs the policy of those working in separate nations for the realization of Socialist aims.

To Marx is due also an "economic interpretation of history" in which all human activity and social development are held to be controlled by economic motives and causes.

Social Legislation. Under this term is embraced a wide variety of measures designed to protect terms of employment and to improve the general well-being. Modern legislation of this character followed the rise of the factory system in England and in Continental Europe and the industrial inventions which revolutionized industry in shops, mines, and transportation.

Legislation in England. During the first decades of the 18th century, there prevailed a doctrine of *laissez faire*, or complete abstention of government from interference in the conditions of employment and in the relations between employer and laborer. Such interference was held to be an unwarranted trespass upon the freedom of employment and of labor and an unwise disturbance of the law of supply and demand. Factory and mining conditions, however, became so deplorable as to lead, in 1802, to the beginnings of English social legislation, the first law regulating the labor of "bound" children. Such legislation was at first confined to the protection of the health, safety, and morals of children and women. In 1842, a working day in excess of 10 hours for women and children was prohibited. The English example was followed in many other industrial countries toward the end of the 19th century, and the program was vastly expanded in the 20th century.

Legislation in America. In the United States, laws have been passed for the protection of the laborer from the following hazards of employment: dangerous gases, acids, and dusts, poisonous and nonpoisonous; harmful bacteria and micro-organisms; compressed or rarefied atmospheres; improper lighting; extremes of temperature and of humidity; and excessive physical or mental strain. Many laws have been designed to prevent accidents both to employees and to the public, and to require the installation of provisions for safety in dangerous employments, such as mining. Child labor is limited or prohibited in most states. Federal laws prohibiting employment of children having been ruled invalid by the Supreme Court, a constitutional amendment was submitted to the states in 1924 which would empower Congress to regulate or prohibit the employment of persons under 18 years of age. It was not ratified, but the situation was saved when the Supreme Court held that the child labor restrictions in the Fair Labor Standards Act of 1938 were constitutional.

Old Age Pensions. These are of two kinds—aid for the needy aged and annuities based on the employment history of the individual. The first kind is a contribution to be matched by states and paid on a non-discriminatory basis to indigent persons over 65 years old. These are the assistance grants paid out of federal and state appropriations and are distinct from the Social Security insurance programs financed by taxes. (*See Social Security.*)

Unemployment Compensation. The Federal government does not directly administer this program. Its part is to collect a pay roll tax and to hand the proceeds, less administrative expenses, over to States for carrying out their own programs provided these programs meet the standards laid down in the Federal law as interpreted by a social security board. Those who have been employed for a minimum period and then lose their jobs are entitled to unemployment compensation for a limited number of weeks. Details differ from state to state. Funds are raised by an impost on pay rolls of employers.

Provision is made also for Federal contribution to states on a matching basis for aid to dependent children and for child welfare. This includes support for needy mothers with children to support. Each state program must be mandatory and uniform in all districts as a condition of receiving Federal contributions.

The Minimum Wage. Legislation has also been passed establishing the "minimum wage" that may legally be paid in certain industries. The theory of a minimum wage is that it corresponds to the lowest compensation which will afford a livelihood that is not destructive to health and to self-respect. Minimum wage laws were initiated by the state of New South Wales, Australia, and were followed by legislation of the British Parliament affecting the industries of Great Britain. Such laws in the United States were long held invalid as interfering with freedom of contract. In 1936, however, the supreme court reversed itself on this point (*Parrish* vs. *State of Washington*).

Social Security. Legislation to insure workers against the hazards of industrial life was first enacted by Germany, a law of 1883 providing for sick benefits. Such benefits have been widened in many countries to include compulsory accident insurance, unemployment compensation, aid for dependent children and invalids, and old age pensions.

A landmark in social legislation in the United States was the enactment, August 14, 1935, of a comprehensive Social Security law providing for old age pensions, unemployment insurance, and aid for dependent children and the blind. Under this act, a wage earner contributes part of his or her earnings in the form of a tax (3 per cent or more, according to schedule), which is matched by an equivalent payment made by the employer. In return the worker is entitled to receive upon retirement at age 65 or total disability a monthly benefit based on his average earnings over a given period. Until he reaches age 72, a retired person receiving Social Security benefit is allowed to supplement his income by earnings up to $1500, or slightly more with some benefits withheld. After he passes age 72, no limit is placed on his supplementary earnings.

From time to time following the passage of the original Social Security Act, Congress has broadened its coverage to include different classes of employed persons like farm owners and farm hands, household workers, and self-employed persons such as professional people engaged in different lines of activity. Women were permitted to retire at 62 with reduced benefits. The law has operated under the Department of Health, Education and Welfare.

Medicare. This is a program of health insurance for persons over 65 years of age. As adopted in 1965, it consists of hospital insurance and medical insurance. Hospital insurance is financed entirely from social security taxes. It pays most of the cost of hospital service. Medical insurance is voluntary and is financed half from social security taxes and half by a fee withheld from recipients of federal old age pensions.

Sovereignty. The ultimate or supreme political authority in the state. In a democracy, sovereignty is vested in the people; in an absolute despotism, it is in the monarch.

Soviet (*sō'vyĕt'*). Russian term for a council or deliberative body; used particularly with reference to the village, city, county, and provincial councils, composed of deputies elected by the workmen, soldiers, and peasants, which form the basis of the Russian Soviet government and constitute the governing bodies of the local districts. See *Russia.*

Sphere of Influence. A "sphere of influence" or a "sphere of interest" is a region, frequently the territory of another recognized state, within which some foreign power claims a position of preponderant or "special interest." The conception arose in the "partition of Africa" by the European states, which followed rapidly after 1884. In these settlements, which were partly arranged at the Berlin Conference of 1884-85, the entire seaboard of Africa, not already possessed, was distributed as colonial possessions or protectorates among the European states, particularly Great Britain, France, Belgium, and Germany. In addition, the interiors or "hinterland" covered by the coastal possessions were declared to be "within the sphere of influence" of these particular states. The agreement aimed to establish rights of subsequent penetration and development over areas of Africa which the colonizing powers were not at the moment prepared to occupy effectively.

Subsequently the conception was applied to China, where vast areas of that country were more or less definitely accorded by one European power to another as a sphere in which economic and political preference was recognized. The foreign country claiming a sphere in China endeavored to maintain a claim of exclusive or preferential opportunity in railroad building, in mineral development, and even in financial and political affairs. Such claims disappeared everywhere after World War II.

Splinter Group. A group which has seceded from a larger parent political organization.

Stampede. A break in the balloting at a nominating convention, when the great majority of the delegates desert the candidates whom they have hitherto supported, and rush to the support of the candidate who appears likely to be the nominee.

State, The. The word "state" is popularly used to denote a country, such as France. It is used also, both popularly and legally, to designate the constitutent parts of the United States, as, the state of Ohio. In this latter sense, the word is applied to the parts of the commonwealth of Australia, as, the state of Queensland.

As used in political science, the term "state" implies a body of people organized for government within a definite territory, and possessing a degree of independent authority within that area. Theoretically, the state is the corporate being or legal person which, under the above conditions, is acknowledged as the supreme source of law. The distinguishing attributes of such a state are sovereignty with respect to its own affairs and independence with respect to other states. The political state is thus to be distinguished from the territory over which it is sovereign and from the government through which it operates. Political scientists generally agree that the state is constituted by the will of the people who share in the making of laws and the choosing of officials.

Modern political thought recognizes that both sovereignty and independence are never actually absolute, but always relative, even in the greatest states. Further it is conceded that a sovereign state may delegate certain functions without impairing its sovereignty. These two considerations justify the application of the word "state" to

the constituent units of a larger state, where, as in Australia and in the United States, a federal form of government exists. By virtue of the constitutions of these countries, the individual commonwealths share in the sovereignty of the general state while retaining, in the spheres of their peculiar interests, a measure of sovereignty.

State Judiciary. In the United States, each state maintains its own judiciary, comprising courts of merely local jurisdiction in counties and municipalities and courts of various higher grades. Each state system includes courts of general civil and criminal jurisdiction as well as special tribunals for certain types of cases. Some of the courts exercise both judicial and large administrative functions, the practice varying rather widely in different states.

The law administered in a state court is, in general, that of the state statutes, the Federal statutes, and the English common law adapted to American conditions. In Louisiana, the civil law is based upon French and Spanish precedent. A state court is bound by the Federal Constitution and by the constitution of its particular state. Some judges and justices are appointed, but the general state practice is to elect judges. In state courts of general jurisdiction a jury is employed, a unanimous verdict being usually necessary.

The following summary represents, in general, the organization of the state judicial systems:

1. *The lowest grade of courts,*—(1) the justice's court, held by a justice of the peace, who may be a town, township, or county officer; (2) municipal courts (under various names) in towns and cities, presided over by judges or magistrates, who are officers of the municipality; (3) the county court, held by a judge who is, in some states, a county official and, in others, a state officer.

2. *The intermediate grade of tribunals,*—known variously as district, superior, and circuit courts. The judges of these courts are state officers, elected or appointed, either for the entire state or for particular districts. Under whatever name, these are the principal trial courts of the state. In a few states, another court, sometimes called "supreme court," either takes the place of the circuit court or is intermediate between that court and the highest tribunal of the state.

3. *The highest tribunal, or court of last resort.*—In most of the states, this is called the supreme court; in others, it is termed court of appeals, court of errors, or court of errors and appeals. The opinions rendered by this court are held to be of binding authority in the lower courts of the state.

Special Classes of Courts. (1) *Court of Probate.*—Generally, this name is applied to the court having charge of the probate of wills, the administration of estates, and the supervision of orphans. In New York and New Jersey, it is called the surrogate's court. In Georgia, the old ecclesiastical term "ordinary" is applied to the judge of probate. In Pennsylvania, Delaware, and Maryland, the name "orphans' court" is used.

(2) *Court of Common Pleas.*—Originally, in England the term "common pleas" applied to cases arising between subjects, as distinguished from those to which the crown was a party. In the United States, the name has been retained in New Jersey, Pennsylvania, Delaware, Ohio, Missouri, and Kentucky for courts whose jurisdiction is limited to a district made up of one or more counties.

(3) *Court of Quarter Sessions.*—This name arose originally from the quarterly sessions held by English justices of the peace. In Pennsylvania, a court under this title has some important administrative functions.

(4) *Juvenile Courts.*—These are sometimes called children's courts. Their jurisdiction includes cases of dependent, neglected, and delinquent children. Generally, the upper age limit is 16 years, although in some states it is 18 or even 21 years. These courts endeavor to correct the conditions responsible for a child's wrongdoing rather than merely to determine punishment for an offense.

State Rights. The field of independent action enjoyed by states in the American Union. The discussion of the exact character and scope of these rights has played a great rôle in the constitutional history of the United States. The framers of American government were divided between those who sought a strong national government and those who jealously defended state rights. Among the most extreme of state claims, advocated after the formation of the Union, were the doctrine of "nullification," or the right of a state to nullify national legislation which it might judge inconsistent with the Constitution, and the doctrine of "secession," or the right of a state to withdraw at will from the Union. These doctrines were lost by the issue of the Civil War.

Growth of Federal Power. There has been a natural and almost inevitable tendency for the Federal power to grow. This growth has been contributed to by decisions of the supreme court of the United States, which during long and important periods of its history was disposed to interpret the Constitution in favor of Federal jurisdiction. But the main factor operating to enhance the power and importance of the national government has been the extraordinary integration of the American people as a nation, the predominance of their national loyalty and interest over state and local feeling, and the binding together of all sections of the country by economic attachments.

This economic unity, which was happily provided for by the Constitution when it assured freedom of trade between the states, has made necessary an ever-increasing authority of the Federal government over economic affairs. This is particularly evident in its control of interstate commerce, which has been defined by the Supreme Court to include intrastate action merely affecting commerce in almost any degree.

The 14th amendment extended the authority of the national government to the protection of life, liberty, and property, while the 15th amendment, enfranchising the colored race, and the 19th amendment, guaranteeing political rights to women, largely removed from the decision of the states the determination of the rights and privileges of citizenship. The 16th amendment, conferring upon Congress the right to levy taxes upon incomes, diverted a source of public revenue of increasing interest to state taxation. In recent years, Congress has passed a number of appropriations providing for the distribution of sums of money among the states in aid of education, agriculture, and other projects, provided additional appropriations are made by the states and a national policy is followed in their expenditure. These sums of money, appropriated out of the national treasury for objects belonging exclusively to state government, have had an undoubted tendency to bring further under Federal control matters constitutionally reserved to the state.

Present Status. The continuous growth of the power, service, and repute of the national government, while highly gratifying from many standpoints, has undoubtedly an unfortunate effect upon the vitality and activity of state governments, and prejudices popular interest in their conduct. Thus the question of state rights emerges anew in American politics, and it is now representative, not of the aims of those who desire to deny or to reduce the necessary powers of the Federal government, but rather of the purpose of those who feel the necessity of preserving an actual distinction between the scope of the national government and the functions which properly and necessarily, under a federal system, are reserved for state governments. Interest in state rights in this sense is no longer represented by party lines. While the Democratic party originally was a strong "state rights" party, since the Civil War, Democratic presidents, hardly less than Republican, have by their actions augmented the national control. And some of the American statesmen who are today most sensitive to the need of preserving state rights are members of the Republican party.

Statute of Limitations. A law which prescribes a definite limit of time within which a legal right or remedy must be prosecuted by action in the courts, or thereafter be barred. Such laws are intended to protect the individual against stale demands, when, from lapse of time, death of witnesses, failure of memory, or other causes, the true situation may be obscured.

The periods prescribed by statutes of limitations vary in the different states, and differ in the same state for different kinds of claims. Under the laws of most states, rights in regard to property must be asserted within twenty years or be barred by the continuous "adverse occupation" of another.

Steam Roller. A term descriptive of the manner in which the faction in control of a political convention or legislative body may force through a slate or program previously determined upon. The use of the "steam roller" at the Republican convention of 1912, through the control of the national committee, gave the term and the procedure wide publicity.

Steering Committee. An informal committee in each house of Congress, dominated by the leading members of the majority party in the body, which determines the order in which business shall be taken up by the house. In the House of Representatives, the steering committee is practically synonymous with the committee on rules, which is vested with the power of reporting a special rule placing any important measure ahead of ordinary business.

Still Hunt. A secret campaign on behalf of or against a candidate for office. The phrase is used also to designate secret propaganda against a particular candidate.

Straight Ticket. See *Scratching*.

Straw Vote. An informal, unofficial canvass of political votes, taken prior to a regular election, for the purpose of determining the direction of political sentiment.

Syndicalism (*sĭn'dĭ-kăl-ĭz'm*). A labor organization originating in France which has for its aim the destruction of the state and the organization of society by trade-unions ("syndicats"). The organization upon which syndicalists depended for the accomplishment of their aims was the

"General Confederation of Labor" (*Confédération Générale du Travail*, commonly known as the "C. G. T."), founded in 1895 and attaining a final form of organization in 1902. This was a national association of revolutionary labor unions.

The Syndicalist Program. Syndicalism differs from socialism and the extreme form of socialism, or bolshevism, in that it entirely repudiates the state. In this respect it approaches anarchism. Syndicalism, however, adopts as a central principle the distinctive socialist doctrine of the "class war." It has developed certain tactics and policies which have been adopted also by bolshevism. These tactics completely repudiate political activity or "parliamentary action" and substitute therefor methods of industrial warfare, commonly called in America "direct action." These include the boycott, sabotage, and the "general strike." By the general strike is meant such an organization of industrial labor, embracing all crafts and industries, and so general and synchronous a cessation of labor therein as to completely paralyze industrial production and the supply to communities of the necessities of life. By so general a strike, syndicalists aim to throw existing society into chaos, to overthrow the state, and to gain social power for the federation of industrial workers.

Syndicalism came into prominence in the great French railway strike of 1910, which was broken by the action of the French minister Briand, who arrested the strike committee, mobilized the army reserves, including strikers, and replaced striking workingmen by soldiers under military discipline.

As stated above, syndicalism differs fundamentally from socialism and communism, with which it is frequently confused, by the fact that these latter social programs have in mind the realization of a "great state" devoted not only to political objects, but also to owning and operating all productive capital, controlling the activities of all individuals, and thereby becoming the common employer.

Influence of Syndicalism. The World War and the repressive action of the French government upon all revolutionary movements shattered French syndicalism, and, since the rise of bolshevism in Russia, revolutionary elements have turned toward the program of this socialist party rather than toward the program of syndicalism. The influence of its theory, however, is traceable in other movements than the above, and particularly in "guild socialism," which, like syndicalism, views with alarm that exaggeration of the state which pure socialism would produce, and proposes to organize society in a decentralized form around industrial groups or "guilds."

Tariff. The word is used in America in two senses: (1) It is used to describe any schedule of charges, but particularly rates for the shipment of goods by public-service corporations, or other services afforded the public. Such charges at the present day are usually controlled by the government, either through the interstate commerce commission or by public utility commissions in the states. (2) Tariff is used to designate the scale of customs duties imposed upon foreign products entering home territory. It is in this second sense that the term "the tariff" is used politically in the United States.

Broadly speaking, a tariff is devised either "for revenue only" or "for the protection of home industry." As a means of raising revenue, tariffs have been employed by nearly all governments. This form of taxation has the advantage of being "indirect." It falls upon the people in higher prices paid for such articles as they purchase and thus avoids the difficulty and the irritation arising from the collection of "direct taxes"; it is relatively easy of administration, being collected at the frontiers at certain designated points where customhouses are established; and, in the case of a highly industrial or commercial people, it may be productive of a very great revenue.

Protection. A "protective tariff" rests upon different principles. It is devised not solely nor mainly for revenue, but rather as a means of building up national manufactures or other forms of production in the face of foreign competition which, if given free entry, would endanger the native industry. It is upon this basis that American tariffs have been largely framed. The effect of such tariffs is undoubtedly to bring profit to certain interests and to certain sections of the country at the cost of the purchasing public generally. Defenders of the protective system, however, urge the desirability of developing all reasonably profitable industries and forms of products as a means of bringing a nation to its highest point of economic development and of making it self-sufficient, particularly in the event of war and blockade.

Reciprocal Trade Agreements. These are pacts, authorized by Congress in 1934, between the United States and other nations for the reciprocal lowering of tariffs. The policy is based on the belief that protective tariffs adopted by many nations against one another's goods have the effect of choking trade and production to the disadvantage of all. These agreements extend to other nations the advantages given each nation signing a pact, but with the proviso that these other nations may be barred from the benefits if they refuse to enter into similar agreements after a reasonable time or if they discriminate against American products. The adoption of this policy in America came at a time when trade barriers had been raised to unprecedented heights and when commerce and industry throughout most of the world had dropped to less than half their volume of five years earlier.

Free Trade. Opponents of protection, or "free traders," take the broad view that the modern world is, or should be, organized internationally for industrial production. Under such a system each country would produce mainly those things which, because of its resources or its situation, it can produce most cheaply, and would purchase elsewhere, in the cheapest markets of the world, other necessities and luxuries of life. Thereby, it is argued, we should avoid the waste through excessive cost to the consumer, occasioned by an artificially stimulated domestic production of goods that can be acquired abroad more cheaply.

Taxation. Taxes are general compulsory contributions of wealth, levied upon natural persons or upon corporations, to defray the expenses of government. They are inseparable from all governments and are a part of the price paid for protection and for the advantage of society. While taxes are general in the sense that they affect all persons and all classes of society, there have been and are many exceptions to their universal payment. These take the form of "exemptions." In European feudal society, the nobility, the clergy, and their properties were untaxed. Even in democratic countries, like the United States, it is usual to exempt from the payment of certain direct taxes persons possessing small incomes or small properties. Ex-soldiers or veterans of certain wars are frequently granted tax exemptions. States that impose a "poll tax" or a per capita tax upon citizens generally exempt women, even though enfranchised, from the payment of poll tax. Taxation may take the form of money payments or of personal services, such as labor on roads or public works.

Kinds of Taxes. Taxes may be classified as "direct" and "indirect." The former embrace contributions of money or service directly furnished by those upon whom the tax is imposed. Indirect taxes take the forms of customs duties, "excises," or taxes on articles of luxury or common use, and government monopolies, where the state reserves the exclusive sale of a product at a price advantageous to the public revenue. The most common and lucrative form of direct tax is the property tax, which may be levied upon land or "real property" or upon movables or "personal property."

Other forms of indirect imposts are the sales tax and the pay roll tax. The most widely used form of the sales tax in America is that imposed on gasoline. The principal argument advanced against sales taxes is that they fall with disproportionate weight on those least able to bear them. The pay roll tax has been used to pay the costs of social security legislation, on the ground that insurance against uncertainty in employment is properly accounted as one of the costs of doing business.

Two forms of taxation which have become extremely important in recent years are "inheritance taxes," or "death dues," and "income taxes." Under the former tax, the state appropriates a certain proportion of the estate of a deceased person before the balance is distributed among his heirs. In the second form of taxation, the state regularly collects a proportion of the gross or the net income of a person or of a corporation. Not only are these last two types of taxes, in certain cases, made to yield large revenues, but they have a definite social effect in limiting the accumulation of private fortunes and their succession. Usually the amount appropriated by the government increases rapidly with the size of the fortune or income.

Income Tax in America. In 1894, the Congress of the United States imposed a Federal income tax, which was declared unconstitutional by the supreme court in 1895. This decision led to the adoption of the 16th amendment, empowering Congress to lay and to collect taxes on income without apportionment among the several states. The Federal income tax became an immensely valuable resource to the government. The states also have made use of this source of income.

As applied to corporations, the income tax has been used as an instrument of governmental policy. By making the rate higher for larger incomes, an advantage is given to smaller corporations. Similarly, by assessing a higher rate when larger proportions of earning are retained instead of being distributed in profits, money is forced out to individuals where, if the individuals are wealthy, it may be taxed at the very high rates imposed on large personal incomes. This device is aimed against concentration of wealth.

Tax Dodging. The practice of avoiding payment of taxes. A means frequently employed by people of wealth is that of acquiring a nominal or actual residence in a small town or village where taxes are light, or in another state,

in order to avoid the heavy personal property taxes which they would bear if legal residents of the city in which their interests are actually centered.

Tenure of Office Act. The United States Constitution, while making the president the general appointive authority to positions in the Federal service, is silent upon the method of removing such officers. In 1789, during the session of the first Congress, the question of whether the president could remove such officers without the consent of the Senate was raised, and at that time, after some discussion, it was recognized that the power of removal rested in the president.

In 1867, however, Congress passed, over the president's veto, an act known as the "Tenure of Office act," which aimed to prevent the president from removing Federal officials without the consent of the Senate. President Johnson disregarded this law, holding it to be unconstitutional, and his conduct was the basis for charges of impeachment.

In 1869, the act was in part repealed, and the remaining provisions of the act were repealed in 1887. A decision by the supreme court in 1926 supported the President's right to remove appointees of executive departments when the term of appointment is not fixed by law. Removal of a member of an independent agency, however, appointed for a definite number of years was ruled beyond the President's authority by a decision in 1934.

Theocracy (*thê-ŏk'rà-sĭ*). A form of government in which God is viewed as the supreme civil ruler, and in which government is conducted by a priesthood claiming the representation of Deity and enforcing laws supposed to be divinely inspired.

Third Parties. The American system of government, as well as the British, is considered to function properly only where two great parties divide the political field and contend for the possession of the government. So-called "third" parties have often been formed, but in the United States they have had brief existence. They have from time to time served the purpose of organizing support for new or neglected policies to the point where they have been adopted by either or both of the major parties. The Prohibition party, the Populist party, and the Progressive party are examples of this result.

Third Term. Before the adoption of the XXII Amendment to the United States Constitution in 1951, there was no limitation to the number of terms a president could serve. The example set by Washington, who refused to consider a third term, established a precedent which was followed until it was shattered by President Franklin D. Roosevelt, who was elected to a third term in 1940, and to a fourth term in 1944.

In 1880, a strong movement within the Republican party sought the nomination of Grant for a third term, but was unsuccessful. Again, in 1912, the question of the third term arose when Theodore Roosevelt sought nomination after having occupied the presidency 7½ years. In this case the third term would have been separated from previous executive position by an interval of four years. This fact, in many minds, removed possibilities of danger.

Other nations which have adopted the institution of the presidency have in some cases limited eligibility to a single term. In Mexico, where the right to indefinite re-election was secured by President Diaz, the principle of "no re-election" has been made constitutional both for national and for state executives.

Three-Mile Limit. By general recognition, it has become a principle of international law that the territorial sovereignty of a nation bordering on the high seas is not limited to its shores at low tide, but extends out into the seas a distance of three marine miles. This understanding among nations permits a country to enforce its domestic laws within this limit and has proved of much practical value. The distance of three miles was settled upon at a time when this was regarded as the extreme possible range of guns. Owing to the difficulty experienced by the United States in preventing the landing of contraband liquor from the sea, the British government consented to an exercise of American jurisdiction over British shipping up to a distance of twelve miles from the coast.

Town Meeting. An assemblage of all of the voters or qualified inhabitants of a town, held annually for the purpose of electing administrative officials of the town and of passing upon all important legislative matters.

The town meeting, since colonial times, has been the chief organ of local government in New England. It is an example of direct popular government in its simplest form. When the community, however, reaches the proportions of a city, some form of representative government becomes essential, and many towns in New England have abandoned the town form of government.

Treason. The Constitution of the United States provides: "Treason against the United States shall consist only in levying war against them, or in adherence to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act or on confession in open court. The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted." (Art. III, Sec. 3).

The purpose of these provisions was to provide a clear definition of this crime in place of the broad and elastic interpretation given to it by English courts and to limit punishment to the actual offender.

Treason may be committed against any state of the Union as well as against the United States. The limitations given above are not limitations upon the states, but most state constitutions contain similar provisions.

Treaty Making Power. This power is quite universally recognized as an executive function. The president of the United States is vested with the power "by and with the advice and consent of the Senate to make treaties, provided two-thirds of the senators present concur." Negotiations leading to the making of a treaty are carried on exclusively by the president, usually acting through the state department. Congress has invariably refused to receive foreign missions or representatives and has not even a constitutional right of being informed of the progress of negotiations. As a means of assuring the Senate's ratification, it is the preferable practice for the president to appoint members of the Senate upon commissions of negotiation, particularly peace negotiations.

Trial by Jury. The United States Constitution, Amendment VI, provides: "In all criminal prosecutions the accused shall enjoy the right to a speedy and public trial by an impartial jury of the state and district wherein the crime shall have been committed." Amendment VII provides: "In suits of common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any court of the United States than according to the rules of the common law." Likewise in all the state constitutions, there are provisions which insure trial by jury to those accused of crime and to litigants in civil actions, the right being generally limited to those cases in which trial by jury was assured at the time of the adoption of the particular constitution.

Trial by jury, unless otherwise constitutionally provided, means trial by a jury of twelve men of the jurisdiction in which the case is tried, men who are impartial and who have been chosen by impartial officials, and who are sworn to render a verdict according to the evidence and the law.

An essential feature of "trial by jury" is that the jury shall proceed under the guidance and instructions of the court, and that only questions of fact upon which there can be a reasonable difference of opinion shall be submitted to the jury. It is the duty of the presiding judge to "instruct the jury" as to its verdict. He may even take the case out of the jury's hands if the situation so demands.

Alongside the common law courts of England, which decided criminal and civil controversies with the aid of a jury, there grew up a system of "equity" jurisprudence, under which cases were determined by the chancellor as the representative of the king. In this field of equity jurisprudence, the right to trial by jury did not exist at the time of the adoption of the United States Constitution and the early state constitutions, and therefore is not guaranteed by them.

Civil and criminal cases of minor importance, by custom, are tried before justices with summary power, and in these cases the right of trial by jury does not exist unless expressly provided by law.

A grand jury is a body of 12 to 23 members which, in some jurisdictions, must bring in a formal indictment before certain types of cases can be tried. It may act on information of prosecutor, witnesses, or its own members.

Ultra Vires (*ŭl'trà vī'rēz*). A Latin phrase meaning "beyond powers." It is used of an act beyond the authority vested in a public or private corporation exercising functions limited by law or charter.

Unicameral System. See *Bicameral System.*

Unit Rule. A practice followed at nominating conventions which permits the majority of a state delegation to decide how the delegates shall vote as a unit.

Unwritten Law. General principles of justice, which, together with the customary rules of law and of procedure of courts in medieval England, formed the basis of the unwritten or "common law" of England and of those countries that have inherited their law from England. The term is used in contrast to the "written" or statute law passed by the legal legislative authority. The unwritten law exists in a vast and ever growing body of judicial decisions in which its principles are expounded and applied by courts.

In a popular and sensational sense, "unwritten law" is used to express a moral justification for illegal acts, like

murder under excessive provocation. This so-called "unwritten law" is entirely without legal foundation, but juries in the United States have been influenced by its appeal to find for the accused in direct disregard of positive law.

Veto. Executive refusal to approve an action, particularly a legislative enactment. The word "veto" comes from the Roman practice of conferring the same power upon two magistrates, as on the consuls, either of whom by pronouncing the word *veto*, "I forbid," could negative the action of the other.

In the constitutional development of Europe, a veto power was assumed to reside in the king, particularly as against acts of Parliament. As late as the Stuart kings of England, the monarch retained and frequently exercised the power of refusing assent to acts of Parliament, and royal assent is still nominally given. Every statute takes the form of an act of the king, but the assumption of the king's powers by ministers and the responsibility of these ministers to the House of Commons have made the royal veto an anachronism. The last employment of the royal dissent was by Queen Anne in 1707. Today, a British monarch's refusal to subscribe to a statute of Parliament would be an act of revolution.

Veto Power. The American colonists were thoroughly familiar with the veto power, as this right was exercised constantly in the name of the king by their colonial governors. It was thus adopted by them in the Constitution of the United States as a presidential power. In bestowing it upon the president, the framers of the Constitution intended to set up another of those "checks and balances" which the political theory of the time recommended. It was also felt that a president's veto was needed to protect the executive department against usurpation by the legislative. The veto, however, was not made absolute; it can be overridden by a two-thirds vote of each house of Congress.

In the early decades of the American republic, the veto power was sparingly employed by the president. It was very boldly used, however, by President Jackson, and its exercise in recent decades has become common. President Cleveland used it unsparingly to defeat private bills. The disposition today is to associate the president with congressional legislation and to hold him, as well as Congress, responsible for all legislation which he may not disapprove.

The veto power has also been finally conferred upon every state governor except in North Carolina, and, in a number of states, it may extend to items of a bill and particularly to items in an appropriation bill.

In American city charters which bestow legislative power upon a council and executive power upon a mayor, the veto power is usually given to the mayor.

The veto power has been provided generally in the constitutions of those countries adopting presidential government. Sometimes it takes the form of a "suspensive veto," whereby the executive simply returns the bill to the legislature for reconsideration. In states where the initiative and the process of framing laws is in the hands of the executive, the veto power has no significance.

The term is often, though inaccurately, applied to the procedure in the Security council of the United Nations, where any one of the five permanent members is able to defeat a motion by voting against it.

Visa (*vē'zä*; *vē-zä'*). See *Passport.*

Voting. Voting is the formal expression of opinion or of choice, either upon some question submitted for decision or upon the election of officers or representatives. In a democratic government or society, voting is almost an essential institution for determining the will of the majority. It may, however, be expressed in a variety of ways: orally, or *viva voce*, either with or without a "call of the roll"; by some physical manifestation, as, by rising, or by a "show of hands"; by ballot.

Early forms of balloting consisted in dropping a small object, like a pellet or ball, into urns, or other receptacles; hence the word "ballot," meaning "a little ball." Balls of different colors, as white and black balls, have been and still are used to express affirmative or negative decision; from this practice comes the expression, "to blackball." For political purposes at the present time, however, a ballot is a written or printed expression of the will or choice of the voter.

In political elections, practically all countries have experienced difficulty in providing balloting machinery that would be simple, inexpensive, and protected from fraud or intimidation. In the United States, voting systems have been greatly abused down to recent decades. Agitation for an official secret ballot commenced about 1882. In 1888, Massachusetts adopted a form of ballot called, from its place of origin, the "Australian ballot," the principle of which rapidly spread until today nearly every state has some such system. In most states voting machines, in which the voter records his choice by pressing a lever, have come into use. The main objects are secrecy, to protect the voter from intimidation and to discourage bribery, and a fair count and return of the vote.

Similar forms of voting have now been adopted by many European countries.

Short Ballot. One of the mistakes of the democratic theory in America has been to make elective too many nonpolitical administrative offices. This results in cumbering ballots with so large a number of offices and names as to make a judicious selection impossible to the ordinary voter. A wise reaction has occurred in favor of the appointment of administrative officials so that the voters' responsibility is limited to the selection of a few important executive and legislative representatives. This is the principle of the "short ballot."

Plural Voting. The democratic theory would seem clearly to limit one man to one vote in any election, on the principle that all persons and all classes should have identical political weight in all decisions. In Prussia, before World War I a system of "three-class voting" existed, whereby electors were divided into three categories, each of which represented equal taxpaying power. Each class then chose one-third of the representation. This system is imitated in Japan. The democratic movement in Germany, which triumphed at the conclusion of World War I, has abolished this system in that country. In Belgium, before World War I, a system of plural voting prevailed, whereby two and even three votes were given to citizens possessing unusual qualifications. This system was abolished in the electoral reformation after World War I. In Great Britain, under certain circumstances, a voter may vote for two parliamentary representatives, one in the district of residence, the other in some other district in which he may have exceptional qualifications.

Compulsory Voting. The lethargy or indifference of the electorate is one of the most serious problems of democracy. Certain countries have endeavored to solve it by obliging qualified electors to vote, under penalties for abstaining. Compulsory voting was introduced into Belgium by constitutional amendment in 1893, the penalty for the first offense being a reprimand from the justice of the peace or a fine of from one to three francs, and, for subsequent delinquency, a penalty amounting to as much as the deprivation of the right of suffrage for ten years.

Absentee Voting. State legislatures in the United States have repeatedly made provisions whereby citizens absent from the state on military duty have had their votes taken at important elections. Certain American states allow all voters absent from their town or election district, but within the state, to cast their votes in another electoral district. Vermont passed such a law in 1896; Kansas in 1901 provided that railway employees might vote by mail, and in 1911 extended this privilege to all voters. Among other states with similar laws are North Dakota, South Dakota, Nebraska, Minnesota, Missouri, Colorado, Iowa, Michigan, Montana, Oregon, Wisconsin, Washington, Wyoming, Virginia, Utah. In Sweden, a husband may deliver his wife's vote in a closed envelope, and a wife that of her husband. In other elections in the same country, soldiers, absent seamen and fishermen, employees of railways, ports, customs, and pilot service, may vote by mail. Absentee voting is legalized also in Australia, New Zealand, Norway, and in some of the Swiss cantons.

War. War is an act of violence inflicted by one people or nation upon another people or nation, in order to compel compliance with its will.

Coercive measures that fall short of actual employment of force and the infliction of damage and destruction are not war. Recognized "measures short of war" include: severance of diplomatic relations; "embargo," or the detention of ships in port; "reprisals," which may take the form of the seizure of property or the death of the citizens of another state, and even such extreme steps as the occupation of enemy territory and "pacific blockade," or the stoppage of communication with a country by arrest of shipping. Such measures as these last may become actual warfare, although war has neither been declared nor been legally recognized. Among such cases may be cited the German blockade of Venezuela in 1902 and the American occupation of Vera Cruz, Mexico, in 1914.

War may be carried on upon the land, upon the sea, or upon both elements at the same time. From the warfare of Rome upon Carthage to World War II, superior sea power, or the domination of ocean communication by one belligerent, has been demonstrated to be a factor of immense influence upon the prospects of victory. The actual decision, however, must almost of necessity be gained by the victory of land forces and by the destruction of the enemy's power of armed resistance. With the great advance in aerial warfare, "control of the air," or the power to deny another enemy the employment of aircraft, is recognized as a paramount and perhaps a decisive factor in future wars.

It has long been the continued effort of supporters of international law and of humanitarian principles to con-

fine the practices of warfare to the armed forces of the belligerents. But modern warfare is waged upon a scale so much vaster and with so much greater intensity of resolution that the undoubted theory of present day warfare is that it is a contest between the entire populations and resources of the belligerent nations. The object of warfare today, therefore, is not only the destruction or capture of the enemy's armed forces, but also the embarrassment, the injury, and the depression of the enemy's civil population to such a degree that its will for resistance may be broken.

Declaration of War. War dates from the first act of hostility and may precede a formal declaration. The declaration of war itself may take various forms, including formal advice to the enemy government, a general proclamation of hostilities, or the declaration of a blockade of the enemy's territory.

The decision to end peaceful negotiation and to embark upon war is without doubt the most weighty and the most terrible responsibility that a government may have. In the past, the power of decision usually has been vested in the sovereign or in the executive branch of government. By the constitution of the former German Empire, the final decision rested with the kaiser. But more and more the development of the sense of responsibility in governments has tended to place this decision in a representative legislative body. This is specifically done by the Constitution of the United States, which recognizes Congress alone as capable of making a declaration of war. In spite of this constitutional provision, however, it must be recognized that the issue of peace and of war rests more with the president than with Congress. The president, by his conduct of negotiations, by the movement or employment of the armed forces, practically may commit the nation to war in advance of the authorization of Congress. Congress alone, nevertheless, has the power to furnish the vast supplies of money and men whereby a war of magnitude can be waged. A similar situation exists in the British government, where, although the war-declaring power is a crown prerogative exercised by the ministry, no British government today would embark upon war without the assured or expressed support of the House of Commons. This was sufficiently indicated in the last days of August 1914, preceding Great Britain's entrance into World War I.

The confiding, to the executive branch of government, of so momentous a responsibility as the issue of war or peace springs from the necessity of prompt decision and the instant employment of war measures. The opening actions of modern warfare have an extreme, if not a decisive, influence upon the outcome. These actions embrace rapid mobilization of troops, the seizure of strategic or defensible positions, the sudden and, if possible, unexpected destruction of the enemy's forces, and the seizure of the "initiative." It is for these reasons that such an extreme proposal as the requirement of a national plebiscite, in place of an executive or legislative decision, might delay a nation in the employment of its military strength until the enemy had gained insuperable advantages.

Restrictions on Warfare. Since the time of the great jurist Grotius, the legal thought of the modern world has been consistently occupied with efforts to abate the severities and inhumanities of warfare. Numerous authoritative writings and repeated conferences of European nations have been directed to this end. Particularly was this the object sought in the agreements reached at the second Hague Conference. The practices of armies and navies in World War I, however, disregarded most of these conventions. Extreme supporters of vehement warfare have laid stress upon the expediency and justification of severity as the policy most likely to shorten war and to bring an enemy to the acceptance of peace. It must be clearly seen, however, that ruthless measures may weaken more than they may aid the nation employing them. This they do by the sacrifice of neutral sympathy, by the weakening of the moral quality of the people employing them, and by the strengthening of the passion of resistance in the people against whom they are employed. These moral elements in warfare, "the imponderables," as Bismarck styled them, are among the decisive factors in victory.

Right to Make War. Justification for warfare is a matter of wide differences of view which must be weighed from moral rather than from legal considerations, although international law writers have attempted to define acts legally warranting hostility, which are termed "casus belli." Opinion varies from the view that war may be engaged in only as an unavoidable act of national self-defense, to the view that war is but a "continuation of politics," a reenforcement to the aims of statesmen and diplomatists where these efforts are unduly obstructed or delayed. This was the view advocated by extreme partisans of war, both political and military, in Germany before World War I.

"The right to wage war" has long been recognized as one of the essential attributes of a sovereign state. In certain cases, however, this right has been surrendered by treaty, as in the case of Switzerland and of Belgium before 1914. Japan renounced war by its constitution of 1946. "Protectorates" also do not possess the right to wage war.

Warfare, however it must be deplored, appears to spring not more from the ignoble passions of a people than from its noble qualities—from its national pride and high spirit; from its quickness to feel injustice and wrong; and from a moral preference for the sufferings and losses of warfare rather than for the acceptance of injustice and oppression. In the defense of national interests, all peoples not weakened by decay show intense stubbornness and resolution.

The prospects of future avoidance of war, as a practical matter, would seem to lie less in the establishment of leagues and treaty engagements than in the general diffusion of sympathy and understanding between nations, and in the cultivation, particularly among the greater peoples, of patience, restraint, and spirit of concession. Such a spirit has the strongest possible support from considerations of the devastation entailed in atomic warfare, which constitutes what has been called a balance of terror.

Welfare State. A state which by its social legislation shows its concern for the well being of the people in such matters as health, old age pensions, unemployment insurance, child welfare, etc., and gives direction and support to such programs.

Whitewash. The exoneration of officials accused of misconduct, without a sincere attempt by the investigation committee to uncover the real facts or to punish the offenders.

Wirepulling. A term used to describe the secret means whereby political bosses control legislation and political appointments.

Woman Suffrage. During the colonial period, women in Massachusetts and Virginia who possessed the necessary property qualifications were at times permitted to vote. However, under all of the state constitutions adopted during the Revolution, voting was restricted to male citizens, except in New Jersey, where women voted until an act of the legislature in 1807 expressly limited the suffrage to "white male citizens."

The woman's suffrage movement in the United States began about the middle of the 19th century. In 1848 the state of New York passed a law, soon adopted by other states, which permitted married women to hold and to dispose of property. This was the beginning of a series of laws which ultimately extended full civil rights to women.

In 1869 were formed both the National Woman's Suffrage Association and the American Woman's Suffrage Association. The latter sought suffrage for women through amendments to state constitutions, while the National Woman's Suffrage Association sought it through Federal amendment. In 1890 the two associations merged into the National American Woman's Suffrage Association.

The first victory of the American suffragists was in 1869 in the territory of Wyoming, where women were granted full and equal suffrage. The territory of Utah followed in 1870. In 1890, when Wyoming was admitted as a state, its state constitution provided woman suffrage, and Wyoming thereby became the first state in which equal political rights were extended to women. The suffrage was granted to women in Colorado in 1893; in Idaho and Utah in 1896; in Washington in 1910; in California in 1911; in Kansas, Oregon, and Arizona in 1912; in Alaska in 1913; in Nevada and Montana in 1914; in New York in 1917; and in Michigan, South Dakota, and Oklahoma in 1918. In 1917 women obtained the right to vote in primaries in Arkansas; in 1918 they obtained a similar right in Texas. In certain other states, the right to vote for president was granted.

Finally, in the fall of 1918, a resolution to amend the Constitution by providing that "the right of citizens of the United States to vote shall not be denied or abridged by the United States or any state on account of sex" was passed by the House of Representatives by the necessary two-thirds vote. It was twice defeated in the Senate and was not passed until the special session called by President Wilson in 1919. The amendment was ratified by the necessary 36 states in 1920.

Suffrage was extended to women in Finland in 1906, and in Norway and Denmark in 1907. By 1936, it had been granted in more than two-thirds of all countries in the world. In some of these countries, however, women were under legal disabilities in holding public office. Enfranchisement of women appears to follow with the evolution of society from a feudal and agricultural stage to the industrial stage.

Zoning Ordinances. Ordinances passed in American cities, dividing the municipal territory into zones or districts of several kinds, as residence zones, business zones, industrial zones, unrestricted zones, and definitely limiting the uses to which property in these districts may be devoted. The purpose of these ordinances is to insure health, beauty, and convenience in the geographical development of the city. Doubt has existed as to the power of legislatures or their agents, the municipalities, to enact such laws; but recent decisions of the courts have upheld them as within the police power of the state.

TEST QUESTIONS

Distinguish between the art and the science of politics 1389
Criticize the 18th century idea that savage peoples enjoyed an ideal freedom 1389
Compare Aristotle's idea of a state with that of Plato. What, in Aristotle's view, is the object of the state? 1389
Discuss the contributions made to political philosophy by Machiavelli and Bodin. Through what ideas did John Locke influence the American colonists? 1389
Point out some political movements produced by World War I 1389–1390
State some of the political problems of the present day. Differentiate politics from history 1390

THE UNITED STATES

Name two intercolonial assemblies, with the date of each, previous to the assembly which declared American independence 1391
What general reason for the issuance of the Declaration of Independence is set forth in the first paragraph of the document? . . . 1391
From what source are governments said to derive their just powers? 1391
Enumerate ten facts set forth in the declaration as proof of the purpose of the king of Great Britain to establish a tyranny in America 1391
By what title are the signers of the declaration described? By what authority do they affirm the declaration to be issued? 1391–1392
Whose name headed the list of signers of the declaration? 1392
Enumerate the defects of the Continental Congress as an agency of government. When were the Articles of Confederation adopted by Congress? When were they finally ratified? 1392
For what kind of united government did the Articles of Confederation provide? Of what body did the central government consist? . 1392
By what title did the members of the Congress refer to themselves in the heading of the Articles of Confederation? 1392
In what words is the confederation described in Article III? What purposes of the union are enumerated? 1392
To how many delegates in the confederation Congress was each state entitled? to how many votes? 1393
How many delegates were elected to the Constitutional Convention of 1787? How many attended the sessions? Characterize the membership of this body 1395
Enumerate the six institutions which were given original form by the Constitution. For what two characteristics of form is the Constitution remarkable? Quote Gladstone's judgment about the Constitution 1395
Upon what date was the Constitution signed? Name the nine states that first ratified it . . 1395
What methods of amendment are provided by the Constitution? How have amendments actually been proposed and adopted? . . 1395
For what reason were the first ten amendments proposed and adopted together? . . 1396
Give the dates upon which the several amendments became effective 1396
Who, according to the preamble of the Constitution, established that frame of government? Enumerate the purposes of the Constitution, as stated in the preamble. 1396
What article of the Constitution of the United States provides for the taking of the decennial census? 1396
What two theories of government strongly influenced the framers of the Constitution? . 1400
Of what two houses does Congress consist? State the length of the term of each Congress. Upon what date do the regular sessions of Congress begin? By whom are special sessions called? 1400
How many United States senators are elected from each state? By whom are they elected? State the length of a senator's term. Who are eligible for election to the Senate? . . . 1400
Outline the powers of the Senate 1400
By whom are members of the House of Representatives elected? for what term? Who is eligible for election to the House? . . . 1400
Outline the powers of the House of Representatives 1401
Summarize the method of electing the president of the United States. State the eligibility requirements of the office 1401
Enumerate the powers and duties of the president 1401
Who elects the vice president when the state electors fail to make a choice? What is the salary of the vice president? State the order of succession to office, in case of the removal, death, resignation, or inability of the president 1401
Enumerate the executive departments of the government. Summarize the particular field of each. What is the salary of cabinet members? 1401
By whom are judges of United States courts appointed? What is their term of office? . . 1401
How many members constitute the supreme court? Summarize the field of the supreme court's original and appellate jurisdiction. What especial function, outside the court, attaches to the chief justice? 1401
Over what classes of cases do the inferior courts have jurisdiction? What judges are competent to sit in a circuit court of appeals? . 1402
How many United States district courts are there? State the jurisdiction of the United States court of claims. 1402
Point out how the Senate is associated with the president in the direction of foreign relations. What customs and practices indicate the extent of the president's power in foreign affairs? Indicate the Senate's peculiar function with respect to war and peace. What body only can declare war? 1402
Compare the importance of membership in the Senate with that of membership in the House. 1402
State the fields to which the legislative powers of Congress are limited by the Constitution. 1402
Enumerate the acts which are at present forbidden to Congress by the Constitution. In what field of legislation may Congress overstep these prohibitions? 1403
Tell three ways in which Congressional committees influence legislation 1404
How does a bill become an act? Is the President's approval necessary for a concurrent resolution of Congress? For a public resolution? 1404
From what powers and practices does the president derive his great influence over legislation? 1404
What is the function of the cabinet? 1404
Discuss the question of the disability of a president. Is the president limited as to the place where he may officially act? 1404
Point out the appointive powers of the president that make him the real head of the national administration. Indicate the extent of his power through the army and the navy and through the department of justice. 1404–1405
Discuss the authority of the president in respect to war and peace. Discuss the growth of the power of the presidency and the maintenance of the integrity of the office by those who have occupied it 1405
Enumerate the functions of the secretary of state with respect to treaties; presidential elections; laws and resolutions of Congress. 1405

Is the secretary of war a civil or a military officer? Summarize his duties 1406
What secretaries of war served under two successive presidents? Name the secretaries of war who later became presidents. Under what president was Jefferson Davis secretary of war? 1406
Summarize the duties of the secretary of the treasury in respect to government finance; in respect to other functions of government. 1406
Outline the duties of the attorney-general. Upon what questions must he give his own opinion? What president appointed five different attorneys-general? 1406
Outline the duties of the secretary of the interior in relation to parks; to conservation of natural resources 1407
When was the first secretary of this department appointed? Under what president was Carl Schurz secretary of the interior? . . 1408
What is the title of the head of the Federal postal service? Indicate the scope of his powers of appointment. Outline his other functions 1408
Name the postmaster-general who served under three presidents 1408
Outline the duties of the secretary of agriculture. By what president was the first secretary of agriculture appointed? 1408
State the general field of action of the secretary of commerce. Enumerate some of his specific duties 1408
What departments co-operate in the enforcement of the food and drug act and the insecticide act? 1408
What are the general duties of the secretary of labor? Summarize his special powers and duties. When was the first secretary of labor appointed? 1408
Enumerate the functions of the secretary of the navy. Is he a civil or a military officer? 1409
In what year was the first secretary of the navy appointed? 1409
What president appointed six different secretaries of the navy? 1409
Discuss the Department of Defense 1409
Tell two duties of each of the following bodies: the Federal works agency; Federal loan agency; Federal security agency 1410
Enumerate the functions of the civil service commission 1410
What Federal body assigns wave frequencies for radio broadcasting stations? When was this body established? 1410
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BIBLIOGRAPHY

Reflecting the wide range of material dealing with politics and government, the following list contains, in addition to encyclopedias and yearbooks, a variety of specific works useful to the student and the general reader. Books in the latter group cover different phases of organic and constitutional law, political philosophy, the evolution of constitutions and party systems, the machinery of government, practical politics and the biographies of outstanding leaders in political thought and action.

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FINE ARTS

INTRODUCTION

For a brief time in Eighteenth Century England, much was heard about an alleged irreconcilable conflict between art and nature. Enthusiastic followers of Rousseau maintained that the natural man was an example of unspoiled goodness, whereas the so-called "civilized" man was an artificial, and therefore an unworthy, product of a decadent social system. Catch phrases like "back to nature" and "the noble savage" were popular cliches of the period.

Of course powerful voices were raised in opposition to this philosophy. Dr. Johnson said that the anti-civilization thinkers would lower mankind to the level of a bear. Edmund Burke silenced their arguments with his famous epigram: "Art is man's nature." Meanwhile, Reynolds, Gainsborough and others were demonstrating that, in the field of painting, England had reached a peak of perfection enabling her art to rival the achievements of Dutch and Italian masters in their classic periods.

If the noisy opponents of art had done a little reading in history, they would have noted that the religious and civic aspirations of peoples and the ambitions, talents, and tastes of individuals living at a particular time had always found expression in works of art. According to the standards of their day, they had produced painting, music, sculpture, or architecture as their creative impulses and the demands of their public had dictated. Thus they had found a means of self-expression and had provided a source of pleasure for those members of the community who could appreciate beautiful things, even though they could not produce them.

Anthropologists could have told the anti-civilization enthusiasts that even the most primitive peoples were interested in what, for them, was the equivalent of the fine arts. Drawings still preserved on the walls of caves and dating back to Cro-Magnon times, pottery designed for everyday use but adding symmetry and decoration to mere utility, blankets woven for warmth but pleasing the eye by their pattern and design—such evidence could be found everywhere in profusion. Governed by the play-impulse, man spontaneously produces the offspring of his imagination. He completes his existence by pursuing activities which neither subserve any practical necessity nor fulfill any moral duty. "Only when man plays," said Schiller, "is man truly man."

The exercise of the play-impulse, in thus completing human existence, acts like a health-giving physical gymnastic. It eliminates the clogging poisons of grossness. It induces the mood that animated Robert Browning, when he wrote: "God's in his Heaven. All's right with the world!"

Value of the Fine Arts. Influences which are soothing, curative, inspiring, must be fostered in the United States, if a national life is here to be permanent. Our "melting-pot of nations" must be resolved into a laboratory, the processes of which shall eliminate and purify, disengage and recombine. And among the agents to be employed there is no doubt that the fine arts might be one of the most active. They are even now cleansing the "city slum," as the "settlement" music schools and elementary courses in drawing and modeling develop, liberating the play-impulse in the minds of those whose lives are set in sordid surroundings. By these beneficent agencies the poor and the rich are brought together, and democracy is so furthered.

In consequence of their social and economic worth, a discussion of the principles underlying the fine arts is essential to complete any reference book professing to survey the mental accomplishments of humanity.

MUSIC

As here presented, such discussion treats the major arts, beginning with music, which meets the widest appreciation among the people. From the early 19th century, this art has been progressively cultivated in the United States, its course having been directed by Germans as instrumentalists and largely by Italians as interpreters of opera and teachers of voice. Within this period, along the Atlantic seaboard and in the Middle West, there have been developed musical centers of great importance, with the result that today New York offers, during a single season, richer opportunities of hearing the newest works of all schools and a larger number of the best artists of all nationalities than any other capital of the world.

History of Music. This situation, temporarily due to the causes which make life so difficult in many European countries, is likely to become permanent. Therefore, in view of such existing conditions, and in consideration of the importance of music in our national life, the means of acquiring an appreciation of this art should be sought by the many. An elementary knowledge of rhythm, of the relations between melody and harmony, and of the families and the functions of instruments suffices, for the casual listener, to transform an orchestral performance from chaos into a cogent example of law and order. To provide such equipment, as well as to show the development of music from its primitive forms, used by ancient, civilized peoples, to its present highly specialized state, has been the aim of the makers of this book.

First to be treated are the periods in the growth of the art and the detailed history of musical notation, the latter section containing an interesting table of characters and symbols, especially useful to students of ecclesiastical music. But a larger number of readers will eagerly follow the discussion of principles—notably that of tonality, which is so important to the appreciation of modern composers.

Musical Form. Under the caption of *Musical Form*, the general reader receives a lesson in the structure of music, necessary to the adequate enjoyment of any worthy concert or recital. Met at the opening of the section by the picturesque definition: "Form is the frame which encloses the musical design," he is led, progressively, from the phrase or "motive" to the sonata, the symphony, and the concerto. At the end of this survey, through the aid of the clear, technical statements there offered in logical sequence, he will have amassed a definite and practical fund of information.

Then, as an interest awakened in musical form is always extended to correlated subjects, provision for that certainty is made by an accurate characterization of the instruments of the orchestra and of the military band, with respect to their tone-quality and their interpretative power. These explanations are given in answer to the growing demand for such knowledge occasioned by the recently and very widely increased opportunities for hearing large bodies of instrumentalists.

Finally, other popularly expressed needs are recognized by including, in the section of *Music*, a chapter of synopses of the plots or "texts" of the most frequently performed operas and a glossary of musical terms.

PAINTING

Among the arts of form, painting permits the freest play of the imagination. Through its essential element of color, it addresses itself to the child who is less easily attracted by line. Through its "counterfeit presentments" of persons and things, it is capable of awakening suspicion in the savage as an exercise of magic. Its history, when followed according to the stages in the evolution of the art, becomes a fascinating succession of movements. If otherwise treated, the same history presents a wearisome succession of names and dates, with descriptions of works having little to connect them save their association with local influences. Therefore, the material here offered upon the subject is divided according to the practice of those who have professed the art.

Two Periods. By the use of this method two divisions or periods suffice. Within the first of these are included the primitive, tentative, incomplete efforts of painters from 5000 B. C. until the beginning of the 15th century. The second period embraces the experiments in perspective, modeling, foreshortening, and the treatment of color by which painting has passed from childhood, through adolescence, to the state of a mature art.

Accordingly, a vertebrate system confronts the reader. His memory is not taxed with elaborate detail, but his imagination is quickened as he follows the solutions of problems in the art of representing things as they appear to be. Further, he reaches a clearer judgment of the individual contributions made to the art during its long development than if he should, as a beginner, study a series of masterpieces, even though they were chronologically presented. At the end of a survey so devised, one who has carefully followed it finds himself equipped to judge of the century, the school, or the movement which has called into being any given picture. For him, a gallery of exhibits chosen with an eclectic taste is no longer pathless. It is a charted sea which invites him to voyages ending in enchanted islands.

ARCHITECTURE

Alone among the major arts, architecture in its visible forms does not result solely from the exercise of the play-impulse. It involves the idea of protection. For this reason, its practice antedates the moment when the savage, beating upon a resonant surface, produced rhythm, which is the first essential of measured music. Again, the primitive dwelling was either excavated or erected long before the forms of animals were graven upon its walls. Developed principally by the Aryan races, architecture might be accepted as the expression of their constantly changing desire to make, unmake, and remake, in the hope of yet higher attainment. This art is, as well, a sensitive instrument, recording the mental fluctuations, no less than the capabilities, of those who produce it.

Four Styles. The history of architecture is here treated briefly, conformably to the structural principles which have been successively used by builders, from the beginnings of civilization in the Nile valley and in Mesopotamia down to the present time.

Classified by means of these principles, architectural development resolves itself into three styles, to which may be added a fourth, determined very recently by accomplishments in engineering and in the use of steel and concrete.

As these distinctive styles pass in historical order before the reader, he will observe that the Parthenon, with its superlative, unique beauty, derives from the cabin built from clustered reeds and clay, some three thousand years earlier, by Egyptian peasants.

The second principle, the domical, as expressed in its simplest, most excellent manifestation, the Pantheon at Rome, acquires an added interest, when traced backward to its rise in the prehistoric baking oven of Assyria and forward to its descendants, Santa Sophia at Constantinople, the cupola of Brunelleschi at Florence, and that of Michelangelo at Rome, with Saint Paul's at London offering the last structural modification.

Then, as a connecting link between the second and the third principle, appear the flexible clay-and-mortar constructions of the late Byzantines (864–1204), which are the antecedents of the complicated, balanced, pointed arch system, misnamed the Gothic.

For knowledge of the fourth, still progressing development, the North American has but to look about him. By the aid of current literature and a visit to an important commercial building, he will, without great difficulty, reach an understanding and an appreciation of the latest structural type, the "skyscraper," and be convinced that, as an expression of the period, it ranks with the airplane and with wireless telegraphy.

SCULPTURE

The art of sculpture, as the handmaiden of religion, attained its first great climax among the Hellenic Greeks. They, with their prompt translation of the abstract into the concrete, personalized and visualized all the forces of nature, all the attributes of Divinity. They rendered them in sculpture as gods in human form. But it was only under the decline of the state polytheism that the greatest works of sculpture came into existence, the prime object of their creation being to maintain and to promote patriotism.

The bloom of Hellenic art, thus dependent upon the unified state, was necessarily brief. But the study of the Greek sculptors, working between 480 and 200 B. C., fixed for all time the treatment of the nude figure. Therefore, the one seeking enlightenment upon any epoch or period of sculpture must first fortify himself by tracing the development of bony and muscular structure, of pose and facial expression, as it is set forth in the statues of the above-named epoch.

Three Periods. Adapted to this point of view, a brief history of sculpture is here presented. It is consequently divided into three periods, with the Hellenic strongly emphasized, the Renaissance being treated as a derivative, and the modern as the heir of the two preceding phases. A survey so finished could not, however, be regarded as complete, since it would leave unexplained certain strong elements resident in the sculpture of the second and of the third period. An acknowledgment is therefore made of the direction given to the art by the Romans, when, having accepted the Hellenic principles, they created a new type of monumental sculpture in the triumphal arch and in the military column. And, in the present instance, as usual, this naturally inartistic people became transmitters, so that the governmental art of all modern nations remains under a great debt to them.

Again, much less adequate would our review have been rendered through the omission of reference to the sculpture of the middle ages. For, although then reduced to a secondary rôle, as an adjunct of architecture, the statues of holy personages and kings, stiffly draped and limited in pose, developed an expressiveness, at once rugged and touching, which they bequeathed to the marvelous 15th century and again, four hundred years later, to the art of Rodin and of his disciples.

All these elements, carefully traced in our review from their beginnings, will be seen to unite in our American sculptors of Parisian training, who have inspired deep respect in the Old World and have already produced several undeniable masterpieces.

HISTORY OF MUSIC

EACH epoch of the world's history bequeaths to its successors, together with its more material possessions, an image of its undying soul. This inheritance, "gift immortal though by mortals given," is Art, whose peculiar graces of form and endowments of spirit so truly portray the higher æsthetic life, in which is to be found the real soul character of a people. To designate all the arts over which the nine Muses presided, the Greeks used the word *μουσική*, from which our word "music" is derived.

PRIMITIVE AND PREHISTORIC MUSIC

Extensive work in what is usually called comparative musicology has provided a clear picture of the music in the various strata of primitive civilizations and, with this picture, a good idea of the evolution of our own music in prehistoric times from the origins to the level of oriental music.

The foremost musical fact in these civilizations is the predominance of singing. The primitive singing is generally very far from the melodic styles of today. It is either a psalmodic, unemotional recitation of poetry on two or three different notes, or else an emotional, passionate ejaculation, in which the voice jumps up to its top and helter-skelter topples down to the bottom.

Instruments were of later origin. The lowest civilizations that we know have no instruments at all. But most of them use parts of the body as an accompaniment in even beats: the feet pound the ground, and the hands either clap together or slap the chest, the abdomen, the buttocks Later, they intensify such striking by some device that anthropologists would call an extension: the bare feet pound a board instead of the ground, or bamboo tubes instead of the feet pestle the ground, and, instead of the hands and the body, sticks would clap together or strike some wooden object. According to their particular shapes and sounds, the earlier instruments became involved in the intricate network of magic ideas, some representing the masculine, solar, and some the feminine, lunar principle. Masculine, solar instruments have an elongated form and a shrill and terrifying sound; feminine and lunar instruments are hollow and rounded in form with a hollow, muffled tone. It must have taken thousands of years before the musical interest superseded magic connotations.

The earliest instruments are idiophones, i.e., they are of solid, sounding materials, such as wood, bamboo, fruit shells, and, later, metal. Rattles, clappers, stamping tubes are among them. Then came the aerophones or instruments in which the air vibrates, such as the propeller-like bull-roarers, the trumpets of branches or conch shells (which at first were used as megaphones), and the whistles of bone or of reed. Membranophones or drums appeared in the third place; and, at last, the chordophones or stringed instruments, which in the primitive world did not exceed the rudimentary stage.

MUSIC OF THE ORIENT

The ratio of the four classes of instruments is entirely different in the high civilizations of the East: the bewildering number of idiophones is reduced to a minimum, and the stringed instruments are in the van There, we distinguish harps, i.e., instruments in which the strings run to or through the soundboard; lyres, in which the strings are tied to the crossbar of a yoke; lutes, in which the strings are tied to a neck; zithers, in which the strings are tied to the body of the instrument without needing a yoke or a neck. The harp, today abandoned in the East, was the chief instrument of ancient Egypt, Mesopotamia, and India. It appears in the Bible as *nevel* (which has been wrongly translated as lyre). The lyre, abandoned, too, was at home in South West Asia and appears in the Bible as *kinnor*, the instrument of King David (mistakenly translated as harp). The lute was and is the common property of all the East from Morocco to Japan, but has its homestead in ancient Persia or Sumer. The zither is still the most essential classical instrument of the Far East, of China (*ch'in*) and of Japan (*koto*).

The stress on stringed instruments implied two novel tasks: to tune the open strings, and to find consistent stopping places on the strings of the lute family. In other words, the Orient provided what the primitives had had no reason to provide: orderly scales and systems based on arithmetical ratios. It is this systematic foundation that distinguishes full-civilized from half-civilized music.

The scales of Eastern music are manifold. The two largest groups among them are pentatonic and heptatonic or diatonic. In heptatonic or diatonic scales there are seven steps within an octave, of which, as a rule, five are wholetones and two semitones (as on the white keys of our pianos). In pentatonic scales, there are only five steps within an octave, of which, as a rule, two are thirds, either of the minor kind (as on the black keys of our pianos) or else of the major kind.

Often, a scale means much more than it does in the modern West. It is not a dry sequence of steps, but a living, flexible pattern, which gives each note a function of its own, requires a certain tempo and a well-defined mood, and even has characteristic turns and formulas of melody. Such patterns, known as *râgas* in India and *maqamât* in Arabic countries, must not be violated; the composer, far from being free, is bound to follow one of the traditional patterns.

Standardization has even extended to rhythm: Indian and Near Eastern composers choose one ready-made metrical pattern for a piece, and often a very complicated one, and they repeat it over and over again to the end.

HEBREW MUSIC

Only two characteristic provinces of the ancient world shall be described here in a brief outline: Palestine and Greece. The few references to music that the Bible contains show clearly two successive phases, one coinciding with the nomadic, cattle-driving, and tribal period up to c. 1000 B.C., and the other, with the sedate, agricultural, and monarchic period from c. 1000 B.C. to the beginning of A.D.

In the former period, both singing and playing, and also dancing, were expressions of the people as a whole and particularly of its women. No mention is made of professional musicians; even young David, called to soothe King Saul's depression with the tunes of his lyre (not harp), was a shepherd, not a minstrel.

The change came in the time of King Solomon, when the newly built temple at Jerusalem required an elaborate ceremonial with representative music, such as the temples in Babylon and Egypt must have had. A conservatory was established to train both singers and players, and we must assume that the court, as did all other courts, entertained educated musicians and orchestras. Such example cannot but have enhanced the formation of a musical trade: the only reference to music in the New Testament is indeed the mention of professional pipers hired to play at funerals.

Of the instruments mentioned in the Bible (the names of which have generally been mistranslated), *ugab* seems to have been a flute, but also any pipe; *kinnor*, a lyre similar to the *kithara* of Greece; the *tof*, a tambourine reserved for women; the *shofar*, still in use in the synagogue, is a curved ram's horn without a mouthpiece; the *hasosra* was a short metal trumpet. The times after 1100 or 1000 B.C. added the *nevel*, a harp; the *asor*, probably a small rectangu-

lar zither with ten strings; the *halil* and the *abub*, double oboes like the *aulós* of the Greeks; the *mnaanim*, a shaken metal rattle or *sistrum* like the one of Egypt; *selslim* and *msiltayim*, cymbals. The *shalishim*, one of the worst stumbling blocks of translators, was obviously not an instrument at all, but a dance. Nor were the numerous terms that we find in the headings of some fifty psalms, as *nginot* or *gittit* or *shoshanim*, in any way connected with instruments: most probably, they indicated the melody patterns to which the psalms should be sung, just as today Arabian poets would indicate the *maqâm* that the composer was expected to follow.

Owing to the extreme tenacity of the Orient, it is quite possible to form a good idea of these melodies from remainders in our days. Remote and isolated communities in West Asia and North Africa have preserved a good many secular songs which, being closely related to each other, must be the common heritage of ancient times. Oriental Jewish congregations outside Palestine, cut off in centuries B.C., have in a similar way faithfully kept the cantillation of the holy books from the times of the Temples.

GREECE

Hellenic music was a province of oriental music; the Greeks themselves credited the East with having given them their music. Like the Orient, Hellas connected music with the planets and their influence on human mood and character; like the Orient, the Greeks gave to music a foremost place in healing and education; like the Orient, they laid the stress on melody and rhythm, without paying too much attention to the consonances in which they used to accompany their songs. But they outdid the East in theory: their system of scales and meters is more complete than that of any oriental people, despite the loss of precious, indeed, of irreplaceable sources.

Still, the difficulties of this theory are so great that its interpretation in almost two thousand years of research has been erroneous. Not until the last decades were writers able to convey a clearer idea of what it meant; and even today we are not yet at the end of our troubles. As we see the situation now, the nucleus from which Greek melody developed, was the stride of a major third, which was downward supplemented by a semitone to form a descending fourth or tetrachord. Out of this tetrachord arose an "enharmonic" heptad or seventh by "conjoining" a second, similar tetrachord so that the lowest note of the one and the highest note of the other coincided. An (later) octave, instead of the heptad, arose by "disjoining" these two tetrachords, so that the highest note of the lower one followed at the distance of a tone, instead of coinciding with the lowest note of the higher one. The Dorian scale, conjunct or disjunct, originated when the stride of a major third was filled in and the tetrachord became a "diatonic," descending sequence of a tone, a tone, and a semitone. The original enharmonic tetrachord, on the other hand, was not abandoned, but eventually transformed by cleaving the semitone into two microtones.

It seems that the other scales of the Greeks can be traced back to tetrachords in which a minor third was supplemented by a wholetone. Again, the third was later filled in to form a tone and a semitone; in the (descending) sequence tone-semitone-tone, the tetrachord assumed the form called Phrygian, and in the sequence semitone-tone-tone, it became Lydian. And here, too, the original empty third could be preserved intact, while the tone was cleft into two semitones. The resulting gender was called chromatic.

Thus, Greek scales followed three genders, enharmonic, chromatic, diatonic; and three modes, Dorian, Phrygian, Lydian.

Out of these elemental forms, the Greeks shaped an unlimited number of scales, in which one of the genders and one of the modes could be used throughout or otherwise mingled with others, and in which the tetrachords could be conjunct or disjunct. Indeed, the very steps had different "shades" or sizes; there were, at least theoretically, eight different thirds, seven wholetones, thirteen semitones, and nine quartertones. And even the same melody could use different shades of the same intervals.

Since the Greeks had a notation or, better, two notations, which we can perfectly well decipher, a number of musical pieces or fragments of pieces have survived and can be read. There are altogether eleven of them, some complete, and some in tiny scraps. The most beautiful is a drinking song, engraved in a tomb stele in a town of Asia Minor; and the most interesting are probably the two solemn hymns to Apollo, which were found in the treasury of the Athenians at Delphi. These latter two pieces, written about 150 B.C., are archaistic in a similar way as the sculptures of that time assume styles of the past: they follow the older enharmonic gender, with major thirds and semitones, modulate between conjunction and disjunction, and proceed in a floating five-beat rhythm.

The leading instruments of the Greeks were lyres and pipes. Of lyres, or instruments with yokes instead of necks to fasten the strings, they had two basic forms: the *kithara*, heavy, solidly built, and carried upright, for professionals; the *lyra*, light, pieced together, and held in a horizontal position, for beginners and amateurs. The pipe, *aulós*, was a pair of separate oboes, which were played at the same time, both double reeds being held in the mouth. Other instruments, as zithers, harps, panpipes, trumpets, tambourines, and cymbals, had only a limited importance, since they were confined to special purposes.

SCHOOLS OF POLYPHONIC COMPOSITION

Polyphony results from the simultaneous sounding of two or more melodies, i.e., polyphony concerns itself with the artistic possibilities of combinations of melodies.

One of the earliest treatises on polyphonic music is the *Musica Enchiriadis*, of uncertain authorship, and dating from the 9th century. It describes a type of polyphony in which the plain chants of the Church were sung by voice groups in a predominantly parallel fashion in fifths or fourths. This simple type of polyphony was called *organum*. Modern instances of it may often be encountered, for example, in the works of Claude Debussy.

The Notre Dame School. Organum reached its high point about the middle of the 13th century at the hands of composers attached to the Cathedral of Notre Dame de Paris, a group of scholarly organists who form the first great "school" of composition. Two of its more celebrated members were *Leonin* (12th century) and *Perotin* (at Notre Dame from c. 1183–1238). *Canon*, the literal imitation of one voice by a succeeding voice, makes its first appearance in works of the Notre Dame school. An important medieval musical form, more properly speaking, a style, the *motet*, characterized by multiplicity of texts and the use of a preexistent *cantus firmus*, gradually evolved from the Notre Dame technique. The 12th century motet should be carefully distinguished from the better-known form of the 16th century associated with the names of de Lassus and Palestrina.

The medieval musician did not disdain to use secular texts and melodies in his motets, and amorous or ribald tunes might be combined with chants of the Church. Incongruities of this sort must not be judged by modern standards: the sacred and the secular were not opposing viewpoints for the Gothic artist be he composer or architect.

Ars Nova. The term *ars nova*, "new art," an expression coined by the poet, courtier, diplomat, bishop, composer, and theorist *Philippe de Vitry* (c. 1291–1361), describes both the spirit and the product of 14th century composition in France. *Ars nova's* principal innovations were rhythmic, duple

rhythm being admitted to a position equivalent to that formerly held by triple. Pitch alterations, akin to our modern chromaticism, also appear. The greatest master of *ars nova* is *Guillaume de Machaut* (c. 1300–1377), a justly celebrated character in his own day. The first complete setting of the Ordinary of the Mass is attributed to him, although his greatest contribution lies in the sphere of secular music.

Ars nova was also assiduously cultivated in Italy, notably by the blind Florentine organist *Francesco Landini* (1325–1397). Characteristic Italian forms of the period, all secular, were the *ballata*, the *caccia*, and the *madrigal*, the last designed to become the secular form par excellence of the 16th century.

The English School. Early English polyphony differed from that practiced on the continent through its predilection for the use of intervals of the third and the sixth, a style of writing known as *gymel*. The technical proficiency achieved by early English composers is demonstrated in the famous *rota*, easily the best known of medieval compositions, *Sumer is icumen in*, a canon for four voices over a ground bass which is also a canon (opp. page 96). *Walter Odington* (c. 1300) and *John Dunstable* (c. 1370–1453) stand forth as the great figures of early English music.

The Burgundian School. The great strides made by the art of music during the 15th century may be traced to the fluency with which composers had learned to express themselves in the polyphonic idiom and to the impetus resulting from the establishment at the courts of the ruling classes, political and religious, of chapel choirs.

The English contributions to polyphony were exported cross Channel to a politically affiliated land, the Duchy of Burgundy, in the Low Countries. It was in the rich cities of this region that the so-called Burgundian school originated.

The two representative masters of the School are *Guillaume Dufay* (c. 1400–1474) and *Gilles Binchois* (c. 1400–1460). Dufay's idiom represents a synthesis of English, French, and Italian influences. Like many of his fellow countrymen he was for a time a member of the Papal choir in Rome.

The Burgundian composers brought the Mass to a high level of development. Dufay, for example, was the first to use one melody, called a *cantus firmus*, as a core around which he created the various sections of the Mass. One of the most famous of these *canti firmi* is the French secular song *L'homme armé*.

The Flemish School. From its significant beginning by the French organists at Notre Dame cathedral, and its scholarly advancement in Burgundy, the development of counterpoint passed next into the hands of the Flemish masters. From the standpoint of purely formal perfection and technical facility, the Flemish school probably represents the culmination of polyphonic development. The great significance which this school assumes in history is that of having assembled, developed, and exploited polyphonic devices and resources and the methods of thematic manipulation in general. It also systematized the acquired knowledge for teaching and so was able to supply all Christendom with singers, teachers, and singing schools. A natural demand for the capable services of the Flemish masters throughout Catholic countries, together with their roving disposition, led many of them away from home. A strong and persistent emigration toward the south of Europe about 1560 furnished Rome and other Italian cities with the rich products of their musical thought.

The most important technical contribution of this great school was the principle of "imitation," produced by causing the various voices of a polyphonic work to enter successively rather than simultaneously. Each voice upon its entry would repeat, i.e., imitate, the words and at least the initial features of the music of the preceding voice. Imitation is now one of the standard devices of the composer and may be seen in a highly developed state in such forms as the present-day *canon* and *fugue*.

One of the first great masters of the Flemish school was *Jean Ockeghem* (c. 1430–1495), *maître de chapelle* to two French kings, Charles VII and Louis XI, a composer of prodigious technical facility, as shown, for example, in a motet for thirty-six voices consisting of four nine-part canons. Another prominent figure in the earlier development of the Flemish school was *Jacob Obrecht* (c. 1430–1505), *maître de chapelle* at the Cathedral of Antwerp and also active in Italy. Obrecht's attractive melodies and sharply defined rhythms made his works quite popular during his lifetime and they achieved wide distribution over the continent both in Ms. and in printed copies.

Ockeghem's eminent pupil, *Josquin des Prés* (c. 1450–1521), enjoyed a fame so great that he was known as "The Prince of Music." He is universally held to be the greatest master of the Flemish School. His music contains much that is immediately attractive to modern ears, and his sensitivity to the rhetorical demands of his texts is quite remarkable.

Other noteworthy members of the Flemish group were *Antoine Fevin* (c. 1473–1512), *Pierre de La Rue* (?–1518), *Antoine Brumel*, at the court of the Duke of Ferrara in 1505, and *Heinrich Isaak* (c. 1480–1517), in the service of the Habsburgs at Vienna.

The art of printing music was first mastered by a Venetian craftsman, *Ottaviano deï Petrucci* (1466–1539). The most famous work to issue from his shop was the celebrated *Odhecaton*, published in 1501 and containing many compositions by members of the Flemish School.

Orlandus de Lassus. One of the greatest geniuses of the polyphonic period and of music history in general was Orlandus de Lassus, the Belgian composer (c. 1532–94). He left his home at the age of 16 and after many wanderings accepted the invitation of the Bavarian duke Albert V to go to Munich as chief chapelmaster. Lassus' style was majestic and dignified, and his works reflected feelings ranging from penitence to the gayest humor. Possessed of much greater versatility than his predecessors, he was momentously active in the transformation from purely linear polyphony to the conception of that independent and powerful harmonic style which reaches down to the present day. The period of the great Flemish school practically closes with de Lassus. Extending over approximately two centuries, the tremendous influence of this school is seen in the fact that it sent forth more than 300 distinguished composers, who carried a highly developed art of music into other countries, especially Germany and Italy.

Italian Schools. Polyphonic music reached its high point during the 16th century. While the imitative style formulated by the Flemish groups predominated and could be encountered throughout Western Europe, ascendency in composition, particularly of sacred music, passed to Italy.

The two outstanding sacred forms of the 16th century were the *Mass* and the *motet*. The latter had nothing in common with the 13th century French form mentioned above, and as used by latter-day composers the term *motet* indicates a polyphonic setting of some biblical extract, usually in Latin.

The Roman School. The musical tradition of Rome was thoroughly conservative and was in keeping with the ecclesiastical eminence of the city and its celebrated Papal choir.

The greatest of the long line of Roman masters is *Giovanni Pierluigi da Palestrina* (c. 1525–94), probably the best-known figure in the history of polyphonic music. His music constitutes the very essence of the spirit of the Counter Reformation, for all secular idioms, many popularized by Flemish composers, are notably absent from it. Its fitness for the high purpose of the Church caused the Council of Trent to commend it to other composers as a model,

Hence there arose a highly colored legend which treats Palestrina as "the savior of Church music." The result of the essentially simple direct idiom of Palestrina was an impressive and truly beautiful ecclesiastical style.

Although not geographically a member of the Roman School, the Spaniard *Tomás Ludovico da Victoria* (c. 1540–1611) has often and correctly been labeled "the Spanish Palestrina," although an intensity foreign to the Roman master may often be found in his works, all sacred in character.

Other well-known composers of the Roman School were *Giovanni Maria Nanino* (c. 1545–1607), *Felice Anerio* (1560–1614), and *Marco Antonio Ingegneri* (1545–92).

The Venetian School. The great republic of Venice, with its rich and bustling seaport and its celebrated St. Mark's Cathedral, was the seat of an enterprising, energetic school of composition whose works were characterized by brilliancy of choral writing and colorful use of instruments, all in marked contrast to the essentially conservative style cultivated in Rome. Much emphasis was placed on the coloristic effects which could be produced by contrasts of either vocal or instrumental groups differng from each other in location or strength. (The basic principle of the *concerto*.)

Two of the important composers who brought fame to the city, *Adrian Willaert* (1480–1562) and his pupil *Cyprian de Rore* (1516–65), were of Flemish birth. But the most prominent member of the school was a native Venetian, *Giovanni Gabrieli* (1557–1612), a composer whose style pointed clearly toward the 17th century. Gabrieli's successes in combining voices and instruments paved the way for much that was to be standard practice a century later. He achieved considerable fame during his lifetime and his style exercised a molding influence on the works of many of his contemporaries and successors, notably German composers such as *Hans Leo Hassler* (1564–1612) and *Heinrich Schütz* (1585–1672).

Willaert and another Flemish master resident in Italy, *Jakob Arcadelt* (c. 1514–57), made important contributions to the literature of the Italian madrigal, a form which reached a high point in Italy during the closing years of the Renaissance. The madrigal, the secular equivalent of the contemporary motet, was often in four or five parts and possessed a structure conforming to the divisions of its text. Although amorous texts were in the majority, almost any subject might be employed, in some instances religious as well.

Later composers of madrigals, *Luca Marenzio* (c. 1560–99), *Carlo Gesualdo*, prince of Venosa (c. 1560–1614), and *Claudio Monteverdi* (1567–1643) developed an elaborate type of madrigal rich in dramatic interest and tonal description. Despite the adherence to polyphonic tradition, dissonant chords, often of a surprisingly modern cast, were utilized for forceful interpretation of the text. *Orazio Vecchi* (c. 1550–1605) set entire plays to music in the form of a series of madrigals. The most famous of these, *L'Amfiparnasso*, performed in 1594, is an important precursor of the opera.

France. The most popular polyphonic form in France during the 16th century was the secular *chanson*, the contemporary importance of which is shown by the four part chansons which flowed from the press of the Parisian printer Pierre Attaignant. Like the madrigal, an analogue of the motet, the chanson might employ a variety of secular topics for its texts. Prominent among the many composers of chansons were *Clement Jannequin* (c. 1485–1550), celebrated for his many realistically descriptive pieces.

Another notable French contribution to 16th century music was the collection of settings of Psalm tunes issued in 1562 and used extensively not only by the Huguenots but by English, Dutch, and German Protestants as well. Of the many Huguenot composers who enriched the French Psalter, the finest was *Claude Goudimel* (1505–72).

Germany. The Lutheran Reformation was responsible for several new departures in music, of which the *chorale*, the congregational hymn which serves as the musical germ of the Lutheran service, is the most important. Viewing music as a vital agency in creating religious feeling, Luther utilized three sources for the melodies of his hymns: Catholic chants, folk-tunes, and original compositions of a simple character. *Ein' feste Burg ist unser Gott*, with both words and music by Luther, is typical. Melodies of the chorales served as material for organ works and for the elaborate combination of voices and instruments known as the church cantata, later brought to its climax by Johann Sebastian Bach.

The Reformation created a tremendous demand for new music, a need quickly met by German composers. Settings of Psalms and chorale texts were widely published, notably those of Luther's friend and musical counselor *Johann Walther* (1496–1570), as well as collections by *Johannes Eccard* (1553–1611) and *Hans Leo Hassler* (1564–1612).

In South Germany and Austria the Catholic musical tradition remained but with Flemish masters such as Orlandus de Lassus occupying most of the important posts. In fact, a Swiss Catholic composer, *Ludwig Senfl* (c. 1492–1555), de Lassus' predecessor at Munich, was the favorite composer of Martin Luther. *Philippe de Monte* (1521–1603), long at the Habsburg court in Vienna, ranks with Orlandus de Lassus and Palestrina as one of the principal figures of the "Golden Age" of music.

England. English music, like its kindred arts, attained an imposing degree of perfection during the reign of Queen Elizabeth (1558–1603). While sacred music of great beauty was produced, the music of the period followed the prevailing spirit of the age in its predisposition for the secular.

The most remarkable aspect of Elizabethan music was the assiduous cultivation of a polyphonic form which had been transplanted from Italy, the *madrigal*. Supplied with a liberal amount of fine texts, Elizabethan composers created a magnificent corpus of beautiful works with a wide emotional gamut. Madrigals were designed for rendition by amateur vocalists who sang from their part books for the sheer pleasure of performance. They were published under such captions as *Songs*, *Ayres*, *Canzonets*, *Ballets*. The last named of these possesses the chains of "fa, la"s which, of obviously Italian origin, are associated with this variety of madrigal.

Among the composers whose names appear in the forty odd collections of madrigals published in Elizabethan England are *William Byrd* (1543–1623), *Thomas Weelkes* (c. 1575–1623), *John Wilbye* (1574–1638), *Orlando Gibbons* (1583–1625), and *Thomas Morley* (1558–1603). Morley's guide, *A Plaine and Easie Introduction to Practicall Musicke*, tells us much about the music and music-making of his time.

Music for instruments also flourished in England in this period, consisting notably of colorful pieces for keyboard instruments, usually the *virginals*, and for an important group of predecessors of the violin family, the "consort" of viols. Variations and dance forms were the most popular types written for the virginals. Players of the viols found delight in the polyphonic "fancy."

Songs to be sung to the accompaniment of the lute also figured in the musical life of Elizabethan England. Particularly beautiful compositions of this type came from the pen of *John Dowland* (1563–1626).

Members of the upper classes were proficient performers on the keyboard instruments and the viols. In fact an English gentleman was expected to take his part in the rendition of a madrigal, playing on the virginals or on one of the instruments of the viol group. He was an amateur in the literal and best sense of the word.

Despite the emphasis on secular music, composers of the period wrote extensively for the service of the Anglican Church, the typical musical form of which was the uniquely English *anthem*.

SECULAR MUSIC OF THE MIDDLE AGES

Inasmuch as the Church was the custodian of most organized knowledge in the Middle Ages, it concerned itself primarily with its own music. Hence a large amount of secular music of the period has been lost to us and attempts to reconstruct much of it from the few available Mss. introduce an element of supposition. Not that there was a strong cleavage between sacred and secular styles. As has often been pointed out, a free exchange existed between the musical resources of the Church and that of the laity.

The Troubadours and Trouvères. Secular music of the Middle Ages is well typified in the activities of the *troubadours*, who originated in Provence (Southeastern France), and their northern French analogues the *trouvères*. The troubadours were members of the upper classes. They flourished from about 1100 to 1300, a significant portion of the Age of Chivalry, and many of their creations have topical significance. About 264 troubadour melodies have survived. A notable feature of the troubadour music is its emphasis on stylized forms and types, probably for the first time in the history of music. Among these may be listed the epic *chanson de geste*, and *canso*, a love song, the *alba*, a song of dawn, the *plainte*, a song of mourning.

Probably the most distinguished trouvère was *Adam de la Halle* (c. 1230–1288) of Arras. His *Le Jeu de Robin et Marion*, written for the Court of Robert of Artois and Naples, dates from c. 1275 and is one of the oldest monuments of French dramatic art.

The Minnesinger. A current of artistic activity similar to that which called the art of the troubadours into existence expressed itself in Germany during the 12th and 13th centuries. The Germanic poet-musicians were known as *Minnesinger* (German: *Minne*, love) and unlike their French counterparts they sang their compositions themselves. Richard Wagner's opera *Tannhäuser* is based on an episode in the life of a celebrated minnesinger of the same name (1205–70), and two other famous practitioners of the art, *Walther von der Vogelweide* (c. 1170–1230) and *Wolfram von Eschenbach* (flourished c. 1200–20) appear in it. One of Wolfram's epics *Parzival* served as a source for Wagner's *Lohengrin* and *Parsifal*. Texts of the minnesinger lean toward the narrative or devotional.

The Meistersinger. The Meistersinger (mastersingers), authentic accounts of whom date from the 14th century, undertook the care of musical art after it had passed from the knightly singers to the burghers and respectable artisans. Guilds of Meistersinger existed in Frankfort, Colmar, Prague, Mainz, and other cities. The meistersong attained its greatest popularity during the 15th century in Nürnberg, Augsburg, and Strassburg; also later in Ulm, Munich, and Regensburg. At Nürnberg the famous cobbler and poet, *Hans Sachs* (1494–1576), was the leading spirit. The schools of the Meistersinger fell into gradual decay after the Thirty Years' war. However, the corporation did not come to an end before 1839, when the four surviving members of the school at Ulm handed their corporation badges and records to the *Liederkranz* of that city, thereby dissolving their guild. In his opera *Die Meistersinger*, Richard Wagner vividly pictures the musical art of the Meistersinger and the traits of the honest but pedantic men who practiced it.

The Strolling Players. Of no inconsiderable value in the development of music is the influence wielded by the vagrant pipers, or *strolling players* (French: *jongleurs*; German: *Gaukler*) who were numerous about the time the minnesong passed over to the meistersong. Vagrant, homeless, despised, they were nevertheless welcomed on festive occasions for the amusement they offered. The strolling players became a significant influence upon the development of music because of the sacred plays which they presented. Up to the middle of the 12th century the sacred dramas, named *passion plays* in Germany and *mysteries* in France, were entirely in the hands of the clergy, but later these vagrants took part in the plays or presented them wholly themselves. One of the real benefits bestowed upon the growth of music by these simple folk was their constantly increasing dexterity in the use of their musical instruments.

The Baroque Period. The Baroque period, which extends from the beginnings of opera to the death of Johann Sebastian Bach, dates from about 1600 to 1750. It gave the world a new musical style characterized by emphasis on a single melody, supported by chords, crystallized an all important combination of music and drama, the *opera*, and witnessed the birth of a host of new instrumental forms. In short, it formulated the idiom of much of the music of today.

Apart from its forms, however, the Baroque period stands out through the conscious efforts of its representative composers to achieve a grand sweep, lively dramatic contrasts and a vividness of presentation. Richness of ornamentation, abrupt changes in instrumentation, harmonic complexity, all account in some measure for the continual movement in Baroque music.

Opera and Oratorio. Toward the close of the 16th century, a group of Florentine musicians in the course of their discussions on the nature of Greek drama concluded that it had been sung in a declamatory manner. Putting their theories into practice, they brought forth the first *opera*, a drama in which music was employed as an agency to heighten the expressiveness of speech. Such "song speech" is called *recitative*. The musical accompaniment, furnished by a few stringed instruments and a keyboard instrument, consisted of simple progressions of chords which by proper choice and arrangement could be used to add emphasis to the recitative The musical texture so produced by the combination of a principal voice and accompanying instruments furnishing a harmonic background, is referred to as *homophony* in contradistinction to the equal-voiced style of polyphony. The chords produced by the instruments were constructed with reference to the lowest part, the bass, of great importance in defining the harmonic structure. This bass received the designation *basso continuo*, later shortened to *continuo*. English equivalents are *figured bass* or *thorough-bass*. So characteristic is the basso continuo in music of the Baroque period that the epoch is sometimes referred to as the *Basso Continuo Period*.

The opera experienced a phenomenally rapid growth in Italy and in 1637 a public theater devoted to it was opened in Venice. Admission was cheap and the public flocked to the new entertainment. But with the rise of the admissions-paying audience came a decline in dramatic values, and music which had initially been assigned a role auxiliary to the drama soon became the thing in itself, i.e., the means became the end. An emphasis on solo song and pure melody resulted and dramatic propriety receded into the background. Works were performed with elaborate stage-effects, complicated machines, and exotic costumes, leading an Englishman visiting in Venice in 1645 to describe the opera as "one of the most magnificent and expensive diversions the wit of man can invent." But the art of music received singular impetus through the development of solo song and the rapid recognition accorded the band of instruments located near the stage and taking its name from its position in the theater, the *orchestra*, eventually to become the supreme instrument of musical expression.

The two most important contributors to the Venetian theater were *Francesco Cavalli* (1602–72)

and *Marc' Antonio Cesti* (1623–69), the former becoming quite wealthy through the frequent performances of his operas.

The presence in Naples of *Alessandro Scarlatti* (1659–1725), a melodist of great gifts, accounts for the shift in the focus of Italian opera from Venice to that city. Scarlatti's use of the orchestra, notably in the instrumental introduction to an opera called the *overture*, and his use of the eventually stereotyped vocal form called the *da capo aria*, influenced almost every one of his European contemporaries. Despite the mythological or classical origin of the texts employed for serious Neopolitan operas, they can hardly be called more than concerts in costume.

It was frequently the custom to interpolate a short comic opera, an *opera buffa*, between the acts of a serious one. Texts of these short works were usually topical in nature. Curiously enough, an opera buffa *La Serva Padrona* by *Giovanni Pergolesi* (1710–36), mounted in Naples in 1733, is the oldest opera which enjoys regularity of performance today.

French Opera. An Italian, *Jean-Baptiste Lully* (1632–87), dominated French opera during its formative period. The national predilection for ballet and spectacle was responsible for the development of the necessary instrumental music, and to meet this need Lully wrote many fine dances, masterfully orchestrated and excellently fashioned. Lully is also an important figure in the evolution of the overture. A type created by him was widely imitated and is known to this day as the *French overture*.

English Opera. Opera in England had been preceded by the courtly entertainment known as the *masque*. With the reopening of the theaters in 1660, operas were produced with great frequency. Though Italian and French conventions were widely adhered to, English opera developed a style of its own, and in the hands of one of England's greatest composers, *Henry Purcell* (1659–95), reached a stage of excellence far in advance of most of the productivity of the Continent. Purcell's greatest work is also his only true opera, *Dido and Aeneas*. But the promise of Purcell was not fulfilled and English music remained essentially a pale imitation of German and Italian style until the end of the 19th century.

German Opera. In Germany as in France, the Italian manner was long dominant in the principal opera houses. The native product, the *Singspiel*, achieved little distinction.

Again as in Italy, commercial and artistic eminence went hand in hand, and Germany's first operatic capital was a prosperous seaport, Hamburg. Here *Reinhard Kaiser* (1673–1739) held sway. Despite the popularity of the Hamburg school in its time, it has little more than historical interest today.

The Oratorio. Like the orchestra, the *oratorio* owes it name to a location, in this instance the *oratory* of the church. Rooted in the liturgical drama and mystery plays of the Middle Ages, the oratorio in the modern sense came into being in Rome in 1600. The name of *Giacomo Carissimi* (1605–74) heads the list of important composers in this combination of music and sacred drama. Other Italians of note were *Antonio Lotti* (1667–1740) and *Antonio Caldara* (1670–1736).

A particular type of oratorio has the Passion of Jesus as its subject. The version of any of the four Evangelists may be used. While Passions had been written both in plain-chant and in the complicated texture of polyphony, the form took on new dramatic vigor with the adaptation to it of the new idioms of the opera, notably the recitative and the language of the orchestra.

The foremost writer of Passions, however, was a German, *Heinrich Schütz* (1585–1672). Active at the chapel at Dresden, Schütz had absorbed much of the Venetian tradition at its source.

Instrumental Music of the Baroque Period. The Baroque period is rich in literature for the organ, an instrument well suited to meet the expressive needs of the Baroque spirit.

The brilliant organ playing which had been found in Venice at the close of the Renaissance was transplanted to northern Europe by the Dutch organist *Jan Pieters Sweelinck* (1562–1621), active at Amsterdam. Sweelinck is of particular interest through his cultivation of a form which became one of the leading features of the organ music of the Baroque —the *fugue*. He taught extensively, and through his many pupils, the most outstanding of whom was *Samuel Scheidt* (1587–1654), created the great German school of organ playing which eventually reached its climax with Johann Sebastian Bach.

Northern German organists typified by *Adam Reinken* (1623–1722), *Dietrich Buxtehude* (1637–1707), and *George Böhm* (1661–1733), were partial to the larger, more spectacular organ forms—the prelude and fugue, toccata, and fantasia. Representatives of central and southern Germany, notably *Johann Pachelbel* of Nürnberg (1653–1706), cultivated variation types such as the *Chorale-Vorspiel*, an instrumental treatment of the congregational *chorale*, and also developed forms which had initially been fostered in Italy under the influence of *Girolamo Frescobaldi* (1583–1643).

Music for stringed instruments underwent rapid development during the Baroque period under the impetus provided by the perfection of the violin family by Italian craftsmen, notably the group at Cremona headed by *Nicola Amati* (1596–1684). Another Italian, *Arcangelo Corelli* (1653–1713), is credited not only with being the father of the modern school of violin playing but also with playing a signal role in the fashioning of two instrumental forms—the *sonata*, a piece for a keyboard instrument alone or another instrument, usually a violin, combined with a keyboard instrument, and the *concerto*, a work for a group of instruments. The basic principle of the concerto, contrast of instrumental groups, underlies almost all of the ensemble music of the Baroque period. Throughout the period emphasis fell on the bowed instruments as the core of instrumental ensembles.

THE CLASSIC MASTERS

Johann Sebastian Bach (1685–1750). Often spoken of, together with Beethoven and Brahms, as one of the "three B's" of music, Bach is one of the great masters of all time. Although he was one of the early classicists, his music contained innovations which in many respects are the basis of the most modern idioms in 20th century music. He was prolific in writing both vocal and instrumental works. For the Church he composed 226 cantatas, several masses, a number of oratorios, and a large number of sacred works for organ. His secular works included orchestral suites, concerti grossi, sonatas for various instrumental combinations, and many works for the organ and for the clavier (the keyboard instrument of the day). Most of Bach's works were unpublished during his lifetime and were not widely known until they were discovered and performed by Mendelssohn a hundred years after his death. Then the Bach Gesellschaft was formed and all of Bach's works were published by subscription. Bach was one of the greatest contrapuntists of all time, but even though his fugues and his part writing were so skillful that they excite the admiration of all musicians, his work was charged with a warmth and fervor that makes listening to it an emotional experience.

George Frederick Handel (1685–1759). Handel and Bach lived contemporaneously and had much in common. Both were master contrapuntists. Handel, however, had a flair for the theater, and his 46 operas exercised a tremendous influence on the operatic stage of the 18th century even though they are to-

day seldom performed in their entirety. The German born Handel spent the later years of his life in London, and wrote many of his works to English texts, particularly his oratorios. His handling of English words and phrases was in the florid Italian style which is outdated today, but because of the beauty of the music, the best of his oratorios, particularly *The Messiah*, are standard in the literature of music. In addition to his vocal music, Handel composed a large number of instrumental works—orchestral suites, concerti for organ, sonatas for various instruments and combinations of instruments, and numerous harpsichord pieces. His famous *Largo*, known today as an instrumental piece, was originally an aria from his opera *Serse*.

Christoph Willibald Gluck (1714-87). An early composer of opera who did much to found the modern styles of operatic writing. Born a German and living most of his life in Paris and Vienna, Gluck at first composed in the style of the early Italian operas. He became disgusted with the artificialities and banalities of the Italian composers of the day, and he sought a more even balance between the action of the story and the music. He tried to make the music less subservient to the whims and demands of the singers, and his innovations were resisted by both musicians and the public. Gluck's principal rival was *Niccola Piccinni* (1728–1800), an operatic composer who followed traditional patterns. Each composer had his adherents, and the controversy between the two factions was bitter. Piccinni was probably the more popular of the two during their lifetimes, but today his works are altogether forgotten, while a number of Gluck's operas are still favorites, notably *Orfeo ed Euridice*, *Armide*, *Iphigenia en Tauride*, *Iphigenia in Aulis*, and *Alceste*. Gluck composed a total of 39 operas.

Joseph Haydn (1732-1809). An Austrian composer who was one of the greatest of classic masters. In his symphonies, string quartets, and sonatas, he brought toward perfection the development of the sonata form which had been initiated by such earlier composers as *Johann Stamitz* (1717–57) and *Philip Emanuel Bach* (1714–88). Haydn also did much for the development of orchestral music. He increased the number of instrumental parts, and he was one of the first to use instruments for their individual tone-color, rather than as a medium merely for playing certain parts of the score, regardless of their adaptability for various instruments. Haydn composed more than 100 symphonies, 77 string quartets, 30 trios, 51 sonatas, numerous concertos, and other miscellaneous instrumental works. In the field of vocal music he composed several operas, numerous cantatas, and several oratorios, of which the best known today are the "Creation" (1799) and the "Seasons" (1801).

Wolfgang Amadeus Mozart (1756-91). Probably the most universal genius in music that the world has even seen. He was great as a writer of tragic, romantic, and comic operas, great as a composer of symphonies, quartets, and quintets, great as a writer of piano concertos and sonatas, great as a writer of songs and of Church music, and great also as an executive musician. Every measure of his music breathes the exquisite charm and tenderness of his nature, and so extraordinary was his facility and versatility that the world is still in doubt as to whether Mozart excels most in his orchestral or in his chamber music, in sacred music or in opera. In all these branches of the art he stands at the very front rank of the world's greatest musicians.

The salient characteristics of Mozart's operas are found in the truthful expression of human nature which is achieved wholly by the music, for Mozart used his librettos merely as skeletons. Even when the plot uncovers the whole gamut of emotional feeling from buffoonery to supernatural terror, as in "Don Giovanni," his touch of mastery never falters. The characters in Mozart's operas are recognizable as types, and their human nature belongs to no period, but to all time. No master was more successful in portraying the curious intermixture of tragedy and comedy, of horror and merriment, in which the emotional background seldom allowed expression of any one pure, unalloyed mood. Mozart grasped the unity of these contrasts and expressed them so surely and convincingly as to open up a new province for his art.

Mozart wrote more than forty symphonies, of which the last three are the most played today—E flat major, G minor, and C major (the "Jupiter"). He developed further than Haydn the art of tone color in instrumentation, and the musical content of his works is less formal than Haydn's.

Ludwig van Beethoven (1770-1827). The greatest of the classic composers, and the link between the classical period of music and the romantic era which was to follow. Beethoven distinctly derived from Haydn and Mozart, particularly from the latter, but his rugged temperament and his intense individuality made him break away from the restrictions of the 18th century and caused him to write music which was revolutionary to early 19th century ears. His first symphony is Mozartian in style, yet it is in no sense imitative. With his third symphony, the "Eroica," he showed the effects of the revolutionary age in which he lived, when the French Revolution had overthrown the court of Louis XVI and artists and writers were having their own struggle for freedom of expression.

Beethoven composed nine symphonies, which are still monuments in the literature of music. The fifth is probably the favorite of all symphonies in the repertoires of modern orchestras. In the ninth symphony the composer introduced a chorus in the last movement, using for his text Schiller's "Ode to Joy." In all his works Beethoven adhered to the classic forms, but he expanded them and made them more elastic and expressive. In his symphonies and sonatas he substituted the scherzo for the traditional minuet movement, and he made other innovations which made the form of his pieces secondary to their musical content, a medium for expressing the composer's ideas rather than a formal end in itself. He also expanded the development sections of the sonata form, and he ended his movements with codas which were in themselves extended developments of themes and material used previously.

In addition to the nine symphonies, Beethoven composed an opera, "Fidelio;" 5 concerti for piano and orchestra, one for violin and orchestra, and one for piano, violin, cello, and orchestra; sonatas for piano solo, and for violin and piano; a large body of chamber music (trios, quartets, quintets, etc.); and a number of choral works and songs.

THE ROMANTICISTS

The romantic era in music, starting in the early 19th century, was concurrent with the same period in the other arts and in literature. The revolts of the common people which led eventually to the Central Europe uprisings of 1848 encouraged artists, writers, and musicians to make their work a more personal expression and to voice their own thoughts rather than those of their patrons and protectors. The classic forms were not abandoned, but they became more elastic, and the composers of the romantic period followed Beethoven's lead in making those forms more sensitive and better adapted to the ideas the composers strove to express. There was also a closer relation between music and literature. Composers, notably Schumann, gave fanciful titles to their compositions. Harmonic combinations became bolder and richer, and composers made freer use of dissonances which had not been tolerated in 18th century music. Naturally, these were resisted at first, just as the more advanced dissonances of the 20th century have been accepted only slowly in our

time, but as the ears of music lovers became accustomed to innovations, the new tonal combinations became part of the accepted harmonic vocabulary.

Karl Maria von Weber (1786–1826). Generally considered the first of the romanticists, his work is considered somewhat archaic today, but in the 19th century he was regarded as one of the great composers. His operas are still fresh and vital, particularly "Der Freischütz," "Euryanthe," and the fairy opera "Oberon." His instrumental music was highly popular for many years. In his day Weber was distinctly an innovator. His orchestral tone color, his treatment of texts in vocal music, and his skill in making his music convey the mood and emotion of the action and dialogue of opera librettos, were matters which influenced all the composers who were to follow him. Even Wagner acknowledged his indebtedness to Weber.

Franz Peter Schubert (1797–1828). One of the greatest melodists, and one of the most natural geniuses who ever composed music. Compared with other great masters—Bach, Beethoven, Brahms, Wagner—his technical equipment was limited and meager, but his natural gift for melody was so fluent and spontaneous that he could accomplish with very little training that which many better trained but less inspired composers could never attain. He belonged distinctly to the romantic era, for his imaginative songs were written for plain people and not for the aristocracy which provided the sustenance of 18th century composers. He was the first of the German *lieder* composers, writing songs in which the accompaniment was such an integral part of the work that it helped either to describe the action of a poem, as in "Der Erlkönig," or to establish its mood. Even in his symphonies and chamber music Schubert was lyric and song-like.

He was successful in almost every form of music except opera, even though he did compose several operas which failed because he had chosen inferior texts. Altogether Schubert composed 603 songs, 8 symphonies, 7 overtures, 22 sonatas for piano, and a large number of piano pieces, 15 string quartets and other chamber music works, as well as choral works and the 14 unsuccessful operas.

Felix Mendelssohn-Bartholdy (1809–47). Mendelssohn was distinctly a romanticist in the poetic and imaginative character of his work, yet he was as much a master of the technique and form of composition as any of the classicists. His fugues and his contrapuntal writing are marked by an inventiveness and facility that rank him with Bach and Handel, even though his works lack the profundity and the emotional depths of the older masters. His music is always amiable, even when it seems superficial. He wrote in almost every form except opera: 5 symphonies, several overtures, two concerti for piano and orchestra, one for violin and orchestra, numerous chamber music works, several oratorios, of which the most famous is "Elijah," and many songs and piano pieces.

Robert Schumann (1810–56). One of the most typical representatives of the romantic movement. His music has a warmth of melody and harmony that proved an eloquent medium for expressing the poetic ideals of the 19th century. For many of his piano pieces Schumann chose fanciful titles which in effect made the works descriptive and programmatic. He was always at his best when writing for piano, for that was the instrument he knew best and on which his wife, the pianist *Clara Wieck* (1819–96), could interpret his music in public. In his orchestral music Schumann was limited by a meager command of the technique of instrumentation, but in orchestral or chamber music works where the piano was featured—notably the Piano Concerto in A Minor and the Quintet for strings and piano—his effective handling of the solo instrument more than atoned for his weak orchestration. In addition to his piano works, large and small, Schumann composed several hundred songs in which he developed still further the integration of voice and accompaniment that marked the best of Schubert's *lieder*. For orchestra Schumann composed four symphonies, a number of overtures, and incidental music for Byron's "Manfred." His concerti included the A minor piano concerto, one for cello and orchestra, and several other pieces for various solo instruments. He composed also three string quartets, the piano quintet, and a piano quartet, two trios and two sonatas for violin and piano, as well as a number of choral works.

Frederic Francois Chopin (1810–49). Sometimes called "the poet of the piano," his works are perhaps the most standard and favored of any composer of any era in the concert repertoire of pianists. Himself a pianist, Chopin composed music that was always well adapted to the technical requirements and expressive possibilities of the instrument. His Etudes did much to advance the art of piano playing by posing difficulties which could actually be mastered, and which led later composers to devise still more difficult and correspondingly effective pianistic patterns.

Entirely aside from the technical nature of Chopin's compositions, their musically poetic nature, bordering at times close to sentimentality, started a school of romantic composition which at its best was sensitive and moving, and at its worst mawkish. When interpreted with restraint and taste, Chopin's emotionalism rarely goes beyond the bounds of good taste, and his subtle, refined voicing of his emotional temperament is marked by elegance and refinement. His works include hundreds of compositions for piano: Waltzes, Mazurkas, Ballades, Scherzos, Preludes, Etudes, Polonaises, as well as the two Piano concerti which are favorites with both pianists and audiences.

Hector Berlioz (1803–69). A composer of powerful individuality and influence. He is recognized as the originator of modern instrumentation. Although he adopted the German classics as his models, he trod a very different path. He was one of the first to let music portray and illustrate a program, and aimed to realize novel tone colors of the most vivid nature. His passion for unprecedented combinations and gigantic mass effects was unsated.

His best-known works are the music drama "The Damnation of Faust," the dramatic symphony "Romeo and Juliet," the overture "Carnaval Romain," the operas "Benvenuto Cellini," "The Trojans," "Beatrice and Benedict," and a splendid treatise on instrumentation.

Franz Liszt (1811–86). Undoubtedly the greatest piano virtuoso known to the music world. He is the founder of "transcendental" piano playing, in which the instrument is made to attempt all the resources of an orchestra. As composer he was an adherent of the new German school (free tonality, romantic realism, program music), and his special contribution to the existing forms was the symphonic poem. In this form he makes free and original use of the leading motive, "local color," and all the arts and devices of orchestration, to interpret the inner meaning of the given poem or program. The best known symphonic poems are the "Dante" symphony, "Faust-symphonie," "Les Préludes," "Tasso, Lamento e Trionfo," "Prometheus," and "Festklänge." Liszt was personally and musically one of the grand figures in the history of music.

Several of the composers of the romantic period represented a reaction against full-fledged romanticism, by returning to the classical forms and by composing absolute, as contrasted to program, or descriptive, works.

Cesar Franck (1822–90). A Belgian-born composer who lived most of his life in Paris. He was one

of the early musicians to develop the "cyclical" form, in which the same thematic material is used in the several movements of a symphony or chamber music work. Franck composed in a meditative, thoughtful style that is contemplative in mood, and lends itself effectively to religious music. He wrote a symphony, a quintet for piano and strings, a sonata for violin and piano, a string quartet, several works for piano and orchestra, many organ compositions, and numerous choral works.

Anton Bruckner (1824–96). An Austrian composer who applied Wagner's instrumental technique to the symphony and who developed a larger formal structure. He completed 8 symphonies and left a ninth unfinished. He also composed several Masses and a large number of organ works.

Johannes Brahms (1833–97). Brahms was an idealist of the highest and purest type, and resisted the romantic tendency to write program music. He composed only absolute music and was the true standard bearer of the classic traditions. He was looked upon by many as the successor of Schubert and Schumann, the combination of the classic and the romantic schools. His harmonization and complex rhythms, with their frequent syncopations and cross accents, are distinctly romantic; his treatment of form and his instrumentation are classical. His harmony is rich, colorful, and new in unexpected changes; his counterpoint, complex. Although a master of every emotional expression, he leaned toward somber shades, in which his serious and classic mind delighted. As opposed to the license and chaotic passion of the ultramodern school, his works point back to the models and ideals of the classic age. Brahms may be called a reflective rather than a spontaneous composer, though for real warmth of feeling, intensity, and exaltation he has no contemporary equal.

In many of his songs one would say that Schubert lives again. The best-known and, in many ways, the most beautiful of his songs is "Wie bist du, meine Königin?" His songs, chamber music, much of his piano music, and several of his choral works ("German Requiem," "Triumphlied," and the "Schicksalslied") gained early popularity, but his four symphonies and the two piano concerti were slower in gaining popular recognition. In recent years they have been increasingly played and are now among the more popular items of the orchestral repertoire.

Lesser composers of the period included the French *Edouard Lalo* (1823–92) whose "Symphonie Espagnole" for violin and orchestra is still a favorite concert work among violinists, and *Max Bruch* (1838–1920), a German composer who is best remembered for his first Violin Concerto. *Robert Franz* (1815–92) continued the tradition of the German lied, and his many songs are still an essential part of the concert singer's repertoire. In Vienna *Johann Strauss, sr.* (1804–49) and his son, *Johann Strauss, jr.* (1825–99), created a type of waltz that is one of the most individual and popular artistic commodities that the Austrian capital ever produced.

19TH CENTURY OPERA

For many years during the 19th century, music lovers looked to Italy for their favorite operas. Melodramatic plots were set to scores which contained easily remembered melodies and effective arias, and which developed the "bel canto" style that in turn produced singers capable of the vocal display expected in the opera house.

Gioacchino Rossini (1792–1868). Although "The Barber of Seville" is the only one of his operas performed in its entirety today, Rossini is still known through his overture to "William Tell" and by his sacred oratorio, the "Stabat Mater." He had an extraordinary melodic gift, and he adapted from German composers the art of using the orchestra in symphonic style. Others of his operas were "Tancredi," "Semiramide," "La Cenerentola," "Moise," and "Italians in Algiers." The overtures to these works are frequently performed as concert pieces.

Gaetano Donizetti (1797–1848). The composer of "Lucia di Lammermoor," "Don Pasquale," "L'Elisir d'Amore," and "The Daughter of the Regiment." His works are filled with arias which are favorites with singers, but most of his operas are showy and superficial in spite of the truly beautiful melodies they contain.

Vincenzo Bellini (1801–35). Bellini was another great melodist, but he lacked the grand manner of Rossini. His "Norma," "Sonnambula," and "I Puritani" are his most popular works. Altogether he composed 11 operas.

Giuseppe Verdi (1813–1901). Unquestionably the greatest master the Italian opera has ever known. After a number of youthful operas, Verdi's most brilliant successes were ushered in by the signal triumph of "Rigoletto," followed by "Il Trovatore" and "La Traviata." Further untiring study and artistic growth, lasting up to the very advanced years of the composer's life, resulted in operas of genuine dramatic vitality, richer and more elaborate style of instrumentation and harmony, melody of greater passion and poignancy, and undeniable beauty. These operas, "Aïda," "Otello," and "Falstaff," have been rightly assigned foremost rank in operatic history.

Contemporary with Verdi were several composers known today principally for one work each: notably *Amilcare Ponchielli* (1834–86), for "La Giaconda," and *Arrigo Boito* (1842–1918), for "Mefistofele." Boito was the librettist for several of Verdi's operas.

Giacomo Puccini (1858–1924). Hailed by Verdi as the most promising of his successors, Puccini carried on the tradition of Italian opera, and developed it to suit more modern tastes. He was skillful in his use of the orchestra, and he adapted it to the requirements of the stage. He also knew how to choose librettos which were well suited to musical treatment. The melodies he assigned to the singers are warm and luscious, often erotic in their appeal. Nearly all of his 12 operas are standard repertoire items in modern opera houses, the favorites being "La Boheme," "Gianni Schicchi," "The Girl of the Golden West," "Manon Lescaut," "Madame Butterfly," and "Tosca."

Several contemporaries of Puccini were active in producing typical Italian operas, but they are each known today chiefly by one or two outstanding works: *Ruggiero Leoncavallo* (1858–1919) by "I Pagliacci;" *Pietro Mascagni* (1863–1945) by "Cavalleria Rusticana;" *Franco Leoni* (1864–1949) by "L'Oracolo;" *Umberto Giordano* (1867–1948) by "Andrea Chenier" and "Fedora;" and *Italo Montemezzi* (1875–1952) by "L'Amore dei Tre Re."

In France the opera advanced along lines laid down by Gluck. Like Gluck some of the early Paris opera composers were born in other countries, but their associations with Parisian opera were so close that they are considered as belonging to the French school. Among these were the Italian-born *Luigi Cherubini* (1760–1842), composer of "Medea;" and *Gasparo Spontini* (1774–1851) who wrote "La Vestale."

The native Frenchmen who wrote operas during the first half of the 19th century included *Daniel Auber* (1782–1871), composer of "Fra Diavolo" and "Masaniello," and *Giacomo Meyerbeer* (1791–1864), composer of "L'Africana," "Les Huguenots," "Le Prophete," "Dinorah," "Roberto il Diavolo," and many other works. Meyerbeer lacked artistic scruples, but he knew how to write effective operas. *Jacques Halévy* (1799–1862) is known today principally for "La Jaive;" *Ambroise Thomas* (1811–96) for "Mignon;" and *Léo Delibes* (1836–91) for "Lak-

me;" while *Jacques Offenbach* (1819–80), born in Cologne but living in Paris from early childhood, created a type of light opera that made Continental operettas supreme until the English Gilbert and Sullivan proved worthy rivals. Offenbach's "Tales of Hoffman" is considered a "grand" opera but the rest of his works fall in the light opera class—"Orpheus in the Underworld," "La Belle Hélène," and many others.

Charles-Francois Gounod (1818–93). His "Faust" is one of the great operas of all time. Its music is delicately sensuous, and seems to derive more from Mozart than from the French Meyerbeer. Gounod followed the trend of making opera strong in its appeal to the masses of people, rather than merely to the cultured aristocracy. His other operas include "Romeo and Juliette," which is still performed, as well as "Mirielle." Gounod wrote much church music, including the oratorio, "The Redemption," and Masses and cantatas.

Georges Bizet (1838–75). Composer of "Carmen," which is still one of the most popular of all operas in the repertoire of the entire world. It combines ravishing melodies with ingenious harmonies, and its plot is melodramatic and powerful. Bizet wrote other operas, among them "The Pearl Fishers," and he also wrote incidental music for plays, among them "L'Arlésienne," and considerable instrumental and vocal music.

Camille Saint-Saens (1835–1921). Composed 12 operas, of which "Samson and Dalila" was his masterpiece. Although many of his works are shallow and facile, Saint-Säens had a gift for melody and he was a skilled musical craftsman. His orchestration was brilliant and his contrapuntal technique was built on a solid foundation. He composed symphonic works, concerti, and numerous instrumental and vocal pieces.

Jules Massenet (1842–1912). Composer of "Thais," "Le Jongleur de Notre Dame," "Manon," "Herodiade," and several other operas. He had a graceful, melodious style, an exquisite command of instrumentation, and a typically French taste for beauty. He composed also considerable instrumental music and about 200 songs.

Gustave Charpentier (1860–1956). His opera "Louise," first produced in 1900, was an early attempt at realism. Charpentier was always interested in the welfare of the working classes and his opera has a sewing girl as its heroine.

Immediately after Mozart and Beethoven, the Germanic composers of opera were *Ludwig Spohr* (1784–1859), whose works are virtually forgotten today; *Heinrich Marschner* (1795–1861); *Albert Lortzing* (1801–51), composer of the light opera "Czar und Zimmerman;" *Otto Nicolai* (1810–49), composer of the "Merry Wives of Windsor;" and *Friedrich von Flotow* (1812–83), composer of "Martha" and "Stradella."

Richard Wagner (1813–83). The most original composer and the greatest exponent of dramatic music of all times. Possessed of a powerful and virile intellect, he attained almost equal eminence as poet and musician. In grandeur of conception and in boldness of execution, Wagner was without peer among musical dramatists. Gifted with a thoroughly poetic nature, he penned his own poems from the outset, and, in all his creations, made the preservation of the dramatico-musical unity his objective. Only in the co-ordinated co-operation of musical, dramatic, and scenic means of expression could he see the realization of his idea of a genuine musical drama.

Wagner made his orchestra the exponent of the dramatic action. By means of highly individualized, reminiscent *leading motives*, used sometimes singly in bold relief, sometimes subtly intertwined and varied, he clearly presented the ever changing moods and emotions of the characters, elucidated the plot, and achieved a broader organic connection between various parts of the dramatic situation. All of Wagner's *leitmotifs* are remarkable for their realism and the exactness with which they fit that emotion, person, or situation which they are meant to represent.

Growth of Wagner's Art.—Of Wagner's first operas, "Die Feen," "Das Liebesverbot," and "Rienzi," it may be said briefly that they represent his immature, formative period. The real Wagner begins with "The Flying Dutchman." In "Tannhäuser" his melody becomes more pliable and expressive, and he shows strength in handling the orchestra, which is very significant in view of future results. In "Lohengrin" he makes still more consistent efforts to merge the poetic and musical factors; the music is written, not to exhibit the beauty and dexterity of the singers' voices, but to follow the drama into its smallest details. The customary set pieces (arias, duets, *ensembles*, recitatives, etc.) are thrown aside in the attainment of a continuous and flexible musical current.

The music dramas "Tristan und Isolde" and "Die Meistersinger" represent twin peaks of an elevation of sustained dramatic energy; poetically they are Wagner's most consistent and perfect works. "The Ring of the Nibelung" was developed by Wagner out of the dramatic ballad on Siegfried's death. In individual scenes Wagner rises to the highest pitch in this colossal work. By the power which he displays in expressing every shade of human emotion, and by the surpassing skill with which he forms, develops, and directs his vast and otherwise overwhelming material, he has constructed a masterpiece that stands alone and without equal in the entire history of music.

Like "The Ring of the Nibelung" and "Lohengrin," "Parsifal," Wagner's last work, is an allegory and shares the weaknesses of allegories. It is a sacred musical drama in which the curious blend of religious mysticism and sensuousness is represented musically with wonderful skill, the religious element being presented with utmost reverence and artistic seriousness. The panoramas in this opera are perhaps the most beautiful in the history of the modern stage.

In richness, variety, and novelty of orchestral effects, in chromatic and enharmonic modulations, in rhythmic contrast, and in the fertility and originality of contrapuntal combinations and thematic exploitation, Wagner is wholly without parallel. The supreme greatness of Wagner's musical genius is now almost universally acknowledged. His works, both literary and dramatic, are an inexhaustible storehouse of instruction and suggestion to composers. Speaking in the broadest sense, Wagner's conception of the mutual relations of music, poetry, and action will henceforth remain the basis of all opera.

Dramatic Works.—"Die Feen" 1833; "Das Liebesverbot" 1836; "Rienzi" 1838–40; "Der Fliegende Holländer" 1841; "Tannhäuser" 1844-45; "Lohengrin" 1846–48; "Das Rheingold" 1853-54; "Die Walküre" 1856; "Siegfried" 1869; "Die Götterdämmerung" 1874; "Tristan und Isolde" 1859; "Die Meistersinger von Nürnberg" 1867; "Parsifal" 1882.

Orchestral and Choral Works.—"Symphony in C"; "Faust" Overture; "Siegfried" Idyl; "Kaiser" March; "Das Liebesmahl der Apostel," for chorus and orchestra; a few piano pieces and songs.

After Wagner the principal 19th century German composers of opera were *Karl Goldmark* (1830–1915) with "The Queen of Sheba" and "Merlin," and *Engelbert Humperdinck* (1854–1921) with "Hänsel und Gretel" and "Königskinder."

England during the 19th century was noted chiefly for light operas. It is true that "The Bohemian Girl" by *Michael Balfe* (1808–70) is performed in grand opera houses, but it is distinctly a comic opera. The most distinguished of all British composers of opera

was *Arthur Sullivan* (1842–1900) who in collaboration with *William S. Gilbert* produced the most delightful series of satirical comic operas the world has ever known; among them "Trial by Jury," "H.M.S. Pinafore," "The Pirates of Penzance," "Iolanthe," "The Mikado," "The Yeoman of the Guard," "The Gondoliers," "Ruddygore," and "The Sorcerer." Sullivan was also the composer of a serious opera, "Ivanhoe," and of a considerable amount of sacred music.

Russian operas of the latter 19th century include many works of nationalist significance: "Russlan and Ludmilla" and "A Life for the Czar," by Glinka; "Prince Igor" by Borodin; "Boris Godounoff" by Mussorgsky; "L'Coq d'Or" and "The Snow Maiden" by Rimski-Korsakov; and "Eugene Onegin" and "Pique Dame" by Tchaikovsky—composers who are discussed under Nationalist and Post-Romantic headings.

POST-ROMANTICISM

After the middle of the 19th century the Romantic movement continued with composers who wrote both absolute and program music, and who carried romantic ideals almost to decadence, some of them making romanticism verge on the over-sentimental or neurotic, and others, like Richard Strauss, applying more advanced harmonies and instrumental techniques to writing descriptive, or program music.

Anton Rubinstein (1829–94). A Russian pianist, one of the greatest virtuosi of all time, who had enormous ambitions as a composer. He was most prolific and wrote in almost every form and for every medium. His music was facile and melodious, but it is not performed often today, partly because it lacked finish and technical skill, and principally because its musical content was shallow and superficial.

Peter Ilyitch Tchaikovsky (1840–93). A great Russian composer, whose 4th, 5th, and 6th symphonies have for years been among the most popular works on orchestral programs. As a composer, Tchaikovsky expressed his emotions intimately and unashamedly. His was a neurotic nature and he never hesitated to move his listeners profoundly by voicing his moods of sadness and even despair. He was able to make his audiences experience his own feelings through his command of modern instrumentation and his genius for writing luscious melodies and warm, mellow harmonies. In addition to his six symphonies Tchaikovsky composed several tone-poems for orchestra, two concerti for piano and one for violin, a number of overtures, 11 operas, of which "Eugene Onegin" and "Pique Dame" are best known today, several string quartets and a trio, many songs, numerous piano pieces, and choral works.

Gustav Mahler (1860–1911). One of the world's great orchestral conductors. As a composer he wrote 9 symphonies, and other large works utilizing all the resources of the modern orchestra, often with choral groups added. His musical conceptions were on a grand scale, sometimes grandiose.

Richard Strauss (1864 1949). One of the great composers of the late 19th and early 20th century. In his early works he composed in a classic-romantic manner derived directly from the Schumann-Brahms school. Then, from 1887, he produced a series of tone-poems which expanded the form that Liszt had developed and used modern dissonances and the increased resources of the symphony orchestra to achieve realistic effects which described vividly the characters and narratives he chose for his subjects. These tone-poems include "Don Juan," "Tod und Verklärung," "Till Eulenspiegel," "Also sprach Zarathustra," "Don Quixote," "Ein Heldenleben," as well as the "Sinfonia domestica." As an opera composer Strauss wrote "Salome" and "Elektra," which contemporary music lovers hailed as being at the outposts of modernism, and also the delightful "Der Rosenkavalier."

Jean Sibelius (1865–1957). A Finnish composer whose symphonies have become enormously popular in recent years. At first Sibelius composed in the manner of Tchaikovsky, but he later developed an idiom of his own which is highly individual and typically Scandinavian in character. In spirit he was distinctly a romanticist, heroic and epic, expressing with rare eloquence the aspirations of his Finnish countrymen. He composed 7 symphonies, a violin concerto, and many tone-poems, of which "Finlandia" has become a concert favorite.

Sergei Rachmaninov (1873–1943). An eminent Russian composer-pianist, who in his compositions carried on the traditions of Tchaikovsky. His early fame was spread by a piano piece, the Prelude in C Sharp Minor, which became so famous that it obscured the other far greater works he was composing. He possessed a splendid command of the technique of composition and a finely developed sense of tonal beauty. He avoided the contemporary trends of impressionism and futurism and his genius for haunting melodies and warm harmonies have made his works prime favorites in the concert hall. He composed several piano concerti, of which the second is the most popular; several symphonies; a number of orchestral tone-poems; and a vast body of piano works.

Others of the 19th century composers who have lived into the 20th century are the French *Vincent d'Indy* (1851–1931), who continued the traditions of César Franck, and *Paul Dukas* (1865–1935), composer of the orchestral scherzo, "The Sorcerer's Apprentice;" *Xavier Scharwenka* (1850–1924), born in East Prussia and composer of the still popular "Polish National Dance;" *Moritz Moskowski* (1854–1925), who, like *Cécile Chaminade* (1861–1944), supplied the world with sparkling salon pieces, or light classics; and *Ignace Paderewski* (1860–1941), the great pianist and one-time premier of Poland who composed in many forms, including an opera, "Manru," and many works for piano. *Hugo Wolf* (1860–1903) carried the German *lied* to a more modern expression. In writing his songs he identified himself closely with the poets of the texts, and vitalized the true meaning of the poems. A 20th century composer who is distinctly a post-romanticist and not a modernist is the Hungarian *Ernst von Dohnanyi* (1877–1960), composer of orchestral works, chamber music, and piano compositions.

NATIONALISM

Nineteenth century political and economic upheavals resulted not only in the Romantic movement in the arts but also in nationalistic tendencies. With old barriers abolished and with small duchies overthrown, it became apparent that people speaking the same language should be politically united as nations. As these nations were formed their racial and cultural traditions and the underlying temperaments of their peoples were expressed in folk-songs and in the more cultivated art of certain of their writers and composers. Particularly in cases where the people of a nation were oppressed, either by their own rulers or by foreign conquerors, music and art were a poignant expression of nationalistic feelings and aspirations.

In Russia, Tchaikovsky, although typically Slavic, was too universal in his appeal to be considered merely as a nationalist, for in his style he combined certain Russian traits with much that he had learned from the Germans and Italians. There was, however, a group of Russian composers who were highly nationalistic, and who often used in their works the folk songs of the Russian people. The pioneer of this Russian nationalistic school was *Michail Glinka* (1803–57) whose opera "Russlan and Ludmilla" was so true to the life of the lower classes of Russian society that some of the aristocrats sneeringly called it "the music of coachmen." Among the followers of Glinka was *Mili Alexeyevich Balakirev*

(1837–1910), composer of a number of orchestral works, including the Oriental Fantasia "Islamey." He gathered about him a group of younger musicians and inspired them with his own enthusiasm for a typically Russian music. His pupils included *Alexander Borodin* (1834–87), composer of the opera "Prince Igor" and many instrumental works; *César Cui* (1835–1918) and the famous Mussorgsky and Rimski-Korsakov.

Modest Mussorgsky (1839–81). A great natural genius who was somewhat musically uncouth, but who was a rugged pioneer, primarily concerned with writing music that would be natural and sincere. His music represented a complete break with the Wagnerian tradition, for he escaped the German and Italian influences that dominated the late century romanticists, including Tchaikovsky. His works seem to grow directly from Russian folk songs. His disregard of the rules of harmony resulted in a harmonic freedom which set a precedent for the modern composers of the 20th century. Mussorgsky is known most widely for his operatic masterpiece, "Boris Godounov," but he composed other operas, among them "Khovantchina," and "The Fair at Sorochintzky," as well as orchestral works, including "A Night on Bare Mountain," and numerous choral works, songs, and piano pieces.

Nicholas Rimski-Korsakov (1844–1908). One of the most brilliant of Russian composers, who combined Slavic traits with Oriental background and coloring. Through study with Balakirev and by rigid self-training he acquired complete mastery of the technique of composition and instrumentation, and was thus able to express to the full his fertile imagination. His works include many symphonic poems and suites, such as the highly popular "Scheherazade" and the "Capriccio Espagnol;" operas, including "L'Coq d'Or," "The Snow Maiden," "Sadko," and "The Czar's Bride;" and numerous chamber music works.

Others of the Russian school at the turn of the century included *Michail Ippolitov-Ivanov* (1859–1935), composer of the popular "Caucasian Sketches;" *Anton Arensky* (1861–1906); *Alexander Glazounov* (1865–1936), composer of the ballet "Raymonda;" *Reinhold Glière* (1875–1956); and *Alexander Gretchaninov* (1864–1956), who spent his later years in the United States.

Igor Stravinsky (1882–). One of the leading composers of modern times. He could logically be discussed in the section on 20th century experimentalists, but he was at one time so much a disciple of his teacher Rimski-Korsakov that he belongs definitely to the Russian group. In his earliest works Stravinsky was somewhat academic, but starting with his ballet "The Fire Bird," he became a true disciple of Rimski-Korsakov and an exponent of the Russian national school. With "Petrouchka," another ballet, he became more advanced harmonically and introduced *polytonality*, or the sounding of two or more tonalities, or keys, simultaneously. With the "Rite of Spring," ("Le Sacré du Printemps"), Stravinsky abandoned all traces of romanticism and carried the realism he had used in "Petrouchka" to an absolute primitivism. This music was so dissonant that it caused a riot when it was first performed in Paris (1913). Stravinsky next became interested in Russian folk-lore, and then in American jazz. In 1920 he changed his style to what is known as neo-classicism, and returned to classic ideals treated in modern fashion.

Serge Prokofieff (1891–1953). Another pupil of Rimski-Korsakov, who with his "Classical Symphony" was at one time distinctly a neo-classicist. Unlike Stravinsky, who had no sympathy with the Russian Revolution and the Soviet, Prokofieff has lent his talents to advancing the Communist cause. His works include an opera, "The Love of Three Oranges," a ballet "The Age of Steel," the musical fairy tale, "Peter and the Wolf," and many purely instrumental works—five piano concerti, 2 violin concerti, a cello concerto, and four symphonies.

Dmitri Shostakovich (1906–). One of the most discussed of the 20th-century composers, who ranks with Stravinsky and Prokofieff as one of the three most important of modern Russian composers. Shostakovitch is particularly interesting as a creative artist who has adapted his work to social and political change, to the tastes of a mass public, and to the requirements of a totalitarian state. Most of his works have political significance, particularly his 7th symphony, which was dedicated to the struggle against Fascism. Up to 1946 Shostakovich had composed 9 symphonies, an opera "Lady Macbeth of Mzensk," a piano concerto, chamber music, and numerous piano works.

Czechoslovakia was typical of oppressed countries whose composers produced highly nationalistic music. Under the rule of the Austrian Habsburgs the Czechs were forbidden to speak their own language, but national feeling was kept alive, and when the restrictions were eased in 1859 creative artists filled their works with the national spirit of their countrymen. *Friedrich Smetana* (1824–84) was one of the leaders, and his opera "The Bohemian Girl" was filled with the songs and dances of his homeland. He was followed by *Antonin Dvořák* (1841–1904) whose "Slavonic Dances" picture the life and temperament of the Czech people. During his few years residence in the United States in the 1890's Dvořák tried to show Americans how they could become nationalists and composed his "New World" symphony as an example. In the 20th century *Jeromir Weinberger* (1896–) continued the Czech tradition with his opera "Schwanda."

In Spain the leaders of the modern nationalists have been *Isaac Albéniz* (1860–1909), *Enrique Granados* (1867–1916), *Manuel de Falla* (1876–1946), *Carlos Pedrell* (1878–1941), and *Joaquin Turina* (1882–1949).

Edvard Grieg (1843–1907) belonged to the late romanticists, yet his work was so filled with either actual Norwegian folk songs, or else the spirit of native Norwegian music, that he was distinctly a nationalist. Grieg is most widely known for his smaller pieces, but such major works as his Piano Concerto and his "Peer Gynt" suite are concert favorites the world over.

In Italy a group of modern composers has been more preoccupied in symphonic music than in the operatic tradition of their earlier countrymen: notably *Ottorino Respighi* (1879–1936), composer of the symphonic poems "Fountains of Rome" and "Pines of Rome;" *Ildebrando Pizzetti* (1880–); *Gian Francesco Malipiero* (1882–); and *Alfredo Casella* (1883–1947).

Others of the modern nationalist composers are the Polish *Karol Szymanowski* (1883–1937) and *Alexander Tansman* (1897–); the Rumanian *Georges Enesco* (1881–1955); and the Hungarian *Zoltán Kodály* (1882–) as well as his countryman *Béla Bartók*, who is discussed in the section on 20th century innovations. Likewise, the modern French composers, from Debussy and Ravel.

In England the Anglo-Saxon tradition has been carried on by such typically British composers as *Edward German* (1862–1936), whose incidental music to "Henry VIII" contained several charming dances which have been popular on light programs. *Arthur Sullivan* is discussed in the section on Opera. His younger colleague, *Sir Edward Elgar* (1857–1934) composed 2 symphonies, a concerto for violin and one for cello, many orchestral and chamber music works, choral music, songs and instrumental pieces. *Frederick Delius* (1863–1934) had an exquisite talent and wrote somewhat in the delicate style of the impressionists. Other British composers who have bridged the 19th and 20th centuries were *Gustav*

Holst (1874–1934), *Frank Bridge* (1879–1941), *John Ireland* (1879–1962), *Ralph Vaughn Williams* (1872–1958), *Josef Holbrooke* (1878–1958), and *Sir Arnold Bax* (1883–1953). Of more recent date is *Benjamin Britten* (1913–), with his operas "Peter Grimes," "Rape of Lucrece," "Billy Budd," and "Gloriana," composed for the coronation of Elizabeth II.

Latin-America has produced many nationalistic composers, largely because the folk songs and dances of the Central and South American republics are highly individual and lend themselves to incorporation in larger works. In Brazil *Heitor Villa-Lobos* (1881–1959) led in perpetuating the national heritage and traditions; in Mexico *Carlos Chavez* (1899–) concerns himself with the ancient lore and musical customs of the Aztecs; in the Argentine there are the *Castro* brothers—*Jose Maria* (1892–), *Juan Jose* (1895–), and *Washington* (1909–)—and the older *Alberto Williams* (1862–1952); while Cuba has produced *Ernesto Lecuona* (1896–), who has written serious compositions as well as many popular songs.

20TH CENTURY INNOVATIONS

Radical changes have occurred in the music of modern times, to such an extent that much of it seems inexcusable noise to conservative ears. Just as the social and political conventions of the 19th century have been overthrown, so have the academic and romantic traditions of music given way to freer idioms which more vividly express the increasing complexity of human existence, the advance of science and invention, and the turmoil of political and social upheavals.

In the last decades of the 19th century the increasing use of dissonance by Richard Strauss was considered "modern," even though Strauss was actually a post-romanticist. Today these works of Strauss are looked upon as almost conventional. What the 20th century considers modern music actually began with the impressionist movement which started in France at the end of the century.

Claude Achille Debussy (1862–1918). Generally acknowledged the founder of the impressionist school in music. His association with the impressionist painters Monet, Manet, Degas, and Renoir, and such symbolist poets as Mallarmé, led him to create a similar style in music and to compose works of shimmering beauty, characterized by vague, filmy, atmospheric effects, and marked by delicate tints rather than by solid tonal colors.

Debussy's impressionism was a reaction against realism and the soaring romanticism of Wagner. It is sentimental, yet it avoids the grand manner and substitutes veiled, mystic half-shadows for the heroics of the Germanic composers. Harmonically, Debussy was most influenced by the work of the Russian Mussorgsky and, like Mussorgsky, he rebelled against the rules that forbade the use of consecutive fifths and octaves and which insisted on the conventional resolution of dissonances. He used the whole-toned scale and chords of the 9th and the 11th, and he reveled in dissonances that could be explained by no other reason than that they expressed what the composer wanted to say.

Debussy's major works include the opera "Pelléas et Mélisande," the ballet "Prélude à l'Aprèsmidi d'un faune," the orchestral "Nocturnes," the symphonic poems "La Mer" and "Images," a String Quartet, and many piano pieces and songs. He was important not only for the works he composed but also for his influence on other composers. Among his contemporaries in France *Erik Satie* (1866–1925) was a companion who helped Debussy clarify his ideas and who himself composed unorthodox pieces which were satirical and ironic. *Florent Schmitt* (1870–1958) was an impressionist in his Quintet for piano and strings.

Alexander Scriabin (1872–1915). A Russian composer who started as a follower of Chopin and Liszt, but who like Debussy became dissatisfied with harmonic restrictions. Under the influence of theosophists he grew into something of a mystic. His works include many piano pieces in romantic vein and, later, the more advanced "Poem of Ecstasy" and "Prometheus" for orchestra.

Maurice Ravel (1875–1937). A French composer who used many devices of the impressionists and who also made experiments of his own, particularly in the field of polytonality. Ravel's "Bolero" has enjoyed a vogue comparable to that of a popular song and his "Pavane pour une enfante defunte" was actually adapted to sentimental words and sung nightly on the radio and in night clubs. His major works include the orchestral "Rapsodie Espagnole," and the ballet "Daphnis et Chloé," two piano concerti, much chamber music, and a long list of piano pieces and songs.

The use of polytonality which was developed by Ravel was actually foreshadowed in the earlier works of Richard Strauss, and even very sparingly by such classicists as Beethoven, but it is only in the music of more recent composers that the composing of a piece in several keys or tonalities simultaneously has become common practice. Among those who have made extensive use of polytonality are the French composers *Darius Milhaud* (1892-), *Arthur Honneger* (1892–1955) whose "Pacific 231," described vividly the night journey of a locomotive, *Francis Poulenc* (1899–), and *Georges Auric* (1899–). In Hungary, *Béla Bartók* (1881–1945) used polytonal harmonies as early as 1912.

Arnold Schoenberg (1874–1951). The Vienna-born composer, who at one time lived in America, is acknowledged to be the chief exponent of atonalism. In his early years he was a combination of romanticist and impressionist, as exemplified in his "Verklaerte Nacht" for strings and his symphonic poem "Pelleas und Melisande." In his Opus 23, "Five Piano Pieces," Schoenberg began to develop his atonal ideas, as well as in his "Pierrot Lunaire" (1912), for voice and chamber orchestra. His works include four String Quartets, a Violin Concerto, orchestral music, songs, and choral works.

His atonality is based for the most part on the twelve-tone row which is derived from the twelve tones of the chromatic scale. From these tones, arranged in any manner by the composer, each becomes equal to each of the others. It is more than a chromatic scale, it is a series of eleven intervals forming a melody with its unique sound. Any order is permissible, but the entire series must be used before any tone can be repeated. The row is simply a succession of tones until rhythmic differentiation is assigned. The row may be used in the original form, in retrograde, by inversion, or by retrograde inversion. The result is highly dissonant, and the atonalists have made a conscious effort to eliminate consonant combinations.

Aside from Schoenberg, the most significant atonalist was his pupil and disciple, *Alban Berg* (1885–1935), composer of the atonal operas "Wozzeck" and "Lulu" and a violin concerto. Others of Schoenberg's followers include *Anton von Webern* (1883–1945), and *Egon Wellesz* (1885–).

Paul Hindemith (1895–1963). The German-born composer who led an extremely rich life in music—from the most practical to the most theoretical. A conductor, a performer on the viola, an inspiring teacher who has left textbooks in basic musicianship and harmony, and a theorist and composer who has left examples of theories in his multitude of compositions. He was known at one time or another as a young radical, a wild expressionist, a neo-classicist, a mature, respected neo-romanticist, and even a reactionary. His main works include three full-length operas, three ballets, large orchestral works, choral works with orchestra, six string quartets and other chamber music, sonatas for almost every orchestral instrument with

piano, three sonatas for piano, and songs with piano and with instruments.

He was interested in writing music for the people (that is, the working people who performed music as amateurs and composed much music for amateur groups.) These pieces are called "Gebrauchsmusik," —everyday music, useful or functional music.

Other composers identified with this area were Ernest Krenek (1900–) and Kurt Weill (1900–1950), both of whom lived in the United States, Krenek as a composer and teacher, and Weil as a composer for motion pictures and Broadway productions.

Still another group of 20th century composers are concerned with a more minute division of the musical scale than the traditional division into twelve semitones. These men hold that music can be made more expressive if there are more tones available within the octave. To this end they have devised instruments which will produce quarter-tones; third-, sixth-, eighth-, and even sixteenth-tones. One of the pioneers in using smaller intervals was the pianist *Feruccio Busoni* (1866–1924), who experimented with third-tones. More recently *Alois Hába* (1893–), a Czechoslovakian, has written many quarter-tone compositions, and the Mexican *Julián Carillo* (1875–) has composed music for especially constructed instruments which play quarter-, eighth-, and sixteenth-tones.

AMERICAN MUSIC

The Psalm singing of the New England Puritans and Pilgrims was the earliest music of European settlers on the North American continent, of which we have adequate record. During the 17th century, from 1620, the singing of Psalms was practically the only music activity of the Colonists. Records exist which show that there were a few musical instruments in the Colonies toward the close of the century, but it was not until the 1700's that secular music activities grew to any perceptible proportions.

For the singing of Psalms the Pilgrims in Plymouth brought with them the "Ainsworth" Psalter and the Puritans in Massachusetts Bay the "Sternhold & Hopkins" collection. In 1640 the Boston Puritans published a Psalter of their own, popularly called the "Bay Psalm Book." In its early editions this work contained no music, and for a full half century the tunes were sung from memory. In 1698 a new edition of the book contained the music for thirteen tunes, and early in the 18th century the more progressive churchmen urged that the congregations learn to sing by note. Overcoming the opposition of the reactionaries, those who advocated improved singing published instruction books which gradually led to the formation of "singing schools" and eventually to church choirs.

The earliest of the printed music collections to contain original compositions by American composers were the "Urania" by *James Lyon* (1735–94) published in 1761, and a series of six books compiled by *William Billings* (1746–1800), the first issued in 1770. Lyon was the second native composer of whom there is record, and Billings the third. Billings, however, was the first native American to make the composing of music his profession. Dissatisfied with the simple cadence of Psalm-tunes, he ambitiously attempted what he called "fuguing pieces," which were pioneer attempts at imitative counterpoint. In his own time Billings became well known and his music was widely performed. During the late 19th and early 20th centuries it fell into disuse and was considered altogether primitive and inexpert. In recent years it has been rediscovered and recognized as rugged and vital, and altogether representative of our early days as a nation.

The New England Puritans were opposed to the use of pipe organs in church services. The earliest organ to be imported was installed in a Swedish church in Philadelphia, 1703. In 1711 Thomas Brattle of Boston imported an organ from England and bequeathed it to the Brattle Square church, which rejected it, and in 1713 it was installed in the Episcopal King's Chapel. This instrument is still extant, in playable condition, at St. John's church, Portsmouth, N. H. Although Episcopal churches welcomed organs, the Puritan congregations were so opposed to them that as late as 1800 there were only twenty church organs in New England, and no more, in proportion to the population, in other parts of the country.

Secular music activity and the giving of concerts started in the early 18th century. The earliest concert of record was presented in Boston in 1731; the second in Charleston, S. C., in 1732; the third in New York, 1736; and the fourth in Philadelphia, 1757. From these dates each of these cities enjoyed an increasing number of musical affairs, with programs similar to those given in London, from whence the latest music published was sent regularly to the Colonies. At Bethlehem, Pa., the Moravian colony, established in 1741, was a music center from its earliest days. The settlers brought their music and instruments with them and they formed an orchestra, chamber music groups, and a choral society. A number of the Colonists were composers and wrote music which was performed by the settlers.

The first known native-born composer of music was *Francis Hopkinson* (1737–91), a signer of the Declaration of Independence, and a judge of the Admiralty. He composed a number of songs in the current English manner of Shield, Storace, and Arnold. The manuscript of his first known song, "My Days Have Been So Wondrous Free," is dated 1759. Hopkinson was a leader in a group of music amateurs who met in each other's homes to play together, and who joined with professional musicians in giving concerts.

After the Revolutionary War foreign musicians came to America in large numbers. They were better trained than the native Americans and for many years they took over the musical life of the nation and became its principal concert artists and teachers. By the early 19th century these foreign artists had themselves become Americans, and gradually native-born musicians began again to take part in the musical life. The most widely known of the native-born American composers in this period was *Lowell Mason* (1792–1872), a composer of hymn-tunes and a pioneer in music education.

Some of our early composers began to have a national consciousness and were eager to write music which would stem from American soil. While the formal music of the concert hall was slowly developing along the lines of European models, the popular balladry of the day was producing several musicians, principally song writers, who were actually writing something which seemed at the time to have only passing value, but which was far more expressive of American life than the more ambitious attempts of the so-called serious composers. Many of the songs of this period were popular songs written for the minstrel shows, a type of entertainment which began in the 1830's and 1840's in imitation of the singing, dances, and humor of the Negro. These white-men's songs of the minstrel show were influenced somewhat by actual Negro singing, but they were shaped also by Scotch and English popular songs.

Stephen Collins Foster (1826–64). Composer of dozens of songs which have become American folk-songs, most of them written for the minstrel shows. Foster's songs were based on several phases of American life: the Southern plantations ("Old Folks at Home," "Massa's in de Cold, Cold Ground"); rollicking good humor and nonsense ("Oh! Susanna," "Camptown Races"); and a 19th century nostalgic sentiment which seemed the American counterpart of the romantic movement in Europe ("Come Where My Love Lies Dreaming," "Jeanie With the Light Brown Hair").

The Central Europe revolutions of 1848 caused another wholesale influx of foreigners, mostly Germans. They settled not only in the seaboard cities but inland as well, and they became the principal musicians and teachers of nearly every American community. They saturated the country with German ideas and idioms so that German music became the model on which most American composers of the day based their own work. Americans studied at home with German trained teachers and to complete their studies went to Germany to work with German masters.

In the latter half of the 19th century there was an increasing number of American composers who had success in writing in the larger forms. Among the first was *John Knowles Paine* (1839–1906), who studied at home and in Germany, and whose first symphony was performed in 1876 by the Theodore Thomas orchestra. Contemporary with Paine was *Dudley Buck* (1839–1909), whose music was largely written for the Church and for choruses. In Boston Paine was the eldest member of a circle of composers which became known as the "Boston Group," and which included *George W. Chadwick* (1854–1931), *Arthur Foote* (1853–1937), *Horatio Parker* (1863–1919), *Mrs. H. H. A. Beach* (1867–1944), *Edgar Stillman Kelley* (1857–1944), and others. These composers were extremely talented and wrote music which was individual to a considerable degree, but they were influenced largely by European music.

Edward A. MacDowell (1861–1908). A contemporary of the Boston group but distinctly an individualist, MacDowell developed a style of his own whose melodic and harmonic idiom reflected his Celtic ancestry and his romantic spirit. His piano pieces have been widely played ("Woodland Sketches," "Sea Pieces") and his orchestral "Indian Suite" and his Second Piano Concerto are still favorites in concert repertoire.

In the 1890's, the Bohemian composer *Anton Dvořák*, an intense nationalist, spent four seasons teaching at the National Conservatory in New York. Deeply impressed by the native folk material he heard in America, particularly the "spirituals" of the Negro and the songs of the American Indian, he urged his American pupils to turn to these sources for melodic material. This advice caused many young composers to follow Dvorák's example by incorporating the spirit if not always the actual themes of these folk-sources in their own works, and to make them something that would express the peculiarities of the American temperament.

The older composers of the 20th century include *Frederick S. Converse* (1871–1940), *John Alden Carpenter* (1876–1951), *Henry Hadley* (1871–1937), *Daniel Gregory Mason* (1873–1953), *Charles Wakefield Cadman* (1881–1946), *Deems Taylor* (1885–), *Charles T. Griffes* (1884–1920), and others whose works have been widely played. Somewhat younger than these are many who have succeeded in adopting a contemporary viewpoint without experimenting with extreme radical departures from accepted tradition; among them are *Roy Harris* (1898–), *Howard Hanson* (1896–), *Walter Piston* (1894–), *Aaron Copland* (1900–), *Virgil Thomson* (1896–), and *William Grant Still* (1895–). Still a younger group, including those who were born since 1900 and who are imbued with a typically 20th-century point of view, numbers such men as *Paul Creston* (1906–), *Otto Luening* (1900–), *Vittorio Giannini* (1903–), *Normand Lockwood* (1906–), *Boris Koutzen* (1901–), *Marc Blitzstein* (1905–1964), *William Schuman* (1910–), *Samuel Barber* (1910–), *Gian Carlo-Menotti* (1911–), *Bernard Herrmann* (1911–), *Leonard Bernstein* (1918–), *Morton Gould* (1913–), *David Diamond* (1915–), *Paul Bowles* (1911–), and *Robert McBride* (1911–).

A number of American composers have been radical experimenters. The dean of this group is *Charles E. Ives* (1874–1954), who started to use polyharmonies, atonalism, and rhythmic intricacies long before Stavinsky and Schoenberg had dropped more conservative patterns. In recent years Ives has won considerable recognition and his works have been frequently played. The French-born Edgar Varese has experimented with rhythmic complexity which sacrifices melody and harmony. *Joseph Schillinger* (1895–1943) worked out mathematical formulae for composing and taught them to many of our American composers, including *George Gershwin*. *Leo Ornstein* (1895–) and *Henry Cowell* (1897–) have separately experimented with so-called tone clusters, or groups of notes sounded simultaneously. *Adolph Weiss* (1891–), a pupil of Schoenberg, has been an atonalist.

In the field of light music the United States has made one of its most important contributions to the music of the world. In the 19th century Stephen Foster wrote songs which are sung in every nation of the globe, and at the turn of the century the stirring marches of *John Philip Sousa* (1854–1932) became so well known abroad, as well as at home, that many foreigners thought that his "Stars and Stripes Forever" was the American National anthem. Starting in the late 19th century and continuing until the early 1920's, the Irish-born *Victor Herbert* (1859–1924) composed music for operettas which was so individual and melodious that it is still widely played. In more recent years the American operetta tradition has been continued by such composers as *Jerome Kern* (1885–1945), whose "Showboat" is a masterpiece, and by *Richard Rodgers* (1902–), composer of "Oklahoma," "South Pacific," and many others. Critics may deplore the "sentimentality" of *Sigmund Romberg* (1887–1951), but "The Desert Song," and "The Student Prince" will nevertheless remain lasting favorites with his many admirers. *Meredith Willson* (1902–), whose background includes experience as flutist with Sousa's band, wove the American tradition skillfully into "The Music Man," which has an appealing holiday spirit. Russian-born *Irving Berlin* (1888–) has written scores for musical comedies as well as individual songs which have inaugurated new styles in music of this type.

During the 1890's writers of popular music started borrowing from the Negroes a form of syncopation which became known as "ragtime". In the 20th century this developed into "jazz" and later into "swing" music. Jazz music is distinguished by the instrumentation of the orchestra that plays it, by definite melody and melodic traits ("blue" notes, dissonant chords, etc.) and by the complexity of its rhythm. It is generally supposed that jazz originated among the Negroes in New Orleans and beginning in 1915 spread rapidly throughout the nation. At first it was largely extemporized and distinctly of the "hot" variety. Then such bandleaders as *Paul Whiteman* (1890–) and such composer-arrangers as *Ferde Grofe* (1892–) developed the "sweet" variety of jazz, with mellow, softer effects. In the 1930's the extemporized, or "hot" variety became popular again, played by such popular bandleaders as Louis Armstrong and Benny Goodman. Its new name was "swing."

Present-day jazz follows two main streams: one directly derived from the folk art of Negro musicians and from the "blues" of the untrained colored singer, and the other a commercialized Broadway product, more formalized and cut to definite patterns.

Jazz has exercised a tremendous influence on the serious art-music of both American and European composers. In the United States it produced the works of *George Gershwin* (1898–1937), who started his career as a composer of highly individual popular songs and of scores for musical comedies. Then he composed his "Rhapsody in Blue" (1924), for piano, and orchestra, which immediately became recognized as a work of symphonic proportions definitely based on a native American idiom. This was followed by a Piano Concerto using jazz patterns, by a

symphonic poem "An American in Paris," and by an opera, "Porgy and Bess," Other American composers who have experimented with jazz in larger works include John Alden Carpenter, Aaron Copland, William Grant Still, *Louis Gruenberg* (1884–), and many others. The European composers who have based works on its patterns include Igor Stravinsky, Erik Satie. Darius Milhaud, Alexander Honegger, Ernst Krenek, and Maurice Ravel.

MUSICAL ORGANIZATIONS IN THE UNITED STATES

The singing schools which resulted from the desire to improve Psalm singing in 18th century New England were among the earliest musical organizations in the United States. After these came choral societies, one of the oldest being the famous Handel and Haydn Society, founded in Boston in 1815. This is still active, as is the Musical Fund Society of Philadelphia, founded in 1821. There were also early orchestral societies in the 18th and 19th centuries, but the oldest in existence today is the New York Philharmonic Society, organized in 1842.

The formation of orchestras and *ensemble* groups followed in all parts of the country. In 1864. Theodore Thomas organized his Symphony Soirées in New York, while Chicago produced both the Philharmonic Society (1860) and the Apollo Club. The Harvard Musical Association, established in 1865, became the firm foundation upon which the Boston Symphony Orchestra was built (1881). (Existing symphony orchestras in the United States are listed under *Development of the Orchestra.*) The New York Symphony Society (founded in 1878 and merged with the Philharmonic Society in 1928), the Oratorio Society of New York (1873), and the Cincinnati Festival Association (1873) exerted a very significant influence in elevating the knowledge and appreciation of the public, and presently became potent factors in the formation and success of the musical festival idea.

Cincinnati, for many years the Mecca of German singing societies, held a festival in 1873, conducted by Theodore Thomas, and the festival idea thus engendered led to the regular biennial May festivals held there since that day. The success at Cincinnati led to similar enterprises in Chicago in 1882 and 1884. Portland and Bangor, Maine, have held festivals since 1897, while Springfield, Mass., inaugurated its successful series in 1903. The famous Bach Festival Association of Bethlehem, Pa., started its glorious work in 1900, but omitted its festivals from 1905 to 1911 to permit similar festivals to be given at Berkeley, Cal. The Bohemian Club of California has supported since 1902 a splendid series of festivals called "Grove Plays."

Other important American festivals, with date of founding, are: Ann Arbor May Festival of the University of Michigan (1879); Evanston Music Festivals of Northwestern University (1909); Berkshire Festivals of Chamber-music (1924); Westchester Music Festival, White Plains, N. Y. (1925); Coolidge Festivals, Library of Congress, Washington, D. C. (1925); Festival of American Music, Eastman School, Rochester, N. Y. (1931); Westminster Festival, Princeton, N. J. (1936); Berkshire Symphonic Festivals, Tanglewood (Stockbridge), Mass. (1934).

The leading opera company of the nation is the Metropolitan opera association of New York, which was founded in 1883. This plays a full season in New York, from November to April, gives weekly performances in Philadelphia and Brooklyn, and makes a spring tour of twelve cities. Shorter seasons are offered by San Francisco opera company; Chicago opera company; Boston grand opera company; St. Louis municipal opera; Cincinnati summer opera association; and Philadelphia La Scala opera company, and tours are offered by the La Scala, the Charles L. Wagner, and the Boris Godowsky opera companies.

MUSIC EDUCATION

The growth and scope of music education in the United States began with the work of Lowell Mason when he taught music to children in the public schools of Boston in 1837 without remuneration in order to demonstrate the practicability of his dream that music has a place in the lives of all persons. The early singing school with its emphasis on the reading techniques of music continued through the century with additional emphasis on massed choruses performing much of the 18th and the 19th century standard choral works.

The first organized music methods for the elementary school system by Luther Whiting Mason in 1870 led to a wide acceptance of music in the schools but, due to the shortage of adequately trained specialists, it became the responsibility of the classroom teacher to attend special courses in order to prepare herself to teach music in her classroom. The emphasis continued on the sight-reading aspect of music and it was not until after the turn of the century that other aspects of the music program received attention. Various groups met from time to time to discuss problems and to organize associations for the advancement of music and music education in America. One of the first, the Music Teachers National Association, was organized in 1876. Another, the Music Supervisors National Conference, was formed in 1907. This group became the leaders of the profession and were soon to set standards of performance, teaching, and organization. The name has since been changed to the Music Educators National Conference with six regional conferences meeting biennially in convention to coincide with the national biennial meetings.

It was not until after World War II that the instrumental area was included in school music programs. Following a demonstration in Dallas, Texas, in 1927 at a meeting of the Department of Superintendents of the National Education Association by the National High School Orchestra—an orchestra of 255 players from 38 states—the growth of support for instrumental instruction in the public schools was phenomenal. In 1930, a generally accepted estimate was that there were 30,000 high school and grade school orchestras in the public schools. From 1930 on, the growth of bands was great and threatened to replace the orchestra in the school music program. However, due to increased emphasis in the string program by the Music Educators National Conference and affiliated State Music Associations plus the American String Teachers Association, the number of string performers is on the increase and orchestra participation is again increasing. The National Music Camp at Interlochen, Michigan, developed from an idea of Joseph Maddy, has done much to raise the musical sights of American music education.

The colleges of the United States have made a significant contribution to their music education program by including the education of music specialists as part of the teacher education program. There is great emphasis on educating prospective teachers who are interested in the over-all musical development of the individual child while still allowing time in the curriculum for special attention in small and large performance groups for the more talented students. The National Association of Schools of Music has worked with the Music Educators National Conference in developing curricula and standards which have helped to provide balanced programs in general education, professional education, and specialized music training.

The past several years have seen rapid growth in the recording industry. Today practically the entire literature of music is available on both records and tape recordings. Broadcasts and recordings have been instrumental in helping develop a new audience for concert performances.

FOLK MUSIC

Folk music may be loosely defined as the music (songs, dance tunes, etc.) of communities and peoples, in contrast to art music composed by musically trained individuals. Most often folk songs are of anonymous origin. Sometimes they are composed by groups, with several individuals having a part in the development of a song, each making his own contribution. In rare instances they are of known authorship (i.e. the songs of Stephen Foster), and in such cases the song becomes so much a part of the people who sing it that it becomes far better known than its author. Folk music differs from primitive music in that folk songs are originated and sung by civilized, though rural, peoples, and generally show some influence of art music. Primitive music belongs to races which have no tradition or background of art music.

Nearly every race and nation in the world has had its folk songs, and they generally reveal racial or national characteristics. It is significant also that similar melodies exist among widely separated peoples, showing no doubt the effects of migrations and racial intermingling.

In Germany the folk songs of the nation, the "Volkslieder," many of them dating from the 14th century, have affected the art music of nearly every German composer. Bach, Haydn, Mozart, Beethoven, the romanticists, and Wagner, all used folk melodies in their compositions. In the 15th and 16th centuries Martin Luther adapted folk songs to sacred texts and started the development of the chorale.

In Italy gay romantic songs and colorful dance tunes reflect the sunny Latin climate. These have had an important part in developing the typical Italian music of the 19th century, while in Spain the folk dances and songs are so characteristic of the Spanish peoples that they have helped the art composers of the nation to write a typically nationalistic music. Moreover, Spanish folk music found its way to the Americas, particularly Latin America, where it blended with native elements and produced something that reflected both the mother country and the New World. In France the folk music is grounded on the 12th century songs of the troubadours and trouvères. The songs of southern France are gay and sentimental, while in the north they are more religiously inclined, and more serious.

Russian folk songs are largely modal in character and are based on modes that probably came directly from the ancient Greek modes through the medium of Byzantine priests. Russian folk songs were first written down and collected in 1782. In the section on Russian nationalist composers it is pointed out that many of the Russian composers (Mussorgsky and others) have been influenced by Russian folk songs.

Hungarian folk music has attracted many of the great composers, largely because of its gypsy elements. Franz Liszt and Brahms used Hungarian gypsy tunes in many of their compositions, and before them Haydn, Schubert, and Beethoven showed their fondness for the highly accented dance rhythms which they marked "all' ongarese." At the beginning of the 20th century, Béla Bartók and Zoltán Kodály conducted exhaustive research into the backgrounds of Hungarian folk music, and found that it may be divided into three classes: the old, or archaic, which is based on scales that can be traced back through the Near East to central Asia; newer songs which originated in the 18th century; and a mixed class of songs which contain elements of art music. It was further established that Hungarian gypsy music was merely the gypsy's manner of performing the popular Hungarian art music of the 19th century. The several Balkan nations have colorful folk songs, particularly Yugoslavia and Rumania, while Czechoslovakia is a veritable treasure house of distinctive folk songs and dances.

The Scandinavian countries have produced folk music which has had a profound effect on the composers of those nations. The National Library of Norway contains between three and four thousand melodies which have been written down and collected. Many of them have been preserved for all time by the characteristic transcriptions of Edvard Grieg. In Finland there are more than 15,000 known songs and dance tunes, many of which have been arranged by such Finnish composers as *Selim Palmgren* (1878–1951) and *Robert Kajanus* (1856–1933). Sibelius has been greatly influenced by the folk songs of his native country but has rarely used them for actual themes in his compositions.

The British Isles have produced a wealth of folk songs. The oldest known English folk song is the 13th century "Sumer is icumen in," which is interesting in being a perfect round, or canon. The balladry of England is very old, but although collections were made of them as early as 1650 it was not until the 19th century that collecting the songs for preservation became a scholarly project. The English ballads were generally conceived in narrative form, and dealt with love, sailors and the sea, hunting and poaching, bandits, and other subjects typical of English life and experience. There were also thousands of lyric songs about the green fields of England, the open air, and lovely ladies.

Irish music became widely known throughout England and the world through the publication of *Thomas Moore's* (1779–1852) "Irish Melodies." The first volume of the series was published in 1808, and others continued to be issued until 1828. Moore reduced many of the modal tunes to the modern minor scale and perhaps changed their character materially and sacrificed some of their native beauty. Irish music dates back to several centuries before the Christian era and there are records of harp-playing as early as 1800 B.C. The ancient Irish held their minstrels in high esteem and the bards ranked next to chiefs and kings. Contests of harpers at Tara Castle date from the 6th century and during the 13th century the harpers visited Wales and Scotland and spread the fame of their playing.

Scotland has produced two general types of folk song. The first is the music and balladry of the Lowlands, which has an affinity with the songs of England. The other includes the songs of the Highlands and the Hebrides, which have a relationship with Irish songs. It is believed that the Highland songs are of great antiquity. Some of them are similar to ancient Arabian and Greek tunes, and others are of a Viking flavor, indicating they may have come from the days of the Norse occupation of Scotland. Many Scotch songs are characterized by the so-called "Scotch Snap," a form of syncopation. A number of the old tunes were perpetuated by Robert Burns, who adapted verses of his own to traditional music.

It is known that bards existed in Wales as early as 60 A.D., but it is not certain what tunes they sang and played. It is evident, however, that the ancient Welsh songs are related to the Irish and Scotch Highland songs. The earliest published collection of Welsh folk songs was in 1844.

The North American continent has had both primitive and folk music. The primitive music was that of the Indians, of whose songs there is record from the 17th century. It was not until 1880, however, that serious study was undertaken by scholars and scientific tabulation was made of the various types of melodies. Although there are certain characteristics common to the entire body of American Indian music, which are shared also with the music of other primitive peoples, it is inaccurate to refer to Indian music as a unified body of folk material. The government office of Indian affairs dealt at one time with 342 separate tribes, each of which had its own customs, religion, and music. The songs and dances of most of these tribes were related to tribal customs and generally were intended for practical

purposes—treating the sick, to win success in battle, for playing games, and to accompany ceremonies. The Indians had their own musical instruments—flutes, whistles, rattles, and drums. Although many American composers have attempted to use Indian themes in their compositions, some with noteworthy success, such use has been limited by the fact that the exotic nature, the interval and rhythmic structure, is so far removed from European scales and idioms that the primitive songs lose their character in formalized treatment.

The folk music of the United States may generally be divided into two main classes—that of European origin, and that developed by the African Negroes who were brought to this country as slaves. Each of these elements has had its effect on various types of American folk songs—the cowboy songs, frontier ballads, etc. Anglo-American folk music embraces the many Scotch, Irish, and English ballads which were brought to this country by the early settlers. Some of them are still sung in versions close to the originals, while others have been altered by various groups in different sections of the country. As a consequence countless versions of the same songs exist today. The isolated mountaineers of the Appalachians have continued the singing of these ballads for generations, sometimes in little altered versions and sometimes with the words adapted to the mountain peoples' own experiences.

Although there were references to Negro music as early as 1784, and though the minstrel shows of the early 19th century caricatured the singing and dances of Negroes, it was not until after the Civil War that native Negro singing became known to the country at large. In the 1860's and 1870's colored singers from the several institutes that had been founded for the training of freed Negro slaves travelled through the country, singing their own songs to raise funds for their schools. These tours acquainted other sections of the country with Negro songs, mostly religious in character and called "spirituals." The Negro's religious fervor found a ready response among the church groups for whom the Institute singers performed and large sums were raised in voluntary contributions.

It has never been determined where the melodies came from which the Negro adapted to his spirituals. It is claimed that some of them were brought from Africa in the slave ships, and comparison is made between certain of the Negro spirituals and songs of African primitives. Several traits are common to both: complex rhythmic structure, the use of the pentatonic scale, and constant syncopation. There are others who claim a white origin for the Negro songs, for white evangelists and "revivalists" travelled among the Southern Negroes and sang the songs from their gospel song books. The Negro undoubtedly imitated these songs and adapted their tunes to his own words, yet while it is most likely that the Negro did appropriate many of the white spirituals, he certainly changed them to the idiom he inherited from his African ancestors.

The religious songs, or spirituals, of the Negro form only one part of his folk song literature, even though for many years after the Civil War they were the principal songs which were collected. In recent years there has been an awakened interest in the Negro's secular songs—his work songs, for cotton picking, stevedoring, shucking corn; steamboat songs; and the bad man's songs which include ballads of the prison and the rock pile. Another type of Negro song is the "blues," a song of self pity, generally voicing a carefree philosophy which keeps it from actual despair. The "blues" are characterized rhythmically by syncopation and melodically by a flat seventh and often a flat third. These have become known as "blue" notes. The "blues" have played an important part in jazz music, and in modern times there has come a commercialized variety which is more stereotyped than the unsophisticated and altogether naive folkblues.

Another class of folk songs which has been collected in modern times is that of the Western cowboy. This literature includes songs connected with the cowboy's occupation—cattle lullabies to quiet the animals at night, "dogie" songs to halt stampedes, and rhythmic calls to stir up lagging cattle—as well as sentimental songs and ballads about desperadoes and heroes. Frontiersmen generally have had their own songs—lumberjacks and shantyboys, rivermen, miners, and the pioneers who opened the West in mid-Century.

Although distinct groups in the United States have their own individual folk songs, there is much inter-relation between the groups and between various geographical sections of the country. Certain cowboy songs are similar to songs of the Negroes, some of the Negro songs have their counterpart in the Appalachian mountain songs, and the lumberjacks sing ballads that are similar to certain seachanties. And while hundreds of American folk songs may be traced to foreign origins, they have been so altered and adapted to American surroundings that they are thoroughly expressive of various phases of American life.

MUSICAL ACOUSTICS

Acoustics is that branch of physics which deals with sound: its production, transmission, and reception. The Greek philosopher and mathematician Pythagoras is considered to be the founder of the science of acoustics, for in the 6th century B.C. he discovered the basic ratios for the octave, the fifth, the fourth, the twelfth, and the double octave. In modern times *Herman von Helmholtz* (1821-94) developed a theory of dissonance and consonance which relates the art of music to the science of acoustics.

The Nature of Musical Sound. Sound is produced by vibration. The difference between musical tones and mere noise is that a musical tone is produced by vibrations which are exactly alike, and which follow one another at regular intervals of time, while noise consists of vibrations which are irregular.

A musical tone has three properties,—pitch, intensity or loudness, and timbre or quality. *Pitch* is that property of musical tones which we recognize when we speak of them as high or low. It depends upon the frequency of the vibrations; the greater the number of vibrations, the higher the pitch, etc. *Intensity*, or loudness, of a tone depends upon the amplitude of the vibrations, in other words, upon the distance the vibrating body swings. In the case of a piano string, the loudness of the sound depends upon the force with which the string is struck. The tone producing agency may also consist of an air column, as in an organ pipe, flute, trumpet, oboe; of metal, as in bells, gongs, cymbals; or of stretched skins or parchments, as in the drums and the timpani. *Timbre* or quality is that characteristic of musical tones by which we distinguish from each other the tones which, for instance, are produced by violin, clarinet, cornet, piano, or human voice, although they may be of the same pitch or loudness. It was Helmholtz who discovered that the timbre of a sound depends upon the relative loudness or actual absence of the various partials or overtones which are comprised in any one tone. Helmholtz called this *Klangfarbe*, or "tone color." Tyndall called it "clang tint." Present day English writers usually call it quality.

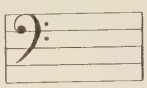
The Perception of Sound. Vibrations of a tone producing body cause air waves to radiate in all directions. Some of these waves strike the eardrum, which in human beings is a thin membrane about two-thirds the size of a dime. From the eardrum the vibrations are transmitted through the bones and fluid of the inner ear to the wonderful "lute of 3000 strings," otherwise known as the organ of Corti, named after its discoverer. The

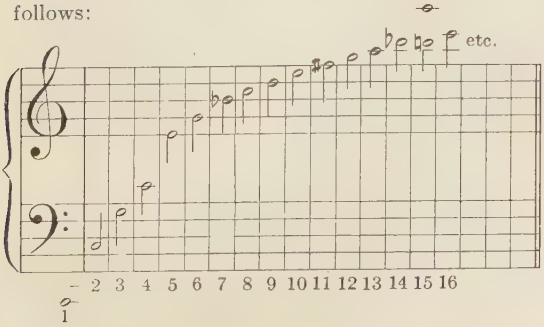
organ of Corti consists of innumerable rods or fibers. It is situated in the cochlea, a bony structure resembling a snail in form, which is part of the inner ear. The sympathetic vibrations of the rods of Corti excite the auditory nerve, which carries the message to the auditory centers of the brain. There the vibrations are transformed, or interpreted as what we call sound.

The ear is a wonderful recording instrument. We are capable of distinguishing tones, not only as pitch vibrations, but as acoustic structures. In other words, we can clearly differentiate between tones of the same pitch but of different timbre. Even though the ability to discern several simultaneous tones varying in pitch and intensity is remarkable in itself, the faculty of differentiating between timbres, as indicated by numberless overtone effects of different strength, really borders on the wonderful. The eye possesses no such power of discernment. If we throw a pebble into a pond a ring of wavelets represents the vibrations. If we throw a handful of pebbles into the water the wavelets caused by the many pebbles cut into each other, conflicting in such a manner that the individuality of each is lost.

Not so with tones. The vibratory frequency (pitch) of each of several tones is received and recorded separately by the ear; the vibrations of every overtone also are separately received and recorded. When we endeavor to conjure up a conception of the complexity of vibratory activity discerned and analytically separated into units or partials by the ear while listening to a simple chord sounded by the different instruments of an orchestra, we realize the marvelous ability of the human ear. Not only is the pitch of the fundamental tones recorded, but the quality-giving overtones of each instrument are vibrating in the labyrinthine waters of the inner ear. A similar composite function is unknown to the eye. Two colors covering each other are not perceived by the eye as separate colors; they are blended to form one compound color. Red and yellow added together are perceived as orange, but the tones C and E do not combine to form a mixture called D, nor do the tone qualities of the clarinet and French horn combine to form the timbre of the saxophone. Each is recorded by the ear as an entity by itself.

Overtones. The ear, affected by perfectly even, periodic vibrations, hears, not only the tone whose pitch is accepted as the standard for the whole tonal effect, but also its *overtones.* The combined sensation Helmholtz has called "Klang." These overtones are due to the fact that tone-producing bodies vibrate, not only as a whole, but also in segments, the halves, thirds, fourths, fifths, etc., producing tones which sound with the fundamental tone produced by the whole vibrating body. The lowest of this series of tones, usually also the strongest, is called the generator or fundamental.

The series of overtones for  is as follows:



Therefore, the total effect produced by periodic vibrations is called "tone" and is composed of a series of separate impressions called partials or overtones. The number which each partial tone has in the above series indicates the ratio of its vibratory frequency to that of the generator, and also, inversely, the size of the section or segment which produces it. For example,— is the fourth partial tone in the series which comprises the full tonal effect known as the tone , has four times as many vibrations as its generator, and is produced by one-fourth of the vibrating body.

It is this analytical separation of a compound vibratory effect, known as tone, into its integral parts which lays the foundation for the theory of music. It explains the relationship of tones to each other, and reveals the principle of consonance and dissonance. Two or more tones are called consonant or dissonant according to the strength of the conflict caused by the generators and the respective overtones. Actually there is no absolute consonance—only a comparative proportion of more or less dissonance.

At (a), in the two tones forming the interval of a perfect fifth, the partials conflict but little. At (b), in the interval of a major third, the conflict is greater, while at (c), in the interval of a major second, conflict is experienced almost throughout the entire range of overtones. Therefore, the relationship between the tones at (a) is closer than that of either (b) or (c), since the consonance is greater. It is seen from this that the theories of tone relation and consonance (or dissonance) go hand in hand.

Musical Acoustics and Musical Effects. For musical acoustics only the simpler overtones (1-10) of a given generator need be considered. The higher, weaker ones (also partly nonharmonic), though perceived and recorded by the ear, merely exert an influence upon the color or timbre of the tone.

It is true that the fundamental alone is strong enough to be distinguished as a tonal entity. If, however, we were to intensify these overtones so that their dynamic strength equaled that of the generator, then we would obtain the real chord—Nature's Harmonic Chord. This, however, is not possible because of the so-called tempered scale. Tempering a scale means tuning it so that the intervals deviate slightly from the acoustically correct intervals used in the system of Pythagoras. In that system the intervals remain perfect within a small

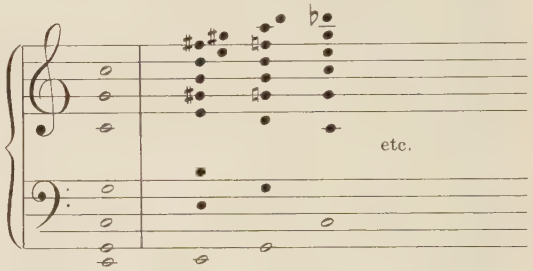
range, but as chromatic tones are introduced the intervals do not add up satisfactorily to produce a perfect octave. Accordingly in equal temperament the octave is divided into twelve equal divisions, and as a result no interval within that octave is acoustically correct or pure. The ear, however, becomes accustomed to these imperfections. Before the tempered scale was perfected it was not possible to modulate satisfactorily from one key to another. It is because keyboard instruments are tuned to the tempered scale that unaccompanied singing or string instrument playing sounds differently from accompanied singing or playing. When a chorus is accompanied by a tempered instrument it follows immediately the interval adjustments of the accompanying instrument. When it sings a capella, or without accompaniment, it is apt to use the true intervals and achieve a natural intonation.

To return to Nature's pure chord, it is because of the fact that we have adopted the tempered scale of equidistant half steps that we can only approximate this absolutely pure chord. In other words, we may substitute for the lightly intoned partials the real tones of the scale, which approximate their pitch values, and so obtain a chord which contains a root, major third, perfect fifth, minor seventh, and a major ninth, our dominant ninth chord, C E G B♭ D. If, optionally, only part of this structure is desired, the incomplete forms, C E G B♭ or C E G would be available. From this it is obvious that the dominant ninth, the dominant seventh, and the major triad are all acoustic entities. Practice has long ignored the slight pitch variation which is known to exist between these chords, as formed from the materials of the tempered scale, and Nature's own chords. Even upon tempered instruments, as, for instance, the pianoforte, experiments reveal the fact that all diatonic tones respond to acoustic tests by sympathetic vibration clearly enough to justify the assumption that they approximate the overtones of the nature chord. In other words, they are the tempered representatives of the pure overtone chord, much in the same manner as our scale tones are all the tempered representatives of the pure scale tones. Thorough investigation of the more complicated phenomena of partial tones and the manner in which they blend with their fundamental has led modern composers, notably R. Strauss and C. Debussy, to the discovery of many of their characteristic harmonic and orchestral colors. Following are a few elementary points of influence exerted by acoustics over musical effects, which the reader may ascertain for himself.

The influence of overtones is great in completing chords in which certain tones are omitted, for the ear unconsciously selects the softly sounding overtones as the natural substitutes for the missing tones. In the following chords the missing third will always be determined by the ear as being major, not minor, for the overtone third is major, and is faintly sensed by the ear in place of the omitted tone (*).

Acoustics clearly points the principle underlying the natural resolution of suspensions. On a well tuned piano the quarter note (C) in the following illustration will be heard to progress to (B), the overtone third of (G), on the last beat of the measure.

In much the same manner acoustics influences the effect of chords which are "inverted," that is to say, chords in which the root is not in the bass. In the fundamental chord form, the blending of the chord tones with the actual overtone series is of natural consequence. In chord inversions, the natural degree of consonance of each integral tone is sacrificed because the tone which is assigned to the bass becomes the lowest and most powerful generator, and its own overtones cause a more or less serious conflict with the chord tones.



Here each tone has its overtones, and the visualization of the chord tones and their respective overtones reveals that the overtones of (E), the bass note, present considerable conflict with the higher tones of the chord and their overtones.

In short, the fundamental nature chords (major triad, dominant seventh chord, and dominant ninth chord) represent in themselves the strengthening of the natural overtones of the root or principal tone of the chord, and show a minimum of conflict by blending with these overtones. The inversions are more dissonant because the bass note is doubled. The traditional rule to avoid the duplication of the third of a chord in first inversions is thus acoustically explained.

MUSICAL NOTATION

Musical scripts have been of three kinds: (1) pitch notation, mostly in the form of figures, letters, or syllables, to indicate the position of individual notes; (2) finger notation or tablature, to indicate what fingers should be used regardless of absolute pitch; (3) notation of melodic movement, or neumes, to indicate whether the melody goes up or down or rests on the same level, again regardless of pitch and even of the sizes of intervals.

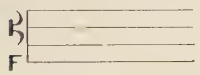
Neumes were derived from the accents used in rhetoric in the early centuries of the Christian era. An upward stroke from left to right indicated that the voice should rise. A similar downward stroke indicated that the voice should fall. A combination of the two, forming a circumflex, indicated that the voice should rise and fall on one syllable. These signs were taken over into Church music in connection with the use of selections from prose Scripture.

A system of such signs had gained acceptance by the 9th century. It consisted of a series of dots and short strokes, also combinations of these, forming markings, the upward or downward swing of which indicated the rise or fall of the melody. Two signs used in modern ornamentation, the trill ∿, and the turn ∾, are remnants of this system of

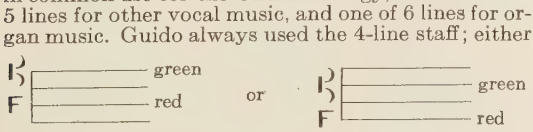
signs. The signs were called *neumes*, from the Greek word *νεῦμα*, meaning "nod" or "sign." While more sightly than the old letter system, the neumes failed to indicate exactly how much the melody should rise or fall and were used largely as an aid to memory. Nor did they indicate a rhythmical value of the tones. Efforts to improve upon this unreliable system of signs led to further experimentation. Quite happy was the thought of the monk Hermanus Contractus (1013-54), who superimposed Latin letters above the text, to indicate the distance of a tone above or below the preceding. For instance, the letter *T*, above a given syllable of the text, indicated that the melody should rise a whole tone (*tonus*). A dot after the letter *T* indicated that the melody should descend a whole tone. Similarly, other intervals were designated by other letters: *S* (*semitonium*), a half tone, and *TS* (*tonus cum semitonio*), a tone and a half. The monk Hucbald of St. Amand in Flanders placed the text syllables between lines and indicated at the beginning where the half steps were to appear.

The Staff. But none of the above efforts assumed the importance of those of the Benedictine monk Guido of Arezzo (995-1050). Being conscientious and exact, he used the simple expedient of drawing a red line to guide him in placing his neumes neatly and accurately above the text. This purely accidental device he soon turned to account as a means of fixing the pitch of the tones. The thicker part or head of the neume was placed so that it rested either upon the line, or just above or below. These three positions, in reference to the line, indicated the relative pitch values of three adjacent tones. This red line was first fixed to represent middle F of the bass register and was identified by the corresponding letter (F or 𝓕). From this our present sign of the F or bass clef (𝄢) has been derived. Some time later a green or yellow line was added to represent the fifth above, (C). This C line was also indicated by its letter (𝄡), which was the original sign for the C clefs. A black dotted line was soon placed between the others to mark the position of the tone A. The dotted line then gave way to a continuous line, the colored lines also being replaced by black lines. In this manner the musical staff was gradually formed. The letters F and C were consciously chosen because they directed the attention of the singer to the half step progression of the tones below F and C. This ultimately led to the use of the G clef when the half step F♯ was desired below G.

The blending of the two elements was a happy idea, and the new system was soon popular. The number of lines grew to 10 and even to 25, but was later reduced to 4 and 5.



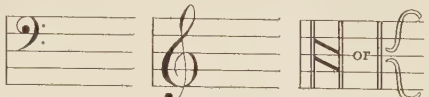
The little thicknesses on the neumes were transformed into squares, with the evident intent of indicating note values. The 5-line staff was universally adopted with the spread of printed music toward the beginning of the 16th century. Prior to that time a 4-line staff was in common use for the Church liturgy, one of 5 lines for other vocal music, and one of 6 lines for organ music. Guido always used the 4-line staff; either



He was also the first to transform the neumes so as to give them a headlike thickness, which was to show the exact location of the note on the staff.

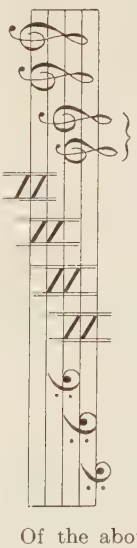
The success of Guido's innovation was rapid and complete. This is shown in the fact that Pope John XIX called Guido to Rome in 1026 in order to satisfy himself as to the excellence of the new form of notation. The pope then ordered all churches and cloisters to accept the notation of Guido.

The Clef. The word clef is derived from the Latin *clavis*, meaning "key." During the 16th century no fewer than five clefs were in common use, and many more had been tried for various purposes. They were evolved from the practice of using Roman letters at the beginning to indicate the relative position of the tones of the scale with reference to the lines and spaces of the staff. The clefs now in common use are the F or bass clef, which indicates that the fourth line represents F below middle C; the G or treble clef, also called the violin clef, which indicates that the second line represents G above middle C; and the C clef.



(F) Bass Clef (G) Treble Clef C Clef

All clefs were originally movable. When the C clef was placed upon the first line it was called the soprano or descant clef; on the second line, the mezzo-soprano or high alto clef; on the third line, the alto clef; upon the fourth line, the tenor clef. In each instance the line upon which the clef sign appears is middle C. Similarly, the treble or G clef sign, when placed upon the first line, was called the French violin clef; on the second line, the violin clef; on the third or fourth line, the low or deep violin clef. The bass clef was transferred, for indicating the baritone and the sub-bass by placing the clef upon the third and fifth lines respectively. The following tabulation will present them all in a clear manner.



French Violin Clef.

Violin Clef.

Low Violin Clefs (uncommon).

Descant or Soprano Clef.

Mezzo-Soprano or High Alto Clef.

Alto Clef.

Tenor Clef.

Baritone Clef (very uncommon).

Bass Clef.

Sub-Bass Clef (very uncommon).

Of the above, the violin clef, bass clef, alto clef, and tenor clef are in use today. The clef signs are corruptions of old Gothic forms of the letters F, C, and G.

Notes. It has been seen that there was a tendency to transform the thicker part of the neumes into little squares. These *nota quadriquarta* evolved naturally though gradually from the neumes. They were not the result of a special innovation. Franco of Cologne, a monk of the 13th century, is given the credit of having invented the idea of assigning a definite time value to each of the several forms adopted. His book on measured music, *Ars Cantus Mensurabilis*, led to the establishment of an entire system, with elaborate rules for composition, called *mensurable music*, which was in vogue for 300 years. In the "perfect rhythm," each note was the equivalent of three of the next lower note values.

This triple rhythm typified the Holy Trinity and was marked by a circle, ○. Double rhythm, considered less perfect, was marked by the broken circle, C. Bar lines did not appear until after 1500, and not until the beginning of the 18th century do we find the method of writing eighth or sixteenth notes in groups, .

Several ways of writing notes sprang up. That which finally gained general acceptance in the 13th century was: , *maxima* or *duplex longa*, meaning greatest or double; , *longa*, meaning long; , *brevis*, short; and , *semibrevis*, half of a brevis. To these were added later: , *minima*, meaning the shortest possible; , *semiminima;* , *fusa*; and , *semifusa.*

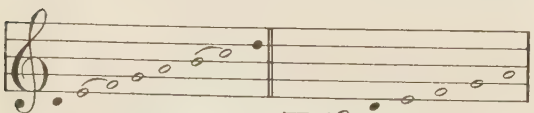
By the 15th century these forms had all become established, though the method of writing differed slightly from that used in 1300. For purposes of comparison the following table shows the notes used in the middle ages as well as those in use today.

Notes used 1700	American names	English names	Notes used 1500	Notes used 1100	Names used 1100
	Double Note	Breve			Maxima
	Whole Note	Semibreve			Longa
	Half Note	Minim			Brevis
	Quarter Note	Crochet			Semibrevis
	8th Note	Quaver			Minima
	16th Note	Semiquaver			Semiminima
	32d Note	Demisemi-quaver			Fusa
	64th Note	Hemidemi-semiquaver			Semifusa

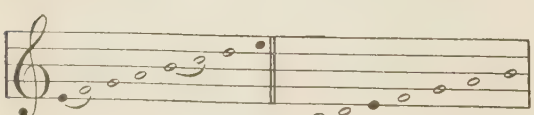
The Church Modes. The Christian Church organized its melodic material in 8 octaves of different structure, called the Church modes, four of which, standing on their *finals* or principal notes, were *authentic*, and four, suspended from the finals, so to speak, *plagal.*

The monks of the 11th century modeled this system on Greek theory but, misunderstanding their sources, misnamed the scales, so that what they called, and we call, Dorian, had actually been Phrygian in Greece, and vice versa. A somewhat miscarried attempt of the 16th century to give the major and minor modes their places in this system, led theoretically to the following 12 scales:

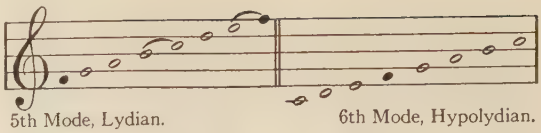
Table of Ecclesiastical Modes, or Gregorian Tones.



1st Mode, Dorian. 2d Mode, Hypodorian.



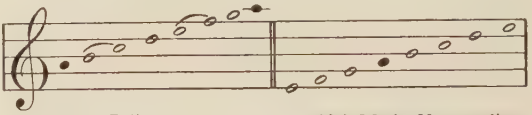
3d Mode, Phrygian. 4th Mode, Hypophrygian.



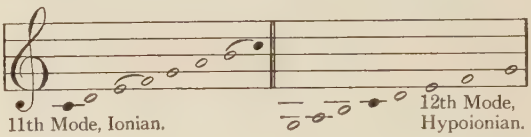
5th Mode, Lydian. 6th Mode, Hypolydian.

7th Mode, Mixolydian. 8th Mode, Hypomixolydian.

To the above were added four more in the course of time.



9th Mode, Æolian. 10th Mode, Hypoæolian.



11th Mode, Ionian. 12th Mode, Hypoionian.

In all the above the black note is the initial and final tone.

Solmisation. However, the singer, who had to grope his way through the maze of the modes was all the time in danger of misplacing the two semitones that the octave contained. As a remedy, Guido of Arezzo (d. 1050) established an ingenious system of three hexachords and adapted to it the age-old oriental solmisation. A hexachord was the largest possible group of notes with only one semitone, provided that this semitone was in the middle, as in C D E F G A. In the series of singing or solmisation syllables on which such hexachord was performed, ut re mi fa sol la, mi-fa invariably marked the semitone. There were three semitones in the whole system to be true, not only E-F, but also B-C and, in some special cases, even A-B flat. These were considered to be mi-fa's in two other hexachords, similar in structure but at different pitches. One of them was F G A B flat C D, and the other one, G A B C D E; and both, again, were sung on the syllables ut re mi fa sol la.

G A B C D E
C D E F G A
F G A B♭ C D

As a consequence, the singer, performing any melody exceeding a hexachord, had to shift into one of the other two hexachords in order to sing the second semitone of his melody once more on mi-fa. This procedure was known as mutation. Whoever learned a melody, learned, with it, the proper syllables and knew that all mi-fa's, and only mi-fa's, were semitones.

The slow process in which the modern scales evolved from the Gregorian octaves and the hexachordal conception, shall not be described here. The semitones, no longer dependent on solmisation, are unmistakably indicated by written symbols.

In our modern *key signature* the required number of sharps or flats is placed at the beginning of the composition in the order in which they accumulate in successive keys. Thus it is found that the key of C major requires no accidentals; that G major requires one sharp (F♯); D major, two sharps (F♯, C♯); A major, three sharps (F♯, C♯, G♯); etc. This points to the fact that the keynote of each progressively sharper key is the 5th step of the preceding key, also that the added sharp is in every instance the 7th step.

Inasmuch as flats are the opposite of sharps in effect, it is logical to find the order of the flats to be that of the sharps reversed. Also, since the next sharper keynote was found upon the 5th step, the next flatter keynote is necessarily the *fifth step in a downward direction*, therefore the fourth step. The proper succession of whole and half steps requires the flatting of the fourth step.

Rhythm and Time Signatures. Musical rhythm is engendered by the onward flow of the tonal effects, and manifests itself in the association of pulsations, their multiples and fractions. In short, while it embraces the division of time into regular and equal units, and the grouping of these units into symmetrical measures, the units may also be subdivided or added together. These units are called "beats," the grouping of which is effected by a regularly recurring emphasis, called "accent," always laid upon the first beat of a group.

Rhythmic groups consist of either *two* or *three* beats. When there are two beats in a group, heavy and light in alternation, the rhythm is *duple*:

When three beats constitute a group, one heavy and two light, the rhythm is *triple:*

Simple Rhythm consists of measures, each containing but one group, and therefore but one accent, 2–4, 3–8, 3–16, 2–2, 3–2, 3–4. Time is said to be compound when the measures contain multiplications of the simple groups, therefore as many accents as there are groups, 6–8, 9–8, 6–4, 12–8.

Diversity of time value is obtained by adding or dividing beats.

Rests represent the silences in music and are indicated with the same accuracy as the tones. There is, therefore, a rest sign corresponding in length to each note.

Syncopation. Where arbitrary metric accentuations do not conform to the natural accent, that is, the heavier notes occupy lighter beats or fractions, such shifting of the natural rhythm is called syncopation.

The *Time Signature* is a sign placed upon the staff, after the key signature, to indicate the rhythm in which the composition is to be played. The lower figure indicates the value of each of the time units, or beats, employed, while the upper indicates the number of such beats which constitute each and every measure. Bar lines are used to separate the measures.

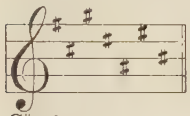
SHARPS

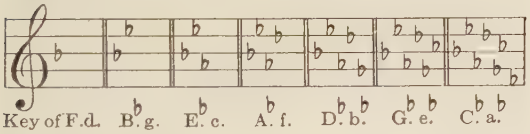
KEYS	SIGNATURES
C major and A minor	Nothing
G major and E minor	One sharp,—f
D major and B minor	Two sharps,—f, c
A major and F sharp minor	Three sharps,— f, c, g
E major and C sharp minor	Four sharps,—f, c, g, d
B major and G sharp minor	Five sharps,— f, c, g, d, a
F sharp major and D sharp minor	Six sharps,—f, c, g, d, a, e
C sharp major and A sharp minor	Seven sharps,—f, c, g, d, a, e, b

FLATS

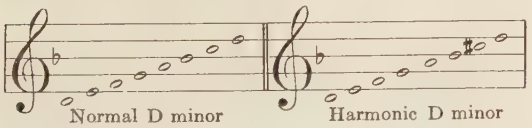
F major and D minor	One flat,—b
B flat major and G minor	Two flats,—b, e
E flat major and C minor	Three flats,—b, e, a
A flat major and F minor	Four flats,—b, e, a, d
D flat major and B flat minor	Five flats,—b, e, a, d, g
G flat major and E flat minor	Six flats,—b, e, a, d, g, c
C flat major and A flat minor	Seven flats,—b, e, a, d, g, c, f

Note that the order of the flats is the reverse of the sharps.

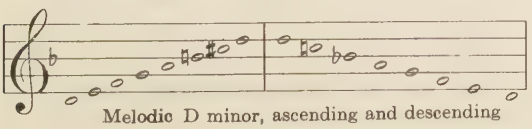




There are three forms of the minor scale. That which is constructed according to the signature is called *normal minor.* We expect a half step between 7 and 8 however. Raising the 7th step to meet this demand results in the *harmonic minor* scale. As indicated by its name, the harmonic minor is the one most used as a basis for the harmonies of the minor mode.



Normal minor has half steps between 2 and 3 and between 5 and 6. Harmonic minor has half steps between 2 and 3, between 5 and 6, and between 7 and 8, also a step and a half between 6 and 7. The awkward and unmelodious skip from the 6th to the 7th step in harmonic minor may be obviated by raising the 6th step, chromatically, as well as the 7th. This is done for certain melodic effects in ascending passages, but, to re-establish the integrity of the minor mode, the scale descends according to the signature. This scale is called the *melodic minor.*

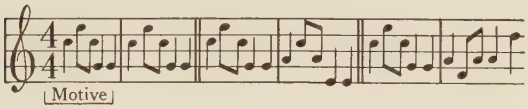


This signature is a complete indication, therefore, that six beats, each an eighth note in length (or its equivalent in subdivisions) are to constitute each measure in a composition written in four sharps. In modern compositions, unusual time signatures (5–4, 7–4, 7–16) have appeared, and also the tendency to change the time frequently by alternating several measures in a given time with one or more in unusual time.

MUSICAL FORM

Musical Form is the frame which encloses the musical design and establishes the relationship between its parts. *Repetition, contrast,* and *balance* are its guiding principles. A fragment of melody that is reiterated, or transformed and developed into a phrase or period, is called a *motive.* Larger musical germs are called *themes.* In fugue forms they are called *subjects.*

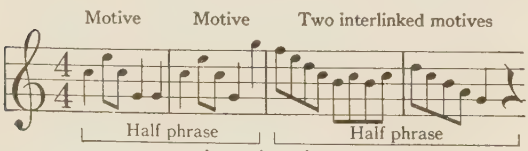
Structural Evolution of Homophonic Forms. A *phrase* is a short musical thought. There are many methods of developing embryonic musical germs into phrases. Provided the composer has a musical idea, a motive or fragment, rhythmically and melodically interesting, then the simplest form of growth is that of exact repetition. Although this method of development is often applied, a sense of *progressive* development is first aroused by a recurrence of the motive upon a different scale step, or by reversing the direction of the various melodic intervals (inversion).

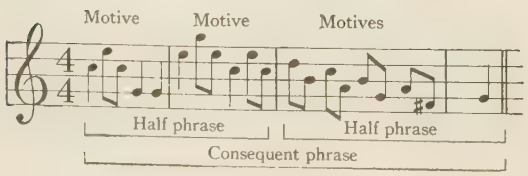


Repetition | Recurrence upon a different scale step | Motive and inversion

However, this sort of form fragment would become monotonous if continually repeated by itself. To develop this motive, or phrase member, into a complete thought, it is necessary to add a second phrase member, the motive of which does not imitate the first, but complements it. Two dissimilar motive measures, for instance, may be followed by a second pair, arranged in such a manner that Nos. 1 and 3 correspond, also 2 and 4. This is analogous to the 4-line stanza in poetry, in which alternate lines rime with each other.

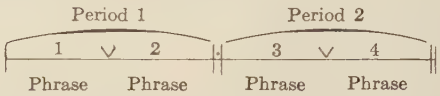
A *period* consists of two phrases, called respectively *antecedent* and *consequent,* and having the relationship of question and answer (thesis and antithesis). In a manner similar to that in which half phrases combine to form a phrase, so two phrases may complement each other to form a *period.*





This is but one of many ways in which musical thoughts may be completed, and often the arrangement of the musical motives is neither as regular nor as consistent as the above.

The *double period* results from the conjunction of two periods (and consequently four phrases) so conceived that the period relation between phrases 1 and 2 and between 3 and 4 is apparent, as is the relation on a broader scale between these two pairs.

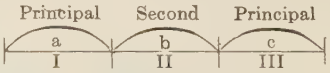


The Song Forms. A so-called "form" in music consists of a connected and related series of phrases or periods, more or less contrasted with a following homogeneous and well-closed group (where two or more such groups are used). A *phrase, period,* or *double period* may be used as an example of a single form. If consisting of but one such group, a piece may properly be said to be in a *one part form.*

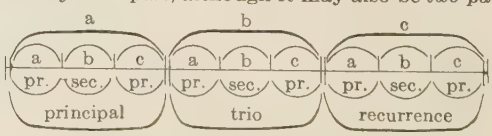
Two Part Forms.—These are composed of two *one part forms,* which stand in the relation of *principal* and *second.* It is not necessary that both "parts" be of equal length.

Three Part Forms.—When the *principal,* which is at the beginning, is repeated after the *second,* for the sake of unity and symmetry, the *three part song form* results. A recurrence of the *principal* becomes a real "*return,*" however, only when it succeeds an equally distinct "*departure.*" In the *two part form,* the *second* complements and co-operates with the *principal,* a certain parallelism of thought being present. It shows further that it completes the group by closing with a perfect cadence in the principal key.

In the *three part form,* however, the *second* is more in the nature of a digression than a mere continuation, its object being to represent real contrast or opposition. As middle one of three parts, it has no tendency toward a definite sense of finality, but, after giving the impression of a distinct digression, its closing strain should lead back into part III, which is the *repetition* or *recurrence* of the *principal.*



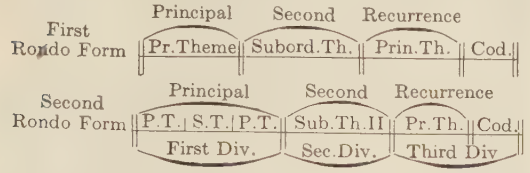
The Compound Song Forms. *Song Form with Trio.*—This larger form results when the *principal* is in itself a complete *three part song form,* possibly with a short transition leading into the middle section, called *trio.* The name trio is handed down from the time when the *principal* and its recurrence were two-voiced, the middle section three-voiced,—hence trio. The form of this *trio* or middle section is generally *three part,* although it may also be *two part.*



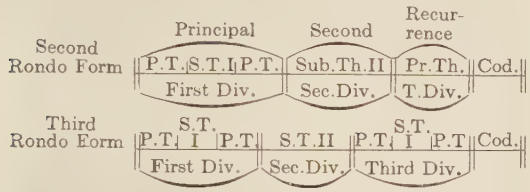
Song Form with Two Trios.—The next form evolving itself in the natural order of growth is the *song form with two trios.* The first trio is usually similar in style to the *principal,* the second may be contrasted as much as desirable.

The Rondo. The *First Rondo Form* is a direct offshoot of the *song form*. It contains a *principal theme*, one *subordinate theme*, and the *recurrence* of the *principal*. Introduction, transition, and *codetta* (a short closing group) may be added at option.

If the *principal* is enlarged into a complete first rondo form, then the *Second Rondo Form* is created.



The Third Rondo Form.—This largest rondo form is obtained by making the *recurrence* a complete repetition of the *first division*, as found in the second rondo form, instead of merely the *principal theme*.



Marches and Dances. The simplest and oldest art forms include the dances, among which the march is to be included, inasmuch as it, like the dance, serves the purpose of regulating the movements of persons in large numbers. The rhythm of marches is generally duple (2–4 or 4–4).

Marches usually have a simple construction, often paralleling that of a three part form. The middle section, the *trio*, is usually quieter and more melodious than the preceding section and in another key, often the subdominant. Longer movements in march style may be found in the oratorio (Handel's *Judas Maccabeus*) and in the opera (Wagner's *Tannhäuser*). The funeral march is a special type well exemplified by the celebrated *Marcia funebre* which serves as the second movement of Beethoven's Third Symphony (*Eroica*).

The *polonaise* of modern times has the character of a stately march. It is written in triple time, moderate tempo, with following characteristic rhythm in the accompaniment, 3–4 .

As the name polonaise (Ital. *polacca*) implies, the dance is of Polish origin.

Other present-day dance forms whose names imply either the country of their origin, their original function, or some characteristic stylistic feature may be cursorily described in terms of their rhythm and tempo. Among them may be listed the Polish *mazurka* (3–4, moderate), the Bohemian *polka* (2-4, lively), the Spanish *bolero* (3–4, moderate), the French *galop* (2-4, quick), the Italian *tarantella* (6–8, very fast), the Italian *saltarello* (6–8, quick), the Austrian *waltz* (3–4, moderate).

The Suite. A popular form of the Baroque period was the *suite* or *partita*, a collection of several pieces in dance forms, usually in the same key. Bach's English and French Suites and his Partitas, all written for the harpsichord, represent the finest flowering of the form.

At least four dances usually appeared in the suite: the *allemande*, *courante*, *sarabande*, and *gigue*. Between the sarabande and gigue any one of a large number of other forms might be inserted at the composer's discretion.

As found in Bach's works the dance forms of the suite possess these characteristics:

The *allemande*, originally a German dance, was later taken up and developed by the French. It is in 4–4, moderate tempo, usually displaying short running figures. It begins, as a general rule, with a short upbeat.

The *courante*, of French origin, is in 3–2 or 6–4, occasionally with these rhythms in combination, and in a moderate tempo. The Italian analogue, the *corrente*, is in quick 3–4, often with running figures.

The *sarabande*, initially a quick, frenzied dance popular in Spain, had by the time of Bach and Handel become a slow, stately dance in 3–4 time.

The *gigue*, a descendant of the English *jig*, is characterized by the use of a triple rhythm (3–8, 6–8, 6–4) and a lively tempo. It often is polyphonic in texture and inversions of thematic material occur frequently.

Among the many forms which may be interpolated between the sarabande and the gigue are:

The *gavotte*, a French dance in moderate tempo and in duple or quadruple rhythm. It usually begins with an upbeat of half a measure. Gavottes may often be found in pairs, gavotte II alternating with gavotte I to produce a three-part form. Gavotte II may possess a bagpipe-like drone bass and will then be called a *musette*.

The *minuet*, of French origin, is in moderate tempo and in triple rhythm, usually alternating with a *trio* section. The minuet enjoys the distinction of being the sole baroque dance form to survive its epoch and appear in music of a later day, i.e., in the sonatas and symphonies of Haydn, Mozart, and the early Beethoven.

The *bourrée*, a lively dance of French origin, is usually in 4–4 rhythm with a short upbeat. Syncopation occurs frequently. Like the gavotte, the bourrée may be paired with a companion piece of the same type.

The *loure*, ostensibly named after a French instrument, is in rather slow tempo and 6–4 rhythm. Dotted figures predominate.

The *siciliano*, of Sicilian origin as its name indicates, is a quiet dance in 6–8 or 12–8. It usually has a pastoral character.

The *passepied*, an old French dance, in triple rhythm (3–4 or 6–8), is quite animated and usually begins with a short upbeat.

The *anglaise*, of English derivation, is in lively duple rhythm, usually beginning on the beat.

The *aria* (English: *air*), song-like in style, and devoid of dance characteristics, may occasionally appear in the suite. A famous instance is the Air which occurs in the third of Bach's orchestral suites. In a transcription for violin solo (not by Bach) it has become misleadingly known as *Air on the G String*.

Two forms which appear from time to time in the baroque suite, the *chaconne* and the *passacaglia*, are in reality variation forms, in this instance on a constantly repeated bass figure, the *basso ostinato* or *ground bass*. The ground bass, a brief melody of four or eight measures, may be altered during the course of the work. The ground bass as an organizing device for a larger work, improvisational in style, has been revived in contemporary music under the name *Boogie-Woogie*.

The Modern Suite. Since the latter half of the 19th century composers have used the term suite as a label for any succession of short movements of a miscellaneous character. Extracts from incidental music for plays, such as Grieg's *Peer Gynt* suite, from the music for ballets, i.e., Stravinsky's suite from *The Firebird*, are typical, as is also the sequence of short descriptive pieces which comprises Mussorgsky's *Pictures at an Exhibition*.

The Song. The song may be divided into two classes,—the *folk song* and the *art song*. A folk song is either one whose author and composer are no longer known, taking its rise among the people, or

one by a known composer, which has been widely adopted by the general populace because it was folk-like in its appeal, simple in melody, and easy of comprehension. An art song, on the other hand, makes greater demand upon the voice and accompaniment.

A song is either a *strophic song*, in which each verse is sung to the same melody, perhaps with slight modifications, regardless of possible mood changes, or a *through-composed* song, in which the melody and the accompaniment are governed by and changed to fit the needs of the text.

The Overture. This form has gone through many phases of development. As its name implies, it has always been an *opening* or *introductory* composition, serving as a preface to a dramatic presentation.

The so-called "French" overture was written by the French composer *Jean Baptiste Lully* (1633–87). It comprised two sections, a pompous slow movement as beginning, followed by a livelier movement in a polyphonic style.

Alessandro Scarlatti (1659-1725), the important Italian composer, developed the "Italian" overture, called *sinfonia* by him, beginning it with an *allegro* followed by a slower second section, and closing with a spirited *allegro*. The term *sinfonia* at that time expressed nothing more than a short instrumental composition of an introductory nature.

Christoph Willibald Gluck (1714-87), The great "Reformer" of the opera, must be credited with having given the overture a greater significance as an individual composition as well as in its connection with the opera.

In modern times we distinguish between three different kinds of overtures: (1) Overture in the *sonata form* (explained elsewhere) with two themes, a development section, and a recapitulation, and with more or less elasticity of form; in short, the so-called *concert overture*, splendid examples of which are Mendelssohn's *Fingal's Cave* and Tchaikovsky's *Romeo and Juliet*. (2) Overtures which, after the style of *potpourris*, are formed by the loose conjunction of selected melodies of the whole opera such as most modern operetta overtures. (3) Overtures which are formed by a systematic working out of the thematic materials of the opera into a logical composition, characterizing and creating a proper "atmosphere" for the works which they precede, for instance Von Weber's Overture to *Der Freischütz* or Wagner's overture to *Die Meistersinger von Nürnberg*.

The Sonata. By the middle of the 17th century, the *sonata* emerged as an instrumental work in three movements in contrasting styles. Brief adagios between the movements were of frequent occurrence. A later four movement type, Adagio-Allegro-Adagio-Allegro, became popular under the name *sonata da chiesa* (church sonata) and may be encountered in many of the sonatas of Arcangelo Corelli. The companion *sonata da camera* (chamber sonata) is practically identical with the suite.

The sonata as referred to today is almost exclusively the form brought to a peak of perfection by Haydn, Mozart, and Beethoven. Available to these masters was the rich legacy provided by the numerous composers who had brought the form from its initial phase as a short polyphonic movement up to the series of essentially homophonic movements which are now associated with the name *sonata*. Among the more immediate of these predecessors may be mentioned the Italians *Giovanni Battista Sammartini* (1701–75) and *Domenico Scarlatti* (1685–1757), the Germans *Johann Sebastian Bach* (1685–1750), his son *Karl Philipp Emanuel Bach* (1714–88), and *Johann Stamitz* (1717–57).

The term *sonata* is slightly ambiguous in its connotations. Strictly speaking it describes a work for a solo instrument in three or four movements, the first and often the last of which is in sonata form. If, however, a composition employ the identical form and be written for two instruments it will also be called a sonata. From this point on, compositions in sonata form are named from the number of performers: *trio*, *quartet*, *quintet*, *sextet*, etc. If an orchestra be the instrumental medium, the composition will be called a *symphony*. Purely from the standpoint of form, then, a symphony may be regarded as a sonata for orchestra.

The general outline of the classical sonata, string quartet or symphony may be described as a sequence of three or four quasi-independent movements exhibiting some system of key-relationship. The first movement will usually be an *allegro* in sonata form, occasionally prefaced by a short *adagio*. The second movement, usually song-like in character and in a slower tempo, may be in a variety of forms: sonata form, three-part song form or variation form being the most common. The third movement will be lively and dance-like, a minuet in the works of Haydn and Mozart, the vigorous, boisterous *scherzo* in most of the works of Beethoven. The last movement, again an allegro, may appear in sonata, rondo, or variation form.

Sonata form as found in a typical first movement consists of four large sections: *Exposition*, *Development*, *Recapitulation*, and *Coda*, all suitably connected. The Exposition presents the various themes of the movement in two well-defined groups differing in key. The dominant-tonic relationship is the most common. The musical potentialities of the thematic material are exploited in the Development. Here the composer can give his fancy free rein. Hence the alternative name *free fantasia* for this section. Ultimately the Development will lead into the Recapitulation which with some alterations of key relationships and some other minor deviations constitutes a repetition of the Exposition. The Coda serves as a summing up or peroration. Here again the composer enjoys considerable freedom in the manipulation of his material.

A *sonatina* is a shorter type of sonata, usually in two or three movements. The development sections are considerably abbreviated, and in the works of older masters such as Clementi, technical demands are slight. The best-known modern sonatina, that of Ravel, is a mature and technically difficult work.

The Symphony. The symphony may be defined as a sonata for orchestra. But the great dynamic range and the almost infinite number of timbres which the orchestra possesses as well as the fact that orchestral music is designed for performance in large halls have combined to make the symphony a form of far greater expressive scope than the sonata.

The modern symphony came into its own late in the 18th century thanks to the contributions to the form made by Joseph Haydn and his younger contemporary Wolfgang Amadeus Mozart. Works of these masters are habitually in four movements—usually an *allegro* in sonata form prefaced by a slow introduction; an *andante* or *adagio* in three-part form, sonata form, or variation form; a minuet; and lastly an allegro in sonata or rondo form. Beethoven's nine symphonies, the world's greatest collection of works in the form, show a marked advance over those of Haydn and Mozart, through highly original use of the orchestra, intensification of development, expansion of dimensions combined with increased economy of thematic material and the substitution of the vigorous and dynamic scherzo for the minuet.

Romantic composers such as Schubert, Schumann, and Mendelssohn have written beautiful works of lesser stature than those of Beethoven. An important symphonic product of the Romantic period is the "programmatic" *Symphonie fantastique* of the Frenchman, Hector Berlioz.

But it was not until the end of the 19th century that composers capable of dealing with the demands of the symphonic style appeared to carry the tradition of Beethoven forward. Outstanding are Brahms, Tchaikovsky, Franck and, more recently, Sibelius.

Since the day of Beethoven the term *scherzo* has been used for various types of rapid movements. Mendelssohn, for example, has written scherzi of a uniformly light texture, colorfully instrumentated. Chopin has labeled four impetuous and dramatic piano pieces scherzi. Dukas has used the term as a designation for a long orchestral movement, *The Sorcerer's Apprentice*, based on a *ballade* by Goethe.

The Symphonic Poem. The term *symphonic poem* was coined by Franz Liszt to describe an orchestral work which, although it may contain many changes of tempo, is played as a single movement. Strictly speaking, the symphonic poem is not a musical form at all for it exhibits no specific arrangement of its materials, i.e., no two symphonic poems will possess the same form. The symphonic poem is "program" music, and its form is determined by some poetic concept either implied in its title or given in detail in a prefatory "program." Typical of Liszt's symphonic poems is his *Les Préludes* with a quotation from a work of the French poet Lamartine. Among those who have followed in Liszt's footsteps may be mentioned Richard Strauss, Bedrich Smetana, Tchaikovsky, Saint-Saëns, and Sibelius. The symphonic poems of Smetana and Sibelius have decidedly nationalistic implications.

The Concerto. The *concerto* has been succinctly described by Donald Francis Tovey in these words: "The primary fact that distinguishes all works that have in them the character of the concerto style, is that their form is adapted to make the best effect expressible by opposed and unequal masses of instruments of voices."

The Baroque concerto, best exemplified in the works of Cornelli, Vivaldi, Bach, and Handel, is usually written for a large nucleus of string instruments called the *concerto grosso* or *ripieno* and a small group of either strings, strings and winds, or occasionally a solo string or keyboard instrument known as the *concertino* or *solo*. The underlying principle of the Baroque concerto is that of contrast between alternating passages of *tutti* and *solo*. Players of the solo sections were usually expected to be superior performers and difficult display passages were written for them. But while the texture of the Baroque concerto rapidly became traditional in its day, the number and nature of the movements into which it was divided, varied.

Another type of concerto, an adaptation of the sonata form to the concerto style, attained a high degree of perfection under the hands of Mozart and had remained a conventional form to this day. This concerto-symphony is a work usually in three movements closely resembling those of the symphony, and calling for a single soloist for whom a difficult and elaborate part is written. In almost all concertos the soloist is provided with at least one *cadenza*, a section in which the performer, totally unaccompanied, has an opportunity to display his virtuosity. Cadenzas are usually improvisational in style. Up to the day of Beethoven they were actually improvised by the performer. Since Beethoven, however, almost every composer except Brahms has written out the cadenzas for his concerti.

Although display of technical proficiency is one of the avowed aims of the concerto, it has not been permitted to obscure the larger expressive purposes of the composer. Profound works in the form, fully equivalent in content to a symphony, have been written by Mozart, Beethoven, Schumann, Brahms, Tchaikovsky and others.

Variations. The *Theme and Variations* as an art form may be traced back to the keyboard music of the 16th century. Here short pieces, often dance forms, were stated and then modified, i.e., "varied" in different ways, many of them quite elaborate. Particularly brilliant variations were written by the English virginalists.

Variation forms were assiduously cultivated during the Baroque period and appear frequently in the suite. Characteristic of the epoch are the variations on a short recurring bass figure, the *basso ostinato*, which make up the *passacaglia* and *chaconne*. Outstanding among them is Johann Sebastian Bach's *Passacaglia and Fugue* for organ. A 19th century revival of the form is the remarkable passacaglia for orchestra which concludes the Fourth Symphony of Brahms.

A particular type of variation for the organ, the *chorale-vorspiel* (chorale-prelude) played an important part in the Lutheran service. The chorale-vorspiel employed as its theme the melody of the chorale which was to be sung by the congregation during the service. While many ways of treating the chorale-melody are to be found, the most impressive is the "interpretive" type of variation which finds its inspiration in some feature of the chorale text and proceeds to elaborate upon it.

Many of the variations which occur in the works of Haydn and Mozart are fairly simple elaborations of a song-like theme. A typical set may be encountered in almost all of the later symphonies of Haydn. Beethoven, however, brought the variation form to an extraordinary level of expressiveness through his ability to exhaust the musical potentialities of the theme. Formal procedures are abandoned by him, variations are of unequal length, merge one into the other and exploit every aspect of the theme. Two of his symphonies, the Third (Eroica) and the Ninth conclude with a gigantic variation series. Many other instances in his piano and chamber music might also be mentioned.

Romantic composers such as Schumann or Mendelssohn wrote many attractive sets of variations. The former was quite fond of utilizing themes based on musical letters of the alphabet, i.e., his *Carnaval*, a set of twenty variations on the musical letters (in German) of the composer's own name. The finest variations since those of Beethoven occur in the works of Brahms. Franck has combined the variation and the concerto in his Symphonic Variations for piano and orchestra.

The Variation form has been successfully fused with the basic principle of the symphonic poem by Richard Strauss in his *Don Quixote*. In this work the various adventures of the Spanish nobleman are described in a set of variations. Similarly Sir Edward Elgar describes some of his friends in his *Enigma Variations*.

It must be emphasized that in the writing of variations composers are free to utilize any aspect of the theme—its melody, bass, harmony, rhythm, form, or some distinctive motive. Hence the relationship between the theme and its many metamorphoses may not be at all apparent on first hearing.

The Mass. The term *mass* is used to designate the principal liturgical ceremony of the Catholic Church. The mass as a musical art form is very old, the culmination of its development having been reached in the 15th and the 16th century, while Pope Gregory the Great regulated the musical part of the Eucharistic service as early as the 6th century. The songs of this period were sung in unison, and, along with the development of polyphonic music, it was particularly in connection with the molding of an artistic mass form that the masters of the 15th and the 16th century made themselves deserving of immortal praise. No composer of note during that period missed the opportunity of writing several masses, for these particular musical forms were at that time the most ostentatious display pieces of the composer's art.

The principal parts of the *mass* as a musical form are named after the various sectional beginnings of the Latin or, as in the case of the first, Greek text.

I *Kyrie*—Three parts; "Kyrie eleison."
II *Gloria*—"Gloria in excelsis Deo," etc. (Luke II: 14).
III *Credo*—"Credo in unum Deum," etc.
IV *Sanctus*—"Sanctus Dominus Deus Sabaoth," etc.
Benedictus—"Benedictus qui venit," etc.
V *Agnus Dei*—"Agnus Dei, qui tollis peccata mundi," etc.

We distinguish between *missa solemnis*, "solemn high mass" (called also *missa cantata* when sung by the priest unattended by deacon or subdeacon), and *missa brevis*, "low mass." The former is celebrated on great festivals of the Church, the latter on lesser feast days or when a moderate time is required for the musical rendition, in which case only the *Kyrie*, *Gloria*, and sometimes the *Benedictus* are sung.

Missa Pro Defunctis or *Requiem* is a mass in memory of the dead. It may contain: I, *Requiem Æternam—Kyrie*; II, *Dies Iræ*; III, *Domine Jesu Christe*; IV, *Sanctus* and *Benedictus*; V, *Agnus Dei, Lux Perpetua*.

The *Gloria* and *Credo* are omitted, and in their place are sung the *Requiem* (a prayer for the repose of the souls of those departed this life), which is rendered before the *Kyrie*; the *Dies Iræ* (the wondrous threnody of the last judgment); and the *Lux Perpetua* (perpetual light).

The most frequently performed of the world's large store of masses are of comparatively recent origin—*The Mass in B Minor* of Bach and the *Missa Solemnis* of Beethoven. This is also true of the Requiem Mass, here represented by the great settings of Mozart and Verdi.

The Oratorio. In 1551, Saint Philip Neri established in Rome a series of biblical lectures or discourses, held at first in the chapel of the monastery of San Girolamo and in Santa Maria. He introduced music into these *congregazione dell' oratorio* (chapel assemblages), and Animuccia, Palestrina, Nanini, and others wrote the music to biblical texts—so-called *laude*, "songs of praise." Accompanied by these songs, certain scenes were presented. Cavalieri's (about 1600) *Rappresentazione di Anima e di Corpore*, "Representation of Spirit and Body," is considered to be the first *oratorio*. It consisted of choruses and solos, though the latter were really more in the character of recitatives than vocal solos, and were constructed upon a foundation of figured basses to indicate the harmonies, which proceeding was in itself a novelty for that period. The orchestra consisted of strings and a harpsichord—while characters representing biblical personages performed upon a stage. This style was adhered to for some time by the followers of Cavalieri, and it was not until *Carissimi* (1604–74) that the scenic representation was dropped and the reciting voice substituted.

Handel (1685–1759) built upon the foundation laid by these predecessors and created his immortal oratorios, which will serve as a standard for all time. *Haydn*, *Mendelssohn*, *Schumann*, *Berlioz*, and others turned to this art form, without altering it in any important particular. According to the character of the text we distinguish between *sacred* and *secular oratorio*; the former is based upon a biblical or religious text, the latter upon some exalted secular text. The modern oratorio has an overture, and consists of solo arias, recitatives, solo-ensemble parts, and choruses. Since a scenic representation does not take place, dramatic moments are conveyed by the music alone, in so far as this is possible and plausible.

The Passion. The name of a musical dramatic presentation of the narrative of Christ's sufferings, which came into vogue in the early middle ages. These performances were usually given during Holy Week, though it is not now known just in how far the music supported or alternated with the action of the play. The culmination of a development, started by *Johann Walther* (1496–1570) and forwarded by *Heinrich Schütz* (1585–1672), is to be found in Johann Sebastian Bach's dramatic settings of the *St. John's Passion* and the *St. Matthew Passion*.

The Cantata. The *cantata*, like the opera, the concerto, and many other forms, is a product of the Baroque period. As its name indicates, it was a work designed to be sung, and like its analogue, the *sonata*, it exhibited two well-defined types during its early history: the liturgical *cantata da chiesa* (church cantata) and the secular *cantata da camera* (chamber cantata). Eventually the cantata became an extensive vocal composition consisting of a series of movements in the diverse styles of aria, recitative and, in the case of the church cantata, polyphonic chorus. The church cantata reached a remarkable stage of development in the some 300 *Kirchenkantaten* written by Johann Sebastian Bach for the service of the German Evangelical Church. (About 195 have been preserved.) The typical Bach cantata calls for soloists, chorus, and orchestra. It opens with an impressive polyphonic chorus followed by recitatives, arias, and vocal ensembles and closes with a single setting of a chorale.

Latterday composers have often called a short secular oratorio a cantata.

The Motet. The *motet*, one of the most widely cultivated of polyphonic forms, traces its ancestry back to the *motetus* of the 13th century. This early form of motet, written for two, three, or four voices was characterized by the simultaneous use of several texts and the assigning to one voice, the *tenor*, of some already existent melody. It might be either sacred or secular. With the emergence of the great Flemish school of composition, the motet became an exclusively liturgical, unaccompanied vocal form employing a Latin text and designed for performance as part of the Catholic ritual. Its organization was determined by its text, each clause of which was usually set in imitative polyphony. With the advent of the new idioms of the Baroque, instruments and solo voices figured in the motet and increased use was made of texts in the vernacular. Six unaccompanied motets with German texts by Johann Sebastian Bach bring the history of the form to a triumphant close.

The Aria. An *aria* is an orchestrally accompanied vocal solo of larger dimensions, forming a part of an opera, oratorio, mass, or cantata. It may also be a separate composition conceived for concert purposes, and is then called *concert aria*. A so-called *bravura* or *coloratura aria* is one which is written with a certain regard for the vocal technique of the soloist.

An aria of short duration is called *arietta* or *cavatina*, agreeing for the greater part with the three part song form. The *aria* served as the characteristic vocal form of the opera until the great reforms brought about by Richard Wagner in his music dramas. Here the expression-restraining formal demands of the aria were eliminated by the use of melodious declamation free in form and designed solely to amplify and intensify the meaning of the dramatic poem.

Recitative (Lat. *recitare*, "to relate"). This term refers to that vocal manner which is characteristic of the singing analogue of the natural speaking voice, its inflection and accent, during the declamation of a spoken text. It is an adjustment of pitch and cadence to text; no rigidly confining tempo or rhythm are found, as in melodic phrases. The sole task of the music is to afford an impressive and suitable delivery of the words. The accompaniment consists only of simple chords. This style admits of great expressiveness. Handel affords, in his "Messiah," a fine example in the tenor recitative "Thy rebuke hath broken his heart." The first upward in-

flections upon the word "rebuke" followed by the downward sweep of an octave in "hath broken his heart" are wondrously expressive. The style might well be designated by the term speech-song. Any composition or section which is contructed according to these principles may have conferred upon it the name recitative.

The Contrapuntal Forms,—Canon, Fugue. The contrapuntal style is one in which several melodies (voices or instruments) are used simultaneously to form a euphonious combination without sacrificing the melodic individuality of any voice.

The first attempt to sound two distinct melodies was the so-called *organum*, in which a second voice sang along in parallel fourths or fifths with the first. Reference is first made to part music under the name *organum* by Regino of Prüm in his *Epistola de harmonica institutione* (9th century). Many other theorists and church dignitaries of the Middle Ages refer to singing in parts. Among them may be listed the Venerable Bede, Bishop Aldhem, and Johannes Scotus. But the first detailed account of organum sufficiently specific to afford an idea of what the practice really constituted is the *Musica Enchiriadis*, a famous work of the 9th century. Its author remains unknown, although the tract was for a long time attributed to the monk Hucbald (ca. 840–930). The *Musica Enchiriadis* describes organum as a kind of two-voiced polyphony in which the parts moved in substantially parallel fashion, removed from each other by an interval of a fourth or a fifth.

The practice of polyphony at once creates several vital issues: what are the laws underlying the simultaneous sounding of pitches? How may simultaneously sounding melodies be synchronized? The first question is answered in terms of *harmony*, the second in terms of *rhythm*. A significant part of the history of music deals with one aspect of harmony—standards of consonance and dissonance.

By the end of the 11th century much independence of movement of the voices could be found in *organum*. The Englishman John Cotton (12th century) writes in his *Musica* that crossing of the parts is desirable. From this point on, organum tends to become more and more free and culminates in the great works of the Notre Dame school.

Canon.—Imitative counterpoint, in which one voice repeats the melody of the preceding voice, while the latter goes on independently, was known and used as early as the 13th century. However, the term counterpoint was not applied to the combination of melodies until the 14th century. *Philippe de Vitri*, an important theoretician of the 14th century whose name is associated with the isorhythmic motet and *ars nova*, made important contributions to rhythmic notation. Other developments followed until *Giuseppe Zarlino*, in his *Institutioni Harmoniche* (1558), gave the various kinds of counterpoint (single and double) and *canon* in their complete form.

Canon is the name of a contrapuntal style of writing, in which the voices present the same melody, successively, each in imitation of the preceding voice. The strict manner of doing this results when each melodic interval of the original melody is exactly adhered to during the imitation; a freer style is obtained by modifying the intervals by accidentals.

When the second voice introduces the imitation (repetition) so that the entire tone series is either of the same pitch as that of the first voice, or optionally a second, third, fourth, fifth, or octave above or below the initial appearance, then the canon is accordingly called a canon in the unison, upper or lower second, third, fourth, fifth, octave, etc. For instance: *canon in the lower octave*, in which the second voice presents an exact repetition of the melody one octave below the first.

There are many different kinds of canon, each of which is minutely described in older textbooks on the subject, yet few have achieved a great importance because of outstanding distinctiveness.

When a canon is so contructed that its final tones lead back into the beginning (so that it may continue indefinitely) it is called a *circle* or *endless canon*. The circle canon is popularly called a *round*. The earliest and probably most celebrated example of the round is the English *rota* (wheel), *Sumer is icumen in*, dating from the 13th century. Rounds were especially cultivated in England during the lively Restoration Period. They were called *catches*. Numerous short and amusing rounds were tossed off by Haydn, Mozart, and Beethoven. A *canon pertonos*, or spiral canon, is one in which the ending leads back into the recurrence at a given interval higher or lower, this to be continued indefinitely.

Puzzle or *riddle* canons are written in an obscure notation provided with a cryptic or enigmatic key often humorous.

Double Counterpoint.—This species of counterpoint, doubtless the most important of all, makes use of a fixed or principal melody (*cantus firmus*) in opposition to which the second independent melody is so applied that the two melodies may change places (as upper and lower melody respectively) without impairing the euphony of the combined voices or violating the laws of counterpoint.

The Fugue (Lat. *fuga* "flight").—In this form the theme or subject is introduced in a given voice, then taken up in turn by the other voices, later being artfully developed. The term fugue was applied, as early as the 16th century, to the strict imitative style of counterpoint, especially the canon, while compositions conceived in a freer contrapuntal manner were designated *ricercare* (Ital. *ricercare*, "to seek again") or even more commonly, *toccata*, *sonata*, or *canzona*. It was much later (18th century) that the term *ricercare* or *ricercata* was restricted to designate the especially learned fugue.

In classifying fugues the three following styles of workmanship are determining factors: We name them (a) according to the interval upon which the imitating voice occurs, for we speak of *fugues in the unison, second, fourth, fifth*, etc.; (b) according to the species of movement, for we distinguish between *fugues in parallel motion and contrary motion*; (c) lastly, the relative value of the notes of the imitation as compared with the initial announcement is considered. If the note values upon the second entrance of the theme are greater than those of the first (for instance, quarter notes as compared with eighth notes) then we speak of it as a "fugue in augmentation," or *fuga per augmentationem*; under reversed conditions (lesser values upon the second appearance of the theme) it is called a "fugue in diminution," or *fuga per diminutionem*.

In the model fugue the following general thematic resources and sections may be distinguished:

1. The *Subject*, the short melody with which the fugue begins and upon which it is constructed.

2. The *Answer*, in the second voice, a reply to the subject and similar to it.

3. The *Countersubject*, another melody often derived from figures of the subject, entering together with the answer and forming two-voiced counterpoint with it. In strictly constructed fugues, the countersubject is present at each entrance of the subject or answer.

4. The *Exposition*, the first section of the fugue, during which there are as many entrances of subject and answer, respectively, as there are voices in the fugue, each voice enunciating the theme once.

5. *Episodes*, passages which serve to continue the movement while the subject or answer rests, and which lead into renewed announcements of the thematic materials. An episode is generally inserted after the answer, as a means of modulating back to

the original key. Episodes are more freely used in later sections of a fugue to afford some relief from the monotony that might result from the incessant use of subject and countersubject.

6. *Stretto* (Lat. *stringere*, "to draw close"), that contrapuntal condition which arises when one entrance of the subject or answer occurs before another is finished, the two thus overlapping.

In the fugue, all the contrapuntal varieties of workmanship—contrary motion, augmentation, diminution—may be applied to the two, three, four, or five voices which are used.

A *double fugue* is one with two subjects, each of which may be developed separately, but in which a third development is found, making use of Subject Number One as countersubject or principal counterpoint for Subject Number Two. There are also *triple fugues*. A *fughetta* is a small fugue. A *fugato* is a contrapuntal section of any composition; for instance, the development part of a sonata or symphony, in which the fuga style is applied for a certain period without extending itself into a regular fugue.

The entire technique of fugal composition has been summarized for all time in Johann Sebastian Bach's monumental *The Art of Fugue*, a series of fugues and canons on one theme, and hence in reality a set of variations as well.

MUSICAL INSTRUMENTS

The instruments of ancient times are discussed in the music history section under the headings: *Primitive and Prehistoric Music*, *Music of the Orient*, *Hebrew Music*, and *Greece*. In the Middle and Later Ages, the instruments of the West were all imported from Asia or Mohammedan North Africa and only in centuries transformed to serve the needs of later European music. This is particularly impressive in the case of the organ.

The Pipe Organ, a compound of one-tone pipes mechanically blown, seems to have originated in Egypt in times B.C. as the combination of panpipes, a windbag, and a bellows, as it is evidenced on a clay figure from Alexandria. Ktesibios, the famous "inventor" of the organ, can only have been the inventor of an ingenious hydraulic device to provide and equalize the necessary wind.

Though the organ in both forms, with bellows and with water pump pressure, was spread all over the Roman Empire, its chief development came only when the medieval Church had overcome its opposition against the "heathenish" instrument and given it a place in the singing classes of monasteries and, at last, in the service itself.

The medieval organ differed in many respects from the modern organ. In the first place, the organ builders were not aware that the pipes, decreasing in length up-scale, should also decrease in diameter, and therefore obtained a roaring sound in the lower part of the range and a mellow one in the upper part. In the second place, the organ had no keys in the modern lever form; horizontal sliders, preventing the wind from entering the pipes, had to be pulled forward in order to open the way and cause a tone. Such clumsy device excluded any fluency in playing. Only in the 13th century were the sliders replaced by levers, which then led to the modern keys.

In the third place, the organ was a compound or, in later terminology, a mixture of furniture: the pressure on one key was not answered by the sound of one pipe, but of a whole set of pipes, sometimes from ten to twenty, sounding the note itself, its fifth, its octave, its twelfth, and so on. It was not before the end of the 14th century that solo stops with one pipe to the key were introduced to serve alongside with the compound, which still was the body proper of the organ. Again, it was not before the 16th century that two or more such solo stops were mixed in order to create new colors. The momentous end of the 14th century, when the poet and composer Guillaume de Machaut could call the organ the queen of all the instruments, saw the introduction of a second manual or keyboard for the hands, and even of a pedal or keyboard for the feet, though this latter, invented in the North, was for centuries used in the North but not in the South of Europe.

The organ had an almost steady evolution, until in the 19th century decisive turns led to a crisis. In 1827, an Englishman, Booth, devised the earliest action in which the purely mechanical connection between the key and the pipe was improved by a partly pneumatic pressure to facilitate and equalize playing. But the successful system, half mechanical, half pneumatic, was created in 1832 by Charles Spackman Barker in London. Much later, in 1868, Barker even combined a pneumatic with an electric action, in which the key closed an electric circuit, while the pallet below the pipe was opened by wind pressure. At the same time, the organ became more and more motley in its dizzying number of solo stops; swell boxes deprived the instrument of its majestic, monumental character; the wind pressure and therewith the thunderous, shrieking effect was continually augmented; and the size grew from year to year. About 1850, large organs had already 100 stops; in 1932, Emerson L. Richard's and Midmer-Losh's organ in the Convention Hall at Atlantic City, N. J., was given 1,233 stops with 32,882 pipes on seven manuals and a pedal under a wind pressure of 100 inches as against the 3 or 4 inches in earlier centuries.

This appears to be an end. A reaction has set in with the goal to rid the organ of its superromantic traits and to re-establish its unification, limpidity, and noble grandeur. Archaistic in their beginnings, the so-called Bach-, Baroque-, and Praetorius-organs are leading the way to the organ of the future.

Predecessors of the Pianoforte. We do not know at what time the Greek and medieval test monochord was given more than one string and keys that allowed to play in chords; nor do we know when the oriental zither became a plucked keyboard instrument. Both devices are mentioned early in the 14th century.

The monochord with a keyboard was usually called a clavichord. It had a moderate number of strings running from left to right in a small and shallow box, and keys that carried, on their rear ends, upright metal tangents to strike the string gently and to produce a weak but charming tone, which allowed the instrument to last for more than five hundred years and even to have a belated bloom in the sentimental days of the mid 18th century.

The oriental zither, provided with a keyboard, resulted in what was called a harpsichord when it had the form of a grand piano; and a virginal or spinet, when it had the square form of the clavichord. In both cases, the key had, on its rear end, a free, upright wooden jack, in which a projecting pointed piece of quill plucked the string when the key was being pressed down. In this plucking action, the tone was metallic, argentine, and rigid, notwithstanding the greater or lesser pressure of the key. From the 16th century on, a certain amount of variety was given the harpsichord (not the spinet) by assigning several strings and jacks to the individual key, which yielded different timbres and could be opposed or combined by the use of a second keyboard, to be played separately or else coupled to the first one. An invention, made in London about 1650, to act on the stops by means of foot levers in order to grant a change of stops in the middle of a piece without removing a hand from the keys, was rejected and ignored as being contrary to the style of the times.

The spinet disappeared at the end of the 17th century and the harpsichord, at the end of the 18th. The pianoforte, called to replace both of them and

the clavichord as well, had been invented in 1709 and played for the first time in a public recital in London, 1768, by Bach's youngest son Johann Christian.

The Modern Pianoforte. Although this instrument is familiar to most music lovers throughout the world, its importance is such, both as a solo instrument and in *ensemble* work, that a brief review of its effects is justified. It adapts itself to all styles of music and, viewed by itself, is practically an orchestra in miniature. For this reason, we find all kinds of vocal and instrumental compositions arranged for the pianoforte. As solo instrument it stands in a class by itself, and the great tone-heroes, —Mozart, Beethoven, Weber, Mendelssohn, Schumann, Liszt, and Tchaikovsky,—have shown in their works for this universal instrument the manifold effects of which it is capable.

Aside from its use as a solo instrument, the pianoforte finds its greatest usefulness in association with other instruments—either in *ensemble* works or merely in accompaniments of vocal or instrumental solos. It has found a place in the orchestra as an instrument on equal terms with other instruments in the third symphony in C minor of Saint-Saëns, where, in association with the organ and the strings, it has produced a charming and characteristic effect. Berlioz, in a chorus of airy sprites, has used the instrument for four hands, in accompanying the voices. No other instrument could produce the sort of harmonious quivering required by the composer to express the sylphlike movements of the characters.

Early Bowed Instruments. It is not true that the family of the violin developed from the family of the viola da gamba. The two of them crystallized alongside at the beginning of the 16th century out of the experimental chaos in which the medieval stringed instruments of the North and the South, of the West and the East had found themselves thrown together, mingled, and mixed.

The *viola da gamba*, leg viol, abbreviated viol or gamba, had generally six strings, much thinner than the modern ones, furthermore frets on the fingerboard, a deeper body, and a flat back. It was mainly built in three sizes, treble, alto or tenor, and bass, though the latitude within these sizes was great enough to provide special models for playing in "consorts" or chamber ensembles, in melodic solos, and in chordal solos. All of them were held upright upon or between the legs. Bowing was done the other way around, palm upward and the accented strokes pushed with the tip of the bow. This and the argentine sound of the strings gave the instrument a delicacy that more or less excluded playing in orchestras and accompanying the figured bass.

Meantime, the family of the violin, or *viola da braccio*, arm viol, had come to the fore. At first with three strings only, it existed in Italy early in the 16th century, replacing the *gamba* family inside Italy early in the 17th, but had in France and Germany to fight for recognition until well into the 18th century.

Modern Bowed Instruments. *The Violin.*—The effects which may be produced on this most marvelous instrument are practically inexhaustible; they meet every subtle shade of expression. The use of the bow is a great factor in the production of the manifold effects. The manner in which the bow stroke is made and the distance from the "bridge" at which the bow touches the strings serve to influence the tone quality and the mode of expression. It may be of interest to note that of the four strings on the violin, each possesses its own peculiar color, similar to the timbre of certain wind instruments. Thus, the first, or E, string approximates the color of the flute, in part also that of the piccolo flute. The second, or A, string has a timbre like that of the oboe; the third, or D, string, like that of the bassoon; while the fourth, or G, string is similar to the horn. The *sordino* or mute, produces a tone color of veiled, suppressed, beclouded, mysterious quality. The *pizzicato* is produced by plucking the string with the finger.

When used in the modern orchestra, the violin adapts itself especially to the lyric song passage, figuration, ornamental melodies, filling and coloring. The *tremolo*, by many violins, produces some excellent effects; it expresses trouble, agitation, terror, in the respective shades of piano, mezzoforte, and fortissimo, when placed on the G, D, or A string. It has a somewhat stormy, violent character in fortissimo on the middle of the first or second string. It becomes, on the contrary, ethereal or angelic, when employed in several parts and pianissimo on the high notes of the first string. *Harmonics* are those sounds which are generated by touching the strings with fingers of the left hand so as to divide them in their length, yet not with sufficient pressure to place them in contact with the finger board, as is the case for ordinary tones. These harmonics possess a singular character of mysterious softness and delicacy, and their crystalline quality renders them appropriate to chords that may be called fairylike, evanescent.

The Viola.—As a solo instrument, in or out of the orchestra, the viola offers wonderful coloring material; its soft, noble, rich, "affectionate" quality is of dreamy magic. The song of the viola on its higher strings is strongly religious in effect. The timbre of the strings is as follows: the first, or A, string resembles the oboe; the second, or D, string has a bassoon-like quality. The third, or G, string and the fourth, or C, string have a soft, tender, earnest, and agreeable quality, which, in the middle registers, suggests the horn tones. What has been said about *pizzicato*, *sordino*, bowing, tremolo, harmonics, etc., in respect to the violin is throughout applicable to the viola—considered as a violin a fifth lower. The viola is no less agile than the violin, the sound of its low strings is peculiarly telling, its upper notes are distinguished by their mournfully passionate accent, and its quality of tone, profoundly melancholy, differs altogether from that of the other instruments played with the bow.

The Violoncello.—An instrument particularly well adapted to express pathetic scenes and conditions, broad melodies being better than superficial. However, it possesses such versatility of expression that it can reflect almost any sort of condition. In general, the color of its tones is serious, the middle range full and sonorous, the depths very agreeable, while the higher registers are of a virility and tense quality which, in song passages, is of tremendous effectiveness. The four strings of the violoncello are tuned an octave lower than the four strings of the viola. That which has been said of the violin and viola, in regard to arpeggios, bowing, etc., applies equally to the violoncello. Nothing is more voluptuously melancholy, or more suited to the utterance of tender, languishing themes, than a mass of violoncellos playing in unison upon the first string. They are also excellent for airs of a religious character.

The Contrabass.—This instrument forms the bass of the string group in the orchestra. There are two kinds,—those with three and those with four strings. Those with three strings are tuned in fifths—G D A—and those with four are tuned in fourths—E A D G. The tremolo is of good effect, also the sordino. The *pizzicato* is intensely dramatic in tense moments, picking its way, like an anxious heartbeat, under a pathetic melody of the cellos, the deep, sustained tones of the clarinets, and the convulsive shuddering of the violins. In a dark, threatening tone color, the *pizzicato* of the basses is of fear creating effect.

The Harp. This poetic instrument is found in very many modern orchestral scores. The effect of several harps in unison is imposing. The harp tone

blends very well with the various color registers of the orchestra, especially with the horns, and also with the human voice. It is suitable for march scenes, for prayer, and for idealistic, elegiac, or religious moments. Its deep tones are rich and full of unction and pathos; its higher tones, fine, clear, and bell-like. Nothing can be more in keeping with the ideas of poetic festivities or religious rites than the sounds of a large body of harps ingeniously introduced. The crystalline sound of the strings of the last upper octave, of voluptuous freshness, renders the harp fit for the expression of graceful, fairylike ideas, and for giving utterance to the tender secrets of exquisite melodies.

The Stringed Instruments Combined. A few effects of the combined stringed instruments are here cited to indicate briefly the emotional and objective conditions suggested. (a) With the use of *sordini* (mutes), a splendid effect of secrecy is suggested or the veiled light of the moon is depicted. (b) For reverie-like conditions there is nothing more beautiful than a lovely adagio passage played by all the strings muted. (c) Deep, strong tones of the basses and cellos may portray the heavy, coarse, powerful, insolent, clownish tendencies in life, while the higher, lighter tones of the combined basses, pianissimo and staccato, fairly rival the high tones of the flute or violin in shadow-like mobility or ghostly evanescence. (d) Also of beautiful effect but a trifle more virile than (b) is a broad, songlike melody in the first violins, accompanied by the second violins, violas, and cellos muted. (e) The strings muted and combined with some of the softer wind instruments, like the flute, clarinet, horn, and bassoon, blend in rich colors for corresponding modes of expression. (f) *Pizzicato* by certain stringed instruments may be used to imitate the harp effects, as in serenades, prayers, etc.

(g) In dramatic or mysterious moments, the basses and cellos may play songlike passages *pizzicato*, an effect which is highly characteristic, especially in minor. (h) Contrasts of a tense character may be produced, and the color effects of the instrumentation greatly heightened, if *pizzicato* tones are more or less alternated with tones produced by the bow (*arco*). (i) A beautiful lyric effect is produced by a slow melody in the first violins, accompanied by arpeggiating seconds, with sustained tones in the violas, and *pizzicato* in the cellos and basses. (j) *Pizzicato* by the entire string orchestra produces an effect like a huge guitar; especially in pianissimo it is full of grace and charm. (k) If the strings are played upon very near the bridge (*sul ponticello*), a rough, somewhat disagreeable tone quality results, which, however, is often the very effect desired for dramatic moments, fear, horror, etc. (l) With strong, sustained tones for all the strings the effect of an organ may be approximated. (m) Of tremendous effect is the unison passage played by all strings in powerful strokes. (n) The *arpeggio* for all the strings would doubtless produce some splendid effects at the proper time. This effect, to the knowledge of the writer, has not as yet been used by any composer.

The Wood-Wind Instruments. The *piccolo flute* has all the shrill brilliancy associated with the highest pitch levels, and may depict great mobility, light intensity, the whistle of the wind, flash of lightning (objectively), or piercing pain, agony, shrill demonic joy. (subjectively).

The Flute.—Its lower range has a color characteristic of lonesome sadness, weakness, humility, resignation, soft lament, etc. In its higher range, it is bright, sharp, incisive; good for simplicity, innocence, joy.

The Oboe.—The color of the oboe tones is suitable for all wailing effects or in depicting pastoral scenes. In minor passages, it voices tediousness, pain, sadness, suffering.

The English Horn.—The alto oboe is splendid for expressing pain, moral suffering, tragic thoughts. It is especially good in minor for a soft emotional wailing or deep religious feeling. It has a melancholy, dreamy, and rather noble timbre, the tone of which possesses a vague, "remote" quality that renders it superior to all others in exciting regret and in reviving images and sentiments of the past. The lowest register is well suited to color, with its menacing impression, ideas in which fear and anxiety predominate.

Clarinets.—Instruments of sympathetic, stately colors suited for pastoral or religious effects. It has been said that the clarinets have four registers, each of a distinct tone quality. The high register is somewhat tearing, and should be used only in fortissimo for rough joy, boisterousness, gayety, lightning flashes, etc. The medium registers are suited to melodies and *arpeggios*, or to melodies expressing *naïveté*, simplicity, innocence, purity, pastoral effects, etc. The lower register is earnest and sad and may be used for religious, melancholic, dramatic, or threatening, terrorizing moments. The "A" clarinet has a soft, melancholy coloring, better for pathetic, earnest religious effects than the "B flat" clarinet, which is of a more brilliant tinge, and is suitable for passionate longing, etc.

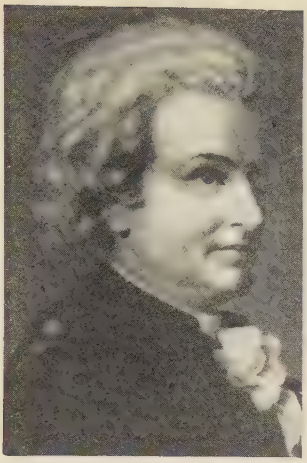
The Bass Clarinet.—A glorious instrument, round, full, majestic in tone quality, which may borrow the wild effects that distinguish the lower notes of the clarinet, or the calm, solemn, sacerdotal accent belonging to certain registers of the organ. It is well adapted for elegiac expression, or to depict religious feelings or those of sadness, and is especially suited for dramatic moments, horror, scenes of dread, pain, sinister prophecies, etc. The character of the instrument demands the song style.

The Bassoon (*Fagott*).—This instrument represents the bass of the oboe, even as the English horn represents the alto. Its low notes form excellent basses to the whole group of wood-wind instruments. When playing *legato arpeggios* it may depict waves of emotion or of the sea. The low tones are splendid for expressing humor, and are very comical in effect, especially staccato. The middle-upper register has a color similar to the human voice. In minor it portrays pain, complaint, depression, fear.

Brass Instruments with Mouthpieces. *The French Horn* (*corno*).—This beautiful instrument has a color peculiar to itself, noble, pure, and poetic, suggesting the fragrant hills, meadows, forest (objectively); or nobility, self-reliance, trust, generosity, simplicity, purity, etc. (subjectively). The middle register, in broad tones, reflects the unknown, suspense; in short, detached tones, mystery. The "stopped" tones, forte, have a color suggestive of awakening fear, and are effective for arousing horror, revenge, fright, distress, danger, terror, demonic rage, passion, etc. In pianissimo the stopped tones reflect pain, discomfort, depression, and the like. The horns, usually four in number, in the symphony or opera orchestra, are splendidly adapted for hunting fanfares or forest scenes. Some tones are quite similar to the human voice.

The Trumpet.—An instrument which adapts itself for march effects, defiance, battle, attack, challenge. In objective music, rhythmically detached passages in punctuated notes, forte, depict scenes or conditions of confusion, turmoil, struggle. Subjectively, the trumpet reflects expressions of joy, trust, generosity, victory, boldness, ambition, courage, masterfulness. In pianissimo its effect is beautiful, and of soft melting quality. The muted tones are sad.

The Trombone.—This instrument possesses a noble, heroic quality or, if desired, a tremendous tone of majestic proportions. Formerly there were four kinds of trombones, each of which bore the name of the human voice to which it had the nearest

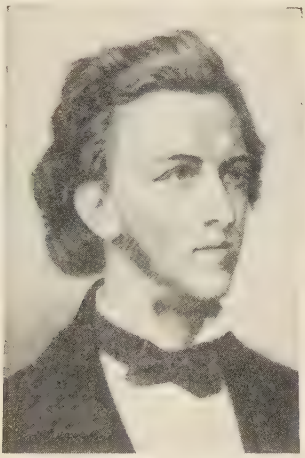


Wolfgang A. Mozart (1756-1791)

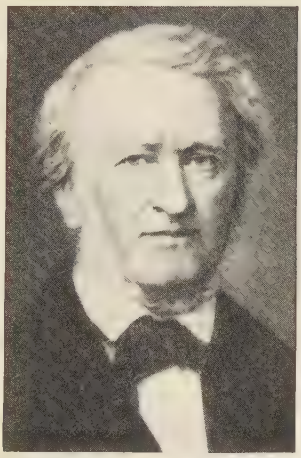
Ludwig van Beethoven (1770-1827)

Johann Sebastian Bach (1685-1750)

WORLD COMPOSERS

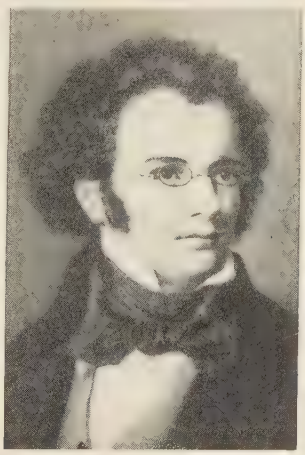


Frédéric François Chopin (1810-1849)



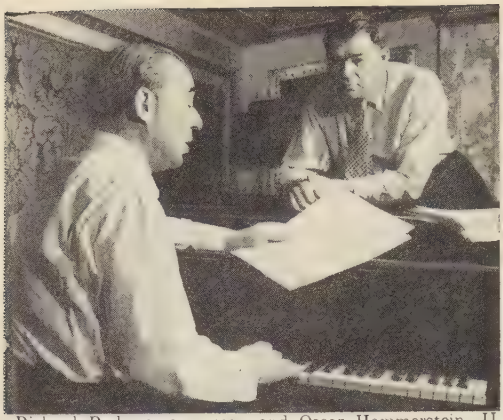
Richard Wagner (1813-1883)

Robert Schumann (1810-1856)



Franz Peter Schubert (1797-1828)

Johannes Brahms (1833-1897)



Richard Rodgers, composer, and Oscar Hammerstein, II, lyricist, gained eminent success as a musical team. A hit show of theirs was "Oklahoma," another was "South Pacific."

Known as the "Father of the blues," Composer William C. Handy who died in 1958 will long be remembered for his jazz classic "The St. Louis Blues" (1914), which started a new trend in music writing.

Culver Pictures, Inc.

George Gershwin wrote his history making "Rhapsody in Blue" in 1924, and his last major work was the negro folk opera "Porgy and Bess."

Victor Herbert and John Philip Sousa are great names in music. Sousa was the composer of 100 marches, including the thrilling "El Capitan". Herbert composed more than 40 light operas.

AMERICAN COMPOSERS

In addition to his work as a composer, Leonard Bernstein is a conductor of note, and is well known as a lecturer on music for the general public.

Doctor Walter Damrosch is known for his compositions "Cyrano de Bergerac," "Man Without A Country," and "Scarlet Letter." For 24 years he was director of the New York Symphony and later for N.B.C.

Stephen Foster is America's best-loved composer. His simple, naive songs, with their homely sentiment and unpretentious melodies, are now considered to be a part of American folk music.

resemblance,—soprano, alto, tenor, and bass. Of these, the tenor and bass are now most commonly used in orchestras. The tenor trombone has a tone of powerful sonority, which, in the middle and lower registers, can express energy, power, grandeur, brutality; in broad lyric passages, piano, it reflects earnestness or religious feeling. In fortissimo it is very effective for horror, terror, or for demonic, dramatic conditions. It is common to use three tenor trombones. In broad chords they have an effect of power, majesty, sublimity, grandeur, and are splendid for religious moments. The pianissimo is full of deep feeling. In fortissimo, three trombones can produce terrifying, overpowering effects. The greatest expressive power of the trombone lies in the effectiveness of the simplest triad passages.

The Bass Tuba.—This colossal instrument possesses an earnest, penetrating tone of rough quality, which is well adapted to furnish the necessary bass for the trombones and trumpets. Combined with the trombones, it is capable of expressing the most overpowering effects,—heavy, gruff, and forceful, The brass instruments combined are used in driving toward a great climax or in producing great volume.

Brass Instruments Played with Reeds. The *Saxophones* are a family of brass instruments created by Adolphe Sax, which have a single reed, with a clarinet mouthpiece, and which give new voices to the orchestra or the band. The quality of tone of the high notes of low saxophones is somewhat plaintive and sorrowful, while that of their bass notes is, on the contrary, of a calm, earnest dignity. Saxophones are seven in number; the high, the soprano, the alto, the tenor, the baritone, the bass. and the double bass.

Instruments of Percussion. *The Kettledrums* or *Timpani.*—These are the most valuable of all the percussion instruments. In most modern orchestras there are but two timpani, the larger one of which is used for the lowest sounds. There are three kinds of drumsticks, the use of which so changes the nature of the drums' sound that the composer often indicates which one he wishes the performer to use. Drumsticks with wooden ends produce a harsh, dry, hard sound. Drumsticks with wooden ends covered with leather are less hard, but still very noisy. Drumsticks with ends made of sponge or felt are the best, and give to the kettledrum a grave, velvety quality of tone, which suits a large number of gradations, soft or loud in execution. The general character of the kettledrums is nerve-racking, from its dimly menacing piano throughout the entire dynamic range up to the most terrific crescendo and fortissimo. They adapt themselves to all conditions, but are especially appropriate for stormy scenes, dirges, and dramatic moments. They splendidly exemplify the heartbeat in anxiety, or add much to the characterization of terrifying scenes. The muted timpani have a color very appropriate for requiems or similar sad occasions.

The Drum.—The so-called "bass drum" (*gran cassa*) is used in descriptive and symphonic music, forte, to aid in characterizing the approach of a climax of volume, also to imitate thunder or cannon. When used softly it is of fine effect.

The Small Drum (*tambura*).—Mostly used in music of a military or warlike character, although Halévy, Donizetti, Meyerbeer, and Rossini have incorporated it in their opera scores.

The Cymbals.—Employed usually for fantastic or characteristic effects. They have a sharp, penetrating, almost shrieking tone if struck with a wooden hammer, of good effect for dramatic climaxes.

The Tam-Tam.—Used forte, this has a terrifying tone, useful in characterizing scenes or conditions of horror, terror, or wildness. In piano it suggests dire prophecy or mystery.

Instrumental Combinations. Every resonant body employed by a composer is a musical instrument. The following groups may be noted:

- **Stringed Instruments**
  - Tones produced by use of a bow . . : Violin, Viola, Violoncello, Double Bass
  - Played by hand . : Harp, Guitar, Mandolin
  - Played with keys . : Pianoforte
- **Wind Instruments . . .**
  - Played with reeds . : Oboe, English Horn, Bassoon, Double Bassoon, Clarinet, Basset Horn, Bass Clarinet, Saxophone
  - Played without reeds . . . . : Piccolo Flute, Flute
  - Played with keys . : Pipe Organ, Melodian, Concertina
  - Brass instruments played with a mouthpiece . . : Horn, Trumpet, Cornet, Bugle, Trombone, Ophicleide, Bass Tuba
  - Voices of men, women, and children.
- **Percussion Instruments**
  - Of definite sonorousness (pitch) . : Kettledrum, Sets of Bells, Glockenspiel, Keyed Harmonica, Bells
  - Of indefinite sonorousness and producing various characteristic noises . . . . . : Drum, Tambourine, Cymbal, Castanet, Triangle, Gong, Tam-Tam

Instruments often reflect emotional shadings in a very definite manner. A sustained violin tone is much like a major chord in suggesting or reflecting contentment or equanimity. A tone on the English horn approaches the melancholy effect of a minor triad. On the other hand, the general serenity of a major triad may be tinged with the contradictory doubt of sadness reflected by the producing instruments. Thus it is that instruments give color lines against a background of harmonic shading, color within color, as it were, giving music its miniature tints. These few simple illustrations of the elementary musical effects and the conditions they reflect will serve to point the way to the more complex combinations of harmony, rhythm, and instrumental color which faithfully portray the details of a more involved and complicated experience or condition.

DEVELOPMENT OF THE ORCHESTRA

The modern orchestra has developed from a collection of ill-assorted and difficult-to-control instruments into one large composite instrument of almost unlimited possibilities. Its compass reaches from the profoundest depths to the most piercing heights. The almost exhaustless tonal shades include the various timbres of the many instruments, capable of expressing singly or in various groups, practically every shade of human emotion. Its dynamic contrast may suggest the faintest whisper or swell to the thunderous power of the combined instruments. There was no definite set of instruments

used in prescribed combination before the development of the form known today as the symphony. For this form, it was necessary to use a balanced combination of instruments. The fact that instruments were improved as experimentation and techniques improved aided in the development. The viols used in the 16th and 17th centuries could not have had the tonal qualities to perform a Haydn symphony. It was the practice of most composers to use whatever instruments were available. In fact, specific instruments were not named by the composer, but the performer or the organizer of the group was free to select the instrument available which could play the part most satisfactorily. Previous to the 17th century, it was not uncommon to find the instrumentalist using the same part as the vocalist and either doubling a vocal part or playing a part when a vocalist was not available. In the 17th century (following the advent of the Cremona violin makers) sonatas or sinfonia for from two to eight specified instruments were included on programs. Even in these strictly instrumental works, substitutions were often made in certain solo or supporting parts.

The composers at Mannheim, Germany did much to prepare the way for the music of Haydn and the classical symphony with its strict orchestration To Haydn's combination, Mozart added the clarinet, although Haydn had used clarinet in his London Symphonic instrumentation, and Beethoven added trombones and the various trappings of the percussion section which heretofore had consisted of timpani only. While these three composers were usually content with two of the usual wind instruments plus a full string section, Wagner and Berlioz, two other outstanding orchestrators, added Piccolo, English Horn, Bass Clarinet, Tuba, and Harp in addition to three of the usual winds. They also used the strings in divided parts. Berlioz and Wagner thus presented a richer orchestration with a resulting variety of color. Richard Strauss continued the use of dividing parts, using three or four each of the winds and subdividing the string section into many parts. In the 20th century, Maurice Ravel has been outstanding in his colorful orchestrations. As did Debussy and other impressionists concerned with color, he used the flutes and other solo woodwinds and muted strings, often divided into four parts to acquire the impressionistic color and smoothness which he desired. With the reaction to the immense size of the orchestrations of Berlioz, Mahler, and Richard Strauss, 20th century composers began to employ instrumentations suited to the nature of the music rather than using instruments merely because they were available. Thus Stravinsky, Shostakovich, Copland, Piston, and other 20th century composers continue to discover new sounds in music and continue to use various combinations of instruments which may best express the particular character desired in each passage. Paul Hindemith made a most significant contribution to music and to the development of the instrumental combinations which can be used to great advantage.

The development of the modern concert orchestra since the time of Haydn may be visualized briefly as follows:

Haydn	Mozart	Beethoven	R. Wagner	H. Berlioz
Timpani	Violino I	Large Drum	(Lohengrin)	(Tuba mirum. Requiem.)
Trompeten	Violino II	Triangle	3 Large Flutes	3 Flutes
Tromboni	Viola	Cymbals	Piccolo Flute	2 Oboes
Klarinetten	Flutes	Flutes	3 Oboes	2 Clarinets
Corni (Horns)	Oboes	Oboes	English Horn	8 Bassoons
Oboes	Clarinets	Clarinets	3 Clarinets	12 Horns
Flöten	Bassoons	Bassoons	Bass Clarinet	4 Cornets
Fagotte	Horns	Horns	2 Bassoons	4 Trombones
Violino I	Trompets	Trompets	4 Horns	1 Ophicleide
Violino II	Trombones	Timpani	3 Ho ns on the stage	4 Trompets
Viola	Timpani	Trombones	3 Trompets	4 Trombones
Vocal Parts	Vocal Parts	Violine I	4 Trompets on the stage	4 Trompets
Violoncello	Violoncello	Violine II	3 Trombones	4 Trombones
Organ	Organ	Viola	3 Trombones on the stage	4 Trompets
Contrabasso	Contrabasso	Vocal Parts	Bass Tuba	4 Trombones
		Violoncello	Timpani in the orchestra	4 Ophicleides
(Exceptional)	(Exceptional)	Organ	Timpani on the stage	16 Timpani
Bariton	Piccolo	Basses	Cymbals	1 Bass Drum
Lyra	English Horn		Drums	1 Bass Drum with two drumsticks
English Horn	Bassethorn	(Exceptional)	Violins (divided)	50 Violins
	Contrabassoon	Contrabassoon	Violas	20 Violas
	Harp	English Horn	Organ	70 Sopranos, 60 Tenors, 70 Basses (Vocal Parts)
	Glockenspiel	Posthorn	Vocal Parts	18 Violoncellos
	Large Drum		Harp	18 Contrabasses
	Small Drum		Violoncello	
	Triangle		Contrabasses	
	Mandolin			

FAMOUS ORCHESTRAS

Since World War II the list of orchestras in both the United States and other countries of the world has grown significantly. The following list contains the outstanding orchestras of the world:

Austria

Vienna—Vienna Philharmonic
Vienna Symphonic Orchestra

Belgium

Brussels—Orchestre Nationalade Belgique

Denmark

Copenhagen—Radio Symphony Orchestra
Royal Opera Symphony

Finland

Helsinki—Radio Symphony Orchestra
Helsinki Municipal Orchestra

France

Paris—Orchestre National de la Radiodiffusion Française
Societe des Concerts Colonne
Societe des Concerts du Conservatoire
Societe des Concerts Lamoureux
Societe des Concerts Pasdeloup

Germany

Berlin—Philharmonisches Orchester (West Sector)
Radio-Symphonic-Orchester
Bamberg—Bamberger Symphoniker
Frankfurt am Main—Orchester der Frankfurter Museumgesellschaft
Hamburg—Philharmonisches Staatsorchester
Leipzig—Gewandhaus Orchester

Munich—Munchener Philharmonic
Symphonic Orchester des Bayrischer Rundfunks
Stuttgart—Stuttgarter Philharmoniker
Symphonie Orchester des Suddeutschen Rundfunks

Great Britain

Birmingham—City of Birmingham Symphony
Liverpool—Liverpool Philharmonic
London—London Philharmonic
Royal Philharmonic
BBC Symphony Orchestra
Philharmonic Orchestra
London Symphony
Manchester—Halle Orchestra

Italy

Rome—Orchestra Sinfonica di Roma della RAI
Orchestra Stabile Accademia Nazionale di Santa Cecelia
Naples—Orchestra Allesandro Scarlatti della RAI di Napoli
Milan—Orchestra dell'Angelicum
Orchestra Lirica di Milano della RAI
Torino—Orchestra Sinfonica della RAI di Torino

The Netherlands

Amsterdam—Concertgebouw Orkest
The Hague—Residentie Orkest
Rotterdam—Rotterdam Philharmonisch Orkest

Norway

Bergen—Musikselskapet Harmonien
Oslo—Filharmonisk Selskap

Portugal

Lisbon—Orquestra Filarmonica de Lisbon

Spain

Barcelona—Orquestra Municipal de Barcelona
Madrid—Orchestra Filarmonica de Madrid
Orquestra Sinfonica de Madrid

Sweden

Goteborg—Goteborgs Orkesterforening
Stockholm—Stockholm Filharmoniska Orkester

Switzerland

Geneva—Orchestra de la Suisse Romande
Zurich—Radio-Zurich (Orchestre de Beromunster)

Turkey

Istanbul—Instanbul Sehir Orkestrasi (Istanbul City Orchestra)
Ismir—Ismir Filarmoni Dernegi Orkestrasi

Israel

Tel-Aviv—Israel Philharmonic
Haifa—Haifa Symphony
Jerusalem—"Kol Israel" (Radio) Orchestra

Australia

Sydney—Sydney Symphony
Melbourne—Victorian Symphony
Adelaide—South Australian Symphony
Brisbane—Queensland Symphony
Hobart—Tasmanian Symphony
Perth—Perth Symphony

New Zealand

National Orchestra of the New Zealand Broadcasting Service

Japan

Tokyo—Tokyo Symphony
Tokyo Philharmonic
NHK Symphony (Japan Broadcasting Corp.)

Russia

Leningrad—Leningrad Philharmonic Orchestra
Moscow—State Symphony Orchestra

Mexico

Mexico City—Orquestra Sinfonica Nacional
Guadalajara—Orquestra Sinfonica de Guadalajara
Jalapa—Orquestra Sinfonica de Jalapa

Argentina

Buenos Aires—Orquestra Sinfonica de Radio National
Orquestra Sinfonica Nacional
Orquestra Filarmonica de Buenos Aires
Cordoba—Orquestra Sinfonica de Cordoba

There are also orchestras in the South American countries of Bolivia, Brazil, Chile, Colombia, Ecuador, Uruguay, and Venezuela.

The United States. Although America's first symphony orchestra, the New York Philharmonic, was founded as early as 1842, the development of similar organizations elsewhere came slowly and was restricted chiefly to a few large eastern cities. The opportunity for establishing an orchestra and its chances for survival depended partly on the population of the community and the number of trained musicians available, and partly on the state of culture and taste in a particular location. Sometimes an orchestra owed its reputation and its success to an outstanding conductor, such as Thomas of Chicago, Toscanini of New York, and Stokowski of Philadelphia. Because orchestras must be heavily subsidized, particularly at the beginning, an important factor was often the patronage of local philanthropists like Higginson of Boston, Eastman of Rochester, and the Taft family of Cincinnati. A general idea of American interest in symphonic music prior to World War II may be gained from a representative list of well-established orchestras which flourished at that time. Their names, location, and dates of founding are as follows:

Baltimore.—Baltimore Symphony Orchestra (1917).
Boston.—Boston Symphony Orchestra (1881).
Buffalo.—Buffalo Philharmonic Orchestra (1936).
Chicago.—Chicago Symphony Orchestra (1891).
Cincinnati.—Cincinnati Symphony Orchestra (1895).
Cleveland.—Cleveland Orchestra (1918).
Denver.—Denver Symphony Orchestra (1933).
Detroit.—Detroit Symphony Orchestra (1914).
Houston.—Houston Symphony Orchestra (1913).
Indianapolis.—Indianapolis Symphony Orchestra (1930).
Kansas City.—Kansas City Philharmonic (1933).
Los Angeles.—Philharmonic Orchestra (1919).
Minneapolis.—Minneapolis Symphony Orchestra (1903).
New Orleans.—New Orleans Symphony Orchestra (1935).
New York.—Philharmonic-Symphony Society (1842).
Oklahoma City.—Oklahoma Symphony Orchestra (1937).
Philadelphia.—Philadelphia Orchestra (1900).
Pittsburgh.—Pittsburgh Symphony Orchestra (1927).
Rochester.—Rochester Philharmonic (1923).
St. Louis.—St. Louis Symphony Orchestra (1880).
San Antonio.—Symphony Society (1939).
San Francisco.—San Francisco Symphony Orchestra (1910).
Washington.—National Symphony Orchestra (1931).

To this pioneering group could be added a list of comparable organizations in Atlanta, Columbus, Dallas, Grand Rapids, Miami, Portland, San Diego, and many other cities that also took the initiative in providing orchestras bearing their names and

serving local residents. Since the close of World War II the number of orchestras established in civic and cultural centers throughout the country has increased to an extent nothing short of phenomenal. As of February, the American section of an "International Directory of Orchestras and Managements" published by *Musical America* lists a total of 232 such organizations located at various points in 45 states.

Canada. The 1958 Directory lists orchestras in the cities of Montreal, Toronto, Quebec, Ottawa, Vancouver, Halifax, and Edmonton.

INSTRUMENTS OF THE CONCERT BAND

Previous to World War I, the concert as known today was called the Military Band. In those days, the open air concert was popular with bandstands in practically every town of any size. Since the flowering of the band movement in the public schools and colleges, the Military Band has all but disappeared from the scene. The band today is called the Symphonic band with an instrumentation which includes the wind and percussion instrument of the orchestra. The full symphonic band may add (in addition to the usual winds and percussion of the orchestra) E♭ clarinet, E♭ alto, B♭ tenor, and E♭ baritone saxophones, and baritone horn.

The brass choir has become a popular group in the college area and the name "Wind Ensemble" has become a more modern name for the select symphonic band.

MUSIC AND THE DANCE

The early history of the dance, although undocumented, may be traced back to the days before the Greek Golden Age. No doubt the rhythmic emphasis quickly led to the alliance with music. Greek drama and pageantry, with the chorus, dancers, and musicians, rose to great heights. Later, the early Church condemned actors, musicians, and dancers for their "evil doings," but the dance continued and some time later became part of the medieval miracle plays. Musicians also participated in these lesson-teaching spectacles.

The use of the term "ballet" became widespread in the 16th century as professionally trained dancers were necessary to the spectacle being performed. Paris was the center of the early ballet in the 16th century. The ballet became part of the ceremonial spectacles for the various courts, and included the entire entertainment—singing, dancing, declamation, pantomime, etc. The spectacles were often staged in a large indoor space with groves of transplanted orange trees, colonnades of green branches and working fountains arranged for the "proper" atmospheric background.

Classic and popular dances have had a part in the life of every country, but France has been most important in the development of the ballet. The world's first Dance Academy was organized in 1661 by order of Louis XIV. The dancing masters of Paris were world famous. Early French opera always contained ballet interspersed among the arias, interludes, and verses.

It took some years for ballet to achieve a form of its own. Early ballet used the classic dance forms—minuets, gavottes, bourees, passapieds, musettes, and rigaudons—before successful attempts were made to unite dancing with acting and appropriate music. In the latter part of the 18th century, Jean-Georges Noverre collaborated with the opera reformer, Christoph Willibald Gluck, in fitting the music to the planned dance action.

The period of romanticism in the 19th century found the dances of the people—the polonaise, the mazurka, the waltz, and the polka—influencing the ballet. The ballet "Giselle" composed by Adolphe Adam in the early part of the century showed a successful formula for the romantic ballet. The composer followed the dramatic and dance ideas of the librettist and the choreographer in writing music which would describe the mood, the emotions, the tempos, and the situations called for. Of the many ballets written during this period, there are very few which have endured as worthy of performance today. "Coppelia" by Delibes, "Swan Lake," "Sleeping Beauty," and "The Nutcracker Suite," by Tchaikovsky are a few of the outstanding examples.

The art of the dance was in need of revitalization by the early 20th century and might have dropped from its popular place had it not been for a Californian, Isadora Duncan. Miss Duncan went to Europe with her new ideas of ballet based upon an admiration of classic design of Greek proportions which she used to bring a more "personal" expressive experience to the art of the ballet. Until the advent of Miss Duncan, technique was beginning to overshadow expressiveness as ballerinas vied for showy and often technical displays which were in poor taste.

It was discovered that much of the program music of the 19th century could be used as a basis for choreographic ideas provided no violence was done to the structure of the music while, at the same time, allowing for perfect co-ordination of choreography and music.

The revival of ballet was made possible by Fokine and Diaghilev, masters in the art of choreography; Pavlowa, Nijinski and Massine, outstanding among the interpreters of the time (the dancers) and the following composers: Stravinsky, Arensky, Ravel, the interpreters of the time (the dancers), and the Satie, Falla, Prokofieff, Poulenc, Auric, and Milhaud.

INSTRUMENTAL GROUPS FOR A TYPICAL BAND OF 65 PIECES

Db Piccolo
C Piccolo
1st C Flute
2nd C Flute
1st Oboe
2nd Oboe
Eb Clarinet
1st Bb Clarinet
2nd Bb Clarinet
3rd Bb Clarinet
Eb Alto Clarinet
Bb Bass Clarinet
Eb Contrabass Clar.

BBb Contralto Clarinet
1st Eb Alto Saxophone
2nd Eb Alto Saxophone
Bb Tenor Saxophone
Eb Baritone Saxophone
1st Bassoon
2nd Bassoon
1st Bb Cornet (solo)
2nd Bb Cornet
3rd Bb Cornet
1st Bb Trumpet
2nd Bb Trumpet
1st & 2nd Eb French Horn

1st & 2nd F French Horn
3rd & 4th Eb French Horn
3rd & 4th F French Horn
1st Tenor Trombone
2nd Tenor Trombone
3rd Tenor Trombone
Bass Trombone
Treble clef Baritone
Bass clef Baritone
Tuba
Percussion
(including timpani)

The above chart of instrumentation appears in the Proceedings of the Tenth National Conference of College Band Directors' Association, held at the University of Illinois in December, 1958.

There are many ballet theatres and companies who are successfully continuing the traditions of the ballet. Among these are: The Bolshoi Ballet, The Ballet-Russe, The Royal Ballet of England, Les Grandes Ballets Canadien, The Polish Theatre Ballet (Makowzke), The Danish Royal Ballet and the American Ballet. Within the past several years Civic Ballet groups have mushroomed in many American cities.

In many cases the use of existing music is most successful if the choreographer is successful in evolving an original dance structure which is true to the theme and characterizations without violating the structure or quality of the music. Experimentation is continually being practiced and presented to the public with the more traditional works.

EXPERIMENTAL MUSIC

Some composers have suggested scrapping all music of the past and starting over with new mediums of sound. One group suggested noise, to be expressed by the sounds about us—the purring of motors; the sounds of water, air or gas in metal pipes; the throbbing of valves; the screeching of gears and tires; the slamming of doors; crowds milling about in various degrees of enthusiasm; printing presses, etc. The Franco-American composer Varese moved in this direction and the result has become *musique concrete*. The tape recorder is used to record the sounds and is then manipulated to produce sound slow or fast, loud or soft, etc. This type of sound has proved to be far more useful for backgrounds in plays and movies than as material for "pure" composition.

Computer music has entered into the experimental period. Coded instructions can be given to a computer so that it will "choose" a "possible" series of musical material. Thus a computer can turn out endless "compositions" in the form of a code which can be transcribed into musical notation. The value of creating "juke box" songs very rapidly is a possibility, as is the trying out of various new ideas of combining sounds.

Another group of experimenters working with *microtonal music* divided the scale into more than 12 semitones to the octave. Of these microtone scales, the quarter tone has received most attention, although third tones, sixth tones, eighth and even sixteenth tones have been used. Many new problems of performance have arisen as the usual instruments (except strings) are incapable of playing such music.

Electronic instruments have been devised which amplify sounds by means of electrical devices similar to those used in radio receivers, with the tone often originating as electrical impulses.

In all of the electronic instruments, electricity is the primary factor, either in amplifying the tone or in actually producing the vibrations. One type of instruments may be termed semi-electronic, for in these the actual vibrations are produced mechanically, generally by strings or reeds, and are then transformed into electrical oscillations which are made audible and are amplified by electric loudspeakers. Thus the electronic piano uses strings and an accustomed piano action and hammers, but no sounding board. The string vibrations are converted into electrical impulses by either electromagnetic or electrostatic systems. In the electromagnetic types a small coil with a magnetic core is placed near the string. The vibrations of the string generate an alternating current in the coil. These are amplified and converted into sound waves by a loud speaker. In the electrostatic type the string itself is charged with electricity. As the string vibrates an alternating current is generated between the string and a nearby conductor. This current is then amplified and made into sound waves as in the electromagnetic type. The amplification of vibrations in both systems makes it possible to produce a great volume of tone and also to determine its quality and timbre. By controlling, altering, and even omitting overtones, the piano may be made to sound like an organ, or a string or wind instrument. The duration of tone may be prolonged and the percussive sound of the striking hammer may be blocked out altogether. The electronic pianos that have been developed include one invented by Benjamin F. Miessner; the *Neo-Bechstein*, invented by W. Nernst of Berlin; and the *Elektrochord*, invented by H. Vierling.

Up to the present time electronic organs have had a wider commercial use than electronic pianos. These organs require far less space than large pipe organs, and are convenient in providing organ music in places where the installation of a large instrument would be impractical. Some of the electric organs operate on the electrostatic system used by the electronic pianos, in which the initial vibrations are produced by reeds and are then converted into electric impulses. Some of the organs, notably the *Hammond Organ*, eliminate vibrating reeds or pipes altogether and produce vibrations by means of rotating discs about the size of a silver dollar. Each of these discs has a number of humps which pass a magnet at regular intervals and induce an alternating current in the coil at a frequency to produce the desired number of vibrations per second. Harmonic controls vary the tone quality to correspond with the various stops on the pipe organ, and the volume of tone is regulated by the amplifiers.

Electronic principles have been applied to bowed instruments. In these there remain fingerboard, strings, and bridge, to which is attached an electrostatic pick-up. Amplifiers and loud speakers are housed in separate cabinets. The steel guitar which appears in dance orchestras uses a pick-up system and separate amplifiers.

Another type of electronic instrument which is played, not by means of a keyboard, or bow, but by a player who does not even touch the instrument, is the *Theremin*, invented in 1920 by the Russian, Leon Theremin. In appearance the Theremin looks like a radio receiving set. An upright rod, or antenna, projects from a corner of a cabinet and a metal loop extends horizontally from the side. Sound vibrations are produced by two high-frequency electric circuits which use oscillating radio tubes. The frequency of one circuit is constant and the other is varied by movements of the player's right hand in front of the antenna. As the hand nears the rod, the pitch of the tone is raised; as it draws away the pitch is lowered. Within a range of three feet the right hand of the player may produce a tonal range of six octaves, including not only the half tones of the diatonic scale, but smaller divisions (quarter tones, etc.) as well. By means of harmonic controls the quality of tone may be regulated so that it sounds like the human voice, or like any of a number of instruments. The volume is regulated either by a switch which sets the volume level or by the movement of the player's left hand over the loop at the side of the instrument. When the hand is moved away from the loop the volume is increased; as it nears the loop the tone becomes softer. Modern composers have been interested in composing music for both a solo Theremin and for a group of the instruments. Among them was Joseph Schillinger, with his "First Airphonic Suite."

Benjamin Miessner, inventor of the Miessner electronic piano, has experimented also with electronic wind instruments and has devised clarinets and saxophones which use an electrostatic pick-up system and amplification. He has also invented a chromatic kettledrum in which the vibrations of thirteen bass viol strings are picked up and amplified. The tones of bells and chimes are likewise produced by electronic instruments. Coiled steel reeds produce vibrations which are amplified to volumes equalling the tone of massive bells. Other types of electronic chimes use strings of piano wire.

DICTIONARY OF MUSICAL TERMS

NOTE:—The references in the following definitions, such as "see Musical Form," etc., are to preceding chapters in the text.

A cappella (It.) (*ä-käp-pĕl'lä*). Music written for the "chapel choir;" choral music without instrumental accompaniment.

Accelerando (It.) (*ät-shĕl'ĕr-än'dō*). Accelerating; increasing the speed.

Accent. The stress or emphasis given to one tone over another. Regular (primary) accent falls on the first beat of a measure; secondary accents fall on the third beat of a 4-4 measure, and in compound meters on the 4th beat of 6-4, the 4th and 7th beats of 9-8, etc. etc. Irregular accents are those which fall on normally weak beats.

Accidentals. Signs of chromatic alteration (sharps, flats, naturals) affecting single notes within a measure, as opposed to those given in the key signature of a composition.

Accompaniment. Secondary instrumental or vocal part providing a background for the principal part. It may be either the secondary part of a piece written for a single instrument (piano or organ) or it may be performed by a pianist, organist, orchestra, or chorus in support of a soloist (singer, violinist, etc.) or of a group of soloists.

Acoustics. The science which deals with the production, transmission, and effects of sound. See *Musical Acoustics.*

Adagio (It.) (*ä-dä'jō*). Slow; quicker than *largo* but slower than *andante.*

Ad libitum (Latin) (*ăd lĭb'ĭ-tŭm*). At the pleasure of the performer with regard to time and expression; also, the part so marked may be omitted.

Affabile (It.) (*äf-fä'bē-lĕ*). Affable. *Affabilmente.* Affably.

Affettuoso (It.) (*äf'fĕt-twō'sō*). Affectionate. *Affettuosamente.* Affectionately; with warmth.

Agitato (It.) (*ä'jē-tä'tō*). Agitated; in a hurried, restless manner.

Air. A melody, or tune. French 18th century term for song in general. In 17th–18th century French opera and ballet, an instrumental or vocal piece intended to accompany dancing. In 17th and 18th century suites, a movement of a melodic rather than a dance-like character.

Alla breve (It.) (*äl'lä brā'vĕ*). A tempo mark indicating quick duple time, in which the half note in 4-4 rhythm is regarded as the unit of time, rather than the quarter note.

Allargando (It.) (*äl'lär-gän'dō*). Gradually slower, louder, and broader.

Allegretto (It.) (*äl'lā-grät'tō*). Diminutive of Allegro. Quicker than andante and slower than allegro.

Allegro (Fr. and It.) (*äl-lā'grō*). Quick, brisk, lively.

Alto (It.) A woman's voice of low range. The second-highest part of a four-part chorus. A tenor violin, or viola.

Andante (It.) (*än-dän'tĕ*). Literally, "going"; moderately slow, but flowing easily; often qualified by other words, as, *con moto, largo, maestoso.*

Andantino (It.) (*än-dän-tē'nō*). Diminutive of andante, used most often to designate a short piece of andante tempo. As a tempo mark, it indicates a slight modification of andante, generally a little quicker than andante.

Animato (It.) (*ä'nē-mä'tō*). Animated; spirited.

Anthem. A choral composition for use in church services, with or without accompaniment.

A poco (It.) (*ä pō'kō*). By degrees; gradually.

A poco a poco (It.) (*ä pō'kō ä pō'kō*). Little by little.

Appassionato (It.) (*äp-päs'syō-nä'tō*). Impassioned; passionate. *Appassionatamente.* Passionately; with intense feeling.

Appoggiatura (It.) (*äp-pŏd'jä-tōō'rä*). Literally, a "leaning note"; a discordant, accessory note, placed before a principal note. If it is marked with a diagonal line through the stem and hook, it is called *short* and is played with the least possible duration; if it is without a diagonal line, it is called *long* and has definite time value as indicated.

Aria (It.) (*ä'rē-ä*). Literally an air or melody. Generally used to denote an extended, elaborate vocal solo with instrumental accompaniment, in an opera or oratorio. See *Musical Form.*

Arietta (It.) A small aria.

Arioso (It.) (*ä-rē-ō'sō*). A style in vocal music halfway between the aria and the recitative; also, a short melodic passage interrupting or ending a recitative.

Arpeggio (It.) (*är-pād'jō*). Playing the notes of a chord in harp style, that is in succession instead of simultaneously; marked with a wavy line before the chord.

Assai (It.) (*äs-sī'*). Very, as allegro assai, very quick.

A tempo (It.) (*ä tĕm'pō*). In time; a term used to indicate a return to the regular tempo after some deviation from it.

Attacca, sometimes **attacca subito** (It.) Literally, attach, but used to indicate, at the end of a movement, that the next movement should follow without pause.

Aubade. Morning music, in contrast to Serenade, or evening music. See *Musical Form.*

Augmentation. Introducing a theme written in notes having double the value given them at their first appearance. Opposite of *Diminution.*

Authentic Cadence. See definition of *Cadence.*

Auxiliary Notes. Usually *grace* notes one degree above or below the principal or harmonic note.

Ballad. Originally a song in dance rhythm, accompanied by dancing; now any simple, romantic, narrative, or descriptive song; instrumental music in ballad style.

Ballade. A form of poetry and music used by the Trouvères. See *History of Music* (*Secular Music of the Middle Ages*). In German usage the term indicates poems derived from English ballads. Chopin and Brahms used the term for piano pieces in which the contrasting themes were alternately dramatic and lyrical in character.

Band. A group of instrumental performers playing together; as, a brass band, a military band, or a string band.

Bar. A line drawn vertically across the staff to divide it into measures; a measure is commonly but incorrectly spoken of as a bar. See *Musical Notation.*

Baritone. A male voice intermediate between bass and tenor; also applied to any musical instrument between bass and tenor.

Bass. The lowest part in a musical composition; the lowest male voice; the lowest of a family of instruments. *Continued or figured B.* Bass notes provided with figures indicating chords to be filled in by the performer. *Ground B.* or *Basso ostinato.* A continually repeated bass phrase.

Baton (Fr.) (*bà'tôN'*). The stick used by a leader in beating time.

Beat. Each movement of a conductor's hand or baton, indicating rhythm; each unit division of a measure with reference to accent; a musical embellishment resembling a short trill; the throb heard when two discordant tones are sounded. See *Musical Acoustics.*

Bel Canto. A style of singing which emphasizes beauty of tone rather than dramatic delivery.

Berceuse (Fr.) (*bĕr'sûz'*). A cradle song; an instrumental composition in cradle song style.

Bolero (Sp.) (*bō-lā'rō*). A Spanish dance in triple rhythm accompanied by castanets.

Bowing. The art and the act of managing the bow; the proper manner of using the bow, indicated by certain marks: ⊓ for *down bow;* V for *up bow;* two dots over a note for *spiccato* or *bounding bow.*

Brace. A curved or straight line used to connect two or more staves; the leather slide on a drum chord for tightening the heads.

Bravura, con (It.) (*brä-vōō'rä, kōn*). With boldness and dash.

Broken Chords. Chords whose notes are taken successively, or in *arpeggio,* not simultaneously.

Buffa (It.) (*bōō'fä*). Comic; in the comic style.

Buffo (*bōō'fō*). The singer of a comic part.

Burden. A refrain or chorus in syllables without meaning; the bass of any composition; the drone of a bagpipe.

Cadence (*kā'dĕns*). A melodic or harmonic progression which gives the impression of temporary or permanent conclusion. *Perfect C.* A closing group in which the melody returns to an ends with the tonic. *Imperfect C.* One ending on the tonic chord, but with the third or fifth tone of the chord in the soprano, or upper, part. *Authentic C.* The perfect cadence in which the final tonic chord is preceded by the dominant. *Plagal C.* The perfect cadence in which the final tonic is preceded by the subdominant chord. *Half* or *Semi C.* One in which a transposition to the dominant or subdominant is effected. *Deceptive C.* A cadence composed of the chords on the fifth and sixth steps. The dominant chord suggests its natural progression into the tonic, but

moves into the chord on the sixth step instead, hence its name.

Cadenza (It.) (*kä-dĕnt'sä*). A florid ornamental passage inserted near the end of a composition, particularly in a concerto, and intended chiefly to exhibit the virtuosity of a soloist.

Calando (It.) Decrease in loudness, and slacken tempo.

Canceling Sign. The natural sign (♮), used to remove the effect of a previous sharp or flat sign.

Canon. Literally, a rule or standard. A contrapuntal composition in which the melody is taken by the leading voice, and then taken up in turn by the second, third, and fourth voices at intervals of a definite number of beats or measures.

Cantabile (It.) (*kän-tä'bē-lĕ*). Melodious; lyrical; in singing style.

Cantata (It.) (*kän-tä'tä*). Originally a vocal piece, in contradistinction to a *sonata* or an instrumental piece; now a large choral work, resembling an oratorio, if sacred, or a lyric opera, if secular, but shorter than either of these.

Canticle. A hymn with non-metrical words taken from the Bible, used in some churches.

Canto (It.) (*kän'tō*). Song; melody; that part in a choral work which carries the melody; now the soprano, formerly the tenor.

Cantor (Latin) (*kän'tŏr*). A singer; a precentor.

Cantus firmus (Latin). A fixed or given melody which is made the basis of a contrapuntal composition or exercise.

Canzona (It.) (*kän-tsō'nä*), **Canzone** (It.) (*kän-tsō'nĕ*). A form of Italian lyric poetry corresponding to the ode; such a poem set to music, resembling a madrigal but simpler; a similar instrumental piece. **Canzonnet(te).** A little song.

Capo (It.) (*kä'pō*). Head; beginning; the top. See *Da Capo.*

Capriccio. A short composition, irregular in form, free and unconventional in style.

Carillon (Fr.) (*kăr'ĭ-lŏn; kà'rē'yôN'*). A set of bells upon which a melody can be played; an instrumental piece in the style of carillon music.

Carol. A song of joy sung principally at Christmas and Easter; formerly, a dance accompanied by song.

Catch. A round for three or four voices, in which each singer in turn "catches" up the melody; later usually with comic effect.

Cavatina (It) (*kä'vä-tē'nä*). A solo song, shorter than an aria and without repetition of words or phrases; an instrumental piece of song-like character.

Chaconne (Fr.) (*shà'kôn'*). Originally a Spanish or Moorish dance; an instrumental composition in the form of variations, written over a ground-bass, in 3-4 rhythm and in slow tempo. See *Musical Form.*

Chamber Music. Any music suitable for a small hall, as distinct from music best adapted for a large auditorium; instrumental music in the sonata form, for a small group of string or wood-wind instruments, with or without piano.

Chanson (Fr.) (*shăN'sôN'*). A song; a vocal solo with piano accompaniment; formerly, a ballad.

Chant (n.). A sacred song, usually in four parts, having nonmetrical biblical words, the oldest form of choral music; a song resembling a chant; (v.) to sing or recite in a chantlike manner; to intone.

Chime (n.). A set of bells tuned to a musical scale; music played upon a set of bells; music or melody.

Choir. A group of singers, usually connected with a church; that part of a church edifice set apart for the singers; applied also to the main divisions of the orchestra —strings, wood-wind, brass, percussion.

Choir Organ. In a large pipe organ, that group of pipes and the corresponding manual having a soft tone and therefore suitable for the accompaniment of vocal music.

Choral. Pertaining to a chorus or to a concerted vocal composition; suitable for singing. *Choral Service.* A service in which the liturgy is sung by the clergy, choir, or congregation.

Chorale (Ger.) (*kō-räl'*). Psalm or hymn tune; a form of sacred song introduced by Luther.

Chord. A combination of more than two tones, or any rearrangement of the tones so associated. *Common C.* A chord consisting of a fundamental tone together with its third and fifth. *Dominant C.* A chord founded upon the dominant of the key in which a musical composition is written; the leading or characteristic chord. *Fundamental C.* Same as common chord. *Inverted C.* A chord whose lowest tone is some other than the fundamental or root

Chorus. A group of singers; a choir; a composition intended for a chorus; a refrain.

Chromatic. Derived from a Greek word meaning color; progression by semitones; any scale, chord, or music, containing tones which do not belong to the diatonic scale.

Chromatic Scale. A scale which proceeds by half steps or semitones.

Chromatic Signs. Marks used in musical notation to indicate that a note should be played a semitone higher or lower than as written. These marks are: the sharp, (♯); the flat, (♭); the natural, (♮); the double sharp, (𝄪); and the double flat, (𝄫).

Clef. A character used in modern musical notation to indicate the position of the scale upon a staff. See *Musical Notation.*

Close Harmony. Harmony in which the three upper of four parts fall within an octave; opposed to *open* or *dispersed harmony*, in which one or more parts, if transposed an octave, would fall between two others.

Coda (It.) (*kō'dä*). A "tail"; formerly a few chords at the close of a composition; Beethoven developed it into a general summing up of the movement or composition; the final episode of a fugue.

Coll' arco (It.) (*kōl-lär'kō*). With the bow; a direction that the notes should be played with the bow and not *pizzicato.*

Colla voce (It.) (*kōl'lä vōt'shĕ*). With the voice; a direction that the accompaniment shall be accommodated to the tempo of the singer.

Colorature (*kŏl'ô-rà-tür*). Florid ornaments; in vocal music, brilliant vocalization.

Comma (It.) (*kŏm'mä*). The minutest difference in pitch recognizable by the ear; one-ninth of a whole step; the difference between, for example, true D♯ and true E♭; a sign (,) used as a breathing mark in vocal music.

Common Time. Four-four time, four quarter notes or their equivalent to a measure.

Compass. The range of a voice or of a musical instrument.

Composition. A musical work; the act and the art of writing original music.

Compound Intervals. Intervals which extend beyond an octave.

Compound Rhythms. Those composed of two or more simple times; for example, 6-8 time which may be treated as two 3-8 measures.

Con- (It.). A prefix meaning with.

Concert. A public performance of music, in which a number of singers or instrumentalists, or both, take part; a group of instruments of the same kind but differing in size.

Concertmeister (Ger.) (*kŏn-tsĕrt'mīs'tĕr*). Concert master; the leader of the first violins, who is next in rank to the conductor.

Concerto (It.) (*kŏn-chĕr'tō*). An extended work for solo instrument, generally with orchestral accompaniment. See *Musical Form.*

Conductor. The leader or director of an orchestra or a chorus.

Consecutive Intervals. The progression of two or more parts in parallel sequence. *C. fifths.* The progression of two or more parts at a distance of a fifth from one another; forbidden in strict harmony.

Console. The case containing the keyboard, pedals, and stops, of a pipe organ; often placed at some distance from the organ pipes.

Consonance. A combination of sounds which is agreeable and restful; the opposite to a discord or dissonance. *Perfect C.* An octave, a fifth, or a fourth. *Imperfect C.* Major and minor thirds and sixths.

Continued Bass. See *Bass.*

Contra- (It.) (*kŏn'trà-*). A prefix meaning an octave below.

Contrabass (It.) (*kŏn'trà-bās'*). The lowest bass in a family of instruments.

Contralto (It.) (*kŏn-träl'tō; kŏn-träl'tō*). The deepest female voice; the word means lower than alto (high), but it is now used as synonymous with alto.

Contrapuntal. Pertaining to *counterpoint.*

Contrary Motion. A passage in which one part ascends while the other descends. The opposite of *Parallel M.*

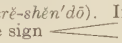
Counterpoint. Literally, point against point, actually the art of adding one or more melodies to a given melody. See *History of Music* and *Musical Form.*

Countersubject. The principal counterpoint in a fugue.

Countertenor. High tenor; the highest male voice.

Country-Dance. *Contre-danse* (Fr.); *Contradanza* (It.). A rural dance, of English origin, in which two lines of dancers facing each other perform various figures.

Courante (Fr.) (*kōō'rănt'*). "Running"; a dance of French origin in triple time; the second part in the old *suites des danses*. See *Musical Form*.

Crescendo (It.) (*krĕ-shĕn'dō*). Increasing in loudness; often indicated by the sign 

Cross Relation. See *False Relation*.

Cyclic, cyclical. Denoting the musical forms which include several movements; compositions in cyclic form are generally sonatas and symphonies in which the same thematic material is used in all or several of the movements. See *Musical Form*.

Czardas (*chär'däsh*). A Hungarian national dance.

Da capo (It.) (*dä kä'pō*). A direction to repeat from the beginning.

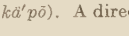
Da capo al fine (It.) (*dä kä'pō äl fē'nĕ*). Repeat from the beginning and end at the mark *Fine*.

Da capo al segno (It.) (*dä kä'pō äl sä'nyō*). Repeat from the beginning and play to the sign ⊕.

Dal segno (It.) (*däl sä'nyō*). Repeat from the sign 𝄋.

D. C. The abbreviation for *Da capo*.

Début (Fr.) (*dā'bū'*). The first appearance of a performer; the beginning of a career.

Decrescendo (It.) (*dĕ'krā-shĕn'dō*). Gradually diminishing in loudness; often marked with the sign 

Degree. A line or a space of the staff; one of the 8 tones in a major or minor diatonic scale.

Deliberato (It.) (*dĕ-lē'bĕ-rä'tō*). Deliberate. *Deliberatamente*. Deliberately.

Descant (Sometimes **Discant**). The earliest attempt at polyphony with contrary, rather than parallel, motion in the parts; the highest part in part-music.

Development. The elaboration of a theme or musical idea by working out melodic, harmonic, or rhythmic changes; the part of a composition in which this is done.

Diapason (Eng.) (*dī'ă-pā'zŏn*). The interval of an octave; the consonance of that interval; the range of a voice or an instrument; a recognized standard of pitch; a rule or scale used by makers of wind instruments to determine the pitch beforehand; a class of fundamental organ stops, also called *principal*.

Diatonic. Pertaining to the tones of the major or minor scale. *D. Interval*. One formed by two tones of the major or minor scale. *D. Harmony* or *Melody*. Those formed by the tones of a single major or minor scale. *D. Progression*. A stepwise progression to an adjacent tone of a single major or minor scale.

Diminished. *D. Interval*. A perfect or minor interval contracted by a semitone. *D. Chord*. One in which the highest and lowest tones form a diminished interval.

Diminuendo (It.) (*dē-mēn'ōō-ĕn'dō*). Diminishing gradually in loudness.

Diminution. The repetition of a theme or melodic passage in notes of smaller time-value (1-2, 1-3, or 1-4 that of the original). Opposite of *Augmentation*.

Discord, Dissonance. Technically, a combination of tones so far related from each other that they produce acoustical beats. Commonly, a combination of tones which requires resolution. Opposite of *Consonance*.

Divertimento (It.) (*dē-vĕr'tē-mān'tō*). A musical diversion; a kind of diminutive symphony; a short selection introduced between the acts or at the conclusion of an opera; a potpourri of airs, from an opera or other large composition, arranged for orchestra or piano.

Divisi (It.) (*dē-vē'zē*). Divided. A direction indicating that two parts written on the same staff of a score are to be played by two groups of the instruments playing from that staff. A return to all instruments of the group playing the same notes, or in unison, is indicated by *a due*, or *a2*.

Dolce (It.) (*dōl'chĕ*). Sweet, soft. *Dolcemente*. Sweetly, softly.

Dominant. The fifth tone in the major or minor scale. *D. Triad*. One having the dominant as its root. *D. Chord*. The dominant triad, or the 7th, 9th, etc. chords, each having the dominant as its root.

Doppio (It.) (*dŏp'pē-ō*). Double. *D. Movimento*, twice as fast.

Dot. A point placed after a note, the effect of which is to increase the length of the note by one-half

Double Stop. In violin playing, stopping two strings at once, and obtaining two part harmony.

Doxology. A hymn of praise to God, used in Christian worship.

Drone. The largest pipe of the bagpipe, sounding only one note, which serves as a bass for every tune. *Drone bass*, a bass on the tonic, or tonic and dominant, which persists throughout a movement, as in the *musette*.

Duet. A composition for two voices, or for two instruments of the same kind, the two parts being of equal importance; a composition for two performers on one piano.

Dur (Ger.) (*dōōr*). German for major, referring to keys; the German for minor is *moll*.

Dynamics. That part of musical science which deals with differences and contrasts in loudness of tones.

Eighth. The eighth note of the diatonic scale. *Eighth note*. A note whose value is one-eighth that of a whole note.

Elegante (It.) (*ĕl-ĕ-gän'tē*). Elegant, graceful. *Elegantemente*. Elegantly, gracefully.

Encore (Fr.) (*äN'kôr'*). Again; a demand for the reappearance of a performer, as by applause; the performance given in response to such a demand.

Energico (It.) (*ĕn-ĕr'jē-kō*). Energetic, vigorous. *Energicamente*. Energetically, vigorously.

Enharmonic. *E. Tones*. Those which are of the same pitch on tempered instruments, but which are actually of different pitch in notation and in the natural scale, as C♯ and D♭, F♯ and G♯, etc. *E. Chords*. Those which are alike in pitch on tempered instruments, but unlike in notation and in the natural scale. *E. Change*. One effected in the harmonic relation of tones and chords by considering them as identical in pitch though unlike in notation. Thus an enharmonic change from the key or tonality of B♭, to A♯ would change the notation but not the pitch in the tempered scale.

Ensemble (Fr.) (*äN'säN'bl'*). The united performance of voices or instruments or both in rendering a composition.

Episode. An incidental, digressive portion of a composition as contrasted with the themes and their development. See *Musical Form*.

Eroica (It.) (*ĕ-rō'ē-kä*). Heroic.

Erotic (*ē-rŏt'ĭk*). Amorous; in an amorous style.

Espressivo (It.) (*ĕs'prĕs-sē'vō*). Expressive.

Etude (Fr.) (*ā'tüd'*). A study; an exercise in technique. *Etude de Concert*. A difficult composition for concert performance, affording opportunity for technical display.

Expression. Interpreting the meaning and emotional quality of a composition, in rendering it. *Expression Mark*. A sign or word introduced to aid the performer to interpret a composition.

False Accent. An accent removed from the proper beat to another.

False Relation. Any tone of a chord stands in a false relation when its chromatic alteration occurs in a different part in the following chord.

Falsetto (It.) (*făl-sät'tō*). The false voice, which lies above the natural register; so called because it sounds forced and unnatural.

Fandango (Sp.) (*făn-dăng'gō*). A lively Spanish dance in triple time, of obscure origin, but very old. A composition in the rhythm of this dance.

Fantasia (It.) (*făn'tä-zē'ä*). A composition not in strict form; a medley of well-known airs with florid decorations.

Fermata (It.) (*fär-mä'tä*). A pause or hold marked thus, 𝄐.

Fifth. The interval between a fundamental tone and the fifth tone above.

Figuration. Ornamental treatment of a passage.

Figured Bass. See definition of *Bass*.

Finale (It.) (*fē-nä'lĕ*). The conclusion; the last piece of any act of an opera; the concluding number of a concert; the last movement of a composition in the sonata form.

Fingering. The method or the act of playing with the fingers upon an instrument; the characters, 1, 2 3, 4, 5, used to indicate correct fingering.

Flat (Ger., b; Fr., bémol; It., bemolle). 1. The symbol (♭) derived from the letter *b*, lowering the pitch of the note before which it is placed a semitone; when occurring in the signature, it affects every note on its line or space. 2. Below the correct pitch; singing or playing "flat." See *Musical Notation*.

Foot. A unit used to designate the pitch of an organ pipe. A pipe two feet long sounds middle C; one four feet

long, the octave below. Applied also to corresponding tones of other instruments,—thus middle C, however produced, is called a two-foot tone.

Form. The pattern or design of a musical composition, which is as essential to good music as a pattern or design is to a piece of architecture or to any other work of art.

Forte (It.) (*fôr'tĕ*). Loud, powerful.

Fortissimo (It.) (*fôr-tĕs'sē-mō*). Very loud.

Forzando (It.) (*fôr-tsän'dō*). Forced; emphasis upon one note or chord; marked ∧ or >.

Fourth. The interval between a fundamental tone and the fourth tone above.

Fugue (*fūg*). A contrapuntal composition which consists of an elaborate interweaving of one or more themes by the different parts at various intervals of pitch. See *Musical Form.*

Fundamental. The lowest element of a tone, the other elements being its harmonics; applied also to the lowest tone of a chord when the chord is founded upon that tone.

Fuoco (It.) (*fwō'kō*). Fire, spirit.

Furioso (It.) (*foo'rē-ō'sō*). Furious, vehement. *Furiosamente.* Furiously, vehemently.

Galop (Fr.) (*gȧl'ŭp; gȧl'ō*). A quick dance, in 2-4 time; a composition in the rhythm of this dance.

Gavotte (*gȧ-vŏt'*). A French rustic dance in quick common time, introduced at the French court in the 16th century, the step characterized by raising of the feet instead of sliding; a composition in gavotte style. See *Musical Form.*

Gigue (Fr.) (*zhēg*). A jig (from the German *geige*, a "fiddle"); a lively dance.

Giocoso (It.) (*jŏ-kō'sō*). Jocose, sportive. *Giocosamente.* Jocosely, sportively.

Giusto (It.) (*jōōs'tō*). Exact, precise, even, steady.

Glee. A vocal composition of three or more parts, popular in England between 1760 and 1830.

Glissando (It.) (*glĕs-sän'dō*). In a slurring or gliding manner In piano playing a *G*, is a rapid scale-effect accomplished by sliding the thumb, or the thumb and one finger, over the white or black keys.

Grace Note. An ornamental note, not essential to the melody but adding grace to it. It is written small and is not counted as part of the measure. The principal embellishments, consisting of grace notes, now in use are *acciaccatura, appoggiatura, mordent, trill,* and *turn.*

Grave. Slow, solemn.

Grazioso (It.) (*grä'tsĭ-ō'sō*). Graceful. *Graziosomente* Gracefully.

Gregorian Chant. A style of Church music without definite rhythm, written in one of the eight Church modes or scales, formerly attributed to Pope Gregory. See *History of Music.*

Ground Bass. See definition of *Bass.*

Half Note. A note having half the time value of a whole note and twice that of a quarter note.

Half Rest. A pause equal in duration to a half note.

Harmonic Mark. A sign (0) used in violin and harp music to indicate that certain notes should be played as harmonics; also a diamond headed note, which indicates the point at which the string should be touched to produce the harmonic, placed above the note indicating the open string to be used.

Harmonics. Higher partial tones present in practically every musical sound, which can also be sounded separately upon many musical instruments. See *Musical Acoustics.*

Harmony. The art of combining musical tones into chords and progressions. The term may be distinguished from *Chord* in that a chord is a single combination of tones, while *Harmony* embodies successions of chords and the relationship between them. Harmony differs from *Counterpoint* in that the latter represents the horizontal weaving of different melodies, while in notation Harmony consists of a vertical combination of notes which represent chords.

Hold. A character(⌒) indicating that the duration of a note or rest should be extended. See *Fermata.*

Homophonic. Literally, many-voiced, designating a style of music in which one melody, or part, is supported by chords. Opposite of *Polyphonic,* or many-voiced.

Idyl. A short poem dealing with simple rural life; the musical setting for such a poem.

Impetuoso (It.) (*ēm-pĕt'ōō-ō'sō*). Impetuous. *Impetuosamente.* Impetuously.

Impresario (It.) (*ēm'prĕ-sä'rē-ō*). The conductor or manager of an opera or concert company.

Impromptu (Fr.) (*ăN'prôN'tü'*). An extemporaneous composition or one written in free style.

Improvisation. The act and the art of composing and performing music without previous preparation.

Instrumentation. The act or art of composing or arranging music for instruments, especially for the orchestra; orchestration.

Interlude. A short piece played between the acts of a drama, the sections of a cantata, the verses of a song or the parts of a church service.

Intermezzo (It.) (*ēn'tĕr-mĕd'zō*). An interlude; a short movement in the symphony; one of the parts of the old suite.

Interval. The difference in pitch between two tones; called *harmonic* if between two tones sounded together, *melodic* if between two tones sounded in succession. The intervals of the diatonic scale are: do, *unison* or *prime;* do-re, *second;* do-mi, *third;* do-fa, *fourth;* do-sol, *fifth;* do-la, *sixth;* do-si, *seventh;* do-do, *eighth* or *octave.* Of these the unison, fourth, fifth, and octave are classified as *Perfect.* The second, third, sixth, and seventh are *Major* in the major scale. *Minor Intervals.* These are a chromatic half step smaller than major intervals of the same name. *Augmented Intervals* are a chromatic half step larger than perfect and major intervals. *Diminished Intervals* are a chromatic half step smaller than perfect and minor intervals. Intervals not exceeding an octave are called *simple;* those greater than an octave, *compound.*

Intonation. The act and the art of producing tone-with the voice or upon a musical instrument *False intonation,* as applied to pitch. Incorrect intonation. *Just intonation.* Correct intonation.

Introit (Eng.) (*ĭn-trō'ĭt*). "Entrance"; a hymn forming a part of the Communion service of many churches, sung as the priest approaches the altar or the Communion table.

Inversion. The transposition of the notes forming an interval or a fundamental chord. In inversion, the interval of a perfect fifth becomes a perfect forth, e.g. C-G, G-C; a major third becomes a minor sixth, C-E, E-C, etc. An *inverted chord* is one in which the lowest tone is not its root.

Kapellmeister. Originally the director of music for a prince, hence the conductor of the court orchestra and chapel choir. Today the term is used in derogation, and *Kapellmeister* music means formally correct music, but lacking in imagination.

Key. A series of tones forming any major or minor scale, virtually synonymous with *Tonality.* The *Keynote* of a passage is the tonic, or lowest note of the scale, and determines its *key.* Also, the levers on keyboard instruments which manipulate the action, and which cover the side-holes on wind instruments.

Keyboard (Ger., klaviatur; Fr., clavier; It., tastatura). The white and black keys or digitals of the piano or the organ taken together. Large pipe organs have three or four keyboards, also called *manuals.*

Largamente (It.) (*lär'gä-mān'tĕ*). Broadly, nobly.

Larghetto (It.) (*lär-gāt'tō*). The diminutive of *largo;* not quite so slow as *largo.*

Largo (It.) (*lär'gō*). Slow, broad; slower than *adagio,* but not so slow as *grave.*

Leading Tone. The major seventh of any scale.

Ledger or **Leger Lines** (*lĕj'ĕr*). Short lines added above or below the staff to increase its compass.

Legato (It.) (*lĕ-gä'tō*). Smooth and connected: often indicated by a slur or *legato-mark;* the opposite of *staccato. Legatissimo.* The superlative of *legato;* very smooth and connected.

Leitmotif (Ger.) (*līt'mô-tēf'*). A "guiding theme"; a musical figure or melodic phrase, which labels or represents a certain person, situation, or idea in a modern music drama or opera.

Lento (It.) (*lĕn'tō*). Slow; slower than *andante,* but not so slow as *largo. Lentamente.* Slowly.

Libretto (It.) (*lĭ-brät'tō*). Literally *a little book;* the text of an opera or oratorio.

Lied (Ger.) (*lēt*). A song, a lay. *Volkslied.* A folk song. *Kunstlied.* An art song. *Strophenlied.* A song composed of stanzas. *Durchkomponierteslied.* A song treated musically as a whole.

Ligature. A slur; a group of notes sung to one syllable or in one breath, or bowed with one stroke.

Litany. A song of supplication.

Loco (It.) (*lō'kō*). A word canceling the sign *8va* meaning an octave above, and indicating that the notes should be played as written.

Lullaby. A cradle song

Madrigal. An unaccompanied song, usually a love song, for three or more voices, often six or eight, making use of counterpoint and imitation. See *Musical Form.*

Maestoso (It.) (*mä'ĕs-tō'sō*). Majestic, stately. *Maestosamente.* Majestically.

Maestro (It.) (*mä-ĕs'trō*). Master; composer; teacher.

Major. *Greater*; used to signify standard or normal as opposed to minor, diminished, and augmented; applied to intervals, chords, scales, and keys.

Major Scale. The scale in which the half steps occur between the third and fourth, and seventh and eighth tones, both in ascending and descending. See *Musical Notation.*

Manual. A key or digital of a keyboard; the keyboard of an organ played by the hands, as opposed to the pedal board played by the feet.

Marcato (It.) (*mär-kä'tō*). Marked, accented; indicated by the sign —

March. A musical composition of strongly marked rhythm, suitable for accompaniment to marching.

Marcia funebre (It.) (*märt'shä fōō'nā-brĕ*). Funeral march.

Mass. A musical setting of the liturgy of the Eucharist. The subdivisions are: Kyrie, Gloria, Credo, Sanctus, Benedictus, and Agnus Dei. See *Musical Form.*

Mazurka (Pol.) (*mä-zōōr'kä*). A Polish national dance in triple rhythm, usually having a strong accent on the third beat; a composition in the rhythm of this dance.

Measure. The grouping of notes or beats into equal units of rhythm, marked upon the staff by perpendicular lines or bars; hence also the space between two adjacent bars.

Mediant. The name of the third scale step.

Medley. A mixture; a composition made up of detached passages from other compositions; usually applied to vocal music; *potpourri*, to instrumental pieces of this kind.

Melodrama. A species of music drama closely resembling opera, in which the dialogue is accompanied by instrumental music; declamation recited to musical accompaniment.

Melody. A succession of single tones varying in pitch, opposed to harmony, which consists of two or more tones sounded simultaneously, the leading part of a composition.

Meter, Metre. The grouping of notes or beats into units of measure to form rhythm; the distribution of long and short, accented and unaccented notes in the measure.

Metronome (Gr.) (*mĕt'rô-nōm*). An instrument for marking time, which consists of a pendulum making one click for each swing, invented by Maelzel in 1816. The pendulum can be made to swing faster or slower by adjusting a weight.

Metronome Marks. Marks placed at the beginning of a piece of music, as for example "M.M. 90," which means that a quarter note has the value of one click on Maelzel's metronome when the indicator is placed at 90, or that quarter notes should be played at the rate of 90 per minute.

Mezzo (It.) (*mĕd'zō*). Medium, half. *M. forte.* Moderately loud. *M. orchestra.* With only half the orchestra. *M. piano.* Moderately soft.

Mezzo-Soprano (It.) (*mĕd'zō-sô-prä'nō*). A female voice, the range of which lies between the soprano and the alto.

Middle C. One-lined C; the C which is nearest the middle of a piano keyboard; written on the first leger line below the treble clef, or on the first leger line above the bass clef.

Minor. Less; smaller; applied to intervals and to chords, scales, and keys having intervals a semitone less than major.

Minor Scale. This scale has three forms: The *Normal* or *natural minor* has half steps between 2 and 3, and 5 and 6. The *Harmonic minor* is the same except that the 7th tone is raised a semitone. This makes it a scale with half steps between 2 and 3, 5 and 6, 7 and 8, and one step and a half between 6 and 7. The *Melodic minor* has half steps between 2 and 3, and 7 and 8, ascending, while in descending it usually has the form of the normal minor. See *Musical Notation*

Minuet. A slow, graceful dance in triple rhythm, which originated in France about 1650; a composition in the rhythm of this dance. See *Musical Form.*

Modes. A system of scales, used in ancient Greek and in early Church music, which may be described as consisting of overlapping parts of our diatonic scale in C major, or as made up of octaves beginning with various notes and using only the tones represented by the white keys of the piano. See *Musical Notation.*

Modulation. Changing from one key to another in a succession of chords; inflecting the voice musically.

Moll (Ger.) (*mŏl*). Minor.

Molto (It.) (*mōl'tō*). Much; very.

Mordent (*môr'dĕnt*). An embellishment consisting of a quick alternation between a principal note and the note below, indicated by the mark (^^) placed above the note to be so rendered.

Morendo (It.) (*mô-rĕn'dō*). Dying away.

Motet. An unaccompanied contrapuntal vocal composition with sacred words, which came into vogue about 1300.

Motion. Melodic progression. See *Contrary Motion* and *Parallel Motion.*

Motif, Motive. A musical figure or phrase which serves as the germ from which a composition or a movement is developed.

Movement. A distinct division of a composition having its own key, rhythm, themes, and general character.

Mutation. The change in the male voice occurring at the age of puberty; shifting the position of the left hand in violin playing.

Mute. A small clamp attached to the bridge of a violin, viola, or cello to muffle the tone; a pear-shaped pad inserted in the bell of a wind instrument for the same purpose. The sign for using a mute is *con sordini*; the sign for its removal is *senza sordini.*

Natural. A character (♮) used to cancel the effect of a sharp or a flat; a note so affected.

Ninth. The interval between a fundamental tone and the ninth above.

Nocturne. A "night piece"; a serenade of a dreamy and romantic character.

Nodes. The points at rest, between the loops of a string vibrating in sections of equal length. See *Musical Acoustics.*

Notation. The act and the art of representing music by means of notes and other symbols; these notes and other symbols taken collectively.

Nuances (Fr. pl.) (*nü'äns'*). Shades of difference in rapidity, force, and expression, which serve to interpret various emotions and musical ideas.

Obbligato (It.) (*ŏb'blē-gä'tō*). *Indispensable*; applied to a part which is essential and cannot be omitted, the opposite of *ad libitum*; recently used also in the sense of "optional," as a *violin obbligato* to a song.

Octave. The interval between a fundamental tone and the eighth diatonic tone above; the whole series of tones within the interval.

Octet. A composition for eight parts or voices; the performers of such a composition taken collectively.

Offertory (*ŏf'ĕr-tô-rĭ*). In the Roman Catholic Church an anthem or instrumental piece performed while the bread and wine are "presented" to God before consecration, and during which a collection may be taken; in Protestant churches, music performed while an offering is being taken.

Opera (*ŏp'ĕr-à*). (1) A drama set to music consisting of recitatives, arias, duets, trios, quartets, choruses, etc., with orchestral accompaniment; performed with the aid of scenery, costumes, and action. (2) The plural form of *opus.*

Operetta. A short opera, usually in a light vein.

Opus (Lat.) A musical work or composition; as, Op. 1, the first work.

Oratorio (*ŏr'à-tō'rĭ-ō*). A drama with Scriptural text, set to music; performed without the aid of scenery, costumes, or action. See *Musical Form.*

Orchestra (*ôr'kĕs-trà*). 1. A band of musicians performing upon various instruments. 2. The space in a theater occupied by the band or orchestra. See *Development of the Orchestra.*

Organ Point. See *Pedal Point.*

Ornamental Notes. Unessential notes introduced for the purpose of embellishment, such as *acciaccatura, appoggiatura, grace notes, trill, turn.*

Ostinato (It.) (*ŏs-tē-nä'tō*). Literally, obstinate. Continuous; applied to a ground bass or a melodic figure often repeated.

Overtone. See *Musical Acoustics.*

Overture (Eng.) (*ō'vĕr-tûr*). An introduction to an oratorio, opera, or other large composition. See *Musical Form.*

Parallel Motion. A progression in which two or more parts in a composition ascend or descend simultaneously, generally by the same intervals. The opposite of *Contrary Motion.*

Partials. See *Musical Acoustics.*

Parlando (It.) (*pär-län'dō*). In a recitative or speaking manner.

Part. A series of tones written for and performed by a voice or instrument, or a group of either. It may be performed as a solo or together with other voices or instruments, each playing or singing its own part.

Part-song. A composition for three or more voices, in harmony, and without accompaniment.

Partita (It.) (*pär-tē'tä*). A composition consisting of a collection of dance tunes, which came into vogue about 1700; also called *suite.* See *Musical Form.*

Partitur (Ger.) (*pär-tĭ-tûr'*); **Partitura** (It.) (*pär-tē-tōō'rä*). The full score, the entire draft of a composition for voices and instruments.

Passacaglia. An Italian dance in triple time and stately rhythm, composed on a ground bass. See *Musical Form.*

Passage. A short section of a composition.

Passepied (Fr.) (*pàs'pyā'*). A lively French dance in triple time, which originated in the 16th century; a composition in the rhythm of this dance.

Passing Tones. Tones not essential to the harmony but serving to make smooth the transition from one chord tone to another.

Passion Music. The story of the suffering and death of Christ set to music; similar to a cantata or an oratorio.

Pasticcio (It.) (*päs-tēt'shō*). A medley; an opera made up of selections from other operas.

Pastoral, Pastorale (It.) (*päs'tô-rà'lĕ*). A music drama or scenic contata dealing with rural life; a vocal or instrumental composition suggestive of rural life.

Pedal. A foot lever, as piano pedal, organ pedal, harp pedal.

Pedal Keys. A set of pipe organ keys played by the feet.

Pedal Point. A bass note which is held while the harmony of the other parts varies.

Pentatonic Scale. A five-toned scale; the same as our major diatonic scale with the fourth and seventh tones omitted.

Percussion Instruments (*pĕr-kŭsh'ŭn*). Those which are sounded by striking, as drums, cymbals, triangles, tambourines, bells, chimes, castanets, and the xylophone.

Period. A musical sentence; it is composed of two or more phrases, usually of four measures each, and closes with a cadence. See *Musical Form.*

Phrase. A short musical figure or passage. See *Musical Form.*

Phrasing. The proper emphasis and grouping of musical phrases in performance; the signs in notation to indicate proper phrasing.

Pianissimo (It.) (*pyä-nēs'sĕ-mō*). Very soft.

Piano (It.) (*pyä'nō*). Soft.

Pitch. That property of musical sounds, or tones, which we recognize when we speak of them as high or low. See *Musical Acoustics.*

Più (It.) (*pyōō*). More. *Più lento.* More slowly. *Più mosso.* More rapidly.

Pizzicato (It.) (*pēt'sē-kä'tō*). Plucked; indicating that the strings should be plucked, not bowed.

Plagal Cadence. See definition of *Cadence.*

Plain Song. A nonmetrical chant in one of the ecclesiastical modes, common in early church music.

Poco (It.) (*pô'kō*). Little.

Poco a poco (It.). Little by little; by degrees.

Polka. A lively dance in 2-4 time, which originated in Bohemia about 1830.

Polonaise (Fr.) (*pŏl'ô-nāz'*). A stately Polish dance in triple rhythm, used as an instrumental form particularly by Chopin.

Polyphonic. Designing music in which the parts or voices are melodically independent while at the same time in harmony; contrapuntal music; opposed to *homophonic.*

Pomposo (It.) (*pōm-pō'sō*). Pompous. *Pomposamente.* Pompously.

Ponderoso (It.) (*pŏn'dĕ-rō'sō*). Ponderous, massive, heavy.

Portamento (It.) (*pôr'tä-mān'tō*). 1. A smooth gliding from one tone to another. 2. A piano touch, semi-staccato, used when notes are marked with dots over which a slur is drawn .

Potpourri (*pō'pōō'rē'*). A composition composed of fragments of other compositions; a medley.

Precentor. The leader of a church choir or of congregational singing.

Precipitato (It.) (*prĕ-tshē'pē-tä'tō*). Hurried. *Precipitamente.* Hurriedly.

Preciso (It.) (*prĕ-tshē'zō*). Precise, exact.

Prelude. An introductory strain, section, or movement, complete in itself; opposed to *introduction,* which leads directly into the following principal section of the composition.

Preparation. Preparing the way for a dissonant tone by using it in an immediately preceding harmonious chord.

Prestissimo (It.) (*prĕs-tēs'sĕ-mō*). Very quick; the superlative of *presto.*

Presto (It.) (*prĕs'tō*). Quick, rapid.

Prima donna (It.) (*prē'mà dŏn-nà*). The leading female singer in an opera.

Program Music. Music intended to portray or suggest a definite series of objects or events; first applied to Beethoven's "Pastoral Symphony."

Progression. *Melodic* progression is the passage from tone to tone in a succession of single tones; *Harmonic p.,* the passage from chord to chord in a succession of chords.

Quadrille (Fr.) (*kwà-drĭl'*; *kä'drēl'*). A French square dance of five figures in 6-8 or 2-4 time; the music for such a dance.

Quartet (Eng.) (*kwôr-tĕt'*). A composition of four parts or voices, each part for one voice or instrument; the four performers rendering a quartet.

Quasi (It.) (*kwä'zē*). In the style of.

Quickstep. A quick and spirited march, generally in 6-8 time.

Quintet. A composition arranged for five voices or instruments.

Rallentando (It.) (*räl'lĕn-tän'dō*). Gradually slower.

Rapido (It.) (*rä'pē-dō*). Rapid. *Rapidamente.* Rapidly.

Recitative (*rĕs'ĭ-tā-tēv'*). Musical declamation. *Recitativo secco.* Declamation with but slight accompaniment. *Recitativo stromentato.* Declamation with orchestral accompaniment. See *Musical Form.*

Reel. A lively dance popular in Scotland, danced by two couples. *Virginia r.* A variant form popular in the United States, requiring a large number of dancers.

Refrain. The *burden* or chorus of a song, repeated at the end of each stanza.

Register. The range of a voice or musical instrument; a portion of the range of a voice or instrument composed of tones having the same quality; an organ stop.

Requiem (Lat.) (*rē'kwĭ-ĕm*; *rĕk'wĭ-ĕm*). A mass for the dead; a musical setting for the same.

Resolution. The progression of a dissonance to a consonance.

Rest. A character indicating silence.

Retard. To slacken the speed gradually.

Retardation. A suspension resolving upward.

Rhapsodic, Rhapsodie. (*răp'sō-dĭ'*). An instrumental fantasy, generally based on folk songs.

Rhythm (*rĭTH'm*). Movement characterized by regular, measured, or harmonious recurrences of stress or impulse, beat, sound, accent, or motion. As a musical factor it deals with pulsations logically grouped by means of accents.

Rigoroso (It.) (*rē'gô-rō'sō*). Rigorous, exact.

Rinforzando (It.) (*rēn'fôr-tsän'dō*). Re-enforced, accented.

Risoluto (It.) (*rĭ'sô-lōō'tō*). Resolute, determined.

Ritardando (It.) (*rē'tär-dän'dō*). Retarded, gradually slower.

Ritenuto (It.) (*rē'tĕ-nōō'tō*). Immediately slower.

Ritornello (It.) (*rē'tôr-nĕl'lō*); **ritornelle** (Fr.) (*rĭt'ŏr-nĕl'*). A short instrumental passage in a vocal composition, as a prelude or a refrain; the *tutti,* or full orchestra parts of a concerto.

Romance. A vocal or instrumental composition of a romantic character, without a fixed form.

Rondo (It.) (*rŏn'dō*). A form of composition, generally instrumental, characterized by recurrence of the leading theme. See *Musical Form.*

Root. The fundamental tone of any chord; the lowest tone if the chord is in its natural position, but some other, if the chord is inverted.

Roulade (Fr.) (*rōō'lăd'*). A florid passage; in vocal music, a number of notes sung to one syllable.

Round. A vocal canon for three or more voices. The first voice sings the melody. The others sing the same melody but enter in turn, each a few measures later than the one before, thus producing the effect of a song going around in a circle. See *Musical Form.*

Rubato (It.) (*rōō-bä'tō*). Robbed; stolen; that is, some tones held a trifle beyond their value, at the expense of the others.

Run. An ornament consisting of a rapid succession of notes.

Saltarella (It.) (*säl'tä-rĕl'ä*). A quick Italian dance, usually in triple rhythm, with a hop step at the beginning of each measure; music in the rhythm of this dance.

Saraband (Eng.) (*săr'ä-bănd*). A slow Spanish dance in triple rhythm, which originated among the Saracens; music in the rhythm of this dance. See *Musical Form.*

Scale. Literally, a ladder; actually, a series of tones arranged according to rising pitches. See *Musical Notation.*

Scena (It.) (*shä'nä*). The largest vocal solo form, usually part of an opera, but sometimes an independent composition.

Scherzando (It.) (*skĕr-tsän'dō*). Sportive, playful.

Scherzo (It.) (*skĕr'tsō*). An instrumental composition of a humorous, playful, or whimsical character.

Schottisch (Ger.) (*shŏt'tĭsh*). A Scotch round dance in triple rhythm, resembling the polka but slower; music in the rhythm of this dance.

Score (Ger., partitur; Fr., partition; It., partitura). Music written upon a number of staves, one for each instrument or voice, and so arranged, one above another, that the relation of any one to the others can be seen at a glance. See *Partitura.*

Second. The interval between a fundamental tone and the next diatonic tone above.

Section. A division of a musical period; a phrase; also a group of periods forming a complete and distinct musical idea.

Semitone (*sĕm'ĭ-tōn*). The smallest interval in European music. One half of a whole tone.

Senza (It.) (*sän'tsä*). Without.

Septet (Eng.) (*sĕp-tĕt'*). A composition for seven instruments or voices; the performers of such a composition.

Sequence (Eng.) (*sē'kwĕns*). The repetition of a figure at different intervals.

Serenade. An evening song.

Sforzando (It.) (*sfôr-tsän'dō*). Emphasis upon a certain note or chord; marked *sf.* or ∧ or >.

Shake. An embellishment consisting of a rapid alternation between two tones separated by a whole step or a half step; also called a *trill*; marked *tr.*

Sharp. 1. A mark (♯) which, placed before a note or in the key signature, raises the note or notes affected one semitone. 2. Above the proper pitch, as one sings or plays sharp. See *Musical Notation.*

Signature. The marks and numerals placed upon the staff at the beginning of a piece of music. *Key signature.* The clef and sharps or flats which indicate the key of a composition. *Time signature.* The numerals in fractional form which indicate the rhythm. See *Musical Notation.*

Sixth. 1. The sixth diatonic tone above a fundamental. 2. The interval composed of the fundamental and the sixth step.

Slide. A movable tube in the trombone which alters the pitch of the tones produced.

Slur. A curved line drawn over or under two or more notes to indicate that the transition from one to another should be smooth.

Smorzando (It.) (*zmôr-tsän'dō*). Quenched, suddenly dying away.

Solfeggio (It.) (*sōl-fäd'jō*). A singing exercise in which a single vowel or the syllables *do, re, me, fa, sol, la, si* are used. See *Musical Notation.*

Solmization. A method of teaching scales and intervals by syllables. See *Musical Notation.*

Solo (It.) (*sō'lō*). Performed alone by one voice or instrument; opposed to *concerted*; a composition for a single voice or instrument.

Sonata (It.) (*sō-nä'tä*). An instrumental composition made up of three or four movements in different though related keys and in different forms and moods. See *Musical Form.*

Sonata Form. See *Musical Form.*

Sonatina (It.) (*sō'nä-tē'nä*). A short, simple sonata.

Song. A lyric, narrative or dramatic poem set to music.

Song Form. See *Musical Form.*

Soprano (It.) (*sō-prä'nō*). The highest female or boy's voice; the treble.

Sordino (It.) (*sōr-dē'nō*). See definition of *Mute.*

Sostenuto (It.) (*sōs'tĕ-nōō'tō*). Sustained; gradually retarded.

Sotto voce (It.) (*sōt'tō vō'chĕ*). In a low voice, in an undertone.

Space. The degree or interval between two lines of the staff. See *Musical Notation.*

Staccato (It.) (*stäk-kä'tō*). Separated, distinct, detached.

Staff. The five horizontal lines, on and between which music is written. See *Musical Notation.*

Step. A melodic progression of a second.

Stop (n.). A set of organ pipes having the same quality of tone, though differing in pitch; the draw knob which controls such a set of pipes; in a reed organ, a draw knob controlling a set of reeds. *Stop* (v.). To press a string of a violin or similar instrument with a finger so as to alter the pitch of its tone.

Strain. A complete period, its close being indicated upon the staff by a double bar; a melody or tune.

Stretto (It.) (*strät'tō*). Compressed, contracted; in a fugue, the part composed of an overlapping of subject and answer. See *Musical Form.*

Stringendo (It.) (*strēn-jĕn'dō*). Binding together; sudden accelerando with increase in loudness.

String Quartet. Music written for four stringed instruments, usually two violins, a viola, and a cello; the performers of such music.

Subdominant. The dominant below; the fourth tone of the diatonic scale, which is in the same relation to the keynote from below as the *dominant* is from above.

Subito (It.) (*sōō'bē-tō*). Sudden; immediate. *Subitamente.* Suddenly; immediately.

Subject. The theme or melodic phrase which serves as the groundwork of a movement or composition.

Submediant. The sixth tone of the diatonic scale.

Subtonic. Under the tonic; the seventh tone of the diatonic scale.

Suite (Fr.) (*swēt*). An instrumental composition consisting of a series of movements in any one of a number of forms and in different keys, sometimes a collection of distinct compositions; formerly, a cycle of dance tunes. See *Musical Form.*

Supertonic. The tone one degree above the tonic in the diatonic scale.

Suspension. A dissonance caused by holding back a tone of a chord while the other tones move, or progress. It later resolves downward to the consonant tone. See *Resolution* and *Retardation.*

Symphonic Poem. A large orchestral composition, originated by Liszt, which differs from the sonata and the symphony in that it is descriptive or narrative and consists of one movement instead of several. See *Musical Form.*

Symphony. A sonata for orchestra, usually in four movements. See *Musical Form.*

Syncopation. A shifting in accent from the normally strong to a weak beat. See definition of *Accent.*

Tarantella (It.) (*tä'rän-tĕl'lä*). An Italian dance in rapid 6-8 rhythm, usually performed by one couple and accompanied by tambourines and castanets; a composition in the rhythm of this dance.

Technic (*tĕk'nĭk*). Manner of execution; musical skill.

Tema (It.) (*tĕ'mä*). Theme, subject, melody.

Temperament. An adjustment of acoustically correct intervals to harmonic discrepancies. See *Musical Acoustics.*

Tempo (It.) (*tĕm'pō*). The rate of speed at which a composition should be played, indicated at the beginning by such words as *largo, adagio, lento, allegro,* etc.

Tenor. The high male voice; a musical instrument, the range of which corresponds to the high male voice.

Tenuto (It.) (*tĕ-nōō'tō*). Held, sustained.

Tessitura (It.) (*tĕs'sē-tōō'rä*). The average pitch of the tones in a composition, as high or low.

Tetrachord (Gr.). A scale series of four tones; half of an octave. See *Musical Notation.*

Theme. A musical subject. See definition of *Subject.*

Third. The interval between a fundamental tone and the third diatonic tone above.

Tie. A curved line connecting two or more notes of the same pitch to indicate they should be played as one.

Time. The rate of speed at which a piece of music should be played. See *Tempo.* Also commonly, but less properly, used as synonymous with *measure* or *rhythm.* See *Measure.*

Toccata (It.) (*tŏk-kä'tä*). A composition for the organ or harpsichord, popular in the 16th century, free in style, resembling the *capriccio;* later a similar composition adapted to the display of technical skill.

Tonality. The chords grouped around and attracted by one central tonic chord. Generally used as synonymous with *Key.*

Tone. A sound of definite pitch and duration.

Touch. The style of touching or striking the keys of a piano, organ, or similar instrument; the resistance of the keys, as light or heavy touch.

Tranquillo. (It.) (*trän-kwēl'lō*). Tranquil, calm. *Tranquillamente.* Tranquilly, calmly.

Transpose. To change a composition from one key to another.

Treble. 1. The highest voice or part; the soprano. 2. Often used as the name of the G clef.

Tremolo (It.) (*trĕm'ō-lō*). The rapid repetition of a note or chord which produces the effect of trembling or quivering.

Triad. Any chord composed of a fundamental tone and the third and fifth above.

Trill (Ger., triller; Fr., trille; It., trillo; Eng., shake). See *Shake.*

Trio (It.) (*trē'ō*). 1. A composition for three voices or instruments; the performers of such a composition. 2. The second part of a march or minuet.

Triplet. A group of three equal notes played in the time of two of like time value; indicated by the sign $\overset{\frown}{3}$ or 3, placed above or below the notes affected.

Tune (n.). An air or melody. (v.) To adjust an instrument so that the tones it produces are correct according to the scale.

Turn. An embellishment following a note, which consists of rapid alternation between the principal note, the note a step above, and the note a half step below; marked ∾. The turn is also used at the close of a *shake* or *trill.*

Tutti (It.) (*tōōt'tē*). All; full orchestra or full chorus; a direction that all should perform together.

Una corda (It.) (*ōō'nä kôr'dä*). One string; a direction in piano music that the soft pedal should be used.

Unison. Identical in pitch; music is said to be in unison when all the voices or instruments perform the same part.

Variations. Elaborations of a theme in a variety of forms differing in time, melody, harmony, or key. See *Musical Form.*

Veloce (It.) (*vĕ-lō'chĕ*). Swift. *Velocemente.* Swiftly. *Velocissimo.* With extreme rapidity.

Verse. That portion of an anthem, or service, to be performed by one singer to each part; a stanza.

Virtuoso (It.) (*vĕr'tōō-ō'sō*). One who is a skillful performer upon some musical instrument.

Vivace (It.) (*vē-vät'shĕ*). Lively, vivacious.

Vocal. Pertaining to the human voice.

Voice. Sound produced by the vocal organs in singing or speaking; the faculty of uttering sound.

Voicing. Tuning an organ pipe.

Volume. The quantity or fullness of a tone.

Voluntary. An organ prelude; an organ solo, often extemporaneous, played before, during, or after a church service.

Waltz. A round dance in triple rhythm, performed by couples whirling around and advancing around the room; music in the rhythm of this dance. See *Musical Form.*

Whole Note. The longest note in common use. Shorter notes are looked upon as fractional parts of the whole note.

Whole Tone. The interval of a major second, hence the interval of two semitones. The whole-toned scale consists of the six whole-tone intervals within the octave, e.g. C D E F♯ G♯ A♯ C.

STORIES OF THE LEADING OPERAS

Africaine (*ăf-rĭ-kăn'*), **L'.** The last and most consistent of Meyerbeer's grand operas; original text by Scribe; première Paris in 1865.

Vasco da Gama, the famous explorer, is the betrothed lover of a maiden named Inez, the daughter of Don Diego, a Portuguese grandee. When the opera opens he is still at sea, and has not been heard from for years. Don Pedro, the president of the council, takes advantage of his absence to press his own suit for the hand of Inez, and obtains the king's sanction to his marriage on the ground that Vasco must have been lost at sea. At this moment the long-lost hero returns, accompanied by two swarthy slaves, Selika and Nelusko, whom he has brought home with him from a distant isle in the Indian Ocean. He recounts the wonders of the place, and entreats the government to send an expedition to win an empire across the sea. His suggestions are rejected, and he himself, through the machinations of Don Pedro, is cast into prison. There he is tended by Selika, who loves her gentle captor passionately, and has need for all her regal authority—for on the distant island she was a queen—to prevent the jealous Nelusko from slaying him in his sleep. Inez now comes to the prison to announce that she has purchased his liberty at the price of giving her hand to Don Pedro.

In the next act, Don Pedro, who has stolen a march on Vasco, is on his way to the African island, taking with him Inez and Selika. The steering of the vessel is intrusted to Nelusko. Vasco da Gama, who has fitted out a vessel at his own expense, overtakes Don Pedro in mid-ocean, and generously warns his rival of the treachery of Nelusko, who is steering the vessel upon the rocks of his native shore. Don Pedro's only reply is to order Vasco to be tied to the mast and shot, but before the sentence can be carried out the vessel strikes upon the rocks, and the natives swarm over the sides. Selika, once more a queen, saves the lives of Vasco and Inez from the angry natives.

In the next act the nuptials of Selika and Vasco are on the point of being celebrated with great pomp, when the hero, who has throughout the opera wavered between the two women who love him, finally makes up his mind in favor of Inez. Selika thereupon magnanimously dispatches them home in Vasco's ship, and poisons herself with the fragrance of the deadly manchineel tree.

Aïda (*ä-ē'dä*). Music by Verdi; story by Emille du Commun du Locle; libretto by Ghislanzoni; the most popular of Verdi's operas, except possibly "Il Trovatore"; première Cairo 1871, New York 1873; impressive open-air production at the foot of the pyramids in Egypt, 1912.

Aïda, daughter of Amonasro, king of Ethiopia, is the prisoner of the Egyptians and has been given as slave to Amneris, the king's daughter. Both love the warrior Radames, chief of the Egyptian army, but he cares only for Aïda. Amneris vows deadly vengeance against the slave.

Radames, having crushed the revolt in Ethiopia, returns in triumph, bringing a horde of prisoners, including Amonasro. The king of Egypt embraces Radames, bids Amneris crown him with a wreath of victory, and promises, as a reward, any boon he may request. Radames asks only that the prisoners be restored to liberty. The king orders that all be released except Amonasro and Aïda. He also bestows upon Radames his daughter Amneris in marriage, but Radames assures Aïda that he will be true to her.

Amonasro persuades his daughter to save her people by extracting from her lover the plan of the route the Egyptian army will take next day. At a clandestine meeting in the temple of Isis, Aïda induces Radames to tell her the secret. Amonasro, hidden behind a pillar, overhears it and escapes, exulting in his knowledge.

Then Amneris, who had entered the temple to ask a blessing upon her coming marriage, appears. Her pleas that Radames forsake Aïda being of no avail, she denounces him as a traitor. However, she offers him pardon if he will accept her love and forsake Aïda. He refuses and is condemned by a court of priests to be immured in a prison vault beneath the temple. There he finds Aïda, who has discovered a means of getting in and has made up her mind to die with her lover. With visions of heavenly bliss, of "never fading, endless love," they expire in each other's arms while the solemn chant of the priestesses in the temple above mingles with the sighs of the heartbroken Amneris.

Andrea Chénier (*än-drā'ŋä shā-nyā'*). A stirring tale of the French Revolution; music by Umberto Giordano; words by L. Illica; première Milan 1896.

The plot centers in the rivalry of Chénier, the poet, and Gerard, a revolutionary leader, for the hand of Madeleine. Gerard condemns Chénier to death, but is melted by Madeleine's pleading and rescinds the order for the execution. The pardon, however, comes too late, and Madeleine and Chénier ascend the scaffold together, in an ecstasy of lyrical rapture.

Barber of Seville, The. *Il Barbiere di Siviglia.* A comic opera; music by Rossini; words by Sterbini; plot from a story of Beaumarchais; première Rome 1816, New York 1825.

Count Almaviva has fallen in love with Rosina, a charming damsel, whom her guardian, Doctor Bartolo, having an eye to her dowry, keeps under lock and key, hoping to win her for himself. Figaro, ubiquitous barber, takes the count under his protection and smuggles him into the house in the guise of a soldier, announcing that he has been billeted there. An argument follows, and the scheme is frustrated by the arrival of the police. The count barely escapes.

Later, upon Figaro's advice, the count succeeds in getting into the house as a music master. In order to gain Bartolo's confidence, he shows him one of Rosina's letters to himself, pretending that he had received it from a mistress of Almaviva. Bartolo, delighted with the news of the count's infidelity, hastens to tell the scandal to Rosina. Her jealousy aroused, she agrees to marry Bartolo. A notary is sent for that the marriage contract may be signed. Happily, while Bartolo's back is turned, the count finds an opportunity of persuading Rosina of his constancy. Figaro bribes the notary to draw up the contract as between the count and Rosina, and Bartolo is duped into signing. When he finds how matters stand, he tries to make the best of it, and, as the count relinquishes Rosina's dowry to him, he is persuaded to be gracious.

Bartered Bride, The. *Prodana Nevesta.* A comic opera; music by Smetana; words by Sabina; première Prague 1866, New York 1909.

Marie lives in Bohemia. Her parents have arranged through Kezul, the marriage broker, that she shall marry Wenzel, the half-witted son of a wealthy peasant, Micha, living in another village. Marie refuses, for she loves Hans, a servant in her father's house.

The marriage broker offers Hans 300 crowns if he will give up Marie. He accepts, on condition that Marie shall marry none other than a son of Micha. Marie is in despair. She is on the point of accepting Wenzel, when Hans makes public declaration that he is the son of Micha by a former marriage, having left home because he disliked his stepmother. As the money remains in the family, there is no objection. Hans and Marie are married and live happily ever after.

Bohème, La (*lä bō'âm'*). Music by Puccini; words by Giacosa and Illica; plot from Murger's novel entitled *Vie de Bohème;* première Turin 1896, San Francisco and New York 1898.

La Bohème is a story of the mingled joy and grief of Bohemian life in Paris. Four young men—Rudolph a poet, Marcel a painter, Colline a philosopher, and Schaunard a musician—live in a garret in the Latin Quarter. It is Christmas Eve. Marcel keeps the landlord at bay until the arrival of Schaunard with an unexpected windfall of money and provisions. After a feast at home, they decide to go to the Café Momus, leaving Rudolph to finish a manuscript.

Mimi, an embroideress, who lives in an adjoining garret, comes to ask a light for her candle. In the draft, Rudolph's candle goes out. Their hands touch. A love duet follows, and the lovers go to join their friends. At the Café Momus, Musette appears with an elderly banker, Alcindoro, for whom she had given up Marcel. She sends Alcindoro on an errand, flies into the arms of Marcel, and joins the party. The jolly revelers leave the bill for Alcindoro to pay.

Mimi and Musette soon weary of the poverty of their Bohemian lovers and accept the attentions of more affluent suitors.

A few weeks later Mimi, ill and abandoned by her viscount, is brought back by Musette. Rudolph places her upon his bed. Marcel calls a doctor; Colline goes out to pawn his overcoat and buy food. It is too late. Weakened by privations and by a dread cough, Mimi breathes her last on the little bed in the attic.

Bohemian Girl, The. Music by Balfe; words by Bunn; plot from a ballet entitled "The Gypsy," by St. Georges and Marzillier; première London 1843, New York 1844.

Thaddeus, an exiled Polish rebel, who has joined a band of gypsies to escape arrest, saves the life of Arline, the six-year-old daughter of Count Arnheim, governor of Pressburg. In gratitude the count invites him and the gypsies to a feast. Thaddeus refuses to drink to the health of the emperor. Confusion ensues. Devilshoof, the leader of the gypsies, tries to protect Thaddeus and is imprisoned. Thaddeus is allowed to go. Devilshoof escapes and carries off Arline.

Twelve years elapse. Arline is grown to womanhood, but all the other characters, strange to say, remain at precisely the same age as in the first act. Thaddeus and Arline, having long loved each other, are united by the gypsy queen, but she swears vengeance, for she too loves Thaddeus. Devilshoof robs Florestan, the count's nephew, of his jewels. The gypsies attend a fair in Pressburg. By the queen's machinations Arline is decorated with a stolen medallion. Florestan sees the trinket and accuses her of theft. Arline is brought before her own father for sentence. The inevitable recognition ensues.

Thaddeus makes known his noble birth and his heroic deeds in battle. The count accepts him as his daughter's suitor. During the betrothal feast, a gypsy assassin attempts to shoot Thaddeus. Devilshoof pushes aside the weapon, and the bullet pierces the heart of the gypsy queen.

Boris Godounov (*gä'dōō-nôf'*). Opera by Mussorgsky, based upon a historical drama by Púshkin; première Petrograd 1873, New York 1913.

Boris Godounov, while regent, killed Dmitri, the legal heir to the throne of Russia, and had himself proclaimed czar. Gregory, a monk resembling the murdered prince, impersonates him and starts a rebellion to overthrow the usurper. Boris, who is haunted by specters and hears voices accusing him of murder, dies of fear.

Carmen. Music by Bizet; words by Meilhac and Halévy; plot from Mérimée's romance of the same name; at first received with a storm of abuse, but now counted among the three or four most popular operas in the modern repertory; première Paris 1875, New York 1879.

Carmen, a beautiful and passionate gypsy girl, is arrested for stabbing one of her comrades in a cigarette factory in Seville. She uses all her powers of fascination upon Don José, a young officer of the guard, who is in charge of her. Because of her charms and soft words, José allows her to escape, having arranged to meet her at the tavern of Lillas Pastia.

For this offense, he suffers two months' imprisonment. At the expiration of his sentence, José appears at the tavern, a resort of smugglers, though a new suitor, the bullfighter Escamillo, has laid siege to Carmen's heart. When the bugle call to duty is sounded, José starts to leave. Because of the taunts of Carmen, he decides to remain. He quarrels with an officer who commands him to go, and to escape punishment he deserts the army to join the gypsies.

At the camp of the gypsies, José repents of his folly, and Carmen tires of her love. José, who is jealous of Escamillo, fights a duel with him. He is about to kill the bullfighter when Carmen intervenes. Micaela, the boyhood sweetheart of José, arrives with a message from his dying mother. José departs, promising to return for revenge.

Escamillo has invited all his friends to attend his bullfight in Seville. José goes to plead once more with Carmen. Carmen spurns him and flings back his ring. In rage and despair, José stabs Carmen through the heart just as shouts are heard from the arena, announcing the victory of Escamillo.

Cavalleria Rusticana (*kä-väl-lä-rē'ä rûs-tē-kä'nä*). Music by Mascagni; words by Targioni-Torzetti and Menasci; adapted from a Sicilian tale of the same name by Verga; première Rome 1890, New York 1891.

Cavalleria Rusticana is a picture of Sicilian rustic chivalry. Turriddu has returned from the war to find his sweetheart, Lola, married to a rich carter, Alfio. Though he has since paid court to Santuzza, the coquetries of Lola infatuate him, and she soon wins him back to her side.

It is Eastertide, and while the villagers are in the church the deserted Santuzza waits outside to meet Turriddu. When he arrives she appeals in vain to his love and pity. Lola, passing, mocks Santuzza and entices Turriddu away. Lola and Turriddu enter the church; Santuzza attempts to follow but falls upon the steps, just as Alfio comes up. In despair she tells him of his wife's infidelity.

Later Turriddu, in merry mood, invites Alfio to drink with him. Alfio refuses, challenges Turriddu to mortal combat, and kills him. Lola departs, on other conquests bent.

Cid (*sĭd*), **Le.** *The Conqueror.* Music by Massenet; words by D'Ennery, Gallet, and Blau; based upon Corneille's drama; première Paris 1885, New York 1907.

Rodrigo, the conqueror, returning from a victory over the Moors, is betrothed to Chimène, daughter of Count Gormas. A governorship, promised to Gormas, is bestowed upon Rodrigo's father, Don Diego. Enraged, Gormas challenges him. Being old, Diego asks his son to protect his honor. In a duel, Gormas is killed accidentally. Chimène demands the death of Rodrigo. The king cannot spare him, for the Moors are again in revolt. On Rodrigo's second victorious return, Chimène demands his death. The king asks her to pronounce sentence. She cannot. The conqueror draws a dagger to kill himself. Chimène restrains him and confesses that love conquers all.

Daughter of the Regiment, The. *La Fille du Régiment.* A comic opera; music by Donizetti; words by Bayard and St. Georges; première Paris 1840, New Orleans 1843.

Marie, found as a baby upon a battlefield and adopted as the daughter of the regiment, is wooed by Tonio, a peasant who has saved her life. He is accepted, on condition that he shall join the regiment. A letter, addressed to the marchioness of Berkenfeld and pinned to the baby

Marie's clothes, is now delivered. The marchioness claims Marie as her niece, installs her in the family castle, and wants her to marry a count. Marie refuses. The marchioness confesses that she is her mother. Marie agrees to obey her wishes. The mother, touched by this mark of filial devotion, lets her have Tonio, who has risen to the rank of colonel.

Don Giovanni (*dŏn jō-vän'nē*). Adapted by Da Ponte from a Spanish tale; music by Mozart; première Prague 1787.

Don Giovanni, a licentious Spanish nobleman, who is attracted by the charms of Donna Anna, the daughter of the commandant of Seville, breaks into her palace under cover of night, in the hope of making her his own. She resists him and calls for help. In the struggle which ensues, the commandant is killed by Don Giovanni, who escapes unrecognized. Donna Elvira, his deserted wife, has pursued him to Seville, but he employs his servant, Leporello, to occupy her attention while he pays court to Zerlina, a peasant girl, who is about to marry an honest workman named Masseto. Donna Anna now recognizes Don Giovanni as her father's assassin, and communicates her discovery to her lover, Don Ottavio; Elvira joins them, and the three of them vow vengeance against the libertine.

Don Giovanni gives a ball in honor of Zerlina's marriage, and in the course of the festivities seizes and tries to seduce her. He is stopped only by the interference of Anna, Elvira, and Ottavio, who have made their way into his palace in masks and dominos.

In the next act the intended vengeance of the three conspirators is still unfulfilled, for Don Giovanni is again pursuing his vicious courses and employing Leporello to beguile the too trustful Elvira. After various escapades he finds himself before the statue of the murdered commandant. He jokingly invites his old antagonist to sup with him, an invitation which the statue, to his surprise, hastens to accept. Leporello and his master return to prepare entertainment for the evening. When the merriment is at its height, a heavy step is heard in the corridor, and the marble man enters. Don Giovanni is still undaunted and, even when his terrible visitor offers him the choice between repentance and damnation, yields not a jot of his pride and insolence. Finally, the statue grasps him by the hand and drags him down, amid flames and earthquakes, to eternal torment.

Elixir of Love, The. *L'Elisire d'Amore.* A comic opera; music by Donizetti; words by Romani; première Milan 1832, New Orleans 1842.

Nemorino, a penniless youth, loves the wealthy Adina. Sergeant Belcore also woos her. Nemorino purchases a bottle of elixir of love from a traveling quack. The elixir is wine and makes him tipsy. Adina, enraged, accepts Belcore. To get money for more elixir Nemorino enlists. The rumor spreads that Nemorino's rich uncle has left him a fortune. Many maidens show interest in him. Adina's jealousy is aroused. She learns from the quack of Nemorino's devotion and buys his ransom. They are happily united. The news of the quack's elixir brings him many customers.

Ernani (*ĕr-nä'nē*). Music by Verdi; words by Piave; based upon Victor Hugo's drama; première Venice 1844, New York 1846.

Ernani, an outlawed Spanish nobleman, loves Elvira, who is betrothed to the aged De Silva and is secretly loved by the king, Don Carlos. Silva finds Ernani and the king in Elvira's chamber. He challenges both. Discovering one is the king he apologizes to him. Ernani refuses to fight and reminds Silva that the king is their rival. They conspire to murder the king. Ernani gives Silva his hunting horn and pledges that Silva may require his life at any time by blowing the horn. The king captures the conspirators and condemns them to death. On Elvira's plea, their lives are spared. The king unites Ernani and Elvira. In the midst of their bliss, Silva blows the horn. Ernani, true to his word, bids Elvira a fond farewell and stabs himself.

Faust (*foust*). Music by Gounod; words by Barbier and Carré; the story is based upon Goethe's *Faust*; has been sung more often than any other five operas combined; première Paris 1859, New York 1863.

Faust, an aged scholar, despairing of solving the riddle of life, raises a cup of poison to his lips. He hears the merry song of peasants outside. Cursing the things of earth, he invokes Satan. Instantly Mephistopheles appears. In exchange for his soul he offers Faust anything he might ask—riches, youth, love. As an indication of what is to come, Mephistopheles conjures up the vision of a lovely maiden. Faust signs the contract.

Faust, now young, appears with Mephistopheles at a fair in the market place. There Faust sees Marguerite, a beautiful village girl. He offers to accompany her home. She declines but cannot forget his tender words.

Mephistopheles then brings Faust to the garden of Martha, Marguerite's aunt, with whom she lives. He engages the attention of Martha, that Faust may make love to Marguerite, having previously left a casket of gems for her, which puts out of mind the flowers sent by her lover Siebel. Marguerite yields at last to the passionate words of Faust.

Following one sweet night of love, Marguerite is deserted. Siebel offers to avenge her dishonor, but she defends the faithless Faust. Valentine returns and finds his sister's love affair the scandal of the town. Mephistopheles and Faust appear. The former mocks at Marguerite. Valentine draws his sword to slay his sister's seducer. In the combat, Mephistopheles interposes his sword and Valentine receives a mortal wound. He curses his sister with his dying breath. Marguerite, who has come to the scene, abandoned by every one but the faithful Siebel, kneels at a small altar outside the church, not daring to enter. Her efforts to pray are mingled with the taunts of Mephistopheles and with strains from the choir within the church.

Marguerite is in prison. In frenzy she has drowned her child. She has been condemned to die at daybreak. Her reason is gone. Mephistopheles and Faust appear in the cell though the gates are locked and barred. Faust in agony declares he loves her and asks her to flee with him. Although weak and wandering, she refuses, and dies, uttering words of prayer. Angels appear to receive her soul. Mephistopheles drags Faust away.

Favorita, La (*lä fä'vō-rē'tä*). Based upon the French drama *Le Comte de Comminges*; music by Donizetti; words by Royer and Waez; première Paris 1840, New Orleans 1843, New York 1848.

Leonora, the favorite of the king of Castile, is wooed by Fernando, who is ignorant of her relations with the king. She refuses to marry and secures for Fernando a commission in the army. He returns victorious. The king, suffering under a papal anathema, consents to the marriage of the lovers. When Fernando discovers Leonora's former relations with the king, he curses both and seeks refuge in a monastery. Leonora follows, is forgiven, and dies in his arms.

Fidelio (*fē-dā'lyō*). Music by Beethoven; words by Sonnleithner; unexampled for its moral grandeur and for the resplendent purity and ideality of its music; Beethoven's only opera; première Vienna 1805, New York 1839.

Florestan, a Spanish nobleman, has fallen into the power of his bitterest enemy, Pizarro, the governor of a state prison near Madrid. He is confined in a dungeon without light or air. Leonora, wife of Florestan, has hired herself, in man's attire, as servant to Rocco, head jailer, under the name of Fidelio.

News comes that the minister Fernando is about to inspect the prison. To escape detection of his crime, Pizarro plots to kill Florestan. He orders Rocco to dig a grave in the prisoner's cell. Leonora helps the jailer, and when their task is finished Pizarro comes down and is about to stab Florestan. Leonora threatens him with a pistol. She holds the governor at bay till the minister arrives. Pizarro is disgraced, and Florestan is restored to his lost honors and dignity.

Flying Dutchman, The. *Der Fliegende Holländer.* An opera by Wagner; based upon a legend by Heine; première Dresden 1843, Philadelphia 1876, New York 1877.

Because of blasphemy, a sea captain is condemned to sail the seas until he finds a maiden, faithful unto death. He may land once in seven years. Senta meets him and, though bethrothed to Eric, feels she is destined to save the captain. Eric begs her to remain. The captain thinks her unfaithful and goes to his ship. She dashes into the water after him. The ship sinks. The captain and Senta, surrounded by a halo of light, rise from the wreck, clasped in each other's arms.

Freischütz (*frī'shüts'*), **Der.** Music by Weber; words by Kind; plot from an old German legend; very popular; première Berlin 1821, New York 1825.

The Freischütz is Max the huntsman. He loves Agatha, daughter of Kuno, the head ranger of Prince Ottokar of Bohemia. Max has been promised the hand of Agatha in marriage, on condition that he win a forthcoming contest in marksmanship.

Kasper, a huntsman who has sold himself to the Evil One, also loves Agatha. His soul will become forfeit unless he brings a fresh victim in his place. While Max is shooting at a target, the Evil One in the form of Zamiel causes him to miss the mark. Max becomes discouraged. Kasper hands him his rifle, loaded with a magic bullet, and bids him repeat the formula, "in the name of Zamiel." Max easily wings an eagle soaring high above.

On the suggestion of Kasper, Max meets Zamiel at midnight in the haunted Wolf's Glen deep in the forest, to procure more magic bullets. Kasper hopes thereby to deliver Max to the Evil One and as a reward to gain an extension of time for himself. Amid scenes of the wildest supernatural horror the bullets are cast in the presence of the terrible Zamiel himself. Zamiel gives Max six bullets

which he may use as he pleases and one whose course he reserves the right to direct.

Agatha makes arrangements for her wedding. A pious hermit gives her a magic garland of roses. She is troubled because she has dreamed she was a dove and Max shot at her. In her dream the dove changed into a bird of prey and dropped at her feet. She is troubled also, because, instead of the bridal wreath she ordered, a funeral wreath was sent her.

At the contest, Max, having already spent six bullets, is ordered by the prince to shoot at a dove flying past. As he shoots, the dove is transformed into Agatha. Her magic garland protects her. When the smoke has cleared away, it is found that Zamiel directed the bullet to the heart of Kasper. The Evil One carries off Kasper. Max confesses his guilt and is banished. Kuno, Agatha, and the pious hermit intercede for him. The prince reduces his sentence to one year's probation.

Gioconda, La (*lä jō-kōn'dä*). Music by Ponchielli; words by Boito; plot adapted from Victor Hugo's drama *Angelo*; première Milan 1876, New York 1883.

Gioconda is a beautiful street singer in Venice. She loves the noble Enzo Grimaldo and buys his safety from the police spy Barnaba with the promise of her own hand, only to find that Enzo uses his liberty to carry on a love affair with Laura, wife of Alvise. She is generous enough to save the lives of Enzo and his mistress, which are in danger from the vengeance of Laura's husband, and finally commits suicide to escape falling into the hands of Barnaba.

Götterdämmerung, Die (*gût'ĕr-dĕm'ĕr-ŏŏng*). *Twilight of the Gods.* See *Ring of the Nibelung, The.*

Hänsel und Gretel (*hĕn'sĕl*) (*grā'tĕl*). A fairy opera; music by Humperdinck; words by his sister Mrs. Adelheid Wette; story based upon Grimm's fairy tale of the same name; some critics pronounce it the most important opera since "Parsifal"; première Weimar 1893, New York 1895.

Hänsel and Gretel, the children of Peter, the poor broom maker, and his wife Gertrude, are left to keep house together. They soon tire of their work and begin to play. The mother comes home without food. While punishing the children for neglecting their work, she upsets the milk bowl, the only hope of supper. Angrily she sends the children out into the forest to pick berries. Soon Peter's voice is heard singing cheerfully in the distance. He has had good success selling brooms, and returns laden with food. He asks about the children and is horrified to learn where they are. He terrifies his wife with the story about the witch of Ilsenstein who steals children. They both hurry out to find the children.

Meanwhile out in the forest the children amuse themselves picking berries and making flower garlands until the approach of night, when, to their horror, they find that they have lost their way. Tired out they sink down on the moss beneath a spreading tree. They say their evening prayer, and the fairy sandman puts them to sleep. Fourteen angels descend on a golden stairway and guard them from danger.

The dawn fairy sprinkles dewdrops upon the children, and they wake up. Near by they discover a beautiful gingerbread house. This is where the witch lives, who bakes little children into gingerbread in her great oven and eats them up. She catches Hänsel and Gretel and almost succeeds in her wicked schemes, but, when she opens the oven door to see if the oven is hot, Hänsel and Gretel push her in and close the door. The oven explodes and the house tumbles down. The witch has been baked into gingerbread, and all the children she has stolen come back to life. While they are dancing and singing, the anxious parents arrive and are overcome with joy to find their children unharmed.

Huguenots (*hū'gē-nŏts*), **The.** *Les Huguenots.* Music by Meyerbeer; words by Scribe and Deschamps; première Paris 1836, New Orleans 1839.

Anxious to reconcile the Catholics and the Huguenots, Marguerite, who is betrothed to King Henry IV, seeks to unite Raoul, a Huguenot, and Valentine, daughter of the Catholic Count St. Bris. Raoul has saved Valentine's life. She loves him, but he unjustly suspects she has another lover. Having knowledge of the proposed massacre of the Huguenots, Valentine, torn between loyalty and love, warns Raoul. He warns his friends but is determined to share their fate and seeks refuge with them in the church. Valentine joins Raoul. All perish in the massacre.

Iris. Music by Mascagni; words by Illica; première Rome 1898, New York 1902.

Iris, a Japanese girl, named after the goddess of the rainbow, who is the messenger of peace, lives with her blind father. The rich Osaka and a dive keeper abduct her. She is brought to a luxurious apartment. Osaka makes love to her but is unsuccessful because of her innocence. The blind father finds her. Thinking she is guilty, he curses her. She throws herself into a sewer basin. Ragpickers are about to steal her clothes, when she moves and scares them away. She lifts her eyes to the sun and dies with a smile upon her lips. Flowers spring up about her body as her soul floats into the infinite.

Jewess, The. *La Juive.* Music by Halévy; words by Scribe; première Paris 1835.

The scene of The Jewess is laid in Constance in the 15th century. Leopold, a prince of the empire, in the disguise of a young Israelite, has won the heart of Rachel, the daughter of the rich Jew Eleazar. When the latter discovers the true nationality of his prospective son-in-law he forbids him the house, but Rachel consents to fly with her lover. Later she discovers that Leopold is a prince, and betrothed to the Princess Eudoxia. Her jealousy breaks forth and she accuses him of having seduced her,—a crime which in those days was punishable by death.

Rachel, Leopold, and Eleazar are all thrown into prison. There Rachel relents, and retracts her accusation. Leopold is accordingly released, but the Jew and his daughter are condemned to be immersed in a caldron of boiling oil.

Königskinder (*kûn'ĭKs-kĭn'dĕr*), **Die.** A fairy opera; music by Humperdinck; words by Ernst Romer (Elsa Bernstein); première Munich 1897, New York 1910.

The king's children are a prince and princess in the disguise of two poor and neglected children. The princess has fallen into the power of a witch who lives in the forest near Hellabrunn. The witch compels her to tend geese. An exiled prince finds her there. He knows she is a princess in spite of her ragged clothes.

The people of Hellabrunn send three men, a broom maker, a woodchopper, and a minstrel, to inquire of the witch whom to choose as a ruler. The witch replies that their rightful sovereign will pass through the city gate at noon on the morrow. The minstrel, having the eyes of a seer, recognizes the princess in the goose girl and breaks the witch's spell.

The next day at noon the goose girl, followed by a flock of geese, enters the city. The prince, who is a swineherd, alone hails her as a princess. The people, expecting to see a king in royal robes, laugh at the prince and the princess and drive them away. In anger the people burn the witch. The broom maker and the woodchopper go to live in the abandoned hut.

The poor children, after wandering in the forest a long time, find the hut. They ask for food. The prince must give his crown in exchange for a loaf of bread. The loaf has been poisoned, and the prince and princess die. The minstrel and children from Hellabrunn find their bodies in the snow and give them a royal burial.

Lakmé (*läk-mā'*). Music by Delibes; words by Goudinet and Gille; plot based upon the romance *Le Mariage de Loti*; première Paris 1883, New York 1886.

Lakmé, the daughter of a Brahman priest in India, loves Gerald, an officer of the British army. Knowing he is on sacred ground she warns him that he would be punished by death if her father should find him. Soon after he leaves, her father, Nilakantha, appears. He notices strange tracks in the soft earth and swears death to the trespasser.

Nilakantha and Lakmé, disguised as penitents, enter the public square. Nilakantha, thinking thereby to attract the trespasser of yesterday, commands his daughter to sing. Gerald falls into the trap and speaks to her. The priest tries to assassinate him, but Lakmé, with the aid of her maid, conveys Gerald to a hut in the forest, where she nurses him back to health. He has grown to love her and one day asks her to bring him a draft of the water said to make earthly love eternal. During her absence, Frederick, a brother officer, visits Gerald and exacts from him a promise to join his regiment which has received orders to march. When Lakmé returns she finds Gerald changed. A faint bugle call is heard. Gerald says duty calls and he must go. He bids Lakmé a tender farewell. She eats some flowers of the poisonous stramonium tree and falls into his arms. Nilakantha appears. Lakmé implores her father with her dying breath to forgive Gerald. One victim being thought sufficient to appease the wrath of the deity, Gerald is permitted to go unharmed.

Lohengrin (*lō'ĕn-grĭn*). Music and words by Wagner; story taken from many sources, including an old German legend and that of King Arthur and his knights; première Weimar 1850, New York 1871.

At the instigation of his wife Ortrud, Frederick of Telramund charges Elsa of Brabant with the murder of her brother Gottfried, who has disappeared. King Henry the Fowler, holding council under the great oak beside the river Scheldt is judging the case. Elsa makes denial. The king, unable to judge, calls for the judgment of God and asks Elsa to choose a champion. She speaks of a knight she has seen in a vision, who will defend her. The king proclaims the combat and orders trumpets to be sounded. No one answers. On Elsa's entreaty the trumpets are sounded again.

A boat drawn by a swan and bearing a knight clad in silver armor approaches on the river. The people declare it is a miracle. The knight disembarks and announces that

he is sent by God to defend a maiden unjustly accused. Turning to Elsa he asks if she will trust him to defend her honor. In gratitude she kneels at his feet. He asks her to become his wife and, if she will grant this boon, to promise further never to ask his name or race. If she should violate her promise he must at once return. They embrace tenderly. In the combat which follows, the strange knight strikes down Telramund but spares his life. Telramund and his wicked wife, Ortrud, are outlawed.

The king orders a royal wedding. As the procession nears the church, Telramund and his wife denounce the strange knight as a sorcerer. They are driven away. Ortrud, however, succeeds in planting seeds of doubt in the mind of Elsa. In the bridal chamber words of endearment are spoken. The knight utters passionately the name of his beloved. She deplores that she cannot speak his name. Why should he not reveal it now when there is no one to overhear? At last, in frenzy, she asks the fatal question, "Who art thou?" At that moment Telramund and four nobles rush in with drawn swords. Too late Elsa sees her mistake. She hands her lord his sword. With one stroke he strikes Telramund dead.

The last scene takes us back to the banks of the Scheldt. Surrounded by the assembled army the knight appears in silver mail before the king, who again is holding council under the great oak beside the river. The king greets him. The knight expresses regret that he cannot lead the troops. He relates how Telramund was killed. He declares sadly that the woman he loves, contrary to her promise, has demanded to know his name and race. He must answer. He is Lohengrin, son of Parsifal, lord of Monsalvat, the keeper of the Holy Grail. His mission is to succor the distressed, but his mystic power vanishes if the secret of its origin be known. Even as he speaks, the swan reappears drawing the boat which is to bear him away.

Now, in her moment of triumph, Ortrud exultingly declares she bewitched Gottfried and changed him into the swan. Lohengrin kneels and after a short prayer loosens the swan's golden chain and steps into the boat. The white dove of the Grail descends from the sky, releases the swan, and, while Elsa clasps her restored brother to her breast, swiftly draws Lohengrin's boat away over the waters of the Scheldt.

Louise. Music and words by Charpentier; a story of Bohemian life in Paris; première Paris 1900, New York 1908.

Louise, a young working girl, and Julien, a poet, fall in love. The parents of Louise twice reject their proposal to marry. Louise then goes to live with Julien. Her broken-hearted father sends for her. She goes home for a visit but is treated so unkindly that she soon returns to her kind-hearted lover.

Lucia di Lammermoor (*lōō-chē'ä dē läm-mĕr-mōōr'*). Donizetti's masterpiece; words by Cammerano; based upon Walter Scott's novel; première Naples 1835, New Orleans 1841, New York 1845.

Lucia, who is betrothed to Sir Edgar, is persuaded by her brother, Sir Henry Ashton, that her lover is unfaithful. To please her brother she reluctantly marries Lord Arthur. As the marriage contract is signed, Sir Edgar appears and denounces her. Lucia becomes insane, kills her husband, and dies of a broken heart. Sir Edgar, griefstricken, commits suicide.

Madame Butterfly. Music by Puccini; words by Illica and Giacoso; plot from story of the same name by John Luther Long; première Milan 1904; Washington 1906.

Madame Butterfly is a Japanese maiden, Cho-Cho-San, of Nagasaki, who becomes the wife of an American naval lieutenant, Pinkerton, through the aid of a marriage broker, Goro. The wedding is attended by the American consul, Sharpless, and the relatives and friends of the bride. Her uncle, a native priest, having heard that Cho-Cho-San has adopted the religion of her husband, rushes in to denounce her as an outcast. Pinkerton drives away the Japanese guests and assures his wife of his devotion to her. A few weeks after the wedding, however, Pinkerton returns to America.

Three years elapse. Butterfly waits patiently. Her husband has promised he will return when the robins nest again. Sharpless, commissioned by Pinkerton, calls to tell Butterfly that Pinkerton will soon arrive with his American wife. He advises her to marry the rich Yamadori who is suing for her hand. Butterfly scorns the advice and brings in her golden-haired boy as proof of her husband's love.

A salute of guns is heard from the harbor. Butterfly rushes to the window. It is the American warship *Abraham Lincoln*. She decorates the little house with cherry blossoms and watches throughout the night. In the morning Pinkerton, his wife Kate, and Sharpless appear. Pinkerton, realizing his baseness, turns back. Butterfly meets Kate in the garden and instantly understands. Kate, in pity, asks to have the boy. Butterfly says she may have him in half an hour, takes him in her arms, and enters the house. She places the boy upon a cushion, blindfolds him, and puts an American flag into his hands. With her father's dagger bearing the inscription, "To die with honor when one can no longer live with honor," she stabs herself. She falls at the feet of her boy and stretches her arms toward him. Pinkerton enters to ask forgiveness. Finding Butterfly dying, he is overcome with remorse and folds her tenderly in his arms.

Manon (*mä'nôN'*). Music by Massenet; words by Meilhac and Gille; plot from the novel of Abbé Prévost; première Paris 1884, New York 1885.

Manon is a pretty country girl, the cousin of Lescaut. The Chevalier des Grieux meets her at an inn while she is on her way to a convent to finish her education. He falls in love and they elope to Paris. Des Grieux not being able to supply the luxuries she craves, Manon elopes with a rich nobleman, De Bretigny.

She learns that Des Grieux is despondent and intends to enter a monastery. She goes to him and they are reconciled. Des Grieux visits a gambling place to gain riches for his love. He wins heavily, but the roué, Gillot, causes the arrest of Des Grieux for alleged cheating, and of Manon as being a dissolute woman. Manon is exiled to a prison colony. On the way Des Grieux, who has been saved from prison by his father, seeks her out. She asks his forgiveness and dies in his arms.

Martha. A comic opera; music by Flotow; words by St. Georges and Friedrich; première Vienna 1847, New York 1852.

Martha is really Lady Harriet Durham, maid of honor to Queen Anne. She is courted by her aged cousin Sir Tristan. Tired of court life, she visits the Richmond fair, dressed as a servant. Sir Tristan and her maid Nancy, dressed as peasants, accompany her.

Two farmers, Plunkett and his foster brother Lionel, attending the fair, engage the two ladies as servants. The ladies accept the customary earnest money and find, too late, that it binds them to serve for one year. In spite of the protestations of Sir Tristan, they are carried off.

The ladies, who give their names as Martha and Julia, cause much annoyance at the farmers' house by refusing to cook and spin. Nevertheless, Lionel falls in love with Martha, and Plunkett with Julia. At midnight the ladies escape with the aid of Sir Tristan who appears with a carriage.

Lionel and Plunkett, in search of their lost servants, happen upon the queen's hunting party in the forest. They recognize their servants and claim them but are haughtily denounced as mad and are arrested.

Lionel had inherited nothing from his father but a ring, which his father had bidden him show to the queen if he ever got into trouble. This ring he brings to the attention of the queen through the aid of Plunkett and the secret aid of the fair Martha. The queen recognizes the ring as having belonged to the banished earl of Derby, and acknowledges Lionel as his son. As the charges against the earl had proved false, his estates are restored to Lionel.

Lady Harriet makes advances to Lionel. He remains cold, thinking she is again merely trifling with his already wounded heart. Resolved to win Lionel, she and Nancy again go to the fair, disguised as servants. Lady Harriet meets Lionel. The clouds roll away. They are betrothed. Nancy and Plunkett unite their fortunes.

Masked Ball, The. *Il Ballo in Maschera.* Music by Verdi; words by Somma; première Rome 1859, New York 1861.

Reinhart, secretary to Count Richard, governor of Boston, seeks the governor to warn him of a conspiracy. He finds him in the forest, accompanying a veiled lady to the retreat of a sorcerer. The conspirators approach. The lady is left in Reinhart's care. By accident he discovers she is his wife, Amelia. Reinhart joins the conspirators and later, at a masked ball, stabs the governor. The dying man declares Amelia is innocent of wrong and gives Reinhart an important commission in England.

Meistersinger, Die (*mīs'tĕr-zĭng'ĕr*). *The Mastersingers.* A comic opera by Wagner, in which the composer satirizes his critics; première Munich 1868, New York 1886.

Sir Walther loves Eva. Her father, Pogner, determines that only the winner in a singing contest may woo her. To enter the contest, Walther must learn the rules of singing laid down by the fraternity of mastersingers and submit to an examination by the clerk, Beckmesser. He fails miserably. Nevertheless, he enters the contest and sings from his heart. He wins the applause of the people and the hand of Eva.

Mignon (*mē'nyôN'*). Music by Thomas; words by Barbier and Carré; plot based upon Goethe's *Wilhelm Meister*; première Paris 1866, New York 1872.

Mignon, apparently a gypsy girl, appears upon the streets of a German village. Giarno, the leader of the gypsy band, brutally compels her to dance before the inn, for the entertainment of a troupe of actors on the way to the near castle. Lothario, an old half-witted harper, interferes. He is on the point of being overpowered by the

gypsies when Wilhelm Meister rescues him. With a purse of gold Wilhelm purchases the release of Mignon.

Upon the invitation of Filina, an actress, Wilhelm accompanies the troupe to the castle. Not knowing what else to do with Mignon, he takes her along as his servant. Wilhelm soon becomes infatuated with Filina. Mignon from the first loved her master. In a fit of jealousy she tries to drown herself. Lothario, who is instinctively drawn to her, prevents this and tries to console her. Mignon expresses the wish that lightning might strike the castle. Lothario sets it on fire.

After the entertainment, the actors emerge from the castle. Filina sends Mignon back for a bouquet of flowers she had forgotten. Repenting of her sinful wish, Mignon obeys. After she has gone, the castle bursts into flames. Wilhelm rushes after her. He finds her unconscious and brings her out in his arms.

Lothario takes Mignon to Italy to nurse her back to health. Wilhelm follows. There it is found that Lothario is of noble birth, and that, when his daughter Sperata disappeared years before, he had lost his reason and had since been wandering about in search of her. The familiar scenes restore his mind. Lothario hears Mignon recite a prayer she learned in childhood and recognizes her as the daughter who was lost. Wilhelm has come to love Mignon as dearly as she loves him. On her recovery they are united

Mikado, The (*mĭ-kä′dō*). A comic opera; music by Sullivan; words by Gilbert; première London 1885, Chicago and New York 1885.

The Mikado is the emperor of Japan. His son Nanki-Poo has run away in the garb of a strolling minstrel to escape marrying the elderly Katisha. He has become infatuated with Yum-Yum, the ward of Ko-Ko, who has a monopoly on guardianship and is also the Lord High Executioner. Ko-Ko too loves Yum-Yum and is planning to marry her.

When Ko-Ko, the tailor, was appointed to his high office, all the ministers of state resigned, and Pooh-Bah succeeded to their titles. He is also "retailer of state secrets at a low figure." This Pooh-Bah informs Nanki-Poo of Ko-Ko's intentions with regard to Yum-Yum. Nanki-Poo nevertheless sees Yum-Yum and, on revealing his high rank, wins her affections.

Ko-Ko, who is a mild-mannered man did not have an execution even on his inauguration day. The Mikado sends him word that he must arrange for an execution of some sort within a month or he will lose his position. Nanki-Poo comes to Ko-Ko's rescue by offering himself as a victim, provided he may marry Yum-Yum and live with her during the month before the execution. Ko-Ko gratefully accepts the offer.

Yum-Yum has made all preparations for the wedding. She is having a tête-à-tête with Nanki-Poo when Ko-Ko interrupts to inform them he has discovered a law which requires that a wife whose husband is executed must be buried alive. To avoid anything so tragic, Nanki-Poo offers to commit suicide. This, however, would only complicate matters and would not save Ko-Ko, so he proposes to make a false statement that Nanki-Poo has been executed with horrible torture.

The Mikado arrives. Ko-Ko tells him about the execution which he claims has taken place. The Mikado flies into a rage and informs Ko-Ko it is the heir to the throne he has killed. As punishment for his blunder the executioner is condemned to be boiled in oil. Nanki-Poo unexpectedly appears. Ko-Ko saves himself by marrying Katisha. Nanki-Poo and Yum-Yum have a royal wedding.

Oberon (*ō′bĕr-ŏn*). Music by Weber; words by Planche; story based upon Wieland's poem; première London 1826, New York 1827.

Oberon, the king of fairyland, and his wife Titania have quarreled. He vows he will not make up until he shall find lovers constant to each other through trials and temptations. Puck, who has tried to find such lovers, enters with news. Sir Huon has been banished by Charlemagne and forbidden to return until he has slain the caliph of Bagdad's wicked councilor, Babekan, and won the caliph's daughter Rezia as his bride. Oberon's interest is aroused. He offers aid. Sir Huon's adventure succeeds. Then Huon and Rezia are successively imprisoned, shipwrecked, sold as slaves, and condemned to the death at the stake, but their love remains constant. Oberon rescues the lovers. Their constancy is rewarded. They are united. Charlemagne restores Sir Huon to favor. Oberon and Titania are reconciled.

Orpheus and Eurydice (*ôr′fūs*) (*û-rĭd′ĭ-sē*). Gluck's masterpiece; the oldest opera still popular; words by Calzabigi; première Vienna 1762, New York 1885.

Orpheus, the great singer, mourns his wife Eurydice, who had died and passed to the Elysian fields. Eros, the goddess of love, promises to aid him in bringing her back, on condition that he will not look at Eurydice during the journey. Orpheus descends into Hades, overcomes the demon guards by his song, and finds Eurydice among the shades. He takes her by the hand and leads her away. Wounded by his apparent coldness, Eurydice implores him to look at her. Orpheus steels himself against the temptation but finally yields and clasps her in his arms. She dies at his feet. The goddess of love, touched by his constancy, restores Eurydice to life.

Pagliacci, I (*ē päl-yä′chē*). *The Players*. Leoncavallo's masterpiece; words by the composer; première Milan 1892, New York 1894.

A troupe of players gives a play in an Italian village. Before the play, Canio, the master of the troupe, finds his wife Nedda with a secret lover who escapes. In the play a similar situation occurs. With scarcely a pretense of keeping to his rôle of Pagliaccio, Canio demands from his wife, representing Columbine, the name of her lover. She mocks him. Overcome by jealousy, he stabs her. She speaks the name of her real lover, Silvio. The latter, who formed one of the rustic audience, rushes to the stage only to receive his deathblow as well.

Parsifal (*pär′sĭ-făl*). Words and music by Wagner; the plot based upon an old legend found in many forms; Wagner's version inspired by epic written about 1300 by Wolfram von Eschenbach; première Bayreuth 1882, New York 1903.

The cup from which Jesus drank at the Last Supper, and which received His blood when He was wounded upon the cross, is called the Holy Grail. This and the spear with which His side was pierced were placed, according to legend, in the care of a pure knight, Titurel, who built for them the splendid temple Monsalvat in the fastnesses of the Pyrenees. He then chose other pure knights to serve with him as protectors of the holy relics. When Titurel became infirm with age he appointed his son Amfortas to succeed him as king of the Grail.

Near the castle dwells the magician Klingsor, who has in vain solicited entry into that company of pure knights. In revenge he has sought counsel of an evil spirit, and is now devoted to the destruction of the knights and to the capture of the Holy Grail. He has constructed a garden of wicked loveliness, peopled by beautiful sirens, through whose charms many of the knights have already fallen. Chief among these sirens is the beauteous Kundry, a strange being, over whom Klingsor exercises hypnotic power. She is that Herodias who laughed at our Savior upon the cross. She was thenceforth condemned to wander through the world, cursed to laugh at pain and suffering, praying only for the gift of tears to release her weary soul.

Amfortas too has sallied forth to subdue the sorcerer, armed with the sacred spear, but has succumbed to the charms of the siren Kundry. He has lost the spear to Klingsor, and received from its point a grievous wound which no balm can heal.

The opening scene is a cool woodland glade, near the castle, where Gurnemanz, an old knight, and two young esquires are sleeping. Upon awakening, Gurnemanz tells the esquires the story of the Holy Grail and repeats the prophecy which promises relief to their suffering king.

> Wise through pity,
> The sinless fool.
> Look thou for him
> Whom I have chosen.

Several knights and esquires rush in, dragging Parsifal, who has slain a sacred swan with his bow and arrow. Finding the youth simple and as innocent as a child, Gurnemanz leads him to the vast hall of the Grail knights in the hope that he may prove to be the sinless fool of the prophecy. There the solemn ceremony of uncovering the Grail is performed. Parsifal, who watches the whole rite, feels a sharp pang of sympathy at Amfortas' suffering, but as yet he does not understand what it means. He is not yet wise through pity, and Gurnemanz, greatly disappointed, turns him from the temple door.

Parsifal now wanders near the castle gardens of Klingsor, who, sensing danger, commands Kundry and the sirens to bewitch him. Parsifal vanquishes the knights who guard the castle, and enters the enchanted garden. Lovely maidens dance around him until dismissed by a voice sounding from a network of flowers. Parsifal turns and beholds Kundry, a woman of exquisite loveliness. She tells him of his dead mother and, drawing him toward her, presses upon his lips the first kiss of love. The touch of defilement awakens in him a throbbing compassion for a world of sin. The wounded Amfortas' cry becomes plain to him. He puts Kundry and her endearments from him, and in her discomfiture she cries to Klingsor. The latter hurls the sacred spear at him, but it stops over Parsifal's head. Parsifal grasps it and makes a sign of the cross; with a crash the enchanted garden and castle fall into ruin. The sirens become withered flowers. The spot, a moment before bright with exotic beauty, becomes a desert waste.

Years pass. Then, one Good Friday morning a warrior approaches the temple of the Holy Grail, clad in black armor. It is Parsifal returned at length after weary wanderings.

Gurnemanz, seeing him approach, recognizes the spear and salutes and anoints Parsifal as the new guardian of the Grail. Kundry, who now serves Gurnemanz, washes the feet of Parsifal and dries them with her hair. Parsifal baptizes the regenerate Kundry, redeemed at last from her curse. The three proceed to the temple where the rites have not been performed since Parsifal's former visit. The knights are gathered for Titurel's burial. Amfortas, suffering unspeakable agony from his wound and from his sense of unworthiness, still obstinately refuses to uncover the Grail. Parsifal heals his wound with a touch of the sacred spear, ascends to the altar, unveils the sacred chalice, and kneels in silent prayer. Once more the sacred glow illuminates the mystic cup. As Parsifal waves it in token of benediction alike to the pardoned Amfortas and the ransomed Kundry, a snowy dove hovers over his head.

Pinafore, H. M. S. A comic opera; music by Sullivan; words by Gilbert; the most popular opera ever produced in England; première London 1878, New York 1879.

H. M. S. Pinafore lies anchored at Portsmouth. The Right Honorable Sir Joseph Porter, first lord of the admiralty, accompanied by sisters, cousins, and aunts, sues for the hand of Josephine, Captain Corcoran's daughter. She rejects him because of love for Ralph, a common sailor. Ralph threatens suicide when Josephine's pride causes her to spurn his offer of love. She relents, but elopement plans are overheard by the wicked Deadeye Dick.

Sir Joseph, believing his position dazzles Josephine, sings "love levels all rank." Josephine seems pleased and assures him that she will hesitate no longer. Sir Joseph and the captain rejoice, after which Deadeye reveals the lovers' plot. Confronted by the captain as they are about to leave the ship, Ralph declares his love, the captain swears and Ralph is sent to the ship's dungeon.

Little Buttercup relates to Sir Joseph that long ago she nursed two babies, one a patrician, the other lowborn. she got the babies mixed. The first was Ralph, the other the captain. Sir Joseph orders Ralph and the captain to appear before him. He reduces Corcoran to the rank of a common sailor and gives Ralph command of the ship. Ralph and Josephine receive consent to marry. Corcoran and Buttercup agree to unite their fortunes.

Porgy and Bess. A folk opera; music by George Gershwin; libretto by Du Bose Heyward; setting is in Catfish Row; composed in 1935; revised in 1951.

Bess, whose "man" Crown is a fleeing murderer, resists the pressure of Sportin' Life, a dope peddler, to accompany him to New York and accepts the refuge offered by Porgy, a crippled beggar.

During a community picnic on a neighboring island, Crown, who had taken refuge there, abducts the somewhat willing Bess. A week later, a repentant Bess returns to Porgy and accepts his protection should Crown return for her. When Crown does return, Porgy seizes the knife in Crown's hand and kills him. "Now Bess has her man" cries Porgy. While Porgy is away the next day, Sportin' Life returns and forces a dose of "happy dust" on Bess and she is easily persuaded to return to New York with him. Returning to find Bess gone, a grief-stricken Porgy starts the long, lonely journey north in his goat cart to reclaim his beloved Bess.

Prince Igor (*ē'gŏr*). The only opera of the Russian composer, Borodin; based upon *The Epic of the Army of Igor*, a chronicle of the 12th century; première Petrograd 1890, New York 1915.

Prince Igor leaves his wife in the care of his brother, Prince Galitzky, and goes with his army to fight the Mongol chief, Kontchak. Prince Galitzky betrays his trust and stirs up rebellion. Prince Igor is captured. When the situation seems hopeless, he escapes, returns home, and restores order.

Prophet, The. Music by Meyerbeer; words by Scribe; première Paris 1849.

John, an innkeeper in Leiden, in a rage against the vice and lawlessness of the nobles, joins the ranks of the Anabaptists and is installed as their chief because of his resemblance to the prophet promised by heaven. During the installation ceremony, his mother, Fidès, recognizes him, but he pretends not to know her, as this admission would prejudice his position with the populace. Fidès is compelled to admit that she is mistaken and is carried off to the dungeon. Later, John visits her and receives her pardon. Realizing a plot is being set against him by some of the Anabaptist leaders, John destroys them as well as himself by blowing up the palace.

Queen of Sheba, The. *Die Königin von Saba.* Music by Goldmark; words by Mosenthal; première Vienna 1875, New York 1885.

Assad, affianced to Sulamith, is sent by Solomon to conduct the Queen of Sheba to his presence. Assad is dazzled by the queen's beauty and renounces Sulamith. Banished for blasphemously calling the queen his divinity, Assad wanders about in the desert. The queen visits him but is repulsed. Sulamith goes to him. A simoom sweeps across the desert. Locked in each other's arms, they perish.

Rake's Progress, The. Music by Igor Stravinsky; libretto by W. H. Auden and Chester Kallman; completed in 1951. This Mozartian-modeled 18th century opera depicts realistic scenes of a dissipated young man who finds corruption and death in 18th century London. The opera is written in a series of arias, duets, and occasional choruses with recitatives added to keep the story moving. The first performance was held in Venice followed by a full-scale production at the Metropolitan Opera in New York.

Rheingold, Das (*rīn'gôlt*). *The Rhinegold.* See *Ring of the Nibelung*

Rigoletto (*rē'gô-lĕt'tō*). Musically, Verdi's masterpiece; story based upon Victor Hugo's *Le Roi s' Amuse*; words by Piave; première Venice 1851, New York 1857.

Rigoletto, buffoon and panderer to the licentious duke of Mantua, hires an assassin to murder the duke, after his own daughter Gilda has been violated by his master. The assassin's sister lures the duke to his house, but on her plea his life is spared. As the assassin must deliver a victim to Rigoletto, he murders the first person who enters his house. It is Rigoletto's daughter dressed as a page.

Ring of the Nibelung, The (*rĭng'bĕ-lōōng*). *Der Ring des Nibelungen.* Music and words by Wagner; based upon the *Nibelungenlied* and the Scandinavian *Eddas*; an allegorical festival drama consisting of four operas: (1) a prologue, *Das Rheingold*, première Munich 1869, New York 1889; (2) a trilogy, *Die Walküre*, première Munich 1870, New York 1877; (3) *Siegfried*, première Bayreuth 1876, New York 1877; and (4) *Die Götterdämmerung*, première Bayreuth 1876, New York 1888.

1. *Das Rheingold*, or "The Rhinegold," symbolizing earthly power, is gold which belongs to the nymphs dwelling in the waters of the Rhine. The dwarf Alberich, prince of the Nibelungs, clumsily courts the maidens, unsuccessfully trying to catch first one, then another. The nymphs incautiously reveal the secret of the gold which, if made into a ring, will make the possessor ruler of the world, provided he renounces love forever. Alberich boldly seizes the gold, carries it to his country, Nibelheim, forges from it a ring, and makes himself master of the realm.

Wotan, of the race of gods, and his wife Fricka awaken from their slumber upon a bed of flowers to gaze upon the stately castle of Walhalla which giants have built for them during the night. The giants, Fasolt and Fafner, carry off their reward, Freia, the goddess of youth and beauty, foolishly promised by Wotan. As a result the gods begin at once to age.

The fire god, Loge, brings news of Alberich's treasure-trove, and the giants agree to accept the golden treasure in place of Freia if the gods can secure it. Wotan and Loge go to Nibelheim on this quest. There they find Alberich dominating his fellow dwarfs by virtue of his magic gold. He has forced his brother Mime, a clever smith, to make a Tarnhelm, a helmet of invisibility. Wotan and Loge cunningly beguile Alberich into exhibiting the power of his new treasure. The confiding dwarf first changes himself into a huge snake, and then into a toad. While he is in the latter shape, Wotan puts his foot upon him, while Loge snatches the Tarnhelm from his head. Together they bind him and carry him off. With his treasure torn from him, his Tarnhelm, and last of all the ring with which he hoped to rule the world, Alberich is in despair. He utters a terrible curse upon the ring, vowing that it shall bring ruin and death upon every one who wears it, until it returns to its original possessors. The giants now appear to claim their reward. Wotan gives them the treasure, Tarnhelm, and the ring, in exchange for Freia. The curse at once begins to work. The giants quarrel over the possession of the ring. Fafner slays Fasolt and carries off the spoils.

Donner, the god of Thunder, calls up a storm and builds a magic rainbow bridge, over which the gods pass into Walhalla. Far below rise the despairing cries of the Rhine-maidens lamenting their lost treasure.

2. *Die Walküre*, or "The Valkyrie," Brunhilde, is one of the nine splendid daughters of Wotan by Erda, the goddess of the Earth. The mission of these valkyries is to bring dead heroes from battlefields to dwell in Walhalla and, if need be, help defend it.

Only a man without fear and without the lust for gold can wrest the ring from Fafner, who had changed into a fierce dragon. To raise up such a man, Wotan, under the name of Volse, weds a mortal who bears him two children, Siegmund and Sieglinde. The brutal Hunding murders the mother and forces Sieglinde to become his wife.

Siegmund, after years of wandering, comes to the hut of Hunding. The story of Sieglinde arouses Siegmund's pity and love. He draws from the trunk of an ash tree a magic sword, Nothung, placed there long before by a stranger (Wotan) who had said it should belong to the hero

able to withdraw it. Siegmund and Sieglinde flee, pursued by Hunding. Wotan sends the valkyrie, Brunhilde, to protect Siegmund. His wife, Fricka, the goddess of marriage, objects. Wotan then sorrowfully forbids Brunhilde to interfere. She, knowing her father's inmost desire, disobeys him. In his battle with Hunding, Siegmund is on the point of victory when Wotan interposes a lance and shatters his sword. Siegmund is pierced through by the spear of Hunding. Brunhilde collects the pieces of the broken sword and escapes with Sieglinde upon her horse, while Hunding falls dead at a contemptuous wave of Wotan's hand.

Wotan punishes Brunhilde for her disobedience by changing her into a mere woman. She is to be put to sleep upon the mountain top, to be the bride of the first man who finds and wakens her. On her entreaty, Wotan agrees to surround her with a ring of fire so that only a hero who will brave the fire can reach her. As Brunhilde's divine powers forsake her and she goes to sleep, Wotan kisses her a fond farewell. He places her upon a moss-covered rock and signals Loge to surround her with the ring of fire.

3. *Siegfried*, the second of the trilogy, advances the drama another stage. Many years have passed. Sieglinde had dragged herself to the forest and had died in giving birth to a son, Siegfried. Siegfried was brought up by the Nibelung dwarf, Mime, who hoped that the boy, now grown to manhood, might win the treasure for him by slaying Fafner, the dragon. Fafner is the former giant who had transformed himself into a dragon by means of the Tarnhelm in order to protect his hoard of gold.

Siegfried compels Mime to tell, bit by bit, the story of his mother and of his father's shattered sword, the fragments of which his mother had preserved. Mime tells also of Fafner, the dragon, ever guarding the treasure in his cave. He plans darkly that after Siegfried has killed Fafner he will drug and kill Siegfried, and gain possession of the ring.

Siegfried forges his father's sword anew, seeks out the dragon, and easily kills him. Touching his lips to the blood of the dragon on his hand, he finds that he can understand the song of the birds. As he listens, the warning voice of one of them tells him to fetch the ring and magic helmet from the dragon's cave. This he does and places the ring upon his finger. From the song of the birds he learns of Mime's dark plans. With one blow of his sword Siegfried slays the treacherous dwarf, then guided by his feathered friend proceeds to the mountain top, where Brunhilde lies within the flaming circle, awaiting the hero who shall release her. Wotan attempts to bar the way, but Siegfried shatters the spear of the god with one stroke.

Fearlessly and gayly Siegfried passes up through the fire and finds Brunhilde asleep. He awakens her by imprinting a kiss upon her beautiful lips. Siegfried speaks of love and persuades Brunhilde to become his bride.

4. *Die Götterdämmerung*, or the "Twilight of the Gods," tells of the destruction wrought by the curse of gold, and of the final triumph of love.

After a period of happy wedded life, Siegfried goes forth to do heroic deeds. Brunhilde remains within her circle of fire. Siegfried gives her the ring as a pledge of faith. She gives him her horse, Grane.

A valkyrie entreats Brunhilde to return the ring to the Rhine-maidens. Wotan had said that by so doing she would lift the curse and save the gods from destruction. Brunhilde refuses, for the ring is the symbol of Siegfried's love.

Siegfried arrives at the court of Gunther, who lives with his sister Gutrune and his half brother Hagen, the son of Alberich. Hagen has been bound by his father to gain possession of the ring. He devises a crafty scheme for getting Siegfried to do his will. He persuades Gutrune to give Siegfried a love philter which makes him forget the past. Siegfried's former love for Brunhilde is swallowed up in a burning passion for Gutrune.

According to Hagen's dark plans, Siegfried is to win Gunther's consent that Gutrune be given to him by fetching Brunhilde to be Gunther's bride. Assuming the form of Gunther by means of the Tarnhelm, Siegfried goes to Brunhilde's Rock, announces himself as Gunther, overcomes her resistance, and robs her of the ring, which he places upon his finger. When they arrive at the court of Gunther, unknown to Brunhilde, he has Gunther take his place. Hagen announces the arrival of Gunther and his bride and orders that a feast be prepared.

Hagen, pretending friendship for Brunhilde, offers to become her avenger. In despair, she reveals that Siegfried is vulnerable only in his back.

In a forest on the banks of the Rhine, Siegfried, having strayed from his companions in the chase, is asked by the Rhine-maidens to return the ring, warning him of the curse attached to it. He laughs at what he considers their womanly wiles and decides to keep it, trusting his sword.

Gunther, Hagen, and the hunters now appear on the scene, with game on their shoulders. After passing around the cup, Hagen addresses Siegfried, saying that he has heard that he understands the language of the birds. Thus invited, Siegfried tells the story of Mime, the dragon, and the forest bird. When he gets to the part where he followed the bird to Brunhilde's Rock, Hagen gives him a potion which restores his remembrance of Brunhilde. He proceeds to relate how he wooed, won, and wedded her. As Gunther listens horrified to this revelation, two ravens fly past. Siegfried turns to look at them, and Hagen stabs him in the back. Siegfried makes one last terrific effort to crush Hagen with his shield, then falls and expires with a greeting to Brunhilde, unconscious of having betrayed her. In silent grief, the vassals raise the dead body upon their shields, and carry it back to the castle through the moonlit forest, to the immortal strains of the "Funeral March."

Hagen demands the ring. When Gunther denies the request, he kills him. Hagen then attempts to take the ring from Siegfried's finger, when the corpse raises its hand in awful warning. At this moment Brunhilde appears, solemnly, majestically. She directs the young men to build a funeral pyre. After taking the ring from his finger she has Siegfried's body placed upon the pyre. With her own hand she applies a torch and, as the flames rise on high, she leaps upon her horse and rides into the burning mass. As the fire collapses, the Rhine begins to swell until it reaches the coals of the pyre, bearing on its surface the three Rhine-daughters, one of whom recovers the ring. Hagen dashes into the flood in search of the ring and is dragged down to the depths by the Rhine-maidens. The sky is seen aglow. Walhalla is in flames. The end of the gods is at hand.

Salome (*să-lō'mĕ*). Music by Richard Strauss; a setting, almost unabbreviated, of Oscar Wilde's play of the same name; première Dresden 1905; has had triumphs in Italy and Paris, but so seriously scandalized New York that it was withdrawn after a single performance. Although ethics of the story are somewhat difficult of digestion, there is a strange, exotic beauty in the weird harmonies and infinitely suggestive orchestration of the opera.

The scene is laid upon a terrace of Herod's palace, where soldiers are keeping watch while the king holds revel within. Salome, the daughter of Herodias, comes forth from the banquet chamber. The voice of Jochanaan (John the Baptist), who is imprisoned in a cistern near by, is heard. Salome commands Narraboth, a young Assyrian, to bring him forth. Dragged from his living tomb, Jochanaan denounces the wickedness of Herodias, but Salome, fascinated by the strange beauty of the prophet, has no ears for his curses. She pours forth her passion in wild accents, but is sternly repulsed by Jochanaan, who retreats once more to his cistern.

Herod and Herodias now come forth from the banquet, and Herod bids Salome dance. She extorts a promise from him that he will give her whatever she asks, even to the half of his kingdom, and dances the dance of the seven veils.

When this weird dance is finished she demands the head of Jochanaan. Herod pleads with her in vain, the executioner is sent into the cistern, and the head of Jochanaan is brought in upon a silver platter. Salome kisses the lifeless lips, but Herod in terrible wrath and horror cries to his soldiers, "Kill this woman," and, as the curtain falls, she is crushed under their shields.

Samson and Delilah. *Samson et Dalila.* Music by Saint-Saëns; words by Lemaire; a biblical opera, almost an oratorio; première Weimar 1877, New Orleans 1893, New York 1895.

The Hebrew leader, Samson, is lured by the Philistine woman, Delilah, to reveal that his hair is the secret of his strength. She soothes him to sleep, cuts off his hair, and puts out his eyes. Brought before the priest of the Philistines, Samson prays Jehovah for renewed strength and with a mighty effort pushes apart two pillars, with the result that the temple falls in ruins.

Siegfried (*sēg'frēd*). See *Ring of the Nibelung, The.*

Suzanne's Secret. *Il Segreto di Susanna.* A comic opera; music by Wolf-Ferrari; words by Golisciani; première Munich 1909, New York 1911.

Count Gil detects the odor of cigarette smoke in the drawing-room and accuses his young wife of having a secret. She does not deny it. He flies into a rage and attacks the furniture. He goes out, then returns unexpectedly, only to find more traces of cigarette smoke. He grasps his wife's hand furiously. In doing so he receives a burn from a cigarette. The secret is out. As a token that all is well, Count Gil daintily helps Suzanne light a fresh cigarette.

Tales of Hoffman. *Les Contes de Hoffman.* Music by Offenbach; words by Barbier; based upon three famous stories by Hoffman; première Paris 1881, New York 1882.

In the first act, or prologue, the poet, drinking with a group of students at an inn in Nuremberg, proposes to relate his adventures in love. The second, third, and fourth acts describe these adventures.

Olympia is an automaton made by Coppelius, who represents the Evil One. Spalanzani buys it and gives a bad check in payment. Hoffman sees Olympia through magic

spectacles supplied by Coppelius and falls in love. He is disillusioned only when Coppelius enters and smashes the automaton because he has been defrauded.

Giulietta, an accomplice of the Evil One in the form of Dapertutto, lures Hoffman to make love to her by displaying her charms and a magic gem furnished by Dapertutto. She then entices him to slay her dupe, Schlemihl, and deserts him for Dapertutto.

Antonie, the daughter of Krespel, is a good soul who stirs in Hoffman a feeling of pure affection. Her mother had been a great singer but died from treatment given by the Evil One in the shape of Doctor Mirakel. Antonie is consumptive and has been forbidden to sing, as the exertion may prove too great a strain. Doctor Mirakel provokes her to sing by conjuring up a vision of her mother. She dies in the arms of her father.

In the fifth act, or epilogue, Hoffman is again at the inn. He declares he has tried all kinds of love—that inspired by mere beauty, that inspired by sensuous charm, and pure affection. Henceforth he will devote himself to art as his only mistress.

Tannhäuser (*tän'hoi-zĕr*). Words and music by Wagner; plot from 13th century legend of contests between minnesinger arranged by the landgraves of Wartburg castle; première Dresden 1845, New York 1859.

Tannhäuser is a minstrel knight who has wasted a year at Venusberg under the spell of Venus. Wearying of his amorous captivity he would fain return to the earth once more. On the way, the pious chant of pilgrims bound for Rome wakens his slumbering conscience and bids him expiate his guilt through suffering, and his prayer mingles with the pilgrims' chant. The landgrave of Wartburg, with a retinue of minstrel knights, returning from the chase, comes upon Tannhäuser and invites him to the castle. Remorse bids him refuse, until the name of Elizabeth the landgrave's niece is mentioned. His heart moved by returning love, he gladly hastens to the castle with his newly found friends.

The landgrave arranges a contest for the minstrels in his great hall of the Wartburg. He proposes they prove their skill in song by singing the praises of love, and offers as a prize to the victor permission to seek the hand of Elizabeth. Other minstrels sing their improvisations of love in lofty strains; Tannhäuser, in brutal terms of the amorous orgies of the Venusberg. Outraged, several rush upon him with drawn swords to execute justice upon the self-convicted sinner, but Elizabeth throws herself before them and pleads for his life. Touched by her agonized pleading they lower their weapons. Tannhäuser, as his madness slips from him, realizes all that he has lost and falls repentant upon the earth. The landgrave bids him hasten to Rome where alone he may find pardon for so heinous a sin.

Elizabeth has been waiting anxiously for the return of the pilgrims. As they file past she eagerly scans their faces, but Tannhäuser is not among them. The faithful Wolfram tries to give her aid and comfort. She is grateful but indicates she must take the way which leads to heaven. Wolfram remains behind, and as darkness comes he sings to the lovely evening star whose bright rays pierce the darkness and reveal the path to the late traveler. To this star he confides her.

Tannhäuser appears, disappointed and despairing. The pope has bidden him hope for no pardon for his sin till the barren staff in his hand shall put forth leaves and blossoms. With these awful words ringing in his ears, Tannhäuser has had enough of earth and thinks only of returning to the embraces of Venus, but he cannot find the way. Venus appears in a light cloud. Through perfumed and rosy mists, seductive nymphs can be seen dancing. A voice reminds Tannhäuser of the myriad joys which await him in the realms of the goddess of love. In vain Wolfram appeals. Tannhäuser breaks from his friend and is rushing to meet the extended arms of the goddess when Wolfram adjures him once more by the sainted memory of Elizabeth. At the sound of that sinless name, Venus disappears.

The morning breaks. A funeral procession approaches. As the bier bearing the remains of Elizabeth is carried forward, Tannhäuser sinks lifeless beside it. Another group of young pilgrims advances swiftly, bearing the pope's staff which has put forth fresh leaves, the symbol of redemption and pardon for the repentant sinner.

Thaïs (*tä-ēs'*). Music by Massenet; words by Gallet; plot based upon novel by Anatole France; première Paris 1894, New York 1908.

Thaïs, an actress and courtesan, is the central figure in the gay life of Alexandria. Athanael, a monk living at the retreat of the Cenobite Order beside the Nile, returns from a visit to the city, saddened by the riotous living of his former wealthy friends. That night he has a vision of Thaïs appearing as Venus before an excited audience at the theater.

Impelled to save her from a life of sin and shame, he visits the house of Nicias, a friend of former days, and declares his purpose. Nicias invites him to remain for a party in honor of Thaïs, after the theater, and robes him in proper garments. Thaïs is attracted by the handsome stranger of stern mien. Athanael tells her he has come to teach her the way of salvation. She says she believes only in love and pleasure. Horrified by the revelry, Athanael departs, after telling Thaïs he will meet her at her home.

In the house of Thaïs, Athanael pleads eloquently that she embrace a higher love and the life everlasting. Thaïs, decked to allure him by her charms, is frightened, then becomes defiant. He commands her to follow him. She hears the voice of Nicias in an adjoining room and hesitates. Solemnly proclaiming she will yet repent, Athanael says he will await her coming on the doorstep until dawn and goes out.

Just before dawn, Thaïs, in somber dress, emerges from the house. She is ready to go but asks to retain an ivory image of Eros, the gift of Nicias. Athanael dashes it to the pavement. He commands her to destroy all her earthly possessions. With her permission he sets fire to the house. Nicias and his friends rush out in rage. They threaten Athanael and Thaïs. Nicias, to avoid violence, scatters gold among the crowd, and Athanael and Thaïs escape.

After a long and hard journey through the desert, Thaïs is given into the care of the White Ladies at their convent. Athanael returns to his retreat, but he cannot find peace. The image of Thaïs oppresses him. He dreams of her as Venus, then as dying at the convent. Though the night is stormy he sets out for the convent. He finds Thaïs upon a couch attended by nuns. In frenzy he begs her to return to earthly life. She has already had a vision of heavenly bliss. With a smile upon her lips she dies. Athanael utters a cry of despair and falls to the ground.

Tosca (*tōs'kä*), **La.** Music by Puccini; the libretto is a clever condensation of Sardou's famous drama; première Rome 1900.

The scene is laid in Rome in the year 1800. The first act introduces Mario Cavaradossi, a painter who is at work in a church, and Floria Tosca, a famous singer with whom he is in love. She pays him a visit and teases him with her jealous reproaches. Cavaradossi befriends Angelotti, a victim of papal tyranny, who has escaped from the castle of Saint Angelo. He dispatches him by a secret path to his villa in the outskirts of Rome. Scarpia, the chief of police, who is close upon Angelotti's heels, suspects Cavaradossi of being implicated in Angelotti's escape and uses La Tosca's jealous disposition to help him in securing the prisoner.

In the next act, Angelotti is still at large, but Cavaradossi has been arrested. Scarpia, who in the meantime has fallen violently in love with La Tosca, extracts from her the secret of Angelotti's hiding place by putting her lover to torture in an adjoining room. From there, his cries penetrate to her distracted ears. La Tosca buys her lover's safety by promising herself to Scarpia. The latter gives orders that Cavaradossi's execution shall only be a sham one, blank cartridges being substituted for bullets. When they are left alone, La Tosca murders Scarpia with a knife when he tries to embrace her.

In the last act, after a passionate duet between the lovers, Cavaradossi is executed,—Scarpia having given a secret order to the effect that the execution shall be genuine after all—and La Tosca in despair throws herself into the Tiber.

Traviata, La (*lä trä-vē-ä'tä*). Music by Verdi; words by Piave; founded upon Dumas's *La Dame aux Camélias*; première Venice 1853, New York 1856.

Violetta, a courtesan of Paris, gives up her gay life to live in a humble apartment with Alfredo. His father persuades her to release him. She returns to Paris. Alfredo, ignorant of the cause of her desertion, insults her publicly. Too late he discovers the truth about the nobility of her sacrifice. Full of remorse he visits her, only to find her dying of consumption. With words of forgiveness on her lips, she expires in his arms.

Tristan und Isolde (*trĭs'tän*) (*ē-zōl'dĕ*). Music and words by Wagner; plot from an old Celtic legend; Wagner's version taken from that of the 13th century minnesinger Gottfried von Strassburg; generally considered Wagner's masterpiece; première Munich 1865, New York 1866.

Tristan is a knight of King Mark of Cornwall. He had killed Sir Morold of Ireland in battle and sent his head to Isolde, the affianced bride of the dead warrior. Wounded by the poisoned sword of Morold, Tristan disguises himself as Tantris and seeks aid from Isolde, far famed as a healer. She recognizes the stranger from a notch in his sword which matched a splinter of steel she had removed from the head of Morold. She is about to slay him, when their eyes meet and love is kindled. Tantris departs. Soon he returns as Tristan and asks her hand for King Mark. Her parents accept.

Isolde sails with Tristan for Cornwall. During the voyage she sends for him repeatedly. As the ship approaches land

he goes to her. She reproaches him with neglect and declares there is a blood debt between them. He bares his breast and offers her his sword. She proposes instead a cup of reconciliation. He suspects poison but drinks. She has ordered her maid, Brangane, to prepare a death philter. The maid disobediently has prepared one of love. When Tristan has taken half the draft, Isolde snatches the cup and drains it. They gaze into each other's eyes. There each reads the other's secret. Overcome with emotion they embrace. As the king comes aboard, Brangane confesses to the lovers what she has done. They look at each other in wild distress. Isolde swoons.

The king goes on a hunt one night. The hunting party has hardly disappeared from view when Isolde gives the signal with a torch which brings Tristan to her garden. They sing of their love, but the night is too short. Suddenly, Brangane, who has been watching in the tower, bursts in to say the king is coming. Kurwenal, the faithful servant of Tristan, comes in backwards with drawn sword, followed by the king, his courtier Melot, and others. The king looks with grief upon the couple and reproaches them bitterly. Tristan spreads his mantle to protect Isolde from the sharp glances of the intruders. He looks with pity upon the king. Turning to Isolde, he says he will go to the dreary country of his birth. There she will find asylum if she wishes to follow. He kisses her brow. Melot, enraged, draws his sword. Tristan defends himself but allows Melot to wound him.

In his old manor in Brittany, whither Kurwenal has brought him, Tristan is slowly dying from his wound. Isolde has been summoned to heal him. At last she comes, but the excitement is too great for Tristan. In delirium he tears the bandage from his wound and expires in her arms. The king and Melot arrive. Kurwenal, looking upon them as enemies, gives battle. Melot is killed; then Kurwenal is wounded and dies beside his master. The king approaches. Sadly he relates that Brangane has told all, that he holds the lovers guiltless and has come to pardon and unite them forever. Isolde does not understand. She gazes upon her dead lover, Tristan, and expires in the arms of Brangane whose ruse of the love philter had but served to intensify the tragedy.

Trovatore, Il (*ēl trō'vä-tō'rĕ*). *The Troubadour.* Music by Verdi; words by Cammerano; plot based upon Spanish drama of the same name; in popularity second only to "Aïda"; première Rome 1853, New York 1855.

Manrico, the troubadour, a chieftain of the prince of Biscay, is really Garzia, the brother of Count Luna, a young nobleman of Aragon, but nobody knows this except Azucena. When Garzia was a child an old gypsy cast a spell over him. For this she was burned to death. The gypsy's daughter Azucena, in revenge, carried off the child, and the next morning the smoldering bones of an infant were found among the charred embers where her mother had been burned. By mistake Azucena had thrown her own child upon the fire. She has brought up Garzia and named him Manrico.

Leonora, a princess of the house of Aragon, has crowned the troubadour victor at a recent tournament. Count Luna, who loves Leonora, lingers under her window at his palace, Alfiera. Leonora enters the garden to meet Manrico. Mistaking the count for Manrico she greets him warmly. At that moment Manrico appears. Seeing her with the count he charges her with being unfaithful. Leonora rushes into his arms. The count challenges Manrico to combat. As the men begin to fight, Leonora falls to the ground in a swoon. Later, thinking Manrico dead, she goes to a convent.

A messenger arrives at the gypsy camp, summoning Manrico to defend the castle of Castelar, relating also that Leonora has gone to a convent. Manrico rescues Leonora as she is about to take the vow and brings her to Castelar but is there taken prisoner by the count's forces. Azucena, brought to the count's camp as a spy, is recognized by Ferrando, the captain of the guard, as the supposed murderer of the count's brother. She calls upon Manrico for help. The count orders her burned. Manrico attempts to rescue her. Both he and Azucena are thrown into a dungeon.

Leonora pleads with the count to spare the life of the troubadour. At last she promises to marry the count if Manrico's life is spared, resolving, however, to take poison as soon as Manrico is safe. The count consents. Leonora visits Manrico in prison to tell him he is free. Having already taken poison, she dies at his feet. The count enters. Enraged at being thus robbed of his bride, he orders Manrico to be taken outside and beheaded instantly. The count drags the sick and weary Azucena to the window to witness the execution of her son. Azucena tells the count in a loud whisper: "You have killed your brother!" The count in remorse utters a wild cry and falls to the floor in a swoon.

Walküre, Die (*väl-kü'rĕ*). *The Valkyrie.* See *Ring of he Nibelung, The.*

William Tell. The last and greatest opera of the Italian composer, Rossini; words by Jouy, Bis, and Marast. The plot is based upon Schiller's drama of the same name; première Paris 1829, New Orleans 1842, New York 1888.

William Tell is the patriot who was instrumental in freeing Switzerland from the Austrian yoke in 1307. The plot deals with conditions which led up to the actual uprising. Leuthold has killed a vassal of the tyrant Gessler, the governor, in order to save his daughter from dishonor. Being closely pursued, his only escape is by way of the lake. In the raging storm, the fishermen refuse to undertake the passage. The voices of the pursuers are heard, when William Tell comes to the rescue, takes the rudder from the hands of the fisherman, and steers Leuthold safely to the other side.

For this act against the government, William Tell incurs the bitter hatred of Gessler. Arnold, the son of old Melchthal, is in love with Mathilde von Habsburg, the ward of Gessler, and is torn by the conflicting emotions of love and duty. Tell tries to win Arnold over to the cause of the fatherland, and to leave Mathilde, the Austrian born aristocrat, whose sympathies are against Switzerland. When Arnold hears that the tyrants have slain his old father, he forgets all but his love for his country, and dedicates himself to a blood revenge against the oppressors of his country.

Further to humiliate the Swiss by his tyrannical methods, Gessler places his hat upon a pole in the market place in Altdorf, and, accompanied by Mathilde, watches the poor villagers acquiesce to his latest order,—that all shall bow humbly before this symbol of his authority. Refusal to do so is to be punished by death. Tell, accompanied by his young son, passes by and refuses to bow before the hat. He is recognized as the rescuer of Leuthold. Realizing that the affairs of the country are approaching a climax, Tell secretly tries to send his son to give the signal for the uprising. Gessler, however, bids the boy remain, and then commands Tell to shoot an apple from the head of his own son. The shot is a long and difficult one, but is successfully accomplished by Tell. Perce ving that Tell had placed a second arrow in his belt before making the shot, Gessler suspiciously asks Tell why he had done so. "With this arrow I would have shot you, and, truly, I would not have missed," is Tell's answer. Again Gessler commands that Tell be bound, but the approach of the armed multitude of angry Swiss announces the beginning of the uprising which follows. It ends in the victory of the Swiss. Tell kills Gessler, and Mathilde, recognizing the cause of her lover, also turns from the Austrians and flies into the arms of Arnold.

Wozzeck (*Vōh'zĕk*). Music by Alban Berg; from a play by George Buchner; completed in 1921.

The opera tells of Wozzeck, a poor soldier plagued by superiors, poverty, his common-law wife Marie, and his own unbalanced emotions. Marie is attracted to the drum major of the military band and, following several circumstances which convince Wozzeck of Marie's unfaithfulness to him, he kills her, later goes mad, and drowns himself in a nearby lake.

Zauberflöte, Die (*tsou'bĕr-flû'tĕ*). *The Magic Flute.* A fairy extravaganza; music by Mozart; words by Schickaneder; plot adapted from tale by Wieland; première Vienna 1791, New York 1833.

Pamina, daughter of the Queen of Night, has been carried off by the wise master, Sarastro, priest of Isis, to protect her from evil influences. Tamino, a noble prince, who has lost his way and spent his last arrow, is attacked by a huge serpent and faints from fright. Three veiled ladies of the queen's suite kill the serpent. They are so much impressed with the beauty of the prince that they cannot decide who shall bring the message to the queen and who shall remain, so all go. When Tamino revives he sees before him the birdcatcher, Papageno, dressed in feathers, and thanks him for destroying the serpent. The birdcatcher boastfully admits his prowess.

On returning, the ladies rebuke Papageno and show Tamino a small portrait of the princess Pamina. He loves her from the first and gladly sets out on a mission to rescue her, accompanied by Papageno. Tamino receives a magic flute to protect him from danger; Papageno, a set of bells.

The queen, suddenly rising from the earth, gives Pamina a dagger and commands her with threats to kill Sarastro. Not knowing that the ordeal of silence has been imposed upon Tamino, Pamina cannot understand his apparent coldness and is inclined to listen to the counsel of her mother. Sarastro however convinces her of his beneficent intentions. The lovers go through the ordeals of fire and water successfully and, having been purified, are united in wedlock by Sarastro. The Queen of Night and her accomplice, the Moor, try to prevent the wedding ceremony, but the scene changes suddenly to the Temple of the Sun with Sarastro on the throne. The bright light baffles the queen, and she, with her retinue, sinks into the earth.

PAINTING

The art of painting is as old and as widespread as human culture. From its earliest beginnings in prehistoric times, it has been a means of expressing important cultural and aesthetic values. As with the other arts, painting derives its significance from man's ability to create symbols, representational and non-representational, and to endow them with meaning. Both the creation and appreciation of painting require the synthesis of sensuous, emotional, and intellectual activities. Our visual and tactile perceptions of colors, values, textures, and shapes are given order and feeling in a painting.

A painting is influenced by many factors. Cultural traditions, materials and techniques, subject matter, composition, the elements of the visual arts, and the individuality of the painter are all important in determining the nature of painting. Cultural traditions provide the artist with a general pattern of form. Often the tradition dictates the subject matter and how it may be represented. Since traditions vary greatly, the art of one culture may not immediately be understood by another. The paintings of the Australian Aboriginals, the ancient Egyptians, and contemporary Western painters are clearly unlike in style, subject matter, materials, and methods of depicting space. Materials and techniques influence the form of painting in the range of colors, values, and textures they provide, in the degree of refinement and flexibility they permit, and in the processes that may be developed for their use. Mosaic, egg tempera, and oil paint are three traditional materials of Western painting. Each requires distinctly different techniques, and each has unique qualities and limitations. Subject matter may be important in determining the organization of a painting. It may suggest the colors and values the painter will use, and may even suggest the technique. Composition is the art of building the structure of painting, arranging subject matter, colors, and values to create a sense of spatial order and surface design. In some cases this order is readily apparent, as in the pyramidal structure of El Greco's "St. Jerome," the radial plan of da Vinci's "Last Supper," or the vertical-horizontal arrangement of Cézanne's "Pines and Rocks." In these examples an obvious structure dominates the design. In other paintings the structure may be less apparent, but equally successful in the balance of value, color, and space. The elements, such as color, value, texture, and line, play an important part in composition and may be used as foils against one another as well as to provide sources of balance and spatial organization. The artist's individuality distinguishes one painter's work from another in his use of all the foregoing. Two paintings from the same period, using the same materials, portraying the same subject, by two different painters, will have many differences because each painter will see and handle his material differently. These differences are often expressed in the use of color or brushwork, or the preference for certain kinds of structure or line. In the study of painting history or in the analysis and appreciation of a single painting, an understanding of all these factors will add significance and meaning for the viewer and provide him with an aesthetic background for enjoyment.

Prehistoric Painting. The earliest examples of painting date from Paleolithic times and have been preserved because they were done in the deep recesses of caves which probably served as ritual chambers. Many such caves have been found in Western Europe, notably in France, Spain, and Italy. The paintings are both figurative and non-figurative, suggesting highly developed observational skills and the early use of symbolism. Prehistoric artists used colors made of earth, red and yellow ochres, which they probably mixed with animal fat for a medium. The paint was applied to the wall with the fingers, with brushes made by chewing the ends of twigs or reeds, or was blown on the wall in the form of dry powder through tubes made of hollowed-out animal bones. Palettes of flat bone have been found, along with other painting tools, in the rubble on the floors of many caves. Small stones with incised sketches have been discovered that suggest a teacher correcting the work of a student. Other small stones with outlined drawings appear to be master drawings which preceded the actual painting on the wall. Some of these seem to have been the source of several paintings done in different caves, as though these particular works had special significance or value and were therefore repeated.

The subject matter of most prehistoric painting consists largely of animal forms: bulls, mammoths, ibex, deer, horses, and occasionally some unidentified, probably fantastic, beasts. These creatures, wonderfully drawn and keenly observed, have remarkable vitality and power. The monumental bulls from the caves at Lascaux, France, or the mammoths from Altamira, Spain, because of their skilled execution and sensitivity of line and modeling, indicate an art tradition already well established. The human figure was also depicted, often simplified to a few linear elements, shown in the act of hunting or partially disguised with animal or bird features which may represent masks or mythological totemic beings. Along with these figurative subjects there are many symbolic forms, ranging from groups of dots or lines to more complex patterns, many of which are clearly sexual in subject matter, while others may represent traps, shelters or clan signs. It is thought that the entire range of subject matter can be related to magic hunting and fertility rituals. There is some indication that the act of painting was itself magic, for many of the paintings were done on top of previously finished works, although this may have been because one period had no regard for the work of former cultures, and the caves were utilized over very long periods of time. Many of the paintings and drawings appear to have served as targets, perhaps in a mock hunting ritual.

Egyptian Painting. Ancient Egypt emerged from a stone age culture into a recognizable civilization about 4000 B.C. Most Egyptian painting which has come down to us was done on the walls of tombs and temples. The Egyptians placed great emphasis on the after-life of the human spirit or *ka*, and the tombs of the priests and pharaohs were highly decorated with painting and sculpture. These paintings were concerned with a depiction of the good life and with the achievements of the dead. The range of subject matter is very great; from household scenes of well-stocked larders, slaves with baskets of food, weavers, farmers, and musicians, hunting scenes with the Pharaoh and his family on barges catching fowl in the papyrus swamps, to scenes of battle and victory. The purpose of this visual richness was to remind the *ka* of its previous existence as it followed its endless journey into eternity.

The Egyptians early developed a system of drawing and painting based on stylized mathematical proportions. In addition, the figure, although shown in a great variety of activities and poses, was generally represented in a conventional manner known as frontalism. That is, each part of the body was shown in its most complete or readily recognizable aspect. Foreshortening was little used. The head was depicted in profile, the torso in full breadth, the hip, arms, and legs in side view. This rendered the figure with clarity and wholeness. Figures and other subject matter were related to a ground line. Although some overlapping was used, complex subjects were developed by layering compositions one above the other to fill the space. Im-

portant figures were drawn larger in scale. Therefore size was not a factor in depicting distance. The spacing and drawing of Egyptian painting was developed with great sensitivity for the voids and contours. Frequently, areas of hieroglyphics were introduced into the compositions, adding a written commentary on the subject, and an overall feeling of pattern.

Egyptian painting was often done over low-relief carving, particularly in the older examples. Painting was also done on plaster laid over the stone walls and on papyrus. Over carefully executed contours, flat areas of color were painted on. No modeling was used. Pigments, it is presumed, were mixed with gum for a binder. The overall effect is one of rich pattern and design, bold in color and strong in the disposition of dark and light. Both interiors and exteriors of buildings were richly painted. An excellent example is the great Temple of Amon at Karnak, which was literally covered with painted incised decoration over the façade, the walls and the columns. Areas not occupied with figures were filled with pattern such as stylized representations of the lotus and the papyrus. Painting was also used to embellish objects such as coffins, furniture, and jewel cases, and to illustrate writing on papyrus scrolls.

Mycenean Painting. The beginnings of Greco-Roman painting can be traced to the Mycenean civilization, which grew up around the Aegean Sea about 3000 B.C. Knossos, the capital of Minos on Crete, was the center of a widespread sea trade which included Egypt and Asia Minor, and which greatly influenced Mycenean art. Mural painting and vase painting were both popular. The Palace of Knossos was lavishly decorated with paintings rich in color and pattern. Although the techniques of painting on plaster show marked Egyptian influence, the style of drawing and the use of color were indigenous. Characteristic are the bold contours, the slender-waisted figures, the broad and free use of color, and the subject matter which reflected local customs and environment, such as the scenes depicting leaping youths and bulls, or sea life such as flying fish, octopus, and sea weed. As in Egyptian painting, women were painted light hues, men dark.

Greek Painting. Greek civilization supplanted the Mycenean, but adopted many of its painting forms. Historians usually divide Greek art into four periods: the *Geometric*, from about 1100 B.C. to about 700 B.C.; *Archaic*, 6th Century B.C.; the *Early Classic*, beginning of the 5th Century; and *Classic*, the end of the 5th Century. Unfortunately very little is known of Greek painting from any period, for none survived. Done on stucco and plaster and wood panels with tempera or encaustic (hot wax), the paintings, according to written commentary, were largely linear in character, with flat areas of color, until the Fifth Century, when light and shade were apparently introduced. Many painters such as Zeuxis and Parrhasius of the 5th and 4th Centuries are known to us through the writings of their contemporaries. Later, Apelles, in the court of Alexander the Great, achieved fame for his ability to imitate nature exactly and for his technical virtuosity. From vase painting, which paralleled mural and panel painting, and from Roman copies of Greek paintings preserved at Pompeii and Herculaneum, we can gain some idea of what Greek painting must have been like. ' The Battle of Issus," discovered at Pompeii, is thought to be a Roman copy in mosaic of a 4th Century Greek painting, and shows a remarkable use of linear perspective, foreshortening and modeling in dark and light. The complex scene with many figures and horses is active and skillfully ordered. Other Roman copies of Greek painting suggest the development of aerial perspective with distant forms muted in value and color, as well as the popularity of portraiture.

Etruscan Painting. The Etruscans, probably originating in Asia Minor, settled in Italy during the 8th Century B.C. They developed a painting style in many ways related to and probably influenced by Archaic Greek and Mycenean. The best examples extant today were those paintings used to decorate tombs. The Etruscans, like the Egyptians, believed in the after life of the spirit, and the tombs were painted with lively, colorful scenes of everyday life, banquets, musicians, and dancing figures. Bright color, usually painted in flat areas, filled the sensitively outlined forms. The frescos from the "Tomb of the Triclinium" (c. 470 B.C.) are excellent examples of the graceful, rhythmic contours, expressive brushwork and rich color of later Etruscan painting. Many aspects of Etruscan painting strongly influenced Roman painting after Rome completed its conquest of the Italian peninsula.

Roman Painting. Roman painting, largely a mural art, is known to us chiefly through the frescoes on the walls of private homes in Pompeii and Herculaneum. Painting was for the most part considered a decorative art, used to embellish architecture with charming scenes from literature and legend, imitation marble walls and columns, landscape vistas and still life. Heavily influenced by the Greeks, modeling in light and shade and linear perspective enabled the Roman painters to develop a strongly illusionistic style, evocative of space and air. The frieze of the Villa of Mysteries (middle of the First Century A.D.) shows a sophisticated treatment of foreshortening and modeling in the rendering of the groups of figures. Another adjunct to Roman architecture was the use of mosaics, both as patterned floors and walls and as a painting medium. Roman Mosaic style varied from the spirited black and white marble floors at Ostia, where figures and patterns enlivened the market place, to some of the mosaics at Pompeii which were frankly imitative of mural painting.

Byzantine Illumination and Mosaics. The Greco-Roman heritage of line and composition in painting slowly lapsed into a long passive state as classic civilization declined. In the new capital created about 330 A.D. at Byzantium by Constantine, painting influenced by Eastern concepts of pattern and design flourished in two major forms: 1) the illumination of manuscripts, practiced by the monks primarily for the propagation of the Church ritual; 2) mosaics, that is, pictures composed of cubes of brilliantly colored stone, glass, or enamel set in a bed of cement. The latter species adorned the basilicas of the new faith and were the successors of the antique murals. They served to announce the doctrines of Christianity and to glorify its martyrs. They appeared wherever Byzantine influence extended itself, and, in Italy and Sicily, were finest in Rome, Ravenna, Venice, Palermo, and Monreale; the period of their production ranging from the 5th to the 14th Century.

Painting in Western Europe. The Byzantine, Medieval, Romanesque and Gothic periods of European painting, with their many influences and varying styles, produced many works of real beauty and significance. Because of the difficult and often troubled political and economic conditions during much of the period of Early Christian art, painting was largely confined to small portable works or to manuscripts. The builders of Romanesque and Gothic churches relied heavily upon sculpture, stained glass, or the structural elements of the building for decoration. The abstract linear and symbolic forms of Early Christian art prevailed until the 14th Century when painting again began to rival mosaics and sculpture as church decoration, and the portrayal of figures became less designed and more related to observation. The beginnings of this new movement were naturally made in the most advanced region of the most civilized country —in the central city-states of Italy. It had undoubtedly two points of origin, Florence and Siena.

Duccio. Duccio di Buoninsegna, the founder of the school of Siena, shows in his work the influ-

ences of both the Byzantine tradition and the emerging humanism of his time. His "Majestas" or "Madonna in Majesty," an altarpiece done in egg tempera, combines the richness of Byzantine pattern, gold leaf, and linear emphasis with a sense of individuality and gesture in the figures. The front of the panel depicts the Madonna and Child surrounded by saints, arranged in a nearly symmetrical form, the figures and the gold leaf halos giving a strong feeling of surface design. On the back of the altarpiece are depicted scenes from the life of Christ. Here the compositions are less formal, the figures more naturalistic. "The Three Marys at the Tomb," one of these compositions, is characteristic of Duccio's use of color and composition. Against a background of gold leaf, the three Marys on the left approach the opened tomb. On the right, an angel is seated. The colors are clear and some modeling is used to suggest volume and light. The landscape of rocky hills in the background echoes the grouping of figures in the foreground, unifying the composition.

Cimabue. The works of the Florentine painter, Cimabue, are very little removed from the conventions of Byzantine art. His "Madonna Enthroned" in the Uffizi, in Florence, symmetrically composed, depicts the Virgin and Child seated on an ornate throne, surrounded by angels. In this and others of Cimabue's works, we sense the beginnings of a new naturalism in the less stylized faces and postures of the figures, and in a greater use of modeling and space.

Giotto. The real founder of the Florentine School was Giotto, reportedly the pupil of Cimabue. He lived at a fortunate period, when imagination was fruitful and effort generous, in the period of great churchmen and sovereigns. Dogmatic Christianity had been softened by the fraternal love of Saint Francis of Assisi. The Gothic cathedrals of France were under construction, and the medieval visions of hell, purgatory, and paradise were assuming concrete form in the brain of his friend, the poet, Dante.

The lifetime of Giotto lay between the approximate dates 1266 and 1336, and his position as the founder in the Italian school may be adequately judged by his extant mural works. Of these, the best exist at three points of Italy: at Assisi in the Church of Saint Francis; at Padua, in the Arena Chapel; and in Florence in the great Franciscan Church of Santa Croce. In addition, more or less authentic examples of Giotto, and certainly of his school, exist in fragments in Rome and in Naples, together with a number of "crucifixions," intended for altarpieces, in the north of Italy.

Giotto's frescoes in the Arena Chapel in Padua depict the life of Christ. The wall is divided into rectangular units, each containing an episode of the great story. In these paintings, the traditional gold leaf background becomes the blue of the sky, and the limited, designed space of Byzantine painting opens out into depth. The figures, animals, and landscapes are given strong reality and three-dimensional forms. The gestures, details, and expressions of the figures indicate their emotional involvement in the subject matter. Both color and modeling contribute to a sense of atmosphere and space. Many of the compositions are extraordinary in their asymmetry and powerful groupings of figures. In the "Lamentation," the dead Christ lies in the arms of the Virgin at the lower left of the painting, surrounded by grief-stricken participants. The diagonal of the rocks divides the area of the painting and leads the eye to the head of Christ. Light and dark are used to create solid forms and space, and to unify the complex composition. The true fresco technique demands a direct, fresh treatment in which Giotto excelled.

The Giottesque Influence. From the wide diffusion of his works and the importance of their locations, it is apparent that the principles and methods of Giotto were accepted without hesitation by the governments, the nobles, and the enriched burghers, who all together then constituted in Italy the body of art patrons. But their acceptance was not based entirely upon an appreciation of his work. It was prompted largely by the recognition of the murals as instruments of religious propaganda; their effectiveness lying in their wonderful narrative quality, their necessity being absolute at a time when only "learned clerks" could read.

For at least two generations following the death of Giotto, slight advance was made in the development of painting. The composition, design, types, and techniques of these first masters were copied, to the neglect of their principles. But owing to the position of Florence, then the financial capital of the world, the local school of painting did not decline, since the art was so useful to the burghers as a means of self-aggrandizement through the multiplication of their portraits and their gifts of great altarpieces to churches or of murals to family chapels.

Masaccio, Pioneer of Realism. The movement toward realism was, perhaps, aided most of all by Masaccio (1401–28), whose chief murals in Florence were made objects of close observation by the masters of two generations later. Masaccio's position in the history of art is that of one who wished to sweep away what seemed to him outworn traditions. As far as he was able, he painted "according to vision." He sought to represent what he saw, rather than to record what absolute knowledge either he or his predecessors had gained of any pictorial subject. His innovations are obvious, even to the eye of an untrained observer and include the careful observations of light and shadow to suggest volume and space, and the blurring of distant forms by the atmosphere. His murals in the Brancacci chapel of the Church of Carmine, Florence, are in subject similar to the works of the primitives.

Uccello. The studies of linear perspective by Paolo Uccello produced far-reaching and durable results. Born on the very threshold of the new century (c. 1396–1475), he was one of the artists to whom we practically owe the laws governing perspective, or the art of delineating solid objects on a plane surface so as to give the same impression of relative positions and magnitudes as the objects would do when viewed from a particular point. Lorenzo Ghiberti, the sculptor (1378–1455), showed in his reliefs the influence of both linear and aerial perspective. Paolo Uccello, the apprentice of Ghiberti, to whom the master taught the new and absorbing subject, found in the youth an extreme aptitude. Other painters took up the study and from this group in central Italy, interest in the study spread to the north and the east of the peninsula, and so fervent did this sentiment become that important problems, when solved, were placed on parchment and exhibited for the instruction of the public in the principal squares of the larger towns. Expert artisans in wood inlay (*intarsiatura*) treated the same problems in designs with which to embellish the furniture destined for rich interiors.

Successors of Masaccio. The point of progress reached by Masaccio was advanced by his immediate successors, *Mantegna* (Vicenza, Padua, Rome, 1431–1506), *Piero della Francesca* (Umbria, 1420–92), and *Fra Angelico* (c. 1400–1506). The former produced, for the Church of the Eremitani in Padua, a ceiling decoration in correct perspective and foreshortening, as judged by the observer standing on the floor far below. He produced also the illusion of a ceiling open to the sky, since he painted figures as if they were suspended in open space; so creating a precedent for the masters of the high- and post-Renaissance, such as *Michelangelo* (1475–1564), *Correggio* (1494–1534), *Paul Veronese* (1528–88), and *Guido Reni* (1575–1642).

The advances made by Uccello and Masaccio were supplemented by Piero della Francesca. His contribution to the development of painting is best

understood by comparing him with those of his contemporaries who devoted themselves to linear perspective. For, while the latter could indicate the recession of planes, they did not give the impression of depth, of free space. On the contrary, Piero treated the effects of light under which every object momentarily changes color. He was among the first painters to disclose the marvels of a world of "values" determined by degrees of luminosity.

The Study of Anatomy. To the great elements of progress in painting just discussed, the knowledge of anatomy also was added in the 15th century. The study of the nude, pursued by the ancient Greeks through observation and later through dissection, had been discouraged by the early churchmen. Nor were there signs of a reversion to sounder judgment, until Saint Francis in his canticles praised God for the visible fairness of nature. But it was not until the invention of printing from movable types, at the middle of the 15th century, and the consequent diffusion of Greek and Latin literature, that the nude was freely represented in painting. Further, it must be acknowledged that this departure was greatly favored by the study of anatomy, inaugurated late in the 14th century at the University of Bologna. The introduction and the rendering of the nude is one of the most obvious proofs of the age and the school of Italian painting.

The High Renaissance. Such was the state of advancement in the art of painting at the opening of the 16th century. During the hundred years just preceding, progress in that art had been almost inconceivably rapid, owing to the enthusiasm of the public interest in their works. In the year 1512, Michelangelo completed the ceiling frescoes of the Sistine Chapel in the Vatican, which mark the climax of the High Renaissance, after which all the worthy accomplishments of the historic Italian schools of painting were inevitable consequences of the impetus given before that date.

As a consequence of civic strife in Florence and the election of a strong pope, Julius II (1503–13), artistic supremacy was transferred to Rome. There the newly-elected pontiff wished to glorify his family and to make memorable his own reign by the creation of great monuments. Therefore, for the adornment of his papal palace, the Vatican, he commissioned Michelangelo to decorate the walls and ceiling of the chapel named the Sistine in honor of his uncle, Pope Sixtus IV (1471–84). At the same time, he chose the more comprehensible and pliable genius, Raphael, to embellish with murals a spacious chamber (stanza) which is now believed to have been the private papal library and study. Four years later both artists had finished their commissions, which represented in the case of each his best mural work.

Sistine Chapel Frescoes. Michelangelo illustrated the history of the world from the Creation to the Deluge, as told in the Scriptures, on the flat panels of the vaulted ceiling of the chapel; filling the triangular spaces between the arches with majestic rhythmic figures, male and female, symbolizing Hebrew prophets and pagan sibyls who foretold the birth of the Christ. The whole constitutes a scheme of overwhelming grandeur, constructed upon the unit of the human figure, which is used, not merely to present the actors in the drama, but also as a purely decorative detail, in the frames of the scenes. Imposing also are the proportions of the composition and adapted to the dimensions of the chapel, which has a height of 68 feet, with an area of 132 feet by 44 feet.

In both conception and execution the Sistine ceiling frescoes are the work of a superman. They, together with the statue of "Moses" and those of the four "Slaves" originally related to the first-named, represent the climax of Michelangelo's physical and mental strength. The pictorial Genesis is still charged with life, impressing with its turbulent power even the modern observer. The influence of Michelangelo upon the painters who were his younger contemporaries of his immediate successors resulted in the foreshortenings of the Venetian Tintoretto and in the sinister force of Caravaggio, the Neapolitan, who inspired the Spaniards of his time in their renderings of revolting martyrdoms.

The Work of Raphael. Slightly before the completion of the Sistine ceiling, Raphael also (1511) finished his first great commission from Pope Julius. He had treated, under the pope's order, subjects lending themselves to his clear, suave, and tranquil style. He was newly come from Florence, where, with his power of rapid assimilation, he had studied the great murals of Masaccio, and the then recent innovations in composition made by Leonardo da Vinci.

In the spacious study of Julius II, the artist presented the subjects of "Theology," "Philosophy," and "The Triumph of Poetry." In the second picture, "Philosophy" (later named the "School of Athens"), Raphael acknowledged the influence of the architects by whom he was surrounded at the papal court, chief among whom was his uncle Bramante. He showed in adequate perspective an imposing interior like that of an imperial Roman bath, apparently filled with atmosphere and serving as a place for discussion. Therein he pictured an assembly of Greek philosophers represented on two levels with two distinct purposes: the first was to show mastery of perspective; the second, to declare that speculative philosophy must be based upon scientific research. For such, without doubt, was his thought in grouping on the lower pavement the physicists, with their various instruments; while he reserved the axial point of the higher level for the figures of Plato and Aristotle, the former of whom was slightly advanced, as became one who dominated the studies of the Renaissance. In the third picture, "The Triumph of Poetry," or "Parnassus," Raphael painted like the greater pupil of his Umbrian masters, Pinturicchio and Perugino, selecting elements from each and perfecting all that he selected.

Leonardo da Vinci. The influence of the third great master of the time, a Florentine, but founder of the second Lombard school, was too subtle to be grasped by the majority of either professional painters or laymen; while for certain of his pupils it was positively baleful. This versatile artist, Leonardo da Vinci, was undoubtedly the greatest genius of the Italian Renaissance. In painting he revolutionized composition and developed *chiaroscuro* to limits previously unsuspected.

The Last Supper. It was rare in Italian art to change the treatment of a subject, once that subject had been presented and its treatment had been received favorably by the authorities of the Church. Therefore, during the quarter millennium beginning at the time of Cimabue and Giotto, the scene of the "Last Supper" had become a historical group, varying only with the development of painting, the school of the painter, and his individual temperament. But Leonardo, with his mastery of facial expression and gesture, which was partly intuitive and partly derived from intensive study of the muscles, presented the event in the light of a trial, showing the effect of the declaration, "One of you shall betray me," upon twelve men of differing character. The composition of the "Last Supper" is built around a radial plan. The lines formed by the receding planes of the walls and the ceiling beams, drawn in one-point perspective, converge in the head of Christ. Thus the two-dimensional radial plan, the linear perspective, giving the illusion of space, and the subject matter center of interest are united in the remarkable composition. Leonardo has further heightened the drama and the structure of the work by organizing the figures in groups of three, two on each side of Christ. Each of these compact groups is related to the whole by a strong

rhythmic movement carried by contours, the direction of the heads, and by a pattern of darks and lights. The figure of Christ is quiet in the midst of agitation. Due to Leonardo's experimentation with an oil glaze technique on an untried ground, the painting began to disintegrate soon after it was finished, and, although restored many times, is now in a state of near ruin.

The Venetian School. Matching with almost equal steps the path of Florentine painting, the very separate and distinct Venetian school produced, with painters such as *Titian* (c. 1477–1576), *Paolo Veronese* (1528–88), and *Giorgione* (1475–1510), special development based upon color used as an element of structure, suggested by the atmospheric phenomena, lovely and kaleidoscopic, which offered themselves ceaselessly to the inhabitants of the multiple-island city. To the atmosphere as a primary influence other contributory causes were added—such as the Oriental commerce which carried into Venice brilliantly-colored fabrics, and the fact that the earliest and most authoritative group of the school had risen on the island of Murano, then a center of the finest mosaic production.

From the use of large, flat areas of color, from a Byzantine stiffness in the treatment of the figure, and an architecture plainly derived from that of Constantinople, the Venetians advanced to what has been called by German critics the "mood-picture" (in German: *Stimmungsbild*). This term has been applied to a picture containing figures placed in a landscape which is gay, grave and tranquil, or sinister, according to the requirements of the action for which it serves as a background. A golden light, caught and softened by shrubbery, suffuses the scene of Giorgione's "Fête Champêtre;" while a threatening sky, charged it would seem with electricity, broods over the dramatic group of Tintoretto's "Miracle of the Slave."

Such quickening of the thought underlying the presentation was the secondary gift and legacy of the Venetians to the art of painting. It was created and bestowed during a portion of the lifetime of *Titian* (1477?–1576). To this painter, color was an orchestra composed of many voices which he used to their limits in his formal compositions, like the "Presentation of the Virgin" in the Academy of Fine Arts, Venice. Furthermore, in the judgment of certain critics, he excelled in the branch of portraiture; while it is certain that he produced a new type of altarpiece, of bold composition, in which a populous group of figures on one side is balanced on the other by the mere folds of a floating banner. Also, he attained in landscape a distinction rare for an Italian and partially attributable to his memories of the picturesque regions of the Dolomites, or Tyrolese Alps, in which he had passed his childhood.

Mannerism. In the early part of the 16th century, there emerged in opposition to the clarity of construction and order balance of the High Renaissance, a style of painting called Mannerism. Many of the artists, such as Michelangelo, Raphael, and Leonardo, who had participated in the earlier movement, took part in developing the new concept of form. Mannerism grew out of High Renaissance ideals, but substituted unrest for repose, distortions of space for ordered linear perspective, and invention for observation. An example of early Mannerist experiments with space and activity can be found in Raphael's "Expulsion of Hellodorus" where a new violence of movement and a strange contradiction in the scale of the figures is combined with an emphasis on empty space to create a turbulence and insecurity characteristic of Mannerism. Later Mannerist painters, such as Tintoretto, Il Parmigianno, and Bronzino, further developed the elements of Mannerist style. During this period there was a great diversity of individual expression. While some painters explored the tensions that result from swift changes in perspective and scale, others produced paintings that were very flat in appearance, almost devoid of space. Many of the results of the Mannerist style led directly into the Baroque.

The Baroque. The Baroque movement is characterized by a new feeling for deep pictorial space and strong compositional unity. Two painters of the early 17th century, Annibale Carracci (1560–1609) and Caravaggio (1573–1610), although quite different in many ways, both exhibit the chief characteristics of the Baroque. Annibale Carracci derived much of his painting form from his Renaissance and Mannerist predecessors. His painting, utilizing strong contrasts of dark and light and emphasis on strong diagonal movement, seems to be based more on his knowledge of the past styles than upon direct observation of nature. Caravaggio, on the other hand, introduced a new realism clearly derived from observation. His painting depicts with great clarity the different visual appearances of the textures of his subject matter. Solid forms are strongly modeled with dark and light, and foreshortening contributes to the effect of space. As with Carracci, Caravaggio's treatment of space and volume is unified by compositional means, and accented by an emphasis on the diagonal. "The Card Players," with its strong dark and light contrasts and choice of subject matter is a good example of Caravaggio's use of space. The Baroque style, as expressed in the work of Caravaggio, with its close observation of nature and formal unity of composition, was a great influence on European painting. The Flemish painter, *Rubens*, the Dutch painters, *Rembrandt* and *Vermeer*, and the Spanish painter, *Velasquez*, all show the influence of Caravaggio and indicate the widespread development of the Baroque.

The Flemish Painters. The Flemish painters of the 15th century were influenced both by local traditions and by increased communication with Venice and Florence. The Low Countries had developed a painting form based on the depiction of many closely observed, realistic details, which they rendered with a new oil technique. In this technique, the painting was constructed with transparent oil glazes over an underpainting, a device which lent itself to the treatment of minute detail and which produced enamel-like surfaces and rich, glowing color. The Ghent Altarpiece, by Jan and Hubert van Eyck is an excellent example of the oil glaze technique. This large, complex work, made up of many sections, unfolds to reveal panels depicting Christ, the Virgin, Adam and Eve, singing angels and, across the bottom, "The Adoration of the Mystic Lamb." These compositions are unified with a pattern of color and dark and light, and show an almost reverential handling of detail.

In the Low Countries the industrial guilds, rather than princes or churchmen, gave commissions to the painters, all of whom, until the time of Luther, treated Biblical subjects and the mysteries of the faith as frequently as did the Italians, but with an ingenuousness and intimacy far removed from the formal, emphatic Italian manner.

The schools of Ghent and Bruges and of Brussels, in the persons of the Van Eycks, Hans Memling, and Rogier van der Weyden, made the beginnings of the modeling and the atmospheric effects which later their neighbors, the Dutch, carried to so great a climax. Their realism was frank and homely, without being grotesque, as when they did not hesitate to emphasize in their portraits the distended muscles, the wrinkled skin, and the stiffened hands of old age. They literally painted "what they saw," but their vision always included a beautiful detail, like a square of idyllic landscape opened in the background.

Bosch and Breughel. Sixteenth century Flemish painting indicates a further development of 15th

century concepts and the increased influence of the Italians. *Hieronymus Bosch* (c. 1450–1516) was a painter of great individuality. Technically similar to the work of his contemporaries, his painting is filled with poetic fantasy, grotesque distortions, and nightmarish symbolism. *Pieter Breughel* the Elder (c. 1525–1569) provides a rich portrayal of peasant life in such paintings as "Harvest," "Peasant Dance," and "Childrens Games." He had a keen ability to depict a lively and realistic view of his subject matter without neglecting the compositional qualities of design and space inherent in the colors, shapes, and textures of his material. In his "Wedding Dance" the shapes of red and white form a vigorous rhythmic movement that spreads over the canvas. The portrayal of the peasant figures, although done with great economy, is sympathetic and sufficiently detailed to give us a clear picture of their lives, manners, and costumes. Breughel enjoyed painting the change of seasons, and his paintings often indicate landscapes white with snow or golden yellow with ripe grain. His work shows the influence of Bosch and other of his Flemish predecessors as well as an awareness of the structural composition of the Italians.

The German Painters. Fifteenth century German painting was strongly influenced by the Flemish painters in color, technique, and interest in detail. By the beginning of the 16th century such painters as *Matthias Grünewald* (1485–1530), *Albrecht Dürer* (1472–1528), *Hans Holbein the Younger* (1497–1543), and *Lucas Cranach the Elder* (1472–1553) show the development of the German tradition with some influence of the Italian Renaissance.

Grünewald. Matthias Grünewald's "Isenheim Altarpiece," a large folding altarpiece, combines several scenes from the life of Christ. The "Crucifixion" from this work is a gaunt, stark portrayal of the event, filled with horror and pathos. The figure of Christ is mutilated and twisted. On the left, the Virgin is overcome with grief. On the right, St. John the Baptist points to the scene he foretold. At his feet, stands the lamb whose blood spills into a chalice. The figures stand out strongly against the dark background, and light and dark both contribute to the emotional impact of the work as well as to the strength of the composition.

Dürer. Albrecht Dürer had the good fortune to be born in Nuremberg, which, of all German cities, had the closest commercial and intellectual relations with Italy at that significant time. He reached his maturity at a proper moment to profit by the fast developing arts of printing and engraving. His life was spent before the Lutheran movement had succeeded in dissociating in his Fatherland all the arts, save music, from the service of the Church. He may be called a lesser Leonardo da Vinci, since he too treated in thesis-form geometry and perspective, military engineering, the proportions of the human figures, and other subjects involving thought and research. Technically, if he could on occasion paint like the Venetians of his period, his personality and power are best epitomized in his great woodcuts of "The Apocalypse" and the "Great Passion," and in his still more famous copperplates of "The Knight and Death," "Melancolia," and "Saint Jerome in His Study."

Holbein. The second of the three, the younger Holbein, has retained down to our own day almost universal admiration. His art in portraiture, searching the character of the sitter, created the figures of Erasmus, Jane Seymour, Anne of Cleves, Sir Thomas More, and "The Falconer." His work is characterized by excellent drawing, and even in his painting, the quality of line predominates.

Cranach. The last of the three distinguished German painters of the 16th century, Lucas Cranach, although born in Franconia, is placed in the school of Saxony, because of his long attachment to the court of the elector of that principality. Less known than either Dürer or the younger Holbein, Cranach produced, like Dürer, paintings, copperplates, and woodcuts; many of the latter showing that complicated symbolism so dear to the Germans, and having either religious or mythological subjects. From the historic Church, Cranach turned to follow Luther, and it is to this painter that we are indebted largely for the portraits (engravings and woodcuts) of all the Reformers and their titled adherents.

Progress in Flemish Painting. The Low Countries, through the marriage of sovereigns and inheritance, fell under Spanish rule. Religious struggle was of incredible violence, since matters of faith were there complicated with aspirations for political independence.

Rubens. Rubens, the greatest of all Flemish masters, born during the exile of his Protestant parents in 1577, returned after his studies in Italy to his ancestral city, Antwerp. Filled with the joy of living, virile, sometimes even coarse in his conceptions, and instructed in all the principles and the processes of his art, he rose to the first rank of painters, irrespective of time and nationality. His genius has been best symbolized by Taine, who said of him: "Rubens mounted to Olympus with his heels weighted by quintals of Dutch cheese." But in spite of his occasional grossness, he does not deserve the warped criticism of Ruskin: "Rubens was a courtly phrased animal." Rubens' painting is characteristic of the Baroque period, in his strong emphasis on the treatment of three dimensional volumes in space, and overall pictorial unity. Rubens' "Rape of the Daughters of Leucippus" is a good example of his ability to organize complex figure groupings and vigorous rhythmic line. The volumes of the figures and horses, while leading the eye in and out of the Baroque space, are stabilized by the diagonals of the rectangle. The darks and lights, although informally balanced and expressive of volume, create a strong surface pattern. Color, rich and enamelled in quality, is used to heighten the sense of depth by means of aerial perspective. The forms become cooler and greyer as they recede in the distance. Many of the edges become lost as the intervening atmosphere blurs the sharpness of outline.

Rise of the Dutch School. At the middle of the 17th century Holland obtained independence from Spain. Dutch painters developed a distinctive type of painting which included portraits, landscapes, interiors, and genre subjects. Characteristic was the art of portraiture, both single and multiple (the guild picture), as represented by *Frans Hals* (c. 1580–1666) of Haarlem and by *Rembrandt van Rijn* (1606–69) of Amsterdam. The greatest examples of landscape were produced by *Jacob Van Ruysdael* (1928–82) and by *Hobbema* (1638–1709). The Reformation had precluded the use of the altarpiece, as well as that of the great religious mural. The Dutch burghers, finally free from the grinding Spanish occupation and enriched by the commercial enterprises of the Dutch East India Company (founded in 1602), wished to bequeath their portraits to their descendants and to embellish their houses with scenes from the country which they had reclaimed with almost superhuman effort from the encroaching sea and from the aggressive foreigner.

Guild Pictures: Hals and Rembrandt. Often the artists and the newly enriched burghers did not agree as to the composition of the guild picture. The latter desired a monotonous procession, all members of which, similarly garbed, should be equally prominent. Frans Hals put an end to these dull presentations of the civic pageants of Haarlem by showing the guilds as preparing for the functions in their chapter houses; introducing sometimes a spiral staircase to break the monotony of line, obtaining by other devices strong effects of light and shade, and brightening here and there the somber citizen garments by a brilliant blue or orange sash.

With the same purpose, Rembrandt painted his group of 29 life-size figures of civic guards issuing in gala attire from their quarters. The composition, known incorrectly as the "Night Watch," seems to move, having the form of a wedge advancing, point forwards, with its mass defined by the gradation of values and the placing of spots of color. Rembrandt developed the concept of Baroque space by including in his compositions large areas of emptiness against which he placed the figures and other subjects of his painting. He explored the use of value to create a sense of volume, often using small amounts of light surrounded by darks. In Rembrandt's painting, the play of the brush is important to the pictorial statement, and he built up areas of thick paint, called impasto, to heighten the modeling. Impasto areas of light contrasted with thinly painted darks enhanced the value range. Rembrandt's color range was generally limited to a few earth hues, black and white. With this limited palette, he obtained a remarkable variety, in part with optical mixtures made by glazing color over color. An excellent example of these characteristics is the "Supper at Emmaus" where the group of figures is placed against a large area of space, and where the painter's sensitive use of light dramatizes the event as well as creating the effect of volume with an almost mysterious glow. In addition to his painting, Rembrandt also produced many etchings such as the "Hundred Guilder Print" ("Christ Healing the Sick") that attest to his masterful understanding of dark and light and line.

Interiors: Vermeer, Terborch, de Hooch. Secondary only to these great masters were the Dutch painters of interiors, *Jan Vermeer* of Delft (1632–75), *Terborch* (1617–81), and *Pieter de Hooch* (1629–83), all of whom set for themselves practically the same problem. They sought to display what the French sculptor Rodin called "the cubical contents of a room." Almost equally but differently fascinating are the pictures of these three painters. The eye is caressed by the soft colors and by the radiance of Vermeer's "Woman Weighing Pearls," with the figure in a delicate light which sifts through a window in the background, touching in its course masses of blue drapery and catching the rainbow surface of the gems piled upon the table. Vermeer's remarkable compositions based on a minute observation of his subject are beautifully and simply composed. The dark and light balance is refined, space is expressed with clarity, and the forms are stabilized and related to the rectangle, often by means of vertical or horizontal repetition.

A graver but still sensuous pleasure is afforded by Terborch's groups of a lady and two cavaliers, with the figures arrayed respectively in white satin and in black velvet; the former fabric being introduced to show the power of reflecting light, as opposed to the absorption of luminosity by the other textile. De Hooch set for himself a single problem, which he stated in the most varied terms. He followed the diminishing echoes of a ray of light, from the moment when it first struck, it might be, the brick pavement of an interior court, until, darting through an open door, it died away on the rounded shape of some domestic utensil of brass or copper.

El Greco. Domenico Theotocopoulos (c. 1547–1614), known as El Greco (The Greek), was born on the island of Crete where, it is thought, he had training in the traditional Byzantine style. He later moved to Italy where he was greatly influenced by Titian and Tintoretto. Finally, he moved to Spain, where he lived in Toledo. Characteristic of his work is the fusion of Byzantine and Mannerist approaches to form. In his painting "Christ and the Money Changers" or "The Expulsion from the Temple" the carefully composed composition, built in part upon the diagonals of the rectangle, is given great rhythmic vitality by means of linear elements and a flickering pattern of darks and lights. This work, one of the series of different treatments of the same subject by the artist, has many of the surface design qualities of Byzantine mosaics coupled with a Mannerist treatment of space and foreshortening. El Greco's nervous brushwork accentuates the action of the figures and the dark-light pattern. Together these serve as a foil to the disciplined order of the pictorial organization. In the history of Spanish painting, El Greco is something of a solitary figure, as his work had little to do with previous Spanish painters, and he had little influence on those who came after him.

Velasquez. In the 17th century a great Spaniard, Velasquez, like his contemporaries, Frans Hals and Rembrandt, worked with light and space. The restrictions binding him to the court were too galling to permit him either to teach or to diffuse broadly his influence. He was free from the asceticism of his great contemporary, Francisco de Zurbaran (1598–1662), the painter of monks in white draperies. Nor did he continue the tendencies of the Spanish painters who preceded him.

Velasquez had the ability to interpret free space and degrees of distance and of light. In his later work he painted in single, loose strokes which, when observed closely, appear unrelated, but which, seen from the proper distance, combine into a concrete whole having depth, solidity, and a changeful color play imitating that of nature bathed in atmosphere.

Murillo; Goya. Murillo (1618–82), the artist of two manners who, like Velasquez, first presented proletarian types, "The Beggar-Boys," "Melon-Venders," and later "Holy Family" and the "Immaculate Conception," softened and sweetened the form and subjects of his painting. *Francisco Goya* (1746–1828), a subtle portrait artist and mordant satirist, technically a luminist, is an example of later Spanish painting. His work often combines innovations in the use of color and paint quality with social criticism. Notable is his series of etchings, "The Horrors of War," in which he depicts the brutality of war and its senseless destruction and exhibits his mastery of dark and light and line as esthetic elements.

French Painting; Sixteenth Century. In the 16th century appeared the first truly French painters, the family Clouet, founders of the national school, who did portraits of Francis I, his son Henry II, and his grandson Charles IX. But, as a consequence of war and of royal marriage alliance, Italian influence penetrated France. The native French painters hastened to eliminate from their work traces of Flemish teaching. As a consequence their portraits, whether shown in three-quarter length or as mounted figures, if deprived of documentary evidence, might appear to have been painted by the 14th century Italians who were then developing their sense of tactile values.

In the 17th century, Simon Vouet (1590–1649), while reflecting in his own composition, drawing, and accentuated shadows, the contemporary school of Bologna, developed three painters, his pupils, whose murals and easel pictures are characteristic of the period. Two of them, *Eustache Le Sueur* (1617–55) and *Pierre Mignard* (1610–95) were overshadowed by the personality and the official position of the third, *Charles Lebrun* (1619–90).

Poussin and Claude. *Nicholas Poussin* (1594–1665) and *Claude Gellée*, also called Claude Lorrain (1600–82) were strongly influenced by the art of the Italian High Renaissance. Both painters studied and lived for some time in Italy. Poussin's pictorial organization is built upon a carefully planned and ordered development of the Baroque ground plane, receding into distance by means of linear perspective, the cooling and greying of color and diminishing value contrasts. In this almost tangible space Poussin arranged figures, foliage, and architecture in a sculptural relationship of solids and voids. In his later work the figures become subordinate to the landscape itself. Claude's interest

was in landscape and light. Like Poussin, he was interested in the treatment of forms in space. His work shows marked skill in portraying light diffused by atmosphere. Both Poussin and Claude composed their paintings in the studio, working from sketches done from nature, building with dark and light, color and structural line.

Watteau; Lancret; Pater. In French painting, the connecting link between the 17th and the 18th century was *Antoine Watteau* (1684–1721), born in the northeast of a wavering line of nationality and reacting throughout his artistic career to the impulses of both the Latin and the Teuton. A scene painter by profession, he gave to his figures the movement, the expressive quality, the aloofness from daily life, which belong to the stage. By a shadow, a gesture, a modulation of color value, he was able to turn comedy to tragedy with a dramatic power suggestive of Molière.

To repeat the delicate art of Watteau was the aim of *Lancret* (1690–1743) and of *Pater* (1693–1736), who were, like the first-named, Flemings. They too painted, in small proportions, figures dressed in silk garments and powdered wigs, projected against a background of formal gardens and parks. Yet in Watteau there is much vitality, as shown by the figure of the Punchinello, "Gilles," garbed in white, which is one of the treasures of the Louvre. There is also in his work a progressive movement. As to the color used by these painters, it is suggestive of Rubens,—warmer, softer, and more luminous than had been characteristic of the French School up to that moment.

The Art of François Boucher. François Boucher (1703–70) was the favorite painter of Madame de Pompadour. This artist was an accomplished classical scholar, and in his time the artificial life of the court had already begun to pall upon the courtiers, in whose minds there rose a longing for the open spaces of nature. Two classes of subjects presented themselves to the painter. Either he pleased himself in portraying youthful deities attended by cupids, who in drawing and pose were reminiscent of the later Italians, or he painted lords and ladies disguised as shepherds and shepherdesses, in whom his noble observers delighted to recognize themselves.

Conventional and unreal as was the art of the 18th century for at least two-thirds of its course, it satisfied the play-impulse of the nobles and of the scholars of France who were the observers of a political and social system in decline. But upon the accomplishment of the Revolution (1789–1800) there followed a new order of things.

Chardin. Unlike Watteau, Boucher and other painters of the court, Chardin (1748–1825) employed simple, homely subject matter of a genre nature. His paintings depict scenes or episodes from daily life, or commonplace still-life material. His interiors and still-lifes treat the space of a room or a table top in a similar fashion to Poussin's treatment of the Baroque ground plane. In his "Still Life with Clay Pipe," for example, the objects are arranged on the table top with an architectural order, forming triangular and diagonal relationships in space. Chardin carefully observed and rendered the fall of light on the objects he painted, utilizing changes in value to create a sense of both volume and texture.

David and His Period. Under the Consulate (1799–1804), in each of the three great arts of form, austerity succeeded sportiveness. In painting, the new school was guided by a single master, David (1748–1825) whose control over his pupils was nearly absolute. David was himself a revolutionist and, wearing the red "liberty cap," sat in judgment upon the aristocrats during the "terrible year" of 1793. Later he devised the republican festivals and pageants after the manner of those in ancient Rome. He was in the strictest sense a classicist. That is, he generalized. With a model before him, and the attitudes of antique statues in his memory, he eliminated from his subjects all effect of movement. During the early part of his career he set his figures against the bare, dark backgrounds of Roman interiors; while later he placed them under a cold, gray light which, for him, symbolized the open air. He championed the History painting as an ideal form because he felt historical subjects enabled the painter to teach and provide moral lessons for the public. An example of such a work is David's "Oath of the Horatii" painted before the revolution. The subject of this work, based on Roman history, had overtones of freedom.

The Romantic Movement. At the beginning of the third decade of the 19th century the painters of France were divided into two hostile groups—the Classicists under Ingres and the Romanticists led by *Eugene Delacroix*, styled by his opponent the "Apostle of Ugliness." The Romantic movement, originally under the leadership of Gericault (1791–1824), introduced a feeling of action and drama accompanied by a broader, less detailed treatment of form. Gericault's "The Raft of the Medusa," depicting the survivors of a shipwreck, is characteristic of the new movement. Although this composition is based on a formal pyramidal plan, the gestures of the figures and the freer treatment of brushwork and color indicate the extent of the differences between the two rival groups. After Gericault's death, Delacroix (1798–1863) became the accepted leader of the Romantic movement. Their spirit is best expressed in Delacroix's exclamation: "I hate systematic painting." Their passion was for color and the indication of violent action and emotion, as is witnessed by Delacroix's massacres, shipwrecks, revolutionary scenes, lion hunts, and wild beasts seeking their prey.

Realism; Courbet. At the middle point of the century, realism, or rather naturalism, asserted itself. *Gustave Courbet* (1819–77) was the champion of this movement. The affiliations of this painter were not with his compatriots, either historical or contemporary, but were derived from the visual painting of Holland and Spain. His subjects, like 'The Wave," show nature in cruel mood, or declare the hard necessity of human labor, as in the "Stonebreakers." But all were the results of direct visual observation differing from the works of *les pleinairistes* (open air school) solely in having been painted in the studio.

Corot and His Associates. Within the walls of a studio Jean Baptiste Corot (1796–1875) painted what may be called his synthetic landscapes, the *motifs* of which, after having closely observed nature, he modulated into compositions whose chief factors were light and atmosphere. His chief objective was to obtain a gamut of luminous values. He developed from the Dutch masters of the 17th century. In addition to the very popular studio landscapes, Corot also did much of his finest painting out-of-doors and directly from a model. His figure paintings, once neglected, are notable for their excellent composition and closely observed value relationships. Corot believed in studying nature without regard for Classic or Romantic precepts. His use of color and dark-light as related to visual experience helped to pave the way for Impressionism.

While excelling all others in treating the phenomena of light, Corot was not the only Frenchman of his time to interpret nature through painting. *Theodore Rousseau* (1812–67) and others of the Barbizon group, painted landscapes directly from nature. *Jean Francois Millet* (1814–75) depicted peasant life in his carefully composed paintings. Some of these, such as "The Gleaners," suggest that common labor is dignified and even noble.

Impressionism. Impressionism included in its sweep many different points of view. In general, however, it involved the use of broken color (the use of short disconnected brush strokes), the optical mixture of color (the mixture of color by juxtaposing its constituent hues, rather than stir-

ring them together, the re-creation of white light by reversing the effect of the prism (juxtaposing the elements of white light—the visual complements—causing them to mix optically), the use of an extended palette with many hues, the suggestion of movement, and the idea of painting the impression of moment, rather than a detailed examination of the subject. Some of the impressionist painters were *Edouard Manet* (1832–83), *Claude Monet* (1840–1926), *Edgar Degas* (1834–1917), *Camille Pissarro* (1830–1903), and *Auguste Renoir* (1841–1919). The movement derived its name from a painting by Monet, "Impression Sunrise," and was first used by critics as a term of ridicule. The Impressionists worked directly from the subject and attempted to capture the effects of sunlight on form. Since they were painting the light, not the subject, a change of hour or weather would present a different subject. They painted, in addition to landscapes, many scenes of contemporary life. Instead of the idealized and poetic subjects selected by the academic painters, Monet painted several paintings of "The Gare St. Lazare," a railroad station in Paris, and other commonplace scenes.

The Impressionists found themselves in opposition to the traditional view of art as represented by the academy, and were frequently bitterly derided by their antagonists. Monet, with his acute perception of reflected color, relished the play of hue over a surface. His renderings of reflected hues, such as blue shadows or cool lights, now easily understood, were revolutionary at the time and the source of controversy. Manet, too, because of his choice of subject as in his "Olympia" was denied exhibition in the salon. Impressionism eventually became accepted and achieved a world-wide following.

Post-Impressionism. Many of the impressionist painters, dissatisfied with the compositional aspects of impressionism, sought to reintroduce strong structural elements into their painting. Cézanne, Renoir, Degas, and Seurat are characteristic of this return to formal principles. Others, such as Van Gogh and Gaugin sought to include an expression of the artist's feelings about his subject as well as a more direct and arbitrary use of color.

Cézanne. Cézanne (1839–1906) said he wished to redo impressionism in terms of the masters. By studying the work of painters such as Poussin, he acquired a sound knowledge of space and structure. To this he added his knowledge of impressionist color and the study of nature. His work is characterized by strong composition and space achieved by means of color. His "Pines and Rocks" shows the strong, sweeping rhythms of verticals, which stabilize the composition and color used to create depth and volume. Cézanne modeled each volume with color—warm, intense color on advancing planes, cool, muted color on receding planes—obtaining a remarkable sense of space and organization. Cézanne's solitary exploration of structure has given him a unique place in the history of painting. Most historians trace the origins of many contemporary painting movements to his work, and he is often called the father of modern painting.

Van Gogh. Van Gogh departed from impressionist principles in both structure, technique and subject matter. He wished his painting to carry his feelings about the subject, and he accomplished this by the use of color, drawing and texture. Van Gogh's "Starry Night," filled with turbulent rhythmic movement, explores the use of rich impasto paint textures applied in linear strokes. The dark flame-like poplars contrast with the agitated starry sky in a rhythmic pattern of texture and color. Because of his dramatic and tragic life and the expressionistic character of his work, the structural value of his painting is often overlooked. Actually his painting is carefully composed and intellectually developed. His "Vegetable Gardens" is an example of a work built on the repetition of the horizontal. Each horizontal band contains an individual treatment of color, texture, and pattern. The seemingly spontaneous use of color is carefully planned to create space and volume.

Continental Painters in England. The play-impulse of the British has externalized itself more powerfully in creative literature than in other forms of art. Nevertheless, in architecture and in painting, native genius, further quickened by contact with continental Europe, has produced results that are most admirable. Painters from the continent were often brought to England to serve the court. Hans Holbein the younger became the court painter of Henry VIII, dying in London late in the reign of that monarch.

Hogarth. Early in the 18th century a truly national master made himself felt in the personality of *William Hogarth* (1697–1764). By nature he was a humorist, by profession a painter and engraver. Critics delight to place him in the company of Cervantes, Molière, and Fielding, those masters of literature "who lashed the morals of their times with laughter." Outside of his social and moral series, which it was his custom first to paint and then to engrave for financial profit, Hogarth executed a number of fine portraits, and he occasionally treated a romantic subject. And it is especially in these two latter species that he shows brilliant pictorial qualities.

Reynolds and Gainsborough. The late Italian influence, visible in Hogarth, was accentuated in the work of the great portrait artist, *Sir Joshua Reynolds* (1723–92), recognized as the head of the first English school. The painters of Bologna, Rubens and Van Dyck, were his masters, as is proved by his still existent notebook, which he compiled during his period of foreign study. His success was most brilliant in his portraits. He far excelled his greatest rival, Thomas Gainsborough (1727–88), in his pictures of children.

Lawrence; Romney; Raeburn. Sir Thomas Lawrence, George Romney, and Sir Henry Raeburn were distinguished painters of portraits during the Georgian period. The first of these three became noted in his early adolescence. At the death of Reynolds, he succeeded to his position at the court and also as president of the Royal Academy. The art of the second of the three, Romney, has a continental flavor reminiscent of both France and Italy. The last of the group, the Scotchman, Raeburn, was simple and virile in manner, in brushwork recalling Velasquez.

Constable and Turner. As the reign of George IV ended, *John Constable* (1776–1837) changed the conventional English landscape by the substitution of verdure for brown foliage, introducing broken color to achieve a new freshness of color. He set himself to reproduce the charms of his moist and rainy island. Constable derived from the Dutch painters, especially from *Cuyp* the younger (1620–91), and in his turn influenced strongly the French landscapists of Barbizon and Fontainebleau. *Turner* (1775–1851), that enigmatic man, gave forth with small loss the sunsets of Venice, and differentiated with nicety vapor, smoke, and rain.

The Pre-Raphaelites; Rossetti. Dante Gabriel-Rossetti (1828–82), the son of a Neapolitan political exile and of a half-Tuscan, half-English mother, was the leader of a group of seven men naming themselves the Pre-Raphaelite Brotherhood and following the professions of painting and sculpture, with among them one literary critic.

These artists believed that they justified both themselves and the name of their association by rejecting the suave line and elaborate composition characteristic of Raphael, adopted by his pupils and subsequently bound firmly into the traditions of painting.

The new movement was aided by *John Ruskin* in his lectures at Oxford (1870–79). By his influence, two young students of Merton College were led to

follow the principles of Pre-Raphaelitism. These youths were *Burne-Jones* and *William Morris*. The first created pictures which readily translated themselves into tapestries and stained glass; the second because of his work in the industrial arts, revolutionized the interiors of Victorian England.

The experiments of Morris in dyeing and weaving greatly advanced these crafts. His designs for textiles were carried through continental Europe, where they especially influenced Belgium and France, where the Pre-Raphaelite movement, modified and broadened, assumed the title of *l'Art Nouveau* at the beginning of the 20th century and came to include all the arts.

First American Painters. The first group of American painters included *John Singleton Copley* (1737–1815), *Benjamin West* (1738–1820), *John Trumbull* (1756–1843), and *Gilbert Stuart* (1755–1815), all of whom were self taught and were afterward strengthened by study abroad. According to legend, West, a Pennsylvanian, began to paint when some Indians showed him how to make red and yellow paint. The family cat supplied him with hair for his brushes. In England he was one of the founders of the Royal Academy, later becoming its second president. Of the four men, the Bostonian Copley and Gilbert Stuart were the most gifted. Copley's father-in-law owned the tea that was thrown into Boston Harbor and, in 1774, on the eve of the Revolution the youthful artist, already famous for his portraits, moved to England.

Trumbull was the son of a colonial governor of Connecticut, a graduate of Harvard, and a soldier of the American Revolution. The war ended, Trumbull went to London, there to place himself under the instruction of Benjamin West in historical and battle pieces, two branches of painting which he subsequently studied in Paris. Certain of his works then produced, both portraits and episodical pieces, were purchased by the United States government, and others, to the number of fifty, by Yale University (then College), where they now constitute the Trumbull gallery. At the time of their acquisition (1831), the institution granted the artist an annuity of one thousand dollars, upon which he established himself in New York, where he practiced his profession until his death.

Gilbert Stuart. Stuart of Rhode Island, while having less soaring ambitions than West and Trumbull, is perhaps better known than either of these men. His head of Washington, projected on an unfinished canvas, is known to every North American school child. He painted more than 100 pictures of Washington. His portraits of other early presidents and patriots are regarded as scarcely less admirable. During the residence of Stuart in England and in France, George III and Louis XVI, Lords Clinton and Lyndhurst, Sir Joshua Reynolds, and Copley became his sitters.

Somewhat later in time, but among our earlier portrait painters, were *Thomas Sully* (1783–1872), who painted many prominent persons; *Chester Harding* (1792–1866), an itinerant artist, and *Samuel F. B. Morse* (1792–1872), who, though generally remembered as an inventor of the telegraph, is now regarded as one of our outstanding artists.

Second Period of American Painting. Following the first period of American painting, which came to an end during the first quarter of the nineteenth century, there was a second period during which the eyes of artists turned away from political events and personalities to the phenomena of nature. *Thomas Cole* (1801–48) was the founder of the so-called Hudson River school of landscape painting. Among the best painters of this school, besides Cole, were *John Kensett* (1818-72), *Alexander Wyant* (1836–92), and *George Innes* (1825–92). The work of these Americans helped to raise the art of the United States in the estimation of European critics.

Other portrayers of the American scene during the 19th century were the genre painters *George Caleb Bingham* (1811–79) and *Eastman Johnson* (1824–1906). Bingham, who was born in Kentucky, but spent most of his life in Missouri, is one of our most important regional painters. His Mississippi valley pictures "Jolly Flatboatmen," "Raftsmen Playing Cards," and "Stump Speaking" are among his best. Both men, in addition to dealing realistically with scenes from everyday life, were also portraitists, Johnson in particular executing likenesses of many distinguished Americans, from Daniel Webster to Grover Cleveland.

Among the finest artists America has produced are three 19th century painters who lived beyond the turn of the century—*Winslow Homer* (1836–1910), noted for his marine pictures; *Thomas Eakins* (1844–1916), who painted domestic scenes and other aspects of American life and also portraits; and *Albert P. Ryder* (1847–1916), whose mystical landscapes were at first misunderstood.

To the 19th century also belong the first Americans of thorough French training. These were *William Morris Hunt* (1824–79) and *John La Farge* (1835–1910), both of whom turned to mural decoration, and the latter also to the production of stained glass.

The Expatriates. Since the days of John Copley and Benjamin West, there have been artists who have preferred to live and work abroad. Famous among these expatriates of the last century were *James A. McNeill Whistler* (1834–1903), *John Singer Sargent* (1856–1925), and *Mary Cassatt* (1845–1926). Whistler and Sargent lived in London during their most productive years. Whistler, an etcher as well as a painter, was an innovator and a great controversial figure in the art world of his day. Sargent, more academic in his viewpoint, was a popular society portrait painter who turned out an amazing number of pictures. Mary Cassatt, a figure painter, lived most of her life in France, where she associated herself with the impressionists, who thought highly of her paintings, pastels, and etchings.

Other artists, besides Mary Cassatt, who were influenced by French impressionists, but possessed original qualities of their own, were *John H. Twachtman* (1853–1902), *Maurice Prendergast* (1861–1924), and *Childe Hassam* (1859–1935).

Painting in the Twentieth Century. With the advent of new methods of communication and increased facilities for travel, local and national schools of painting, so characteristic of the past, have largely disappeared. To understand the influences that may come to bear on a painter of today, one must relate his work to influences often far removed in place and even in time. For in addition to the ready accessibility of the works of other contemporaries in museums or reproductions, there is also a wealth of art from diverse historical periods and widely separated cultures easily available for study. The sculpture of African Negroes, prints and paintings from Japan and China, and even paleolithic painting and sculpture have all had an influence on contemporary art. Art movements, although still often associated with a particular place, have become international. The Fauves, for example, although largely French in character, exerted an influence on painters in many other parts of the world. The same is true of the Cubists, constructivists, expressionists and other schools, whose adherents are of various national origins, and whose work has obtained world-wide influence and acceptance.

Les Fauves. In 1905 a group of younger painters in Paris exhibited in the *Salon d'Automne* a number of paintings with such free use of color, line, and drawing, that they seemed a completely new departure. Based in part on the discoveries of Van Gogh and Gaugin, these paintings explored the expressive and structural qualities of brilliant, often raw, color and the free use of contour to create compositional unity and to express subjective

values. Far from desiring pretty effects these painters dared to seek the poetic values of ugliness and distortion. Because of these shocking innovations, the critics dubbed them *les fauves*—the wild beasts. Among the fauves were such now revered painters as *Matisse* (1869–1954), *Rouault* (1871–1958), *Derain* (1880–1954), *Utrillo* (1883–1955) and *Dufy* (1878–1953). Matisse's "Blue Window" shows an arbitrary use of color to flatten the canvas and a rhythmic disposition of line to establish a pattern of arabesques and sturdy relationships with the rectangle. The subject matter, a group of still life objects against a window, is treated as a series of separated forms arranged to diminish the effects of depth by avoiding overlap, while at the same time building a pattern of varied shapes that dominate the canvas. Matisse's later work developed a more lyrical quality, filled with joyous color and pattern, strongly and simply stated. Rouault offers a contrast, both in feeling and composition. In his "Christ Mocked by Soldiers," forms and colors are used for their expressive qualities. Using thick black lines, reminiscent of the leading in stained glass windows, Rouault presents his subject with great expressiveness. The colors, built up of layers of heavy impasto, often applied with a palette knife, are used in an arbitrary way to achieve the jewel-like encrusted surfaces that contribute to the total effect.

Cubism: Picasso, Braque, Léger. Cubism began with the exploration of Cézanne's advice, "See the world in terms of the cylinder, sphere, and cone." In other words, to analyze natural forms by means of their geometric counterparts. To this the cubists added the possibility of multiple points of view, rather than the fixed (and less realistic in terms of normal experience) point of view assumed by earlier students of reality. Members of the cubist movement included *Pablo Picasso* (1881–), *Georges Braque* (1882–1963), *Juan Gris* (1887–1927), and *Fernand Léger* (1881–1955). The early phase of cubism, called analytical cubism because of its basis in the analysis of natural form, is exampled by Braque's "Road Near l'Estaque." The trees, houses, and road are seen in simple planes. The color is severely limited to muted greens and browns so as not to intrude in the underlying examination of volume and plane. Analytic cubism was followed by a period called hermetic cubism, where the planular facets of form are arbitrarily reorganized for compositional purposes and have lost their obvious reference to the subject matter. Picasso's "Still Life with Chair Caning" is an example of this. In this painting a piece of oilcloth printed to resemble chair caning has been glued to the canvas, incorporating collage into the painting technique, and offering a fragment of unexpected reality to the otherwise fragmentized planes derived from the still life subject matter. The treatment of space presents an innovation, for the forms appear to exist in front of the picture plane rather than behind it. This new concept of space has become the basis for most post-cubist painting. Picasso's "Young Woman Before a Mirror" is an example of synthetic cubism, the last phase of cubist style, where the disassembled planes have been reassembled into a new cogency with the reintroduction of color. Although Picasso has been the undisputed leader of this cubist movement, other painters made great contributions. Léger, for example, was probably the first to recognize the classic beauty of the machine and other aspects of urban environment, which he included in such paintings as "The City." Here the bold pattern of color and movement of the city surround the simplified human figures central to the composition, suggesting the rich varieties of visual experience and activity in contemporary life.

Pure Abstraction: Kandinsky, Mondrian, Malevitch. *Vasily Kandinsky* (1866–1944), a member of the Blue Rider group and an associate of the Bauhaus, began his career as an expressionist, but soon saw the potentials of removing subject matter from his work completely, relying on the expressive qualities of paint and shape alone. He compared this way of achieving pure form to music, which does not require subject matter to be expressive. He painted a series called "improvisations" or "compositions" which were developed as a free play of color, line, and shape on the canvas. These works have a validity, strength, and unequalled inventiveness which show the painter does not need subject matter to express feeling or provide visual stimulus. Because objects are not depicted in his work, it is frequently called "non-objective" painting.

Piet Mondrian (1872–1944), the Dutch painter, also began as an expressionist. Seeking the basis of painting structure, he increasingly limited his pictorial means until only the primary colors (red, yellow, and blue), black and white, and vertical and horizontal lines remained. With these simple elements he created a new visual world, filled with extraordinary variety and equipoise. Within such severe limitations even very small adjustments are critical. For example, Mondrian's 'Composition in Red, Blue, and Yellow" has a sensitively balanced asymmetry and subtle variation in spacing and width of line. Mondrian was associated with a group of artists and architects called *de stijl* who have had enormous influence on contemporary design and architecture.

The constructivists were another group of painters who worked with pure abstraction. *Kazimir Malevitch* (1878–1935), the Russian painter of the famous "White on White," also tried to strip painting of all but the most essential means. This group is of interest also because they wished to play a constructive role in the then new government of Russia after the 1917 revolutions. However, once the communist regime was established, all forms of experimental art were abolished in favor of more traditional "understandable" art that those untrained in art could readily enjoy or be instructed by.

Futurism. The futurist painters, including *Giacomo Balla* (1871–) and *Gino Severini* (1883–), added the ideas of dynamic movement and the beauty of the machine to the precepts of cubism. As Marcel Duchamp had done in his "Nude Descending a Staircase," they attempted to show objects in motion rather than at rest, much as in a stroboscopic photograph. This idea, which is very true to normal experience, was at first the subject of great controversy. Balla's "The Dog on a Leash," for example, shows multiple views of the dog's legs in various positions of walking, and indicates the swing of the leash. In this way time, or a fourth dimension, was added to their painting.

Fantasy, Dada, Surrealism. The world of imagination and fantasy as expressed in subject matter has undergone as many wide and thought-providing changes as have other areas of contemporary painting. Twentieth century painters have drawn upon the resources of dreams, memories, contemporary psychology, and social criticism for their subject matter. *Marc Chagall* (1887–), of Russian-Jewish origin, has created in his work a world peopled with childhood memories and broad symbols. His gentle paintings have a haunting nostalgic quality at once childlike and dreamlike. His "Birthday" for example shows an interior of a home in a small Russian village. A man is levitated with the happiness of a kiss. The cheerful colors and the apparent naivete of the drawing reinforce the simple eloquence of the subject matter.

Paul Klee (1879–1940), a German-Swiss, also calls on fantasy for his subject matter. His paintings are at times satirical as in his "Christian Sectarian" or filled with childlike whimsey as in "Landscape with Yellow Birds," which suggests another world, operating under other laws of gravity. Klee's painting utilizes a wide variety of materials—water-

color, ink, gouache, tempera, and oil in various combinations. Klee, with Kandinsky and Feininger, was associated with the Bauhaus in Germany. This dynamic school, founded by *Walter Gropius*, the architect, has had an important influence on contemporary art and architecture.

The Dada movement began as a rejection of formal art values. *Marcel Duchamp* (1887–), *Kurt Schwitters* (1887–1948), and others of various national origins tried to express their contempt for a society which had led them into World War I by the production of work which they termed "non-art." This "non-art" included the exhibition of "ready-mades," objects such as shovels, as fine art. The dada painters relished the accidental, the indecorous, the unintended, and the outrageous as basic to their expression. Even the name of the movement reflects this idea in its apparent meaninglessness. The work of Marcel Duchamp, perhaps the best known of the dada painters, ranged from a postcard reproduction of the "Mona Lisa," upon which he drew a moustache, to his complex and somewhat mechanistic "The Bride." Although the avowed intent of the Dada painters was the destruction of art and the demonstration of the purposelessness of modern society, these very attitudes led to new and fresh areas of creative thought which have had a great influence on subsequent painters.

Surrealism, akin to fantasy, is another movement of importance in 20th century painting. As the name suggests, the surrealist painters attempted to portray a more than real world, which includes the reality of the unconscious as well as the conscious mind. Many of the painters, such as *Giorgio de Chirico* (1888–), *Salvador Dali* (1904–), and *Joan Miró* (1893–), drew from the dream world for their inspiration. Often the subject matter is as incoherent and mysterious as dreams themselves. Dali's "Persistance of Memory," handsomely and meticulously painted, portrays a somewhat nostalgic and foreboding landscape in which solid watches have grown limp and are covered with swarming ants. The shock of these disturbing and inexplicable incongruities supplies the motive of the work. We respond as to a dream, with an unconscious understanding that is often tinged with displeasure or wry humor. Miró's painting, while utilizing a similar unconscious imagery, treats forms as more abstract symbols. His "Harlequin's Carnival" with its seemingly chaotic assortment of shapes, is a masterpiece of inventiveness. His well defined forms and clear colors make a pattern of movement that is at once well composed and evocative. Although many painters in the course of art history have explored similar themes, the surrealist painters seem very much a part of the 20th century in which so much has been learned about the human mind and its irrational elements.

Twentieth Century Painting in America. With the coming of the 20th century, American art entered a third period of development, a vital characteristic of which has been its multifariousness. Advancement has been along many different lines, some of them so individualistic as to be difficult to classify. But a retrospective glance over the past four decades shows developments in the fields of realism, regional painting, social consciousness, abstraction, expressionism, and surrealism. Many controversial issues have been raised by painting influenced by modern European art, but this has had the salutary effect of stimulating public interest in art. More people have attended exhibitions and more attention has been paid to art by the press than at any time in our history.

Of contemporary American painters, *Charles E. Burchfield* (1893–) is a leading water colorist. Other fine artists in this medium are *Edward Hopper* (1882–), *Charles Sheeler* (1883–), and *John Marin* (1872–1953).

Regional Painters. *Grant Wood* (1892–1942) was a leader in a regional school of art that portrayed the Middle West. The somewhat exaggerated Midwestern and Southwestern types of *Thomas Hart Benton* (1889–) are unmistakable. Among other contemporaries who are American or regional in subject matter, the following may be mentioned, with their favorite subjects: *John Sloan* (New York City), *Reginald Marsh* (Bowery and Coney Island), *William J. Glackens* (New York Parks), *Paul Sample* (New Hampshire), *Peter Hurd* (Southwest), *Aaron Bohrod* (Chicago), *Millard Sheets* (California).

Abstract American Painting. In 1913 a group of painters organized an exhibition in New York to introduce Americans to the recent developments in European and American painting. This exhibition, called the Armory Show, although the source of extreme controversy and even ridicule, became a landmark in American Art. Here the public saw, in many cases for the first time, important works by the post-impressionists, fauves, cubists, and other advanced painters of Europe and America.

After the Armory Show the influence of the newer modes of expression became increasingly important in America. Many American painters, such as *Max Weber* (1881–1961) and *Henry McFee* (1886–1953) had participated in the Cubist or other European movements. Other artists who are abstractionist in much of their work are *Georgia O'Keeffe* (1887–), *Karl Knaths* (1891–), and *Marsden Hartley* (1877–1943). Traces of abstraction or surrealism appear in the work of *Peter Blume* (1906–) and *Ben Shahn* (1898–).

The primitive paintings of *John Kane* and *Grandma Moses* have attracted much attention.

Pollock, Davis, Hofmann, *Jackson Pollock* (1912–1956), *Stuart Davis* (1894–1964), and *Hans Hofmann* (1880–) represent three phases of American art with worldwide influence. Pollock's chief innovation lies in the abandonment of the brush as the painter's tool. He mixed paint in tins and poured it on the canvas. As in his "Painting No. 6," this produces a vital rhythmic organization of amazing richness and variety. This approach has been termed "action painting." Stuart Davis, who began as a cubist, has developed a "hard edged" treatment of form into an active, monumental abstraction based on visual experience. His "Report from Rockport," with its clearly defined shapes, establishes a lively American Landscape with gas stations, billboards, and forms which suggest structural elements. His color is brilliant and rhythmic. Hans Hofmann, famous also as a teacher, is known as an abstract expressionist. His painting, with rich, heavy impastos, and daring treatment of surface, has brought the intense feeling associated with expressionist painting to the level of pure abstraction.

Mid-Twentieth Century. Other American painters of the mid-20th century, such as *Abraham Rattner* (1893–), *Willem de Kooning* (1904–), and *Franz Kline* (1910–) have in individual ways extended the directions of western tradition. There has also been some influence from the Orient, notably in the calligraphic abstractions of *Mark Tobey* (1890–) whose fluid line and symbolic forms connect eastern traditions with post-cubist space. Other mid-20th century styles reflect a restatement of traditional concerns, but with a characteristic independence and new vision. "Pop Art" for example is involved with contemporary subject matter, a common theme in the art of western culture. However, instead of elegant and contrived still lifes or interiors, it explores many of the more commercial and commonplace aspects of our visual environment. And, as is also traditional, each new style or statement of form has led to healthy controversy between its adherents and its detractors.

AMERICAN FOLK ART

Above A ship's figurehead carved in polychromed wood and depicting Columbia. It stands five feet, eight inches high.

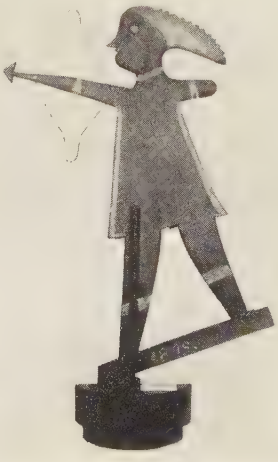
Upper center Girl of the period carved in wood and resembling a cigar store figure. Carved by an unknown artist in the late nineteenth century.

Above Horn cup, incised, picturing blacksmiths at work. The cup, originally used for drinking, stands four inches high.

Lower center Navigator in polychromed wood and standing 26 inches high. The figure is possibly a ship chandler's or nautical instrument maker's sign.

Below George Washington on horseback. The wood is polychromed and the horse trappings are cane. The figure was carved in the mid-nineteenth century.

Below An Indian weathervane, of polychromed wood and wire. The figure was carved by an unknown artist in the late nineteenth century.



Folk Art Galleries, Fenimore House, Cooperstown, N. Y.

Photo By Eric M. Sanford

"Witch House," Salem, Mass., Early Colonial, 1642 (restored). Remodeled to 1692; Gable Compound type; steep roofs, casement windows, English Medieval style. Home of Witchcraft Judge Corwin.

"Westover," Charles City County, Va., c. 1730. Dignified and elegant early "Georgian" style residence of brick and Portland stone with baroque English entranceway. In spite of classical symmetry, medievalism lingers in use of steep pitched roof and towering chimney.

AMERICAN RESIDENCES 1660-1850

Vassal "Longfellow" House, Cambridge, Mass., 1759. Later Colonial after 1750. Subtlety of proportions; classic serenity in emphasis on horizontals. Low hip roof, wood pilasters, fine chimneys and balustrade add charm.

Photo By Eric M. Sanford

"Montpelier," Thomaston, Me., 1793. Neo-classic style (Federal period, 1790-1820). Reproduction of original Knox mansion. Gen. Henry Knox was Washington's Secretary of War. Delicacy, slenderness of engaged columns, elliptical bay, suggest influence of English Adam Bros. and American McIntire.

"Monticello," about 3 miles east of Charlottesville, Va., 1769-1809. Neo-classic, Roman Revival element from late 18th century France combined with Adam delicacy. Innovations pave way for later grandeur of Greek Revival. Designed by Jefferson.

Orton Plantation, near Wilmington, No. Car., c. 1840. Greek Revival style, dignity, austerity of Doric temple suggested in wooden, marble-white columns and frieze. Typical of grand Southern plantation mansions.

ARCHITECTURE

Among the fine arts, architecture alone does not proceed from the "play-impulse"—from the desire of the creative artist to communicate to others an idea, which has arisen within his spirit, in terms of sound, line, or color. The origin of this art is almost synchronous with that of the family, since its practice is necessary to the protection and maintenance of life. The man of the later Stone age, when he had learned to polish his crude implements, used them to construct his dwelling according to one of the two types—the rectangular and the domical—out of which all architecture has expanded.

The Primitive Cabin of the Egyptians. In the valley of the Nile, the primitive builder with his rude ax cut the papyrus reeds at the river bank, clustered them, bound them together, and set the clusters deeply into the earth, at rhythmic intervals,—as the pulsations of his heart, regulating all human activity, taught him to do. Then, with the easily worked clay, accumulated by the yearly inundations of the region, he reared walls between the columns, until he had reached a desired height, when he laid other reed clusters horizontally upon his supports, in order to form with more clay, used as before, the ceiling of his habitation. The walls of his completed structure, viewed externally, suggested by their inward inclination the later pyramids and pylons. Finally, the builder finished his dwelling by drawing his spatula over the roof, without, however, heeding to cut the damp overhang. This overhang, depending from the edges and hardening, became the forerunner of the temple cornice of stone—sometimes called the hawk-beak, from its sharp concave profile—so effective in casting shadow against the atmosphere saturate with light.

The Ancient Mesopotamian Oven. The second architectural type, known as the domical, has, according to certain French archeologists of great authority, been developed from the oven, fashioned of concentric rings of clay, which decrease in circumference as they rise, leaving an aperture at the summit for the escape of smoke. Ovens of this type are still built by the women of the alluvial plains lying between the Tigris and the Euphrates, and they are unquestionably of a traditional form whose origin dates from a past too remote to be realized.

These two structural types of differing principles being accepted, it is easy to follow the progress of each throughout the history of architecture. But, before engaging upon this long sequence, it is necessary to understand the principles underlying the forms beneath which they present themselves to the eye.

The Lintel. The primitive Egyptian, in providing himself with shelter, used the column and the beam—in other words, the *lintel principle*, which, developing to maturity in ancient Greece, where stone was available in large masses, has in our own day and country advanced to new favor, owing to the skillful and extensive employment of concrete. The lintel may be defined as a horizontal bar of solid material (stone or wood), which spans an opening, such as a door or window, with its extremities resting upon two uprights. Against this bar the weight of the wall above presses vertically, causing it, if too heavily loaded, to crack or split about midway in its span,—a danger which, early in the use of the principle, was averted by voiding a triangle directly over the horizontal. Examples of this construction are to be seen in the entrance to the subterraneous tomb chambers of the Egyptian sovereigns of the Old Kingdom (about 3000–2400 B C.), and over the city gate at Mycenæ in the Peloponnesus.

The Dome and the Arch. The second or *domical principle*, with its close relative, the arch, contains within itself a disruptive force, commonly known as the thrust, tending to make it spread, and requiring an equal opposing force to assure the stability and permanence of the structure. The true dome exerts its thrust equally at all points of the circumference, while the arch, which is a collection of interdependent wedge-shaped solids held in place by the central, or key, stone, demands that the resisting masses, the buttresses, be concentrated at certain accurately determined points.

Therefore, judged from the point of view of structure, the column and lintel produce inert masses and dead weight. Domes and arches, on the other hand, are the visible expression of unseen elements constantly active and mutually hostile, constrained, like turbulent individuals beneath a strong government, to concur in shaping a fabric and in maintaining it in equilibrium.

Both these principles, so early apprehended, were either advanced or hindered by the physical environment of the ancient peoples who, successively holding power, developed architecture, in order to meet their own special religious, civic, and domestic requirements.

Egyptian and Greek Use of the Lintel. Therefore, if the beauty worshiping Greeks perfected the column and lintel, the achievements of the Egyptians cannot be disregarded. The inhabitants of the Nile valley were earlier by at least a thousand years in their use of the simpler of the two fundamental principles of architecture, as exemplified in their great temples, such as those of Karnak and Luxor, and in the structures of Queen Hatshepsut, all of which were erected between the 16th and the 12th century before our era. Compared with the Greek temples of the 5th century B. C., the Egyptian temples of a thousand years earlier are like the skeletons of certain great animal species, preserved or imitated in our museums, but now extinct, because they could not adapt themselves to the progress of terrestrial life.

The Temple of Karnak. This comparison cannot but suggest itself to one who observes the plan and the proportions of the Temple of Amen-Ra at Karnak, which so conspicuously lacks co-ordination and cohesion, but, at the same time, conveys a sense of the superhuman. To the propagation of fear and awe among a craven people, the works of the Egyptian builders, at the very first, lent themselves, as is instanced in the pyramids and in the rock-cut tombs of the Old and the Middle Kingdom. The same intention animates the structures of the Empire (1580–1150 B. C.), although it is hidden beneath the exuberance of display then demanded by the arrogant, splendor loving Pharaohs.

The Confused Plan of Karnak. Symptoms of an inorganic state of society are visible in the colossal House of Amen-Ra, which lacks a co-ordinated plan, created once for all and admitting of no material change. Here pylon has been added to pylon, so weakening the first impression of an entrance to a holy place. Other temples, with their smaller forecourts, hypostyle halls, and sanctuaries, have been allowed to meet or to pierce the lateral walls of the great structure or even to rise within its very body, to the detriment of order and symmetry. It remained for the Greeks, the creators of the city-state, to formulate an architectural expression, the harmony of whose parts should attest corporate effort, and whose elevated, restrained beauty should be eloquent of an elect people daring to converse with Divinity in terms of philosophy, of ethics, and of art.

The Architecture of Ancient Persia. But, in passing, there must be mentioned very briefly the use of the column and lintel made by the first Indo-European people to hold dominating power in western Asia. These were the Persians, who seem to have been in many ways the forerunners of the Hellenic Greeks, as appears particularly in their

religion, Zoroastrianism, which required each man to choose a positive position in the fundamental questions of life and faith.

Religion, as exercised by the Persians, demanded no temples, properly speaking, nor even tombs; for their sacred writings, the *Avesta*, far from encouraging the preservation of the bodies of the dead, prescribed their exposure. This custom, however, was not followed by the great sovereigns of the 6th century B. C.; so that the royal sepulchers of this period are among the important remains of ancient Persian architecture—those at Persepolis having columnar porches, entablatures, and gable roofs. But it was in the palace type that the Persians put forth their best structural efforts. They united in one area of different levels fortress, residence, and audience halls. The Palace of Darius contained a hypostyle hall, which served as a throne room, set with a hundred columns nearly as high as those of Karnak, and far more slender; while the Palace of Xerxes, son of the preceding monarch, covered a site of 7500 feet, and was, therefore, larger than any Gothic building subsequently erected in Europe, with the exception of the Cathedral of Milan.

Persian Porticoes. In these Persian structures, the open porticoes occasion comment, as having no precedent or models in either Egyptian or Assyrian architecture. They are originals, the principle of which was destined to modification and splendid expansion under the supremacy of the Greeks and the Romans. And, quite apart from the architectural principle here involved, interest attaches to the special form under which it is displayed. First, the spacing of the columns in the palace at Persepolis is much wider than in the hypostyle hall at Karnak. Thirty-six columns suffice in the former for the area occupied by one hundred thirty-four in the Egyptian temple. The small number used by the Persians is permissible because their roofs appear to have been formed by timber beams reaching from one column to another, rather than by massive stone blocks, supported, as in Egypt, by the enclosing walls and the closely set stone columns of great diameter.

Egyptian and Persian Gifts to Greece. Toward the attainment of Hellenic perfection in the use of the column and lintel, the legacies of the Egyptians and the Persians contributed. The primitive clustered reeds of the Nile cabin, the colossal stone roof-supports at Karnak, the slender, widely spaced columns, and the open porticoes at Persepolis and Susa, as well as the structures of the Homeric cities of Asia Minor, were groping, tentative efforts toward the perfect results attained on the Acropolis at Athens in the second half of the 5th century B. C.

Greek Architecture. But the Hellenic perfection in architecture did not suddenly manifest itself in maturity, as Pallas Athena, according to the myth, issued in full panoply of armor from the head of her all-powerful father, Zeus. The development of the column-and-lintel principle among the historic Greeks was gradual, although constant, for at least two centuries. It was effected by two tribes of opposing qualities, whose concurrence produced the most happy results, not alone in architecture, but in sculpture and in the drama as well, with the work and influence of each tribe distinct and parallel in the three arts. From the second quarter of the 8th century, the Olympic games called together at stated, not infrequent, intervals the male population of the Greek world. Gradually, other similar festivals were inaugurated through the enterprise of various leagues, the objects of which were religious political, and athletic. And, for the use of such corporations, temples and treasuries were needed.

Early Greek Temples. The earliest of these structures were of wood, for which stone was substituted when the tools of the builders had become more accurate. The periods of the use of the two materials overlapped each other in the Temple of Hera at Olympia, where the archeologists discovered that the older wooden parts, as they decayed, had been separately replaced by corresponding members of the more durable substance. It is accepted also that the earliest Hellenic temple constructed entirely of stone was erected on the isthmus of Corinth in the middle of the 7th century B. C., and was dedicated to Apollo, the god especially revered by the Dorians. But of this building no traces remain, and for archaic architectural types it is necessary to pass outside of Greece proper, eastward to Asia Minor and westward to Sicily and to lower Italy, known in classical geography as Magna Græcia. These latter lands were colonized by the Dorians, who, four centuries previously, had, as barbarians, come to peninsular Greece. They had been attracted by the riches of the race who, between 1600 and 1100 B. C. built the polygonal walls and the "beehive tombs" of Mycenæ, besieged and conquered Troy, and wrought the marvelous objects in gold unearthed in 1876 by the German excavator, Schliemann.

The Dorians, on their arrival in the Peloponnesus, either enslaved or expelled the conquered inhabitants, and closed their ports to foreign commerce. Then, during the so-called Homeric age (900–750), while a cognate people on the shores of Asia Minor, leavened to a certain degree by the exiles from peninsular Greece, were producing the *Iliad* and the *Odyssey*, the greatest of epics, the Dorians were developing militaristic states and were rapidly multiplying their own numbers. At last, but a single way remained open for their further development. This was colonial expansion, the main current of which turned to the fertile, volcanic lands lying toward the Pillars of Hercules, the western limits of maritime enterprise, named from the national hero of the Dorians.

Dorian Temples in Sicily. The eastern and southern coasts of the island of Sicily received their earliest important colonies, which became the cities of Syracuse, Selinus, Segeste, and Akragas (Agrigentum), the last three being noted for their archaic temples still existing in a ruined state. Of these ancient cities the most interesting architecturally is Selinus, with its acropolis and neighboring areas, the site of seven temples of uncertain dedication.

Greek Democracy and Art. The structural elements of the Greek temple having been chosen in the column and lintel, and the plan definitely fixed before the middle of the 6th pre-Christian century by the Dorian race, nothing more was required, in order to bring these barely formulated ideas to maturity, but a great event which should unify the rising city-states into a strong federation and create a common treasury by means of which to advance civilization. This event was provided by the wars which rose between Persia and Greece in the early years of the 5th century and continued for two decades. Toward their close, occurred the naval battle of Salamis (480 B. C.), fought in the bay of Athens and won largely through the sagacity and brilliancy of the men of that city, who, as a result of the brief conflict, obtained a leadership of the Greek world, which lasted for eighty years.

Age of Pericles. From this victory, as from the hand of a sower, a sentiment of national consciousness was broadcast, and, where it penetrated most deeply, it was subjected to a gradual, healthy period of germination. Then it bloomed in the three arts which, during the age of Pericles, attained, each of them, one of the greatest climaxes of its history: in architecture, the Parthenon; in sculpture, the group in the eastern pediment of that temple, representing the birth of Pallas Athena; in the drama, the Orestean trilogy of Æschylus, the *Œdipus King* of Sophocles, the *Alcestis* of Euripides, and the satiric comedies of Aristophanes.

Under the Athenian democracy, immortal types of art were created, as they were also called into being in France of the 13th, and in Italy of the 15th

and 16th centuries. For in these periods also genius and talent were supported by the esteem, the understanding, and the applause of the entire people,—as when the problems of the rapidly developing art of perspective, drawn in large proportions, were exhibited in the public squares of Tuscan towns.

But the Hellenic art of the 5th pre-Christian century—especially the art of the Parthenon—differs from all other climaxes that have followed it, in the possession of two qualities: simplicity and subtlety, both carried to the extreme. The plan of the temple is easily read by a child, while for more than a century and a half its curves have given to mathematicians material for discussion and even acrimonious controversy.

The Parthenon. The ruins of the Periclean Parthenon are those of the fourth building to occupy on the same site. The older foundations were skillfully treated by the last architect, Ictinus, who changed the long rectangle of the archaic period into a more compact structure, the proportion of length to breadth standing as nine to four. Further, in place of the porous limestone of the 6th century, readily absorbent of polychrome, marble from the quarries of the not distant Mount Pentelicus was chosen for its close texture and brilliancy. The chief architect had as his coadjutor Callicrates, designer of the beautiful miniature Temple of the Wingless Victory, destined a few years later also to rise on the rock of the Acropolis. The director of the entire work was Phidias, one of the greatest of sculptors, irrespective of time, nation, or school.

Plan of the Parthenon.—The conception of the Parthenon would seem to have been the result of a brief artistic ecstasy, since it is a whole, concentrated and co-ordinated, such as could not have been impeded by hesitations and afterthoughts. Its actual construction, begun in 447 B. C., was advanced nine years later to a point which permitted the use of the temple; detail work and embellishment were continued upon it until 432. But in 438, as we know from documents, the colossal gold-and-ivory statue of the titular goddess, Pallas Athena, created by Phidias, was placed in position in the cella, facing the eastern entrance.

The western façade of the structure was first seen by the visitor to the Acropolis after he had passed through the monumental gateway called the Propylæa. It presented to him a breadth corresponding in our system of measurement to 101 feet, and, because of this considerable expansion of an older proportion, eight columns were aligned across the porches at front and rear, instead of the traditional six of the true Doric type.

The Colonnade.—The peristyle, or fully surrounding colonnade, was completed by seventeen columns at the sides, making a total of forty-six, the treatment of which presents a refinement already observable in archaic temples, although there existent in a much less developed state. These supports, having a height of thirty-four feet, incline inward three inches toward the cella walls; the latter also following the same direction, and the whole thus offering the suggestion of a pyramid, as the Greek architects intended their structure should do, in order to proclaim its stability. Further, the upward diminution of the shafts was such that the diameters just below the capital measured more than one-third less than that of their base; while the angle columns were made slightly thicker than those ranged between them, in order to overcome what a French critic has called the "devouring" quality of the sunlit atmosphere of Athens.

Again, every apparently horizontal line of the Parthenon, as, for instance, the three steps of the stylobate (platform serving as the continuous base of the colonnade) show, if measured, an exceedingly slight convex curvature. This device appears to have been used by the architects in order to correct the optical illusion of "sagging," produced in a horizontal when seen from a distance, provided the line be extended and met by a number of evenly spaced verticals. At least, such is the explanation accepted by most experts, although a certain few—among them the American, Professor Goodyear, in his *Greek Lines*—present other reasons for the existence of these curvatures.

Sculpture and Color on the Parthenon.—To these subtleties on the part of the architects, the sculptors who were employed to embellish the temple responded with an equally delicate appreciation of the possibilities of their own art. In the external frieze of *triglyphs* (projecting blocks marked by vertical grooves) and *metopes* (intervening spaces filled with figures in relief), they emphasized rhythm, the basic principle of architecture, as well as of music. But, lest the clear, firm uprights of the triglyphs should appear too aggressive, these marks of accent were tinted to a deep blue, which the Greeks regarded as no color, since it belongs naturally to free space and makes the objects which it clothes seem to retire into the background. Blue also was given to the *tympana* (triangular areas enclosed by the cornices of the pediments or gables), and, within this refined setting, groups of superb figures, representing myths of intense patriotic interest to the Athenians, were so placed that, to use borrowed words, "the sun played melodies upon them from dawn to dusk." Nor was red excluded from the scheme of color. It was used in the metopes to receive the shadows cast by the relief sculptures, just as the Moorish ornamentalists of the 13th Christian century placed it on the walls of the Alhambra in the lowest plane of their starlike linear combinations, so that the rich gold applied to the highest level might, with its fusing power, eliminate crudity of tone.

Greek Ornament Independent of Structure. All these embellishments, so exquisite in themselves and so harmoniously adapted to one another, as well as to the structure regarded as a whole, nevertheless played no functional part in the building. The pedimental groups could have been removed without injury to the prevailing fineness of line and of profile. The Panathenaic frieze, compassing the cella walls at their top, was an applied ornament, serving the same purpose as a detachable tapestry. Finally, the metopes of the exterior or Doric frieze were mere artistic treatments of former voids, the purpose of which in archaic temples was the admission of light. Consequently, it is plain that in the column-and-lintel or trabeate (beam) construction, all embellishments are nonstructural; that the Greek architects, having secured stability, sought in their designs to emphasize the column to which that essential was due; that they allowed no detail, however beautiful in itself, to impede the "vertical movement" of these supports; that their chief aims were clarity, simplicity, restraint, and accurate, harmonious expression,—precisely those qualities that are found in the language, the drama, and the sculpture of the Periclean age.

Decline of Greek Architecture. But perfection is of brief duration. In common with the other arts cultivated by the Hellenic Greeks, architecture reached its highest development during the eighty years following the battle of Salamis (480 B. C.). And, as the political supremacy of Athens ended with the 5th century, so, beyond that point, the productions of the artists, if they did not wholly cease, were hybrids, departing farther and farther from type and becoming more and more wayward; although, especially in the 4th century, they were often most attractive, brilliant, and beautiful. Of the truth of these statements the second Temple of Artemis (Diana) at Ephesus and the Temple of Apollo at Miletus bear abundant evidence.

Transition to Rome. It is useless to follow the column-and-lintel system farther than its appearance in the Doric temple erected on the Acropolis at Athens, with its extreme, virile qualities harmonized and softened by Ionian influence. For, as world leadership transfers itself to the Romans,

it becomes necessary to seek among them the development of a second architectural principle capable of varied application, as well as to observe its fruitful union with the first.

The founders of Rome were a pastoral people who, having exhausted the grazing lands of an earlier residence, were attracted by a site set with hills and watered by a stream sufficient to supply their flocks. To their first stockade, dedicated to Pales, the god of sheepfolds, they gave the name of *Roma*, "city by the river." And, within this primitive citadel, their leader established in crude form a paternal government.

From the time of this early settlement (about 753 B. C.), there have been preserved, deep in the accumulated débris of the Roman Forum, small earthen receptacles, containing human ashes, which have been named by the archeologists "hut urns." These objects have, significantly, the form of the primitive dwellings of those who fashioned and dedicated them. They represent in their incised ornament a structure built of river reeds or tree boles supporting a thatched roof and having walls, supposedly of clay, filling the spaces between the uprights. To complete the resemblance between the model and the suggestion of the original, but one detail is lacking,—an aperture at the summit of the domical roof for the escape of smoke. This detail, it is plain, could not be repeated in the cinerary urn.

Another variant of the same structural idea appears in two so-called temples of Vesta—one in Rome and the other not far from Hadrian's Villa, Tivoli. Both of them are cylindrical structures and also lack the aperture. Of these, the prototype, according to Lanciani, was the hut containing the single fire of the stockade village on the Palatine hill, which was devoutly tended by the girl children, while the adult members of the community, with their young sons, were away feeding their flocks.

The Pantheon. The temples of Vesta, although important in the history of the dome, must yet yield in point of interest to the rotunda of the Pantheon. In this building we find the simplest, most logical application in all architecture of the principle which it represents, not excepting the admirable example occurring in the Basilica of Santa Sophia, Istanbul, which is later than the Pantheon by four full centuries.

The great rotunda was erected in 124 A. D., under the reign of Hadrian (117–138), whose architect destroyed an older, rectangular three-cella (Etruscan type) temple, standing on a portion of the same site and having as a frontispiece a portico of ten granite columns, over 45 feet in height, with capitals of Pentelic marble. In order to preserve these valuable materials, the later builder had them transferred to his rotunda, that they might aid in the composition of a new portico. But, he used only eight columns, in accordance with his adopted scale. In the *tympanum*—the triangular field enclosed by the horizontal and the inclined cornices—raised to a very acute angle, he placed a superb bronze group. Above this group on a screen wall of the same length as the portico, he set a triumphal chariot (*quadriga*), also of bronze, together with a number of human figures, arranged so as not to mask the outline of the dome. The last named feature had as its object internal lighting, rather than external effect. Therefore, it is without exaggerations and without structural error, such as mar the integrity of the majority of the domes of the Italian Renaissance.

Origin of the Dome. All the later experiments grew, the one from the other, responding to the personal imprint of the architects who designed them or to the demands of the people who bore the expense of erecting them. The rotunda of the Pantheon, however, sprang directly from a model which, although allied to that of the temples of Vesta, and, like it, of domestic origin, had never an acquired religious significance. This dome, in the opinion of Perrot and Chipiez, repeats exactly, in more resistant, durable materials, the clay baking oven of prehistoric Mesopotamia, which was built of stepped rings of river clay, with provision made for the escape of smoke.

Source of Roman Dome. The oven, so fashioned, would seem to be an invention of northern Mesopotamia, that is, of Assyria: consequently of Semitic origin. Therefore, the student of the history of architecture gropes his way through centuries, seeking to connect the humble baking oven with that imperial Temple of All the Gods which was erected in the wealthy and populous quarter of the Campus Martius at the period of the greatest splendor of Rome.

At first thought, the column-and-lintel system would seem the one traditionally to have been preferred, especially because of the style of the earlier Pantheon and of the valuable materials remaining from it, which were to be employed in the newer temple. On the other hand, the emperor Hadrian was widely traveled and of necessity had mingled with Semites during his visits to Alexandria. Besides, one important cylindrical building of concrete already existed in Rome,—the mausoleum of Augustus, which, from the death of that emperor in 14 A. D., had continued to serve as an imperial burial place until the last vacancy was filled in the year 98 by the ashes of Nerva. Then, after the interval of the reign of Trajan (98–117), its functions were replaced by a similar structure erected by Hadrian himself, and described by the Byzantine historian Procopius as a work of great magnificence, having its tufa walls faced with Parian marble and being surrounded by a colonnade enriched with many statues.

Significance of the Pantheon. Although of the first of these cylindrical structures only the bare core now remains, and although the second, defaced from the time of the Gothic sieges of the 6th century, serves today as a municipal fortress (*Castel Sant' Angelo*), the Pantheon is structurally intact and has never lost its sacred character. This great rotunda has been called by the eminent Englishman, Frederic Harrison, in his book, *The Meaning of History*, "the central building of the world." Lest this assertion should appear to be rhetorical and unwarranted, it is well to justify it, apart from its general historical sense. For architecture also the statement is valid, understood in reference to the structural type represented by the rotunda. The statement being so interpreted, no critic will venture to deny the following claims made for the dome of the Pantheon:

First, that it is unique in showing in a building of prime importance one of the three existing principles of architecture, presented in its primitive form.

Second, that it is the parent of all structural (not *apparent*) domes which have been created since the date of its erection in the year 124 of our era.

The Pantheon Dome; Primitive Form. To prove the former of the two claims, one has but to glance at a sectional drawing of this dome and then to call to mind the clay oven earlier described as of immemorial use in Iraq. Both structures, it will be seen, rise in stepped circles toward a summit never realized; its attainment being forbidden by practical requirements in both instances, and, in the case of the Pantheon, also by the necessity for impressing the visitor with his proximity to God and Nature. Further, in the two constructions—the one small and domestic, the other monumental—the materials used are the same, except that in the Pantheon they have been subjected to processes devised by man in order to render his work more permanent. Therefore, the masonry of the great dome was made of Roman brick, set in almost horizontal courses, which were interrupted, perhaps, near the summit, by a series of arches to relieve pressure upon the interior substructure, and again resumed just below the *oculus*

(the aperture at the summit); the whole, through the use of concrete, gradually becoming monolithic.

Pantheon, Parent of Structural Domes. As to the second claim made for the rotunda of the Pantheon, it cannot be questioned. To prove that this dome is the parent of all structural devices of its kind that have followed it in the history of architecture, only a few words of explanation are necessary.

Santa Sophia. Its first descendant is the admirable construction occurring in the Basilica (now mosque) of Santa Sophia, at Istanbul, erected more than 400 years later than its parent. The authors of the scheme were two architects, uncle and nephew, of the cities of Tralles and Miletus, Asia Minor. Like the dome of the Pantheon, that of Santa Sophia was devised for internal lighting. Therefore, when viewed from the outside, it offers a flattened aspect, rendered yet more massive by flanking semidomes which are each buttressed by paired smaller ones of similar figure. This assemblage, disappointing as it may seem in description, is but a necessary preparation for the interior, acknowledged to be one of the finest in existence, by reason of its proportions, its curves, and what may be termed the buoyancy of its soaring ascent. The small half domes pass into the larger, and these in turn apparently evaporate into a great central canopy, which is smaller in diameter than that of the rotunda at Rome, but the summit of which marks a height of 179 feet above the pavement.

The dome of Santa Sophia is without oculus. The function of this opening, through which, in the Pantheon, the serious mind escapes to reflect upon the Infinite, is here assumed by a series of windows encircling the base of the dome. The latter, instead of rising from a circular wall, is set upon pendentives—that is, spherical triangles of masonry with downward pointed apex, springing from four great piers to support the concave mass above them.

Byzantine Central and Subsidiary Domes. The massing of domes, entailing the opposition of abutting to disruptive forces, is the principal structural legacy of the Byzantine builders to architecture. By such means they pointed the way toward the Gothic, as they did also by giving lightness and flexibility to their domical constructions, such as those at Ravenna, notably San Vitale, by making an ascending spiral of slender clay jars closely fitted one into the other and held in place by cement. The thin shell so devised did not require the heavy centerings of the Roman vault; while the menacing thrust was still further averted by binding the sturdy supporting piers of the octagonal dome to arches leaping to the external wall, and by strengthening the salient angles with buttresses.

Therefore, because of their clever devices tending to diminish and distribute thrust, through the employment of the impost block (an inverted truncated pyramid of stone placed above a capital of similar form) to receive the load weighing down upon it from above, the Byzantines have come to be regarded by the most modern and discerning critics as the creators of the second of the three structural types which have developed during the entire course of civilization. Before them the Greeks perfected the use of the column and lintel. After them the stonemasons of western Europe, following a long period of experiment, brought into being the elastic, truly vitalized Gothic or pointed-arch system. But they, receiving in heritage the clay dome from prehistoric Eastern peoples and having present in their imagination the example of Hadrian's Pantheon, proceeded to mathematical subtleties; displaying a genius quite apart from that of the sturdier, more candid, and more materialistic Romans of the West. They succeeded in giving the name of Byzantine to the domical principle, and of late their architecture has been recognized, not only as a logical transitional style, but also as "a powerful and self-sufficient art."

The Dome Set on a Drum. The dome on pendentives, the second stage in the evolution of the principle, was followed inevitably by the dome set on a drum. This latter arrangement was conditioned in great measure by the plan of the building of which it was to form the most striking feature. The circular Roman plan had given place to the Greek cross, in which were inscribed five domes raised on spherical triangles and presenting a complicated assemblage of reciprocally hostile forces assuring equilibrium. In the same way, the Byzantine dome, dating, in its chief example, Santa Sophia, from the 6th century (532–548), gradually yielded to a third device, which contained an element of instability, greater or less, according to the skill of the constructing engineer. In the new phase, the dome rose singly, as if free from restraining lines, soaring with pointed section far upward into space. Its object was external effect, as was demanded by the citizens of the Florentine Republic, at the beginning of the Renaissance, from Filippo Brunelleschi (1377–1446), architect and engineer of the dome of the Cathedral of Florence.

The Renaissance in Italy. Renaissance architecture really begins with Brunelleschi's doming of Arnolfo di Cambio's Cathedral in Florence in 1420, and this feat typifies the Renaissance belief in the power of man's mind to understand and alter the world around him. Based on a rediscovery of nature and the serene vocabulary of Classical art, Renaissance architecture of the 15th century is a "humanist" architecture, related to human scale, preferring symmetry to asymmetry, and delighting in logical deductions and the order of mathematical relationships. Private palaces for such ruling families as the Medicis rival the magnificence of churches, and the charm of all buildings, religious and secular, is to be found in effects of clarity and poise.

During the 16th century, the Reformation and invasion of Rome by the French created a restless style called "Mannerist," well illustrated by Michelangelo's Laurentian library which is both a revolt against the logic of the 15th century and a subjective expression of inner tensions.

The Baroque phase (1600–1750) represents the Church Triumphant. Here optimism, elegance, and power are reflected in the sinuous, sculptural treatment of architectural forms. The rich complexity of sensations provided by the merging of painting, sculpture, and architecture into one great spatial fusion is ordered, however, by an ever-present feeling for focal direction and climax.

Aspects of Italian Renaissance architecture formed the character of all later European building and that of American as well, late into the 18th century. Perhaps one of the happiest of hybrids is found in the merging of a comfortable English medievalism with the decorative and elegant vocabulary of the Italian baroque. English churches and manor houses of the 18th century well attest to this style known to us so well as "Georgian."

The Baptistery of Florence. Here the building material is stone, and plan, dome, and roof exactly correspond in form; the octagonal dome being sprung from a level below the top of the enclosing walls. Therefore, the roof, rising from the vertical wall, meets the dome after it has passed more than halfway to its summit, and forms with it a solid stone construction; leaving, however, a void between the wall and the point at which the dome springs. This void widens to the top of the wall and then narrows to the junction of roof and dome. The upright walls of the octagon are re-enforced by strong buttresses at the angles, between each two of which two secondary buttresses are placed. Each side is thus divided into three equal spaces. Upon the buttresses, barrel vaults are set, properly inclined to the roof, under which all voids are filled with masonry; the whole constituting a thoroughly stable construction.

The Baptistery and Brunelleschi's Dome. The device in the baptistery, by which the dome and the roof are partially consolidated, suggested to Brunelleschi a dome with double shell, which he proceeded to construct in the character of a really great translator, who first seizes the spirit of the original and then clothes it in his own idiom. At the same time, he created one of the most admired monuments in the history of architecture. Moreover, as if to mark the Renaissance apart from the middle ages, Brunelleschi, although without intention, succeeded in attaching his name to his work; while the Gothic masterpieces which preceded it must always be regarded as results of corporate effort and of the travail of many minds.

The mere structure of the dome of Brunelleschi is a very clever adaptation of the roof and dome of the baptistery, as may be determined from a comparison of cross-section drawings of the two systems. But to end the judgment of the former at this point is to spurn that imponderable quality of genius which vitalizes and gives wings to the heaviest matter. This the most prosaic of observers must realize, when his eye follows the soaring, elastic curve of the great cupola, from its springing at a level of 175 feet above the pavement to its crown at an additional height of 120 feet, where it is surmounted by a "lantern," the Renaissance device for closing the aperture (oculus) of a dome.

The Lantern. Nor is the lantern itself so unimportant in domical construction as to need no word of comment. As used by Brunel'eschi and his successors, Bramante and Michelangelo, it is a cylinder or polygon built of stone, provided with openings for light, encircled by engaged columns or pilasters, and capped by a finial ornament. To this feature, allusion was made by Brunelleschi in his discourse before the building committee of the cathedral, when he argued: "Most worthy gentlemen: Having considered the difficulties of this construction, I find it absolutely impossible to build a hemispherical dome, since the upper surface, there where the lantern is set, would be so extensive that, if weight were applied to it, the structure would soon collapse"—a remark which in itself is a criticism of the second Renaissance scheme for a great dome, produced a century later by Bramante, at the court of Pope Julius II (1503–13), but never executed.

Weakness of the Dome of the Renaissance. From these examples, the truth may be inferred that the dome of the Renaissance tended toward instability; that its new object, external effect, had in a measure deprived it of the admirable qualities imparted to it by the Roman and the Byzantine builders. Its thrusts were no longer opposed by stepped rings of masonry, as in the Pantheon. Neither was it firmly upheld on pendentives, nor was it flexible and elastic in itself, as at Constantinople and at Ravenna. It was now set upon a high drum, and, in the first great instance, all the mathematical and mechanical ability of a Brunelleschi was required to render it measurably self-sustaining, both by its shape and by its structure. These technical points were ignored by the contemporary public, except such few engineers as were delegated from time to time to report upon the stability of certain buildings. Consequently, the dome of the Cathedral of Florence, externally imposing, majestic, suggestive of aspiration, was praised for its very defects. Milizia, one of its enthusiastic admirers, wrote of it: "It is worthy of special mention that in the construction of this cupola there are no visible abutments."

The marvelous and the mysterious were the natural, nourishing intellectual food of the Italians of the Renaissance, which dawned during the lifetime of Brunelleschi. The soaring dome was of right demanded by the men who conquered the outer world by navigation and the inner world by speculative philosophy set on the bases of physical science. The form and setting of the dome in its third phase was determined as much by instinct as by considerations of structure and material.

The Roman Renaissance. A half century after the death of Brunelleschi (1446), Florence yielded her artistic supremacy to Rome, as the result of complex, interdependent causes, prominent among which was the civic strife prevailing in the former city and rendering it unfit as a place of productive labor. Men of genius, not only those of declining Florence, but others from northern Italy, answered the call of Pope Julius II, who, from the moment of his election (1503), determined to make memorable his own reign and to glorify his family by fostering the production of works of art with rapidity and in great number. His principal schemes were to restore the old basilica of Saint Peter, which he had chosen as his burial place, and to enlarge the Vatican, which, although the residence of the popes from the time of the barbarian invasions, owed to Nicholas V its development into a palace at the middle of the 15th century. Lastly, it was the intention of Julius II to commission the first painters of Italy to decorate with the utmost magnificence the chapel built by and named from Sixtus IV (uncle of Julius, who had preceded his nephew in the papal office by only a few years), as well as to illustrate the history of the Church on the walls of the *Stanze*, or series of ceremonial chambers in the same palace of the Vatican.

Restoration of the Old Basilica of Saint Peter; Bramante. To restore the Church of Saint Peter, choice fell upon a native of Urbino, who, according to unverified rumor, was an uncle of Raphael. This was Bramante, in his early youth a student of perspective and a painter, who was destined to be remembered chiefly for his work as an architect. Obeying the promptings of his positive nature, he left his own province of Umbria, then subject to the sensuous, ecstatic art of the painter Perugino. He traveled northward, pausing to study the instructive architecture of the Lombard plain, and finally fixed his residence in Milan, where he remained for more than twenty years. From this city, whose brilliancy had been obscured by the French wars, he traveled to Rome, where he established himself under the pontificate of the Borgia pope, Alexander VI (1492–1503).

The Tempietto. According to the most authoritative historians, a miniature domical building, called the Tempietto, is the first attested work of Bramante in Rome. This interesting little monument is situated in the cloister of the church erected at the supposed place of Saint Peter's martyrdom (San Pietro in Montorio), in the district beyond the Tiber (Trastevere). Intended as a receptacle of sacred relics and providing the focal point of an architectural composition, it demanded a design corresponding to its importance. Bramante, therefore, employed the dome and took as his model the Temple of Vesta at Tivoli, which, like the Pantheon, has the thrusts of its dome abutted by stepped rings of masonry, and a circular cella surrounded by a colonnade of the Corinthian order. This model, plainly of the period of the Pantheon, suffered, at least in structural integrity, through interpretation by Bramante. For the Italian, aiming, like all his artist contemporaries, for external effect, set a dome of hemispherical section on a high drum without abutment. He was saved from disaster only by the toylike proportions of his scheme.

By order of Pope Julius II, Bramante prepared plans for erecting on the site of an early Christian chapel a great basilica dedicated, as was the original building, to Saint Peter, apostle and martyr. At the middle of the 15th century, the chapel was included in a great scheme for the reconstruction of Rome planned by Pope Nicholas V (1447–55). But that enlightened pontiff, prevented from realizing his projects, died a broken-hearted man, and the work

Above Saint Paul's Cathedral in London, England. Constructed during the years 1675-1710. It was badly damaged by German bombings during World War II. Designed by Sir Christopher Wren, it is considered the finest example of Renaissance architecture in England.

Upper right Cathedral of Saint John the Divine in New York City. Completed in 1911, the original style was Romanesque. In 1928, Cram and Ferguson, architects of Boston, undertook to remodel the nave along Gothic lines.

Aerial view of the famous Saint Patrick's Cathedral in Manhattan. Located on Fifth Avenue between 50th and 51st Streets, Saint Patrick's cornerstone was laid in 1858. Renwick, the architect, designed the Cathedral in Gothic style.

FAMOUS CATHEDRALS

Right Pride of Fort Worth, Texas, the new Casa Manana Theater building has a dome of geodesic design made of aluminum and supported by steel struts. Space within the auditorium is not interrupted by beams or pillars.

Below The newly enlarged Albright-Knox Art Gallery, located in Delaware Park, Buffalo, N.Y., was originally a gift of John J. Albright to the Buffalo Fine Arts Academy. In 1961, in connection with an expansion and rehabilitation program, the benefactions of Seymour H. Knox were acknowledged through the incorporation of his name in that of the institution. Among many distinctive features of the Gallery are eight monumental caryatid figures in marble, the work of Augustus Saint Gaudens.

Ezra Stoller Associates

Below Towering 39 stories above New York City's East River is the Secretariat Building of the United Nations. At its base is the domed Conference Building for the U. N.'s councils and committees. Five years of planning and building by architect Wallace Kirkman Harrison plus $67.5 million were required to complete this structure. In order to air-condition the building 14,000 gallons of water must be pumped into the cooling system per minute.

AMERICAN BUILDINGS

of his architect Rossellino counted for nothing. So that when, after the lapse of a half century, Bramante received his commission from Julius II, he entered upon a new scheme which, when completed by his successors, constituted one of the most noted works in the history of architecture.

Bramante's Model for the Dome. Following Byzantine precedent, Bramante submitted a plan showing a Greek cross with a dome at the junction of the arms. The dome, as may be seen from the model which is still preserved, was to be hemispherical and abutted, like that of the Pantheon, with stepped rings of masonry. But, in order to gain an imposing external effect, which he sought as an architect of the Italian Renaissance, he transferred the interior colonnade surrounding the base of the dome in the Pantheon to the exterior of his own model, adding also the Renaissance feature of a crowning lantern.

Construction of Saint Peter's Begun. Having produced the plan and the model, Bramante engaged in the actual construction of Saint Peter's, building one bay of the nave and the piers which now support the great dome. He worked with the utmost diligence and fervor. The complicated influences of the court interfered to slacken the interest of Pope Julius, and prevented him from urging the completion of either the basilica or the monumental sarcophagus. The latter, for which a commission had been given to Michelangelo, was, from its position beneath the dome, to present in contrast Moses, the lawgiver of the Hebrews, and the pope, the successor of Saint Peter.

Errors in Bramante's Model for the Dome. In the opinion of the competent, Bramante's scheme is excellent in so far as it follows Roman precedent, as exemplified in the Pantheon. On the other hand, all departures from that model are to be condemned as weakening the structure. Such is the transfer of the Order to the exterior, since the colonnade, being so placed, interrupts the solidity of the masonry. Such, also, is the higher level at which the dome is made to spring, losing thereby an important part of the support of the abutting wall. Such, again, is the use of metal clamps to avert the danger of collapse, which should have been eliminated by a dome of proper shape—in this case, one of pointed section—since it would have exerted a greatly diminished thrust.

Bramante's scheme, although it failed to be realized, yet occupies an important place in the evolution of the architectural principle which it represents. It allies itself, so to speak, with the Roman and the Byzantine dome, as compared with the Florentine example of Brunelleschi, which served to inspire the last and most ambitious of the series of three devised in the Italian Renaissance—the existing cupola of Saint Peter's.

Michelangelo, Architect of Saint Peter's. Under Pope Paul III, a member of the Farnese family, distinguished as nobles and as patrons of art, Michelangelo was appointed chief architect of the basilica. He had finished his career as both sculptor and painter. His spirit had been broken by long litigation with the heirs of Pope Julius, as his physical frame had been weakened by difficult journeys. Yet he did not in his decline abandon the practice of mural painting, an art which, at that period, demanded such assurance and dexterity of touch. He continued to work in the Pauline Chapel of the Vatican, with interruptions caused by grave illnesses, until he finished his commission at the age of 75. His advanced age is made the subject of comment by the contemporary art historian Vasari, who said: "Painting, and above all, painting in fresco, is beyond the capacity of old men."

This comment cannot so forcefully be applied to architecture, the least imaginative of the major arts, and Michelangelo was justified in his acceptance of the great work left unfinished by Bramante more than thirty years before. The plans and the model of his predecessor he praised with a warmth quite foreign to his nature, which would seem to indicate a diplomatic action on his part, especially since he changed them immediately and so radically.

Precedents Followed by Michelangelo. For Bramante's hemispherical dome, Michelangelo substituted one of pointed section, recalling in outline that of Brunelleschi, which had lived in his mind from childhood. Furthermore, he replaced the dome of solid masonry, conceived by the former architect, by one of three shells, the inner of which was to be hemispherical and the two above it of pointed section. And, recalling the Lombardic Baptistery of Florence, in which dome and roof are fitted together, leaving voids, Michelangelo's small extant model shows the cap as solid up to a point nearly at the level of the haunch, and there separating into three shells which diverge from one another; the lowest one being semicircular and the two upper ones of pointed section. Still following Brunelleschi, Michelangelo used eight heavy ribs to pierce the two outer shells and bind them together, but he did not continue the resemblance by carrying the internal structure to the extreme of security, as did the earlier Florentine architect.

The innermost shell, destined to be of hemispherical section, but never executed, was probably so devised in order to assure an interior effect similar to that of the vault of the Pantheon, whose spreading expanse is much more inspiring to one who passes under it than is the steep, contracting ascent of Brunelleschi's cupola.

One other feature Michelangelo adapted from a Roman precedent. As Bramante, in his design, transferred to the exterior the interior colonnade surrounding the base of the dome of the Pantheon, so Michelangelo changed Bramante's colonnade into a series of sixteen isolated buttresses masked by coupled columns. By these changes, both the Italian architects, in their desire for external effect, weakened their structures. But Michelangelo committed the far greater error. By isolating his buttresses, he did not oppose the continuous resistance to the thrust of the dome. What is still more to be regretted, he placed his columns at too low a level to receive properly the thrust of the enormous ribs which it was their task to buttress.

Delay in Execution. This design, commissioned in 1546, was committed to drawing and long remained in that state, owing partly to the artist's press of occupations, but largely to his habits of delay. A number of years elapsed before he could be brought to prepare a wooden model, and, when he finally proceeded to the execution of his scheme, his life was nearing its end.

Death of Michelangelo (1564). Michelangelo died in 1564, at the age of 89, leaving his dome completed only to the top of the drum. The cap remained to be finished. It was constructed, under the direction of Fontana and Giacomo della Porta, according to the original models and drawings; but two small lateral domes, which are fine in themselves, although ineffective in their relation to the whole composition, were added by the noted architect Vignola (1507–73).

The Petrine Construction. As completed, the dome has an internal diameter of 137½ feet, and the apex of its lantern measures a height of 405 feet from the pavement. The entire scheme, including the revised plan of a Latin cross, under the name of the Petrine Construction, became a world model. It gave the inspiration for the French domes of the 17th and the 18th century, as well as for that of Saint Paul's, London.

The Church of Saint Peter has an outside length of 727 feet. Its façade is 369 feet wide and 145 feet high. Its interior width across the transepts is 451 feet. The floor covers an area of 163,728 square feet, or nearly 4 acres.

Threatened Disruption of the Dome. Michelangelo's dome was admired by his contemporaries, like the creation of Brunelleschi before him, because it rose high in the air without visible abutments. But, for the reasons already given, it was faulty in construction and lacking in stability. Nor were its defects long in betraying themselves.

By the middle of the 17th century it threatened disruption, and a council of experts was called by Pope Innocent XI (1676–89) to devise means by which to avert a possible disaster. This first commission seems not to have acted, but the dangers increased so progressively that, in 1742, three distinguished mathematicians were charged by Pope Benedict XIV to examine the dome and to make drawings of the lesions existing in its fabric. Their work finished, these mathematicians declared the disruptive cause to be the form of the dome itself rather than any weakness of the piers and pendentives constituting the substructure. As a substitute for efficient buttressing, the commissioners recommended the use of iron clamps and of additional chains, as they believed those originally employed to have fallen into the masonry with an entire loss of their restraining power. Still later, the same pope appealed to one of the most competent engineers of the period, the marquis di Poleni of Padua, who, while expressing a more hopeful opinion of the stability of the dome than the three earlier commissioners, criticized its shape and suggested that a new system of chains be applied to it.

This suggestion came like a match to inflammable material. Advice, ranging from serious to the most radical, suggested expedients of equal diversity, until a revolutionary spirit demanded that both dome and drum be demolished, for the purpose of rebuilding the former in a more pointed form, by which to diminish the thrust. It is enough to add that Poleni's advice prevailed and that today the much discussed structure is stanchioned by the binding chains which he advocated, in order to supply a resistance to disruption which should have resided in the fabric itself and rendered it entirely self-supporting.

Transference of Artistic Capital from Rome to Paris. Like Florence at the end of the 15th century, so Rome, in the 16th, lost the artistic supremacy of the world, which passed to the French people. Wars politically disastrous for France began when Charles VIII, king of that country, invaded the duchy of Milan in 1494. They continued for thirty years, during which period the changeful relations among the principal European states resembled the interesting combinations of a kaleidoscope in being no sooner formed than dissolved. These wars had the beneficent result of advancing the economic development of France, as is demonstrated in the Cluny Museum, Paris; since there the industrial products of France, such as pottery and textiles, are placed side by side with those of Italy and show a progressive refinement as a result of contact with the country south of the Alps.

Finally, long after the restoration of peace, when the heir of Francis I, the prince who succeeded as Henry II, married the Florentine Catherine de' Medici, Italian influence became dominant. The Gothic cathedrals, perhaps the greatest artistic glory of France, were condemned as barbarous, while the charming impetuosity of the French tongue submitted temporarily to the more rhythmic suavity of the closer Latin derivative.

The So-called Italianate in France. This period, often called the Italianate, culminated under the widowhood of Catherine de' Medici, when she commissioned Philibert Delorme to build the Tuileries (1564); bidding him create an Italian palace with flower gardens and fountains, rather than a feudal castle with moat and drawbridge. The queen could command but not control. In the work of Delorme, the French genius asserted itself, as it had done before in Pierre Lescot's Louvre of the preceding reign (that of Francis I, 1515–47). A new style was born naturally, as are all styles worthy of the name. And it was original, although it was made up from borrowed elements: a statement capable of being proved in few words, were it not outside the present purpose, which is to deal exclusively with structural principles.

Early or Valois Renaissance in France. The palaces above mentioned struck, as it were, a modulating chord. The Early French or Valois Renaissance passed into the Bourbon Style, the most important subdivision of which was the period of Louis XIV (1643–1715). Under this absolute monarch, architecture assumed a grandeur and dignity that were neither hollow nor absurdly pompous. The Louvre was continued, and Versailles, as we now know it, was planned and executed, with its ruinously extravagant water system, and its landscape gardening. The latter was the work of Le Nôtre, perhaps the greatest of his profession until his time, as well as the artistic ancestor of those who plan the embankments and the boulevards of our modern cities.

Use of the Domical Principle by the Architects of Louis XIV. Under Louis XIV the domical principle was twice used in Paris to create imposing external effects, and in both instances by members of a family whose name, Mansart (Anglicized, Mansard), has become a household word. The earlier of these two domes is that of the Val-de-Grâce, a votive church erected as a thank offering by Anne of Austria, wife of Louis XIII, for the birth of the heir to the throne who became the "*Grand Monarque.*" This church, as a whole, is the work of three distinguished architects. Levau and Le Muet each had a part in its creation, but Mansart (François) the Elder began the dome, which was completed by his nephew, who was much the greater of the name. The latter, Jules Hardouin-Mansart, erected also the second building of the Hôtel des Invalides, entirely distinct from the original plan and known in his time as the Church of the Dome.

Dome of the Hôtel des Invalides. This cupola, judged by the critics of today as showing externally the most graceful lines of all similar structures in France, recalls Michelangelo's dome. When seen from a distance sufficient to obliterate an overelaborate ornament, which has been scathed by expert French opinion, the lines of the structure as a whole assert themselves as a pyramid which apparently retracts its sides to spring the higher into the air above. At such points of view, the composition has a dignity which belongs to Roman, rather than to Renaissance, architecture.

Dome of the Pantheon by Soufflot. From the cupola of the Invalides, the student passes naturally to consider that of the Pantheon, Paris, a work executed in the 18th century by the architect Soufflot (1713–81). Externally, the dome of the Pantheon marks a new departure for the continent. Except for the pointed section of its cap, it only remotely suggests its predecessors in Florence and Rome or even the dome of the Invalides. The reason for the departure or difference lies in the influence which had arisen during the intervening century, consequent upon the erection of the dome of Saint Paul's, London.

The dome designed by Soufflot shows a very high drum surrounded by a continuous colonnade: a treatment for which the first suggestion was derived by Bramante from the interior of the ancient Pantheon of Rome and transferred to the exterior of his model for the cupola of Saint Peter's. Through the emphasis given by Soufflot to the free standing colonnade, the parts above it suffer by comparison; yet the transitions are well effected, and the outline of the whole, as it contracts in ascent, is very agreeable to the eye. It is not, however, harmonized with the cruciform building, to which it appears to be applied and from which it is easily removable,

instead of being an essential, even the principal, part of the composition, as are the domes of the Cathedral of Florence, of the Invalides, and of Saint Paul's, London. But, in spite of certain obvious faults, the exterior of the Pantheon is imposing in both architecture and position. It is not unworthy of its neighbors—that picturesque anachronism, the Church of Saint Etienne du Mont, and the Library of Sainte Geneviève, the rhythmic, modern design of Labrouste, comparable in effect with a Greek temple of the best period.

Dome of Saint Paul's, London. The final European example of the dome to be treated is that of Saint Paul's, London, completed within the half century following the Great Fire of 1666. Even before that disastrous event, Sir Christopher Wren had been commissioned by Charles II to examine the Norman (1066–1154) and Early English (1189–1273) structure of Old Saint Paul's and to report upon its condition, a work which the architect-mathematician accomplished with great thoroughness and detail. He included in his demonstrations the plan, elevation, and section of the cathedral, all of which he had formulated as the results of his survey.

Together with his report, Wren submitted a radical scheme for the restoration of Saint Paul's, which was never executed, owing to the outbreak of the plague, a few months later, and to the rapidly following fire. As a consequence of changed conditions, he almost immediately presented plans for the reconstruction of London. These, owing to their disregard of former property lines, were never realized; but the same architect was appointed to restore the churches of the Strand and to build a new and greater Saint Paul's. The latter, as completed in 1710, ranks as one of the finest Renaissance cathedrals in Europe and is the masterpiece of Wren. Externally, it is majestic and restrained, unmarred by the elaboration so characteristic of the late 17th century. It has, however, been unduly praised by certain Englishmen, who have lacked the sense of justice and the breadth of view shown by Sir Christopher himself in his judgments of foreign art and artists, as expressed in his letters from Paris in 1665.

Wren's Designs for New Saint Paul's. Obedient to his admiration for continental design, Wren presented, for the restoration of Saint Paul's after the fire, a scheme which was censured by the clergy. The architect, following Bramante and Michelangelo, had proposed the plan of a Greek cross, with a great dome at the intersection of the arms, and an emphasized narthex at the western end. But this simple and familiar figure of his predecessors Wren complicated with the visual power of a geometrician. He filled the spaces between the arms of the cross with segmental curves struck from the corners of an imaginary square enclosing the entire composition; setting also small domes on pendentives between the great cupola and the curved walls of enclosure.

The model, constructed from this plan and showing a dome with double shell, may still be seen at Saint Paul's. It was regarded by its author as his best conception and was approved by King Charles II. But it is open to the same criticism as is Bramante's model for the dome of Saint Peter's. The section of the cupola is such that it would have lacked stability, had it been executed in large dimensions and in heavy building materials.

For ecclesiastical rather than for technical reasons, this first scheme was rejected. Then, to satisfy ritual requirements, as defined by the clergy, Sir Christopher reverted to a so-called cathedral form; that is, a long nave with a short transept near the middle, a semicircular apse (eastern end), and two western towers. Finally, in obedience to the king's command that Saint Paul's should be "conspicuous above the houses of the City," he created the great existent dome, quite similar in outline to his first conception, but differing essentially from it in structure.

Structural Details of the Dome of Saint Paul's. Following architectural precedent, the architect first formed a circular bed by means of arches sprung from eight piers, and on these supports set a tall and massive drum. From this point, Wren became original, making the drum double and using its external wall as a stylobate or platform on which to set the lofty, imposing Corinthian colonnade already mentioned. The inner wall of the drum, separated from the outer by a passage and strongly abutted, he used to carry a dome of masonry which springs at a point much below the top of the wall. This dome, moderately elliptical in shape, with a circular aperture at its summit, he surmounted with a hollow cone of masonry devised to bear the weight of a heavy stone lantern fifty feet in height.

Finally, having assured the stability of his construction, he raised the wall of the inner drum above the entablature of the colonnade set on the outer drum wall; giving to the exterior surface of the former an antique attic or frieze treatment, above which he erected a wooden dome covered with lead and appearing to support the lantern.

By these devices, the architect-engineer obeyed at once the king's command and the voice of his own conscience. By the revision of his plans, he gained the approbation of the clergy, the jealous guardians of tradition. By the sustained dignity of the completed edifice, he won the admiration of his compatriots, which is expressed in a Latin inscription carved on his tomb and repeated over the door of the north transept of Saint Paul's: the adjuration to the reader being in translation, "If thou seekest a monument, look about thee."

This great Renaissance cathedral, completed at the end of the first decade of the 18th century, contains the latest example of domical structure necessary to be treated; the more recent domes presenting no interesting problems and certain of them, notably that of the Capitol at Washington, being of metallic substance.

Third and Last Architectural Principle. From the achievements of the Roman, Byzantine, Italian, French, and English engineers who successively treated or modified the principle of the hemispherical or half-ovoid roof, the student is now free to pass to the third architectural element which, properly speaking, has created a style; that is, an outward manifestation of an inner shaping and determining force. This element is the arch, developed in its most interesting form by the builders—it were better to say by the master masons—of the middle ages.

Arch Principle in Its Primitive Form. But as all the world knows, the arch principle was used in remote antiquity. The arch appears as a voided triangle (to lighten superincumbent weight) over the entrance to sepulchral chambers in the Pyramids. Later, when the Egyptians and the Assyrians had mingled in war and trade, the developed arch marked the structures of Rameses II (Empire, 13th century B. C.). Further, it is now recognized that a system of arches, some of which were 75 feet high, supported the Hanging Gardens of Babylon, which were constructed nearly 600 years before our era. Again, the excavations of Dr. Schliemann in peninsular Greece (1876) demonstrated the use of the voided triangle by the builders of the Mycenæan age (about 1600–1000 B. C.). This device appears above the lintel of the Lioness Gate at Mycenæ and also similarly placed in the neighboring "Treasury," the finest of the domical or so-called "beehive" tombs. Finally, the same archeologist, in association with another learned German, Dörpfeld, laid bare the palace at Tiryns (1884-85), in the circuit wall of which occur pointed-arch openings. These shapes are secured by setting massive stones separated by a wide void at the lowest tier and then by gradually narrowing the void until the topmost stones meet. In this instance, the arch principle is

ignored, but the attainment of the shape is in itself significant.

Consequent upon the Dorian invasion of peninsular Greece (about 1100–1000 B. C.), an age of chaos followed, and, when the Hellenic civilization rose, experiments upon the arch principle were not renewed. It remained for the Romans, through the influence of their Etruscan builders, to revive and develop them.

Lintel and Arch in the Colosseum. Toward the end of the 1st Christian century (69–96), the Flavian Amphitheater, more commonly, but incorrectly, called the Colosseum, was constructed by the order of those emperors whose name it bears in adjective form. Built of concrete, brick, and travertine, it joined in fruitful union the arch and the lintel. It was erected at a period when the building principles of the Greeks and the Orientals had met in Rome, that great crucible of the antique civilizations.

The arch, although used in developed form in the 3d pre-Christian century, within the limits of the Hellenized world, at Pergamum, Asia Minor (arched bridge with span of 27 feet), was yet a device of Eastern origin. On the other hand, the column-and-lintel was, as we have seen, an element brought to perfection in Greece during the age of Pericles. When the two opposite structural principles were united in Vespasian's amphitheater, their union formed a point of departure at which the student of today may begin a survey of the architecture of at least fifteen centuries. A unit or single bay of the great building just named is the first member of a progressive, practical series by which the free standing column was gradually taught to maintain the arch in equilibrium.

In the Flavian Amphitheater, the arch appears as if framed within columns and their entablatures; the whole constituting the so-called "arch order." In this instance, the element is not counteracted by buttresses but, to a very considerable degree, by the great thickness of the walls and by the vertical pressure of the uppermost story, which is not arched, but is a solid wall pierced at regular intervals by windows.

Before the middle of the following century, in the Pantheon of Hadrian, the entablature served as an impost for the arch. Still later, in the Baths of Caracalla (211–217), a fragment of the entablature increased the height of the column and made a larger bearing upon which to spring the arch. In the buildings of Diocletian, erected on the Dalmatian coast about 300 A. D., the entablatures disappear and the arches spring from the Corinthian capitals.

Within the limits of the succeeding century, Christianity was legalized (313) and the Empire was divided (395). These two events completely changed the course and the purpose of architecture. Byzantium, under its new name, Constantinople, became the capital; while Rome, beginning with the 5th century (410), suffered repeated siege and sacking. Thus threatened, the rich patricians fled toward the Adriatic coast, Ravenna becoming their principal place of refuge. This seaboard city served as a dike against the barbaric invasions, which, however, with the coming of Theodoric the Ostrogoth, in the last decade of the 5th century, ceased to be destructive and began to upbuild a new civilization whose religious faith demanded and determined new expressions of art.

Establishment of the Lombard Kingdom (568–774). Among these invaders were the Lombards, of Scandinavian origin, who descended into the fertile valley of the Po, like "a stream of stagnant mud," as the English historian Hodgkin has described them. Still pagans, they brought with them the cruel myths of the North, and, in the scathing opinion of Pope Gregory the Great (590–604), they were in all things *nefandissimi*, "most abhorrent." Overcoming the population, they did not mingle with it, yet they established themselves securely at points reaching from Pavia in the North, which they made their capital, to Naples in the South; everywhere giving evidence of their will to supplant and to dominate. Gradually, however, responding to climatic as well as to moral influences, they so softened their natures as to accept Arianism, a Unitarian form of Christianity, and they finally became orthodox toward the end of the 7th century. A hundred years later, they began to erect crude temples of their faith. In certain instances, as at Brescia, they converted those of the pagans to their own uses.

The leader of this movement was Queen Theodolinda, wife of the grandson of the invading king Alboin. The builders themselves have already been described under the name of the Comacine masters and as the architects of domes. Furthermore, they were the creators of the Lombard or northern Italian Romanesque; the relation between the creators of the style and the style itself being such as to recall the lines of Victor Hugo in his drama *Hernani*, when he describes the Teutonic Charlemagne molding anew in his powerful hand a formless mass of bronze, which, in this instance, corresponds to the ruined institutions of the antique world.

The Lombard Basilica, Baptistery, and Campanile. The barbaric Lombard style was created spontaneously. Its birth was inevitable. Its very name explains the principles upon which it was based. Its elements were the round arch, the barrel vault, and the dome, crudely fashioned and covered externally by a conical or polygonal roof. Combining or choosing from these elements, the Romanesque builders of upper Italy, between the 8th and the 12th century, aligned across the Lombard plain, from Milan to the Venetian territory, a series of religious structures, consisting in many instances of basilica (church proper), baptistery, and campanile (detached bell tower), which render that region one of the three or four of the world most interesting from the point of view of architecture.

The Basilica. The first member of the trifold type, the basilica, is the Greco-Roman law court applied to a new use. This the Lombard received from the early Christian architects of the 4th century. In its primitive form, as a church, the basilica was rectangular in plan with a width not exceeding two-thirds its length and at one end a semicircular expansion called the apse. The latter was set at a level slightly higher than the rectangle and was separated from it by a breast-high wall with entrance gates, beyond which the laity could not advance. Further, the rectangle was divided by columns into three longitudinal sections; the central being the most spacious. The early roof was flat, but subsequently the lateral divisions (aisles, that is, "wings") were covered with barrel vaults, and, still later, the central space (nave, "ship or keel") was similarly treated. Properly to vault the wide nave and to assure, at the same time, stability to the buildings, as well as sufficient light to the interior, became the chief architectural problem of the middle ages. But the solution was not reached until the 13th century had half passed and the principles of the Lombardic Romanesque had been absorbed into the French Gothic.

The second member of the tripartite type is already known to the reader by the previous reference made to the Baptistery of Florence. The third member, the campanile, must be omitted, since it does not involve the arch principle.

The Lombardic Façade. But it is the Lombardic façade which vitally interests the student of the history of architecture, since it is so obviously the forerunner of the same imposing and distinctive feature of the French Gothic. The same structural elements, displayed at their beginning and at their highest stage of development, may be seen in the western front of Saint Michael's at Pavia (the

old Lombardic capital), in the façade of the Abbaye-aux-Dames at Caen (Normandy), and in those of the cathedrals of Paris, Amiens, or Reims.

The Façade, Exponent of the Interior. The Romanesque—that is, the barbaric—example states, with the distinctness of words, the divisions of the interior into nave and aisles. And this fact is expressed twice: first, by the three separate and distinct portals, each serving one of the longitudinal divisions of the interior rectangle; then by the slightly raised, narrow bands of masonry running from base to cornice at the ends of the façade, and also between the portals. One glance of the observer suffices to explain to him the interior arrangement and to invite comparison with a clear sentence construction, the strength of which is increased by proper punctuation. Further, the western front of Saint Michael's is pierced by a number of round-arched windows and by one unimportant circular opening; while later Lombardic examples show a more precise and concentrated manner of lighting in the great oculus, opening immediately above the central portal.

Façade of the Abbaye-aux-Dames. In the French Romanesque example of a structural façade—that of one of the two Norman abbeys built at Caen by William the Conqueror and his queen Matilda—the pilaster strips have become strong tower buttresses. In this form, they serve to resist the thrust of the interior and to consolidate the building into an indivisible organic whole, instead of allowing the façade to remain a mere screen wall without function, as is true of many vaulted structures in England, notably of the Cathedral of Peterborough.

Façades of Notre Dame, Amiens, and Reims. In the third example, the façade of Notre Dame, Paris, of the Cathedral of Amiens, or of the Cathedral of Reims, now restored after its war-time ruin, the organic quality is still stronger, still more visible, even to the examiner of slight training. Furthermore, it appears to be progressive in the above-named sequence. For the solid, massive masonry of Notre Dame, Paris, producing a definite rectangular effect, Amiens substitutes a more elastic, springing line, firm and tense as living sinews; while Reims, with its piercings, bold and beautiful, suggests the body of a perfectly trained athlete from whose frame judicious exercise has removed every ounce of superfluous, clogging flesh.

Once again it must be insisted that the structural problem of the middle ages was to vault the basilica; also, that only by following the stages of this problem can the nonarchitect hope to realize the significance of the third and last historic style and then to proceed to the study of modern buildings.

But, before discussing the problem and the devices which led to its solution, it is necessary to understand the function and the nature of the arch, as well as its relations to the dome and the barrel vault, together with which it constitutes a single principle.

The Arch Defined. The arch, so strong in its æsthetic appeal to all classes of observers, is a necessary means of spanning openings too wide to permit the use of the lintel. And, unlike the latter principle, which depends for its stability upon adequate support, the arch demands proper abutment or resistance. Also, while the lintel, if too heavily pressed from above, yields and breaks near its middle point, incurring the vertical fall of the pressing mass, the arch, insufficiently resisted, spreads laterally and succumbs to a disruptive force inherent in its form. Consequently, this effort, called the "thrust," must be counteracted by immovable masses which will permanently assure equilibrium and stability.

Gothic Arch and Buttress. The arch-device, as used for centuries by the Romanesque and the Gothic architects, was an interior feature; leaving the buttresses, that is, the resisting masses, for the exterior. This arrangement, according to an English authority, is, to a large degree, responsible for the singular interest excited in the minds of the sensitive by the sight of a Gothic structure. For, seeing at first only the supporting members, the observer desires to enter the portals that he may determine, by means of his own senses, the concealed, ponderous burden so mysteriously announced.

Opposition to thrust, as understood by the Romans, was passive resistance: such, for example, as that offered by walls of great thickness in the Flavian Amphitheater and the Pantheon at Rome. But, by means of constant, patient experiment continued for centuries, the medieval architects, in dealing with the arch problem, were able to transform the passive resistance to thrust into an activity equal to that of the disruptive force itself.

Development of Vaulting. The medieval experiments in vaulting began naturally with the aisles, or narrower, lower, lateral, longitudinal sections of the interior. The architects threw a continuous barrel vault over the aisles. This construction was really but an arch prolonged laterally, whose usefulness was found to be greater than was at first suspected. By this means the nave, or central division, could be raised much higher, forming a clerestory (clear, light) which could be pierced by numerous windows, as is implied in its name.

When the builders had succeeded in vaulting the nave by means of diagonally intersecting arches (first example at Vezelay, Burgundy), the half barrel vaults over the aisles were found to act in the most effective way as buttresses, counteracting the "thrust" or disruptive force of the nave arches. Then, only the following and final step remained to be taken in the development of a device which was to be the most striking, as well as the sole original, *structural* contribution made by the Gothic system to architecture. The half barrel vault, in principle at least, and in the form of an arm of masonry, was transferred to the exterior. It was set firmly on the top of each of the massive buttresses which indicated, along the sides of the building, the interior division into bays, a bay being the space between two supports. It was then flung over the aisle roof to meet and to re-enforce the pier buttress or mass of masonry whose function was to resist the thrust of the soaring arches of the nave.

The Complete Flying Buttress. Thus transferred and having assumed a new form, the arm of masonry acquired also a new name. It is known in English as the flying buttress, while in French it is designated more picturesquely and accurately by *l'arc boutant*, a phrase which suggests the idea of an aggressive animal, like the ram or goat, in the act of thrusting back the enemy with his horns. So treated, this device served to transmit the thrust to the aisle buttress below it. In instances of extreme development, as in the Cathedral of Reims, it appears in two stories and in two flights, with an intermediate upright; so that the second exterior buttress, which receives the remnant of the thrust, stands at a considerable distance from the walls.

Through the development of the flying buttress, that is, the organ of the transmission of thrusts, the Gothic system became complete. The strains were directed and carried by the ribs to certain points, where they were met by masses of stone, which, if not sufficient in themselves to prevent the collapse of the interior arches, were re-enforced by other arms of masonry reaching to other supports; these latter being weighted at their summits by pinnacles or cone-shaped figures, at once structural in their function and most ornamental in aspect.

The Ribs and Their Functions. The ribs of the Gothic structure were named from the offices which they exercise: the "wall" or lateral; the transverse, or those springing at right angles to the wall; finally, the diagonal or groin ribs, which are the most important. This arrangement can be

easily visualized without the aid of a diagram, and its meaning is at once clear, if the definition of a bay be remembered as the space between two supports or buttresses. Each of these buttresses, consequently, receives from the ribs five thrusts: two from the wall or lateral ribs, one from the transverse, and two from the groin ribs, or diagonals. To assure stability, therefore, became a matter of simple calculation. Through the proper direction of the ribs and the accurate transmission and annulment of the thrusts by means of the flying buttresses and of the real or supporting buttresses, it became possible to tear away the mass of wall between each two of these organs of resistance; so leaving a skeleton recalling that of the human body.

Climax of Gothic System. The wide voids left by the suppression of the masonry could now be filled by arched windows corresponding in form to the interior vaults. The entire structure so became, as defined by the great French authority of the 19th century, Viollet-le-Duc, "a framework of stone with walls of glass." The architect absolutely controlled the forces brought into play by the use of the vault. Having eliminated all inert masses, he had reduced the structure to its active parts.

By means of a static mechanism constructed from point to point as laboriously as a legal argument, he had overcome the comparative poverty of his materials and resources. He had produced a system of skillful, ingenious devices in which the principle of poise was substituted for that of dead weight; thereby perfecting one of the most admirable schemes ever conceived in the history of architecture, as well as one of the greatest creative works of the human imagination.

The Gothic system reached its climax in the 13th century. The years 1220–22 witnessed the foundation of cathedrals in several widely separated cities: Amiens, France; Salisbury, England; Toledo, Spain; and Cologne in the Rhineland. And each of these edifices symbolizes in its own terms that wonderful hundred years of great actions and great thought.

The genius of the French builders in achieving an organic unity of thrust and counterthrust, with unyielding stone being made to serve the purpose of a resilient "stone cage for stained glass," has provided a legacy of building which leads naturally into the present age of steel and concrete, with all the ingenious structural devices these new materials have made possible.

The Gothic System Developed in France. Although practiced widely on the continent of Europe and in the British Isles, the Gothic structural system was developed in France. Like the roots of a great tree, so its nourishing sources are concealed and interwoven with an intricacy defying solution. They are flung far backward into the building art of the Romans and of the Byzantines, absorbing massiveness from the former, and, from the latter, flexibility and elasticity. These sources became, as it were, the trunk of the tree, when the Comacine or Lombard master masons reared their churches and baptisteries across the breadth of upper Italy. But there the growth lost its vigor, and its life was transferred into France, to be fostered in Burgundy, in Normandy, and in the monarchical lands of the Capetian kings, whose capital was Paris.

From France the germinating Gothic principles were carried into England by the clerical architects of William the Conqueror, and they, in their adopted country, showing advancement in their art, gave color to the unfounded belief that the system there received earlier development than in their motherland. Later, but for a brief time only, France, England, and the regions threaded by the Rhine became a single architectural country. The Rhineland, however, was reluctant to abandon its impressive Romanesque, which had produced the cathedrals of Worms, Speyer, Bonn, and a group of interesting churches at Cologne similar in all essentials to those erected in northern Italy by the Lombards.

The Rhineland, Spain, and Italy. The Germans, it would appear, were three-quarters of a century later than the French in producing complete Gothic. No church east of the Rhine shows a groin rib before the beginning of the 13th century; while the apsidal vaults of the Abbey at Morienval date from the end of the first quarter of the 12th. In Spain, the Romanesque of the just mentioned period was robust and massive, with many Lombardic resemblances. But even stronger in these Spanish examples are the Burgundian influences, which had been carried from France into the Iberian peninsula by the architect monks of Saint Bernard, the reformed Benedictines, renamed Cistercians. Further, it is true that the development of structural Gothic was not progressive in Spain; since, in the same building, the earliest devices are frequently to be observed side by side with the more advanced. Nor can it be denied that the great Gothic art of France, as it is evidenced in Paris and Bourges, Amiens and Reims, is reproduced in the practically contemporaneous cathedrals of Toledo, Burgos, and Leon. These are, as to French influence, the parallels of the Cathedral of Cologne on the Rhine. They furthermore offer proofs that French architects and workmen had some share in their actual construction.

During the 13th and 14th centuries in Italy, the Gothic style appeared only in decorative features—pointed arches, pinnacles, crockets, and finials, with mosaics and frescoes substituting for the richness of stained glass. Orvieto, Siena, Florence, and Milan have noteworthy Gothic Cathedrals, but in all cases the treatment is decorative rather than constructive, and under the shimmer is the simple basilican church of Roman tradition.

English and French Gothic. In England, for three centuries following the Romanesque period (1189–1519), architecture followed an independent development. The designer and the builder were not united in one and the same person, as on the continent of Europe, the former being often a bishop or the prior of a monastery. From this fact resulted strong individuality, each cathedral receiving a treatment different from that of every other and so impeding the progress of structural, organic Gothic.

English Gothic. In the year 597, the monk Augustine was sent by Pope Gregory I to Christianize England. Near Canterbury he founded the first of many Benedictine abbeys, and these abbeys served as places of prayer and study, schools of instruction in industry and agriculture—in short, self-sustaining communities in times of peace and fortresses in times of invasion.

With the coming of the Normans late in the 11th century, rebuilding of Canterbury, damaged by fire in 1174, was directed by a Frenchman, William of Sens. Although the three-story elevation and proportions of the choir suggest the French Gothic Cathedral of Sens, there is an English linear and decorative quality present in the horizontal emphasis on length rather than width, and in the use of contrasting colors and textures in the building materials. The rich contrast of limestone and Purbeck marble is a frequent occurrence in English cathedrals.

There are three distinct styles of English Gothic: 1) the Lancet or Early Gothic of the 13th century; 2) the Decorated Style, corresponding to the late 13th and 14th centuries; and 3) the Perpendicular Style of the 15th and 16th centuries echoed in France by the flickering delicacy of the late "Flamboyant." Salisbury Cathedral, in the Early English Style, begun in 1220 and finished within forty years with the exception of its beautiful spire, is the finest example of a uniform Gothic structure in all of England. Examples of all periods of English church building from Saxon to Perpendicular may be found in Canterbury. At Ely, particularly in the Lady Chapel, we have an excellent example of the Curvilinear ar-

rangement that characterizes the Decorated Style, and another superb example is to be found in the beautiful Angel Choir at Lincoln. Examples of the late Perpendicular Style with its gorgeous fan vaulting are seen best in the choir and cloisters of Gloucester Cathedral and in Henry VII's Chapel at Westminster Abbey. The latter is not a cathedral, since it is not the seat of a bishop; yet it is probably the best known of all British churches.

Contrast of French and English Cathedrals. Compared with the French, the English churches are long and low, being six times the width where the French are four. The great length of the English cathedral with its horizontal emphasis induces more tranquil emotions, whereas the French cathedral soars upward with a sense of rapturous ecstasy. The French cathedrals are urban, a material expression of the corporate religious and civic intensity of the 13th century; the English cathedrals are developed from monastic churches and country bishoprics formed from abbey communities, and consequently have a more isolated quality, with lovely surrounding areas of lawns and gardens. The tendency toward a screen type facade with small entrance doorways increases the sense of privacy. Many English cathedrals have two transepts (the archepiscopal type) where the French have one. The English church differs also in having usually a square apse end, a more decorative but less bold vaulting, and an absence of flying buttresses. Although Wells and Peterborough have sculptured facades, these are exceptions, the carving being centered on the decorative treatment of mouldings rather than on symbolic statement involving figures, birds, and animals. Some of the most beautiful English Gothic carving is to be found in the famed "hammerbeam" truss which had its greatest vogue in secular Gothic of the 16th century.

The Development of Modern Architecture. Modern architecture has its beginnings in the tremendous social changes brought about by the Industrial Revolution with its replacement of handwork by steampower. Against the trend of the new ruling middle class toward respectable eclecticism, was the demand for new types of buildings to conform to the needs of a mounting labor force. The growth of large cities and factory towns not only created new problems in housing, but also posed the need of other shelters for an enlarged and complex community: theaters, auditoria, railway stations, and commercial buildings of all kinds. It was, however, the discovery of such new materials as iron, steel, and concrete which first directed architects toward solutions independent of historical styles, the first cast-iron bridge being built at Collbrookdale in 1775 (although it was over a hundred years later in 1883 that John Roebling's suspension bridge united Manhattan with Brooklyn over the great East River).

As early as 1843, iron supports were used in European buildings, Henri Labroustes' Bibliothèque Sainte Geneviève and Bibliothèque Nationale in Paris both utilizing cast-iron columns and metal vaults and domes to support glass coverings which admitted light. The London Crystal Palace of 1851, by the extraordinary gardener-architect Joseph Paxton, was a building of glass and iron that did much to stimulate the new movement toward the frank use of structural materials. Among other innovations, Sir Joseph inaugurated the standardization of prefabricated parts, so that a million square feet of glass over a floor space of 17 acres could be set in its cast-iron shell in the incredibly short space of six months. Yet through the 19th century revivals of Gothic, Romanesque, Italian, and French Renaissance, and even Baroque, as seen in Garnier's Paris Opera House (1875), tended to obscure the steady march toward more spacious planning and more direct expression of materials. The soaring beauty of Alexandre Eiffel's iron tower, and the 360-foot span for the "Galerie des Machines," at the Paris Exhibition of 1889 gave increased impetus to the appreciation of revealed structure, but the great success of the 1893 Columbian Exposition in Chicago with its unified planning of buildings all based on Renaissance models marked once again the triumph of the "Classical." Beautiful and tasteful as these buildings were with "all the virtues of the originals except originality," Sullivan's reaction was that this exhibition had set back the honest development of architecture fifty years.

Steel combined with brick, concrete, mosaic, and colored glass was used by Belgian architects in the 1890's, and Victor Horta's wonderful planning of the long narrow house at No. 12 Rue de Turin with its skillful handling of different levels and conservation of livable space is a landmark in this period. The attenuated metal railings ending in strange geometricized flower and plant forms represents a kind of bizarre compromise between the willingness to let materials speak for themselves and the need to retain the decorative elements of older styles. In Austria and Germany, this new structural system called "l'Art Nouveau" followed the style of the glass and iron subway stations already designed by Hector Guimard for Paris. Otto Wagner pioneered the Austrian revolt, known as the "Secession," (against historical styles) and utilized steel framework beneath marble veneers in his Postal Savings Bank, Vienna (1905) and concrete and steel in his stations of the Metropolitan Railway of Vienna.

The Skyscraper. The first tall buildings were built in Chicago, and such early structures as the Home Insurance Building (1883–1885) by William LeBaron Jenney and the Tacoma Building by Holabird and Roche used steel frames with non-supporting "curtain" walls. But it was left to Louis Henry Sullivan in the Wainwright Building in St. Louis (1890–1891) to give the steel frame its first real recognition and expression, dramatizing the function by the use of decorated terra cotta panels beneath the windows and a frieze with his own geometrically inventive ornament beneath the simple cornice. Here Sullivan justified esthetically his credo of "form follows function."

In New York in Cass Gilbert's 792-foot Woolworth Building (1910–1912), Gothic flying buttresses brought the soaring design to its climax, and, although Burnham's Flatiron Building used an Italian Renaissance dialect with rusticated lower story and a crowning cornice from the Medici Palace, and Ernest Flagg's Singer Building—elements from the French Renaissance, the Gothic seemed to many the most suitable style for these romantically named "cathedrals of commerce." Eliel Saarinen's unsuccessful 2nd prize for the Chicago Tribune Tower (1922) (ultimately built in the Gothic Style by the winner, Raymond Hood), used the new zoning setbacks to create a strong upward sweep with gently decreasing masses and a sparse use of original ornament. This sculptural simplicity was to influence all skyscrapers that followed. Hood's Daily News Building in New York, Shreve, Lamb and Harmon's Empire State Building, The New York Telephone Company Building and Van Allen's Chrysler Building, all show Saarinen's influence in his acceptance of Sullivan's "form follows function."

The group known as Rockefeller Center or Radio City (1932) is a masterpiece of simplicity. Space and air surround the 15 separate structures placed in plus-and-minus relationship to one another like a delicately balanced Mondrian painting. With the plane or slab character of the tallest building of all, the R.C.A. Building taking command, the whole group suggests the inevitable triumph of the block type of skyscraper, shown in its latest nonobjective impersonality in the bronze and glass Seagram Building by Miës Van der Rohe and Johnson. Other examples may be found in the U.N. Secretariat and the new Lever House by Skidmore, Owings and Merrill, all in New York. The latter, with its glittering glass and steel tower gracefully poised behind a landscaped base, and its height re-

duced to a more modest scale, suggests that the age of the "monster" skyscraper may now be over. The more individualized type of skyscraper is illustrated in Frank Lloyd Wright's Price Tower in Bartlesville, Okla., and the Laboratory Tower he designed in Racine, Wis., for the Johnson Wax Company. But whatever the design of the skyscraper, its most awesome accomplishment lies in the machine-age speed and efficiency with which great numbers of workers of vast knowledge and technical skill have co-operated to bring it to fulfillment.

Contemporary Building. In Frank Lloyd Wright's Guggenheim Museum (1958), the plane is dismissed in favor of the massive sculptural sweep possible with poured concrete. The building is treated as abstract sculpture, with outward sloping walls admitting greater light at the top, while a continual sloping ramp in the interior descends in spiral ease to the ground floor. Architects such as the French Le Corbusier and the Germans Walter Gropius and Miës Van der Rohe have dealt with masses interpreted in almost classically proportioned planes of concrete, stucco, and glass, but a tendency toward greater freedom in curved "prestressed concrete" or "ferrocement" forms is seen in the work of the Italian Nervi (Roman Sports Arena, 1958) and Oscar Niemeyer (Palace of the Dawn, Brasilia, 1958). The geodesic dome of R. Buckminster Fuller (e.g. Casa Manana Theater, Fort Worth, Texas), a continuous cage of Tetrahedrons where pressure at any external point is distributed throughout the structure, has infinite uses for spanning large areas with materials as varied as plastics and aluminum. And so the possibilities of solving new spatial problems through engineering precision seem numberless. Structural shapes have moved from vault and dome to "Cantilever" and "hyperbolic paraboloid."

The concept of "Modern Space" is born of modern speed, for as Marcel Breuer has said in his *Philosophy of an Architect* "We have learned to move faster than anyone ever moved before . . . We no longer see little details disconnected or detached from the overall picture. We see continuities . . . We have a new experience in space: space in motion, space in flow . . . We subordinate everything to the greater unity of this new space."

A sense of "continuing flow" affects not only the plan of today's building, but also is reflected in the growing integration of painting, sculpture, and the decorative arts with architecture itself. This integral relationship appears in Nivola's cast concrete bas-relief for the facade of the Mutual of Hartford Insurance Building (1958), and in the sculptured metal screens of Harry Bertoia for projects as widely separated as Eero Saarinen's Kresge Chapel at M.I.T., Boston, Mass. and the Fifth Avenue office of the Manufacturers Trust Company of New York.

Schools and Churches. The new space concept and analysis of function has had a profound effect on modern school building, often restricted to a height of no more than a single floor, with the changing aspect of the school day rooted in the general plan. Classrooms lead with safety and ease of circulation into auditoria, lunchrooms, and play spaces. Glass is emphasized for light and airiness and surfaces are kept free of ornamentation with the exception of occasional decorative areas of colored tile, glass, or plastic integrated with the constructive surface itself. Such an example is seen in Reidy's Primary School, Gymnasium and Housing in Rio de Janeiro (1948).

The "back-to-fundamentals" approach of modernism and its desire to express the changed image of man in his new environment have been the major influences on modern church architects. The Early Christian symbol of the fish determines the exotic plan and elevation treatment of Harrison's Presbyterian Church in Stamford, Conn. (1958); in Le Corbusier's "Notre Dame du Haut" at Ronchamp, France (1955), we have a sculptural "vessel" on a "high place," a possible interpretation of the old symbol of the ark, inspiring man anew as he looks out upon the four corners of the universe. Beyond a recasting of old symbols, however, there seems to be a larger desire to challenge all previous concepts of church building, to stress asymmetry and novelty of conception, and unease rather than rest. In churches as different as Eliel Saarinen's Tabernacle Church of Christ (1940), and Felix Candela's Virgin of Miracles Church, Mexico (1957), the first austerely rectangular, the latter dynamically curvilinear, there is a sense of inner restlessness and tension. Even the off-center placing of the cross in the Tabernacle Church may be interpreted as an empathic reflection of man's quest for new standards, new values, and new interpretations of his religious heritage in a changed and changing world.

HOUSING

Modern architects have planned houses either of austere simplicity following the "International Style" of Gropius and Van der Rohe, or with greater attention to the "organic" unity of individual, site, and materials, stressed by Wright. In some cases these qualities have been combined. Still, the most well known of both types have been designed for the wealthy. Gropius' "Architects Collaborative" group have attempted successfully the design of houses with additive modules for the less well-to-do, and these may in time supplant the now so-popular modern ranch house. Huge housing developments have attempted to include lawns and parks within a city environment in order to give more normal lives to the city populace, but the increasing population in urban centers continues to be architecture's most pressing problem.

In Rio de Janeiro, Brazil, mass-housing has occupied the suburbs, with skyscraper apartments fronting attractive vistas such as Guanabara Bay; in Detroit, Michigan, Gruen, Yamasaki and Stonorov have attempted the building of an attractive suburban development within the very heart of the city. In both cases the architects design for a population far different from that of the Baroque or even the late 19th century era, when rich ornamentation became a kind of badge of concentrated wealth. The buildings have great variety of shape and arrangement, but are extremely simple in design; lawns, gardens, courts, and parking areas provide the delights of enrichment and here they are communal rather than individualistic.

To ease the housing shortage after World War II, the United States government placed billions of dollars in credit at the service of the building industry. The Federal Housing Authority (F.H.A.) by generously insuring loans on houses enabled builders to borrow the money needed to build. At the same time, by liberally insuring the purchasers' mortgages, particularly those of veterans, the government made it equally easy for people to buy their homes. In 1949 one million non-farm homes were begun aided by government financing. Over 1.6 million housing units were started during 1963.

Summary. Architecture may affect one's way of living, but it is Life itself that determines architecture. The Gothic Church is a still-living expression of the Medieval mysticism that reared it, the well-balanced palaces of the Renaissance reflect its humanism, and even the symmetrical church interiors of the period were designed to be seen from the center by Man, master of all he surveyed. Today we are living in an "Age of Analysis" in which architecture shows man's desire to align himself with an increasing sense of world or even outerspace community. The great use of glass gives to the inhabitant Nature herself for a wall, the glass serving merely as a screen against the elements. Perhaps Frank Lloyd Wright, who stressed always the need for making architecture a reflection of man's deepest relation to Nature, summed it all up best when he said, "Architecture is Life itself taking form."

"Wedding Cake" House, Early Republic house, Kennebunk, Maine, c. 1800, with Victorian Gothic filigree added about 1850. Example of architectural fantasies of Romantic era 1820–1860.

Residence of Isaac Bell, Jr., Newport, R.I., 1883 (McKim, Mead & White). Based on Richardson's adaptation of Romanesque tradition to new "shingle" style, with faint touches of M.M.& W's preference for Italian Renaissance seen in arched windows, bamboo poles for veranda supports, and open, modern floor plan.

AMERICAN RESIDENCES 1850-1960

"Biltmore," Asheville, N.C., 1895 (R. M. Hunt). Based on early French Renaissance style of Francis I, especially Chateau at Blois. Archeologically correct and beautiful, but showy rather than livable. Superb example of Age of Elegance 1872–1913.

"Falling Water," Bear Run, Pa. 1936 (F. L. Wright). Rough local stone with cantilevered white concrete slabs for porches. Informal, flowing plan suitable to weekend retreat. "International style" clarity in planes contrast with vertical masses of native stone; organic relation of building to site.

Residence of Weston Havens, Berkeley, Calif., 1941 (H. H. Harris). Interior view showing how "inverted gable" ceilings give soaring relationship of interior to exterior; modern emphasis on intersecting planes with great attention to beauty of combinations of different materials.

Residence of R. M. Shainwald, Atherton, Calif., 1948 (Wurster, Bernardi and Emmons). Modern residence of great domestic charm; simple verticals and horizontals of fine proportion combine with sensitive use of wood and stone to relate exterior and interior living.

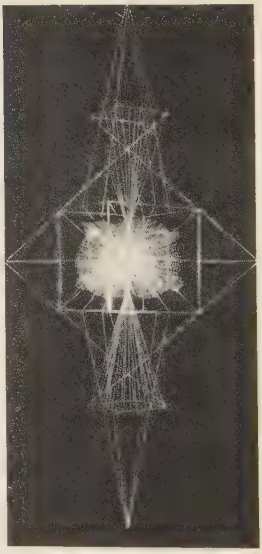
Left "Lobster Trap and Fish Tail" by Alexander Calder. Created in 1939, this is an example of mobile art. It is composed of steel wire and sheet aluminum. The mobile stands 8½ feet high and is 9½ feet in diameter. *Courtesy of the Museum of Modern Art.*

Right "California" by Hiram Powers, one of the leading American sculptors of the nineteenth century. This piece of art was created in Florence, Italy. *Courtesy of the Metropolitan Museum of Art.*

Below "Dancer and Gazelles" by sculptor Paul Manship. Suggestions of Greek sculpture characterize Mr. Manship's figures. In 1922, the American Academy of Arts and Letters elected Mr. Manship to its organization. *Courtesy of the Cleveland Museum of Art, John Huntington Collection.*

Left The "Two Natures," an allegorical work of art by George Grey Barnard in 1894. The artist is famous for his statues at the capitol building in Harrisburg, Pennsylvania. *Courtesy of the Metropolitan Museum of Art.*

Right "Variation No. 7. Full Moon" created by Richard Lippold in 1949-50. It is made of nickel-chromium wire, stainless steel wire, and brass rods. The figure stands 10 feet high. *Courtesy of the Museum of Modern Art.*



AMERICAN SCULPTURE

SCULPTURE

THE history of sculpture may be reduced to the development of the two figures, male and female. These appear among all peoples in the early stages of their worship and cults. They represent the qualities and attributes of Divinity divided and apportioned among many separate individualities, since the concept of a Supreme Being, a Great First Cause, cannot yet be understood. The symbolic figures progress in resemblance to human forms as the tools by which they are fashioned pass from rough to smooth stone and thence through bronze to iron.

Portrait Sculpture in Egypt. As in architecture the cabin of reeds and clay built in the Nile valley offers to the student the first structural type; so the sculptures in clay and wood of the Old Kingdom of Egypt (3400–2400) afford the beginnings of the art which they represent.

For many reasons, the most important extant example of such works is "The Sheik," a figure, now in the museum at Cairo, portraying a high official of the government. Its substance is wood, with the body and head of a single block, while the arms are carved separately and attached; the left one, since it is bent at the elbow, being formed from two pieces. As finished by the sculptor, this device was concealed by a thin sheet of the finest linen glued to the surface of the wood and itself covered with stucco, to which various pigments were applied. Still further to heighten the appearance of life, the artist did not leave the eyes "blind," but inserted in the socket cavities fragments of opaque white quartz with pupils of rock crystal, at the centers of which are highly polished bronze nailheads; the whole outline of the eyes being traced by narrow rims of the just mentioned metal. Realism and portraiture, it is plain, were the aims of the author of this figure, as they were also the qualities demanded by the authorities for whom he labored. But he attained his object and has been able, after 4000 years, to communicate with the descendants of his race. So permanent and accurate was his realism that, upon the excavation of the portrait statue of the official, the modern Egyptian peasants, as the features and the pose of the statue were revealed to them, exclaimed: "Sheik el Beled" (The Village chief)!

Of the same period there remain two other admirable pieces which, like "The Sheik," are self-explanatory—"The Scribe" and "The Dwarf." The former of the two, carved from limestone (colored red), is widely familiar, because of its conspicuous position in the Louvre, where it is observed by thousands of visitors, instead of being reserved for the enjoyment of the comparatively few travelers who exert themselves to study Egyptian art in its birthplace. The scribe is represented, as a specialist should be, in the exercise of his office. He is seated on the ground, with his legs crossed beneath his body. He holds on his knees a tablet, and his face is slightly lifted, as if he were receiving dictation from a person standing before him. Without the slightest claim to beauty, of uneven—in some parts of the crudest—execution, and in spite of the repellent Orientalism of its attitude, this figure is yet interesting to the modern eye. The face suggests a clear, receptive, and alert intelligence. It is plainly the portrait of an efficient accountant.

"The Dwarf Knemuhetep" is another primitive masterpiece. Carved from limestone, the disproportions of his ugly shape are reported with the faithfulness of a Dutch painter, but he is quite free from any flavor of the sinister, which is so pronounced in the portraits of dwarfs by the Spanish masters. The head is consistently and abnormally large, with a face expressing patience and determination. The subject of this admirable portrait was an upper servant of the royal household, perhaps the keeper of the linen, as has been suggested by the Egyptologists. His personality has been preserved through at least 45 centuries, so that it is still instantly comprehensible, the artist having pierced through a hesitating technique and attained a precision of statement rare even in periods of high development.

Egyptian Colossal Sculpture. Nor among the early Egyptians was successful portraiture limited to the representation of middle-class or humble subjects. The figures of the sovereigns were presented in awe-inspiring proportions, either standing or advancing or else seated in an attitude which suggested eternal, avenging, merciless, and immutable presences; the elevated spirit of art dissolving, as it were, the obstacles offered by the narrow mind and the limited resources of the artist. And not only do the statues in the round, of the Old Kingdom, awaken an admiration almost inconsistent with their archaic quality, but a similar emotion is produced by the sight of the contemporary relief sculptures. In these, the clear contours, the broad, slightly raised surfaces, and the vigorous action offer a pleasing stimulus which is afforded only by masterpieces.

Later in Egyptian history, under the building Pharaohs of the 18th, 19th, and 20th dynasties (1580–1150 B. C.), the desire for the colossal in sculpture prevailed at the court, as it did also in temple architecture. In fact, the seated figures of Rameses II, projecting from the rock-cut façade of the Temple of Abu-Simbel, nearly equal in height the tallest columns of the Great Hall at Karnak erected by the same Pharaoh. This taste, refined by its entrance into the Greek mind, prompted the creation of the gold-and-ivory statues of the age of Pericles (450–400 B. C.), and the very technique of the last-named works was developed from that of the bronze figures of the Egyptians, made by carefully fitting and fastening a thin sheet of metal to a wooden core. But this strong tendency toward display did not vitally injure the art of the empire, which, in spite of a certain lack of vigor and spontaneity, is to be regarded as the best produced in the long course of Egyptian history; since the expressions of the Ptolemaic period were Hellenized and those of the period of Roman domination were hybrids.

Mesopotamian Animal Sculpture. Among the peoples whose supremacy succeeded that of the Egyptians, the Mesopotamians—especially the Semitic Assyrians—excelled in the minor or decorative, rather than in the major, arts. They, although remaining primitives in the sculpture of the human figure, treated the larger animal forms with great impressiveness, as may be learned from the reliefs in stone of the 9th to the 7th century B. C., representing hunting scenes, and now in the British Museum. Of these, the finest example is the widely known "Wounded Lioness," with her body transfixed by a spear, and other javelins hanging from her flanks; with her hind legs useless and dragging, and the line of her back hollow, indicating that her spine is broken. The agony of the beast is noble and pathetic. Surely, the sculptor who portrayed it was among those from whom the 19th century Frenchman Barye learned his art!

One masterpiece of advanced modern spirit, such as this is, even were it not companioned by many others of equal merit, would atone for the archaic conventions long used by the Assyrians and copied by them from the Egyptians. Included among such devices is the eye seen as from the front, with the head in profile, and the introduction of a fifth leg in animal forms, so that, when viewed in frontal aspect, they might not appear to have but three. Yet again, it is only justice to add that these careful and childish provisions were no longer in force at the moment when the "Wounded Lioness" was created.

Finally, in order to distinguish between the methods of sculpture of the two most ancient

peoples whose art is yet today deserving of study, the remark of a French archeologist, M. Perrot, will suffice: "The Egyptians saw as through a veil; the Assyrians as through a microscope." Or, less figuratively stated, the sculptors of the Nile valley emphasized outline, which formulated itself in black against an atmosphere saturate with light; while the Assyrians in the misty Mesopotamian plain naturally observed the projections and depressions of objects and translated them into modeling.

From the Assyrian reliefs to the Hellenic Greek statues the passage is not one of time, but of place; since Ashurbanipal, or Sardanapalus, reigned at a period considerably later (668–626 B. C.) than that of the foundation of the Olympic games (776 B. C.).

Genesis of Greek Sculpture. From the moment of that great event the male population of the Greek world flocked every fourth year, in the late summer, to Olympia in the northwest of the Peloponnesus. There, the sight of the youthful, pliant bodies of athletes, seen in the most graceful exercises and poses, caused the rapid development of sculpture. Dorian centers of this art were created in the not distant cities of Argos and Sicyon. Thence, as well as from certain islands, went out figures, the earliest of which are classed under the one title of "Apollo types"; the god of light (intellect) and of music (rhythm—that is, law and order) being the patron of the Dorian race.

Simultaneously, on the shores of Asia Minor, on many islands of the Ægean, and on the mainland of Greece, another wholly different figure was developing. This was the female draped type, not, like the athlete, original with the Greeks, but showing resemblances to the cult statues of early Eastern peoples. In this creation, necessarily, the energy of the sculptor was concentrated upon the face and the drapery; the whole evidencing much more plainly than the Apollo type the evolution of the statue from the rudely carved tree trunk, which had served as an object of worship for earlier generations. The difference separating the two figures is a significant one and is paralleled by the other contributions of the Dorians and the Ionians to the remaining two arts in which the Hellenic Greeks excelled. For in each instance the former gave force, structure, restraint; while the latter refined the force of the opposite race, embellished structure, and, for restraint, substituted emphasis.

The earliest stone statues in the Greek world probably appeared toward the middle of the 7th pre-Christian century. And from that point of time down to our own day the history of sculpture can be followed as easily as the growth of a tree with widely divergent branches.

The Apollo Type. From the first, the Apollo type, that is, the Dorian statue, was conceived as walking. It suggested, rather than represented, a human form. The arms hung closely pressed to the sides and ended in hands clenched and presented in displeasing triangular form. The torso or trunk was flat, seeming to be the result of four views taken separately from the front, the back, and the two sides, and then clumsily combined. The neck gave the effect of a cylinder set on the shoulders, and was made thus heavy to avoid fracture of the stone through imperfect tools and unskillful manipulation. The face aggressively displayed widely opened eyes and a mouth of which the two lips followed the same concave curve, so producing the grimace known as the archaic smile; both of these effects being unsuccessful efforts on the part of the sculptors, who were endeavoring at once to follow nature and to master their chisels.

The Ionian Figure. In the Ionian type the pose was similar, but the figure was conceived as stationary, so far as may be determined from an archaic, fully clothed body and from the idea of a goddess presented in a shrine and demanding adoration. The drapery was interesting in its accurately defined, perpendicular folds, which, without doubt, represented the grooves of the bark in the tree trunk stage of the racial statue. Further, the texture of the drapery was indicated as that of a fine woolen fabric, a product of the looms of the East.

In the Ionian type the arms were not invariably both pendent at the side; one being sometimes laid on the breast with the hand holding a fruit or flower. As to the faces of preserved examples, they are coarse of feature, and they have the archaic conventions already noted in the Apollo statues. Also, as in the latter, the heads are set on the same columnar necks, and the hair similarly falls in strands on the breast or the back, in order to lessen still further the danger of breaking the stone.

Archaic types, such as those just described, are not earlier than the middle of the 6th century B. C. These, having lost their religious and symbolic significance, offer no interest today except for the deep student. They are mere links in a long chain of development. They were produced in a formative period of society, which ended in the almost fortuitous naval victory over the Persians, at Salamis, in 480 B. C.

After that decisive event in world history, as was logical, the rise of national consciousness tended to fuse together the differing types of Hellenic art. In sculpture, the Dorian and the Ionian influences acted reciprocally, and a new spirit came to inhabit and vitalize the bronze and the marble figures of the Periclean age. During the 80 remaining years of the 5th century, the Greek sculptors produced, almost exclusively, monumental types, such as were fitted to adorn the temples and served to foster the religion of the state.

Myron. Pre-eminent among these master sculptors are three, each of whom contributed to what may be termed the capital fund of sculpture. The oldest of the three, Myron, working largely in Athens, chose preferably the athletic figure, showing it set for action, but in the brief instant which precedes the act, or, in one remarkable instance at least, in the first overwhelming instant of defeat, with the muscles responding to the mental shock. Yet Myron did not seek to leave the spectator with an impression of violence. Had he done this, he would have been unworthy of his period and of Athens. The poses and gestures so emphatic in themselves, when accepted merely as parts of a whole, concur in the production of sweeping, contrasting, and harmonious curves, grateful and tranquilizing to the eye. Myron was above all else an accurate, profound observer of life and movement. In common with the architects of the period, he made his eyes his chief instruments. As the builders scorned the use of the compass, so did he, without ever having dissected, render the play of muscle with a precision that has never been surpassed. Judging him correctly, the ancient critics wrote: "Myron gave *anima* (the appearance of life) to his statues, but he failed to give them *animus*," that is, the suggestion of mentality. The decision still stands, affirming the admirable qualities and recognizing the limitations of the man who may with propriety be called the first world sculptor.

Phidias. The second who deserves the same title was Myron's contemporary, Phidias, the close friend of Pericles, and the director of public works at Athens. Master of both bronze and marble, as also, on occasion, in gold and ivory, he possessed the rare ability of treating with equal success the male and the female figure. More distinctly Ionian than Myron, he usually presented majestic, clothed figures, standing at rest; expending his artistic energy upon the head and upon the drapery, considered both as mass and as texture. But, since it is from Greco-Roman copies, more or less remote or debased from the originals, that we know his single statues, we have no means of judging his quality of linking "the human with the Divine," as it was described by the observers of antiquity.

The Parthenon Frieze. However, we may form a direct opinion of this master's power of composition from the partially destroyed processional frieze which surrounded, like a tapestry, the exterior walls of the Parthenon. It was intended to be seen by the visitor who followed it either by walking around the pteroma (passage between the columns and the wall) or by looking through the spaces between the columns themselves; his position, in the latter case, being at a point more than 40 feet below the sculptures. Of its special class, this frieze is the most successful example ever produced. Its problem was to join fast and slow moving bodies of human figures and animals in unbroken sequence, and, also, to reach a climax over the eastern entrance, through which access was obtained to the statue of the patron goddess, Pallas Athena.

To accomplish this result, the festival procession was divided at the northwestern angle of the temple; one division moving across the western end and up the northern side, while the other paralleled its passage along the southern side; the two going forward to meet the company of the Olympic council of the gods seated in calm dignity above the principal portal. As participants in the procession, youthful knights are represented, now tying a sandal, now restraining a restive horse, again cantering or in full gallop. Then, crowned victors of the great games are seen advancing proudly in their chariots; following are old men and aliens bearing tokens of their submission to Athens; cattle to be sacrificed, sent from the colonies to the mother city. Here we see aristocratic young girls who had embroidered the mantle of the goddess, to be dedicated on the day of the ceremonial; lastly, there are the frequently recurring marshals and magistrates, whose gestures act, so to speak, as modulations between each two differing units.

One such personage marks the beginning of the procession and, by his gestures of head and arms, invites the youths nearest him to follow the bodies moving along the southern side, although they evidently belong to the company of horsemen gathering on the western end, who will eventually pass northward. Similar gestures effect the transition between the rearing, bounding horses of the knights and the dragging chariots. The pose of the marshal at this point indicates that the horsemen must further accelerate their pace—a subtlety which deflects momentarily the attention of the observer and maintains his interest in the procession, even though the climax of movement be past.

This subtlety of composition was equaled by the fineness of technique. Further, calculation was made to assure the visibility of the design from below and under reflected light, by deeply incising a line around the lower portion of the figures and by making the relief greater at the top than at the bottom, although at no point did it exceed the depth of one and a half inches; while the height of the frieze was slightly less than three and one-half feet.

The Parthenon Pediment. Beyond all doubt, the design and, in part also the manual work of Phidias, the processional (Panathenaic) frieze has ts peer in the composition of the eastern pediment or gable of the Parthenon. Here, too, the artist, defiant of established rules, plays with difficulties: setting the statues toward or away from the axis, as he wills; but, by the force of his genius, attaining a rhythm as clear to the mind of the student, as if it were beaten out by the baton of an orchestral leader. In point of mere execution, this pediment far exceeds the frieze. In the group wrongly styled the "Three Fates," it contains the finest draped statues of antiquity, and, in the carving of the horses' heads of the chariots of "Day" and "Night," delicacies of texture, such as may be detected only at the closest range of vision and by touch.

The works just described should be regarded as those determining the rank of Phidias among the sculptors of history. But his fame, as it is affirmed in popular oratory, rests upon his two decorative statues of Zeus and Pallas Athena, intended as cult objects, of colossal proportions, and formed from gold, ivory, and precious stones, applied upon a wooden core. After some thousand years of existence, these figures disappeared, but their types of countenance are still renewed in every modern drawing whose author seeks to present the idea of supreme power or of wisdom under an austere and noble aspect.

Polyclitus. Thus enriched by Myron, who gave vitality to his figures and an inspiring eloquence to the represented action of muscle, and enriched still more amply by the monumental works of Phidias, the art of sculpture advanced to further development by Polyclitus.

The last-named master, younger than the other two, seems yet to have reached his artistic maturity midway in the 5th century B. C., and he is known to have had an exceptionally long career. He was typical both as a Greek and as a Dorian. As a Greek, he sought perfection within a narrow frame, choosing to repeat proportions and poses with a uniformity which, except for his skill, would have been monotonous. As a Dorian sculptor, he naturally treated the athletic male figure; developing the traditional "Apollo type" into such statues as his "Youth with the Fillet" (*Diadumenos*) and his "Lance Bearer" (*Doryphorus*), the latter of which was an epoch-making work. In fact, it illustrated perfectly the principles to the elaboration of which Polyclitus devoted his life, and he gave it the name of the "*Kanon*" (Law), in allusion to his own table of anatomical proportions. These he studied after the manner of an architect of his own race, with the result that the "Lance Bearer" can be compared to a Doric temple, in all that concerns the adaptation of parts to a given whole, constructed upon a unit of measurement. For Polyclitus, this unit was the head, which he made one-seventh the height of his figure, precisely as the semidiameter of the column employed had been accepted as a constructive gauge for the temple.

Innovations of Polyclitus. But the chief interest of the figure does not lie today in the more or less academic question of proportions. Instead, it resides in an innovation which, as now regarded, carried Polyclitus to a position equal to that of Phidias, as a sculptor (not of course as a master of composition), and, perhaps, even to a higher level. Abandoning the traditional pose, the Dorian master threw the weight of the body upon one foot; thus creating a contrast between the two sides, emphasizing on one the contracted and supporting muscles and, on the other, those which were supported and elongated. The right leg was thus made to resemble a column, upright and firm; while the left, bent at the knee, offered a pleasing curve, and the toes of the raised left foot grazed the ground.

This pose, also adapted by the sculptor to the female figure, as in the "Wounded Amazon," was the principal legacy of Polyclitus to his art. A secondary contribution, and one permanently valuable to students, was his practice of breaking his muscular structure into large, clear, and distinct masses, grateful to the eye and conducive to the quick grasp of the sculptor's meaning by the observer. The same treatment he extended to drapery, which, as a Dorian, he used very rarely, and never indicating the texture, woolen or silken, as was the custom of Ionian artists.

Nor were athletes and maiden warriors his only themes. In his old age, he turned to the gods, leaving as the chief accomplishment of his second manner the colossal gold-and-ivory statue of Hera (Juno), seated on a throne and wearing a crown adorned with figures of the Graces and the Hours. This work equaled in richness of material the Zeus and the Athena of Phidias, and it was as highly esteemed as they by the critics of the Periclean age. It fixed for all time the features and the figure of the

consort of Zeus, such as we know them through the statues and medals of the Roman Empire and the period of the Renaissance.

The beginning of the 4th century was marked by a lessening of restraint in Hellenic life, under whatever aspect it may be regarded. In sculpture, the masters of the two contributing races had already given the impetus and direction which the younger enthusiasts followed without question. Again two Ionians and one Dorian distinguished themselves above all their contemporaries, creating masterpieces whose charm cannot wither.

Praxiteles. The name of the first of the three, the Athenian Praxiteles, recalls the marble "Hermes," discovered during the excavations conducted in 1876 at Olympia, under the auspices of the German government. This, a statue of the utmost distinction, is, in fact, a natural evolution from the Dorian figures of Polyclitus. But it is the work of an Ionian artist whose preferred medium was marble, instead of bronze. The pose, that is, the disposition of the weight, is merely emphasized by causing the figure to lean on a support, like a pillar or tree bole, in order to obtain an undulating line and a greater contrast between the two sides, one of which now presents a strong convex and the other a deeply concave curve. The face reflects the intellectual and social culture of Athens. The glance is meditative, bespeaking elevated thought, and concurring with the physical pose to awaken immediately in those who stand before it a sense of tranquillity, like that which is secondarily produced by the "Discobolus" of Myron, but more intimate and more rarefied.

Of the female figure treated by Praxiteles numerous reflections and reminiscences remain; the most trustworthy being variants of the "Aphrodite (Venus) of Cnidus." For the goddess, the sculptor used a pose similar to that of his "Hermes" as to the torso and lower limbs, which entailed the extraneous support, but gave a different position to the arms. He heightened the sensuous appeal of the face, as befitted the subject. But, while making the head admirable in construction and outline, he omitted the slightly projecting bar of muscle which accentuated the brow of Hermes; purposing by this omission to diminish the suggestion of intellect and thoughtfulness.

This statue and that of "Eros" (Cupid), similarly conceived, were held in antiquity to be the masterpieces of Praxiteles. The "Aphrodite of Cnidus" especially became the parent of a long series of derivatives, of which the Vatican statue of the same title is, perhaps, the most faithful to the nonexistent original. Another example is the "Bathing Venus" of the Capitoline Museum, Rome, and a third, the universally known "Venus de' Medici," now in the Uffizi Gallery, Florence.

The last-named would appear to be a Roman work of the 2d Christian century, which, while retaining certain qualities of the Praxitelean type, displays aggressively the affectation and falsity of the empresses and the imperial favorites of that period. An additional blemish upon the beauty of this Venus is made by the forearms and hands added in the 17th century by the architect and sculptor Bernini, who copied the excessively tapering fingers of some mincing aristocrat received at the papal court. Apart from these flaws, the "Venus de' Medici" is an invaluable example of classical art. The undulations of its modeling were a source of the deepest delight to the great French sculptor, Auguste Rodin, who used the figure as a proof that, contrary to the general belief, the Greeks did not limit themselves to the rendering of the essential and the typical; but, at the climax of their civilization, presented, in all forms of their art, individuality and detail, according to the demands of their chosen subjects.

Scopas. To the school of Praxiteles, with its contemplative figures radiating the joy of living, that of Scopas stood in direct contrast, portraying tragic incidents and climaxes of enthusiasm' although none of these lacked the truly Greek quality of restraint. The master of the new movement, although presumably a native of the island of Paros, seems to have studied first in the Peloponnesus, where he is known to have executed the pediments of the temple of Tegea, one of which represented a battle and the other a heroic hunting scene. Of these two compositions, each of which contained 15 figures, there remain fragments of compelling interest. These are heads massive in structure and breathing a sentiment unknown in previous Hellenic sculpture. They are inclined upward, with the eyes made short, round, and having above them a projecting muscle, which rolls about the outer corners. In observing them, one cannot but recall the tragic playwright Euripides, who, less than 50 years earlier than this work of Scopas, had introduced into Greek drama characters human and pathetic, which are modern because they are universally significant. A different passion, rising from the practices of nature worship, was also portrayed by Scopas, in his figure of a mænad (maiden votary of Bacchus), which is known from a copy in small proportions preserved in Dresden. From the statuette may be developed in imagination the larger figure, with the backward strain of the legs, torso, and, above all, of the neck, which causes the head to lie in an almost horizontal line. This pose, it must be admitted, did not originate with Scopas. It was traditional in Greek art, and probably first appeared in vase paintings long prior to the 4th century. But in these the intention was purely decorative, so that the figure was merely mapped out in flat, black blocks on a smooth, light background. The rudimentary suggestion does not detract from the elaborated figure or even from the inspiration of the sculptor who conceived it in such evident ecstasy of spirit.

In the most monumental labor of his career, the royal tomb of King Mausolus at Halicarnassus, Asia Minor, Scopas was associated with three other sculptors of great reputation. This information, together with a description of the structure, was given by the Roman writer, Pliny the elder (died 79 A. D.), whose statements are too general to be adapted to the remaining mutilated fragments. But among these are blocks from a frieze representing battles of Greeks with Amazons, which have, to a degree, the emphasis and the exalted quality of the "Mænad" of Scopas. The same characteristics are apparent also in the dignified portrait statue of King Mausolus, treated correctly as a non-Hellenic type, with beard, long hair, and distinctive robe.

The Niobe Group. Thus it will be seen that at the middle of the 4th century two schools of sculpture, equal in advancement and refinement, but of opposed sentiment, were active in the Greek world about to be extended by the conquests of Alexander. Their influences mingled to produce the interrelated figures interpreted as "Niobe and Her Children," a work in which the emotional power of Scopas is joined to the incomparable Praxitelean line. Among these figures is that of a youth in profile, with his body, from head to extended right foot, making a single, sweeping curve. His right forearm and hand are enveloped in drapery, projecting far beyond his brow: a device used to create an emphatic shadow, which reappears in Michelangelo's "Thinker," as also in a modern figure of "Grief," by the American sculptor, Augustus Saint-Gaudens.

Lysippus. In observing the results of the mingling of the Praxitelean and Scopian schools, we have passed the limits of the 4th century. But a return must be made, in order to note the influence of the Dorian master, Lysippus, who became the court sculptor of Alexander the Great. As the heir of the traditions of Argos and Sicyon, he excelled in the portrayal of the athlete. He was, in fact, a reincarnated Polyclitus who, working under new conditions, produced a new ideal figure, more slender, more sinewy, and with smaller head than the "Lance Bearer" of the earlier sculptor.

Like his great predecessor, Lysippus preferred bronze to marble, according to the traditions of his school and as better showing the relations of the muscular to the bony structure of the body. In that metal he wrought exclusively, from a figure of Zeus, 60 feet in height, to a statuette of small proportions. But none of his original works has survived until the present day, although several of them were standing in the public squares of Constantinople at the beginning of the 13th Christian century, when the doge, Enrico Dandolo, having seized the city, sent them to the crucible, that he might coin them into money wherewith to pay his soldiery.

In marble, however, the "Youth with the Strigil" of the Vatican museum, until recent years, was believed to be a very close, if not a studio, copy of the masterpiece of Lysippus. But this error was rectified from a discovery made by the French, at Delphi, of a series of marble statues known to be replicas of bronze originals in Thessaly, one of which bears on its base the name of the pancratiast (wrestler and boxer) Agias, as also that of the sculptor Lysippus. It is, therefore, upon this figure, rather than upon the "Youth with the Strigil," that an acquaintance with and estimate of the Dorian master must be based. In the "Agias" the muscles have a more even flow, as if observed from the exterior by a sympathetic artistic eye. In the Vatican figure they are rendered with a knowledge which savors of the dissecting room and is characteristic of the decline of Greek art.

These athletic figures strongly influenced the sculptors contemporary with Lysippus and still more strongly those who followed him in the Hellenistic (declining) period. But during his lifetime his peculiar prestige was due to his position at the court of Alexander, and it is principally from his portrait statues and busts, through many replicas and variants, that we derive our knowledge of the features of the youthful conqueror.

The Dying Gaul. Lysippus was the last of the six great masters; the minority in numbers being on the side of the Dorians, although possibly not the lesser excellence and influence. For, if the school of emotion and passion produced, after the death of the major artists, the "Niobe Group" and, as well, the "Victory of Samothrace" vibrant with windswept motion and poising as if her wings were of feathers rather than marble, these masterpieces did not stand alone. Out of the first school of Pergamum, Asia Minor, at the middle of the 3d century B. C., came the figure of the "Dying Gaul," Lysippan in type and technique. Noble and restrained, although representing death agony, this statue, as it is treated, shows its descent from the great art of the two preceding centuries. It was created at the order of King Attalus I, who shared in the distribution of Asia Minor among the successors of Alexander. And its purpose was to commemorate the king's victory over the predatory Gauls who had harassed the Mediterranean countries for more than a century. As presenting death in a cruel, physical aspect, and as conducive to sentiments quite different from those evoked by the pediments of the Parthenon, or even by tragic works with death imminent, the "Gaul" belongs to a declining civilization. But the sculptor has given to the face, to the pose of the head, and even to the action of the muscles, a reflection, as it were, of supreme fortitude.

Altar of the Gods, Pergamum. Another work of the same school, and later than the "Dying Gaul" by a half century, continues the superb Dorian technique, while, at the same time, it carries passion to the maddest paroxysms of violence. This is the frieze of the "Altar of the Gods" at Pergamum, which was discovered by German excavators late in the 19th century and is now in the former Kaiser Friedrich Museum, at Berlin. It is a continuous series of relief sculptures portraying battles of gods with giants. These scenes are artistically infinite in variety, and they display all the resources of Hellenic sculpture; ranging in type from the most dignified to the ultra grotesque, and including nearly every deity and every monster known to classical mythology. The finest of the blocks represent Zeus and Pallas, evidently developed from Phidian concepts, and each in conflict with a misshapen giant. The subjects reflect the turbulent, irrational spirit of a period following upon decisive wars. But the composition and the execution have the incomparable beauty attaching alone to Greek masterpieces.

The highest qualities of this work are rightly placed emphasis and the suggestion of rapid motion, a combination which a French sculptor of the 19th century presented, with the same superb results, in a strangely similar composition. The latter is a relief executed on one of the eastern piers of the Napoleonic Arch of Triumph, Paris. But the modern artist, François Rude (1784–1855), cannot be charged with imitation, since he died more than 20 years before the discovery of the Greek marbles.

Laocoön; Farnese Bull. The frieze of the "Altar of the Gods," produced toward the middle of the 2d pre-Christian century, shortly before the reduction of Greece to a Roman province, had few worthy successors, since the once highly praised "Laocoön" and the "Farnese Bull," dating from approximately 100 B. C., cannot be counted as such. The first of these is a work of the school of the island of Rhodes; the second, of that of the city of Tralles, Asia Minor; each of them presenting an act of vengeance and a revolting scene of torture.

Venus of Melos. But consolation and atonement for such brutality exist in a statue belonging to the time which has been called, not inaccurately, the "Autumn Days" of Greek art. This is the "Venus" or, better, the "Aphrodite," discovered a century since by a peasant who was digging a well on his own holdings in the island of Milo (Melos). To the critical estimate of this figure, Furtwängler, a high modern authority, devotes much space in his *Masterpieces of Greek Sculpture*. He believes it to date from about 100 B. C.; describing it as the production of an artist who had studied the works of his great predecessors, and who, with a rare selective power, combined their best qualities into a figure of more than human beauty. The critic further observes that, had the "Aphrodite" belonged to the 5th century, she would have been fully draped, like the statues of Phidias; that in the 4th century she would have been wholly nude, like the figures of Praxitelean type; but that by being partially draped, without emphasis upon the texture of the draping material, she evidences a master who lived late in the course of Hellenic art—indeed at the very end of its independent course. Finally, Furtwängler, in assigning her, by reason of pose and countenance, to the victorious Venus type, places her in a long series of variants from a lost original by Scopas. This argument is worthy of consideration, at least, and that the "Venus of Melos" is a "Victory," rather than an "Aphrodite," appears credible. Especially does this seem true if one recalls the silver bronze statue in the museum of Brescia, also a "Victory," which embodies an ineffable virginal charm, and appears to be a younger sister of the "Venus of Melos."

The figure at Brescia is the chief treasure of a small collection of objects of art and archeology, salvaged from the ruins of a temple dedicated to the emperor Vespasian (69–79), who established at this point of Italy a Roman colony on lands taken from a Celtic tribe.

It is regrettable that these statues capable of awakening fervent emotion should not have been the only ones to mark the end of Hellenic sculpture. Yet, they, in their small number, are able to compensate the lover of art for the many decadent and vicious products of their times; while, beyond all doubt, they themselves stood on a level with the masterpieces of the 5th and 4th centuries.

Transition to Rome. This hybrid art, properly called Hellenistic, with its excellences and its great defects, gradually transferred its seat in the Greek world to the single city of Rome, after Corinth had been seized by the consul Mummius, and Greece politically had ceased to be (146 B. C.).

When established in Italy, the Greek art came into contact with the Etruscan, in which Phœnician influences were blended, especially in all that concerns the technique of bronze. In this metal the native artists executed their public statues, such as the dignified "Orator" (preserved in Florence) draped in mantle and tunic, with his right hand and arm raised in exhortation. For family tombs, they employed stone, often placing on the covers of the sarcophagi or coffins figures resting on one elbow, as if they were reclining at a banquet. They also produced in terra cotta much sculpture in relief and in the round, destined to embellish the pediments and the roofs of temples which they built for the Romans, such as that of Jupiter Capitolinus, widely familiar through illustration.

Sculpture under Augustus. As in architecture the Roman style grew out of the union of the Greek with the Etruscan, so from these same elements Roman sculpture developed. The latter, under Augustus (27 B. C.–14 A. D.), became an official art, the object of which, like that of the Egyptian graving, was to glorify the emperor. Consequent upon the utter destruction of Carthage and the fall of Corinth, both of which events occurred at the middle of the 2d century B. C., Rome became the crucible in which all peoples were fused together. The majority of foreigners in the capital were slaves, with among them many literary men and artists, who served their masters devotedly in the hope that some exceptionally successful effort on their part might give them freedom. At the same time, the Roman poets were glorifying, in measures founded upon Greek prosody, the one-man power that had replaced the republican form of government. Therefore, the *Æneid* of Virgil, the *Carmen Sæculare* of Horace, and the Vatican (*Prima Porta*) statue of Augustus in armor intone the same hymn of praise.

This last work betrays what might be termed a *petrified* Greek manner. The figure is of heavy proportions and the pose labored and awkward, if compared with that of Greek masterpieces. Further, the narrative ornament of the armor, although beautifully carved, dulls the effect of the *ensemble* and would have been rejected from the design by Hellenic sensitiveness. Yet the statue is dignified and imposing. It must have afforded an intimate satisfaction to the people for whom it was a symbol. The gesture of the uplifted arm would seem to accompany the lines of the *Æneid*:

> "Remember, O Roman, to rule the nations with thy power! These shall be thine arts: to create the permanent habit of peace, to spare the subdued and to defeat the haughty."

The same spirit appears in the Altar of Peace, erected by Augustus, which is interesting to the art student because of its processions in relief treated in different planes, as are those of the Panathenaic frieze of the Parthenon.

The Arch of Titus. Both artistically and historically however, the sculptured reliefs of the Altar of Peace yield to those of the Arch of Titus, finished in the closing years of the 1st Christian century. In these the imperialistic propaganda is seen at its climax. The sculptures occur in two opposite panels beneath the vault of the archway, and the interest of each composition is strongly centralized with a view to political and moral effect. No spiritual triumph is here chosen for portrayal like the victory of a Greek over a bestial centaur. In its stead there are war, pillage, and desecration. In one panel the emperor stands in his quadriga, attended by Victory. In the other the Romans are bearing away from the altar of the Temple of Jerusalem the sacred seven-branched candlestick. However, from the point of view of technique, these panels contain admirable features. The relief is so treated as to give an impression of space and air. The pulse of the observer is quickened by the implied resistless advance of the horses. But the artist failed in perspective, since, in the one panel, the four aligned animals move at right angles to the emperor's chariot, and in the other composition the soldiers are directed toward the side, rather than to the entrance, of the arch.

The Column of Trajan. In common with these reliefs, the spiral, sculptured bands of the Column of Trajan (98–117 A. D.) offer enlightenment in history, but of a nature quite different from the species presented in the Arch of Titus. Winding like a ribbon about the column (the height of which is 140 feet), scenes illustrating the Roman conquest of the Danubian regions show in detail the landscape, the races of men, the military and domestic customs there existent. In these subjects—and quite correctly—natural proportions have been destroyed and everything, except the figures, reduced to the minimum in size and detail. This treatment, which has been named the "continuous style" and is adapted especially to bronze, has been frequently used in modern times, and most successfully, perhaps, in the Colonne Vendôme, Paris.

Roman Portrait Sculpture. In another branch of sculpture, that of portraits—figures and busts—the Roman artists gained distinction. There remains today a varied series of imperial likenesses, reaching from Julius Cæsar to Constantine and including many of the empresses and favorites, which corroborates written history. No visitor to the galleries of Rome can possibly forget the typical Latin (brachycephalic) head of Augustus, the lustful face of Agrippina the younger, and the swinelike mask of Caracalla.

Symbolic Sculpture. From the works of the decadent Empire of the West, sculpture passed into another phase, the symbolic, consequent upon the new ideals of Christianity, the barbaric invasions of Italy, and the Oriental influences emanating from Constantinople.

In the 8th century, figure sculpture in the round virtually ceased to be practiced, through the decree of the emperor of the East, which forbade the use of images in worship and commanded the destruction of those then adapted to such purposes. This decision was to a greater or less degree opposed by successive popes, but marble and bronze were largely discarded as artistic materials. For these, ivory was substituted, in which plant forms, birds, and monograms, all of symbolic meaning, were carved in relief and most delicately upon sheets or plates of slight thickness. The ivory was afterward applied to a foundation of wood, in order to form chests, chairs, and missal covers, examples of which are still extant in Byzantine centers like Ravenna.

As a result of the controversy between the Eastern and Western churches, thousands of Byzantine craftsmen passed into Italy, where they worked side by side with crude artisans of untamed spirit, as is evident in the Basilica of Saint Mark, Venice. There capitals of almost melon shape with finely undercut netlike ornament may be contrasted with others which issued from the hands of clumsy semi-barbarians. But it is emphatically in the cathedrals of Parma and Modena and in Saint Michael's, Pavia, that Italian Romanesque sculpture, 5th to 11th century, shows itself to be reduced to a system of animal symbolism.

Sculpture Tributary to Architecture. This decline and transformation of sculpture, verging even upon the semblance of death, was but a season, like winter in the natural world, justifying Robert Browning's aphorism, "Decay is richer life." When the year 1000 had passed without bringing the long announced destruction of the world, Christendom

wakened from its lethargy, and churches multiplied throughout western Europe. Architecture, which, as necessary to human existence and to worship, had never ceased its activity, called sculpture to its service. The latter art became, as it were, the qualifying adjective of the former.

In France, where the questions of structure were most deeply studied, a long line of heavily draped, bearded figures, wearing crowns, were deployed across the façades of cathedrals. Again, other figures, with heads projected against great disks which proclaimed them to be saints, were aligned on the sides of monastic cloisters. Architecturally, they served to emphasize the horizontals of the building on which they were seen and so gave the appearance of solidity to the design.

Similar figures, always accompanied by special attributes, such as the picturesque miter and staff of the bishop, followed the moldings (archivolts) of the faces of the arches. These moldings were placed one behind the other (recessed), sometimes to the number of seven, and the arch head itself rested on a great pier, the face of which was thrown back at the same angle and was carved on its upper half with closely set figures. Those of the moldings stood within delicately chiseled shrines, with the whole scheme of ornament obedient to the structural lines; so that, while the first members of the series were upright at the springing of the arch, they inclined inward as the curve contracted, until the upper figures were rendered at an improbable inclination. In the 12th and 13th centuries, sculpture was truly the handmaiden of architecture and virtually without a separate existence. Its function was not purely æsthetic. Through its agency the cathedral front was a pictorial Bible, an open encyclopedia before the age of printing. There were offered the stories of the Creation and the Redemption, the genealogy of the Virgin, the procession of the seasons, the signs of the Zodiac, and, most frequently, above the principal portal, the terrors of the Last Judgment. Sculpture then concurred with the pulpit and the liturgical drama to instruct and direct the illiterate.

Influence of Medieval French Sculpture. In the Latin countries the art struggled to resume its independent position, the attainment of which the student is pleased to follow from the blunted contours of a Romanesque relief to a statue in the round. And, while the first successes were unavoidably obtained by Italians, the Abbey of Saint Trophime, Arles, and the cathedrals of Paris and of Chartres contain most valuable examples of progression.

In the first-named edifice, the figures of ecclesiastics show a flat, blocklike, angular modeling, a Byzantine elaboration of details, a lack of suggestion of skeleton or flesh beneath the drapery, an absolute *stoniness* of rendering. At Chartres, another body of sculptors, as if they had discarded a formula of production, recorded their perceptions of persons and things in a rounder, softer, more detailed modeling of bare forearms, hands, and faces, and in a simpler, more truthful presentation of fabrics and folds. Still more vitality appears in the beautifully calculated statue of the Virgin in the porch of the northern transept of Notre Dame, Paris. Although yet, beyond denial, an adjunct of architecture, this statue marks the renewed independence of sculpture. The figure is no longer perfectly upright, with shoulders level to assure the vertical fall of the drapery. Rather, one knee is slightly bent, one shoulder lowered, and the cloak so disposed as to give on one side a swelling curve, which is finely emphasized by the severity of the architectural support made very assertive on the other. In consonance with the subject, the face of this statue, framed in crown and wimple, expresses a sympathy, a sweetness, and a fortitude that Hellenic sculptors could not give and that would not have been fitting to the countenances of their divinities.

As a whole, the architectural sculpture of medieval France surpassed that of Germany and Spain, and in many cases the first-named country lent its workmen, as well as its inspiration, to its neighbors of the east and of the southwest. But, in the study of the work of the 11th and 12th centuries, too much stress should not be laid upon the imitation of French work by the Germans, since both peoples then derived much of their art from the Neo-Greeks or Byzantines. Later, since the Germans, satisfied with their fine Romanesque, did not themselves develop the Gothic, they accepted from the French, not alone structural principles, but also the ornament which so well harmonized with them. To a certain degree, the same statement is true of Spain. Into that country French influence spread through immigration and through the transference of bodies of Burgundian monks (Cluniacs and Cistercians); so that Spanish Romanesque, as well as Spanish Gothic, reflects in its accompanying sculpture the skill in composition, the dramatic power, and the poetry possessed by the artist masons of France.

Of the Romanesque, the finest Spanish example exists in the portals of the cathedral of Santiago (Saint James) de Compostella (Gallicia), signed by a certain Master Matthew in 1183 and recalling the porches of Chartres and of Vezelay. The subjects portrayed in this great work are the 4 evangelists, the 24 elders of the Revelation, the Tree of Jesse (genealogy of the Christ), scenes from the life of the Savior, and the Last Judgment, all of which were later treated by Gothic and Renaissance sculptors with more delicate but not more expressive chisels. Among Spanish works dating from the 13th century, several portals of the cathedrals of Burgos and Leon show the purest French influence of the period. In the second of the two buildings especially, the figures stand clearly detached one from another, with a considerable intervening space. The anatomy is felt beneath the churchly vestments, but with no suggestion of the swollen abdomen or leg muscles so prominent in German work of the same age, as in the choir of Saint George, Bamberg, Westphalia.

Medieval English Sculpture. Of the architectural sculpture of medieval England we possess less extended and detailed knowledge. Originally less important than in France, partly because of the relatively secluded situation of the monastery-cathedral, it suffered in the 16th century from the bitter dissensions between the historic and the reformed Church and, in the 17th, from the fury of the Puritans. Nevertheless, in spite of wanton destruction, much beautiful material remains at Canterbury, Lincoln, Exeter, and Wells, and at other points of the island. These examples illustrate the exterior use of statues made by the English, as differing from the custom prevailing on the continent, where recessed portals were usual. On the façades just mentioned, the figures are ranged in rows, but not as in the French "gallery of kings" to emphasize horizontal effect. Instead, each is set beneath a hood and in a niche or tabernacle contained between two projecting perpendiculars either rounded or angular. Then, since in a porch composition the rows of figures are superposed, sometimes to the height of four stories, the perpendiculars are continued from base to cornice, and the whole assumes the character of a magnified reredos, on altar back, erected in the open air.

Sculpture Independent in Italy. Thus, to the north of the Alps, sculpture continued to be an accessory art until the end of the first quarter of the 16th century. But, early liberating itself from architecture in Italy, it there progressed continuously, until, while the Valois kings were reigning in France and the Tudor sovereigns in England, it attained spiritual and emotional qualities which it had never before evidenced.

The anatomy of the human figure attracted the early Italians as the inheritors of the classical tradition, but it was not until the end of the 14th century that this branch of instruction was given forth from the University of Bologna. With the revival of

pagan learning, the presentation of the nude became more and more frequent, until the last years of the 15th century, when, through the influence of the Dominican, Savonarola, it received a temporary check, affecting painting only.

Throughout the Renaissance the sculptural nude alternated with draped figures, which were appropriate to certain biblical and historical subjects. Yet, early in the 15th century, in the work of the Sienese, Jacopo della Quercia (1371–1438), the figures of "Adam and Eve" in the nude are much more agreeable to the modern eye than is the same sculptor's archaic Madonna swathed tightly in the twisting folds of her mantle.

Donatello's "David." The next stage of advancement is apparent in the "David" of the Florentine Donatello (1386–1466), the sculptor whose great influence upon modern art has been second only to that of Michelangelo himself. In this bronze statue, the pose is Praxitelean Greek, with the head of Goliath supplying the place of the tree trunk in the "Hermes," the "Faun," and other antique works. But above the hips the figure ceases to be stylistic. The torso, the attenuated arms, and the face are those of a scantily nourished Tuscan peasant; the straw hat and its garland of vine leaves adding the last realistic detail. As a composition, the "David" is disappointing through its lack of unity. On the contrary, it incarnates the working principle of Donatello: "One should labor always with the antique in mind and the living model before the eye." And further, between the beginning of the 6th and the middle of the 15th century, the "David" was the first statue to be executed wholly in the round and free of architectural setting.

Just as painting developed in Italy, so sculpture advanced in a straight, progressive path for more than 200 years—from Niccola Pisano (1206?–78) until the death of Verrocchio (1435–88). Its course—which may be compared to that of an impetuous river ending in a delta—was then deflected and weakened by Michelangelo (1475–1564), whose genius in this one art was immeasurably superior to that of all other Italians of the Renaissance.

Michelangelo. Rising from the virile school of Donatello, Michelangelo first revealed his own genius in the "Pietà," or group representing the Virgin supporting on her knees the dead Christ, which he finished during his first residence in Rome (1496–1501). Open to criticism in the disproportionate size of the two figures and the archaic complication of drapery, this work is yet pathetic and powerful. Further, the rendering of the cadaver evidences accurate, impassioned study, differing from the Greek in being founded upon dissection rather than upon observation.

But this group, while profoundly emotional, is self-explanatory and strictly traditional. The latter comment applies also to the following major work of the young sculptor, the "David," which is a freer, more modern interpretation of the adolescent male than the still rising Italian art had yet been able to produce. To the same period is to be attributed the lost cartoon of the "Battle of Cascina."

Thus far had Michelangelo been constructive in his art. As he approached maturity, his genius turned aside to enter a new path wherein no sculptor could follow him without loss of mental poise. Struggling with heavy personal griefs, but titanic in power, he expressed himself in the "Moses," the "Slaves," and the "Thinker," and in the "Day" and the "Night." The name, "The Thinker," a translation of *il Pensieroso*, was given to the statue of the Duke Lorenzo de Medici in a thoughful pose.

"Moses".—The first of these statues, which has been alternately ridiculed and ignorantly praised, is not wholly an enigma. As a man of his century, Michelangelo confused classic and Semitic archeology. For the head of the supreme Jewish lawgiver he chose a modified Phidian Zeus, emphasizing the lionlike frontal locks and adding the beard of a Roman river god. The lower drapery of the figure he imitated from the statues of barbarian kings on the Arch of Constantine; while the torso, arms, and hands have immortalized those of some humble man of toil who served as a living model. Such is the genesis of the "Moses," from the point of view of its physical proportions. As to its informing spirit, it sprang from the godlike, travailing brain of Michelangelo in an effort which could not be repeated or imitated by artists of weaker imagination.

"Slaves" and "Thinker".—The element of grotesqueness, undeniably present in the "Moses," is entirely eliminated in the "Slaves" and the "Thinker." In rendering the former figures, Michelangelo forgot all save to make them artistically expressive. Swerving aside the torso, he drew the legs together and bent them forward in order to produce deep shadow and also an effect of struggle quite unwarranted by the slight band which either girdles the body or binds the arms behind it. The "Slaves" mark a new period in the history of sculpture, in which some psychic process is implied in the statue presented. The men of the Renaissance had opened for their own higher necessities new worlds of matter and of thought. To these men the concepts of Michelangelo's maturity made their appeal.

The anguish of spirit so acute and paroxysmal in the "Slaves" relaxes into an absorbing introspection in the "Thinker" of the Tomb of the Medici (new sacristy of Saint Lawrence, Florence), executed by Michelangelo between the years 1523 and 1531. In this statue the meaning of the attitude is instantly clear. The extremities are contracted and drawn inward; the face, lest, if fully visible, it should fail in expression, is partially thrown into shadow by the advanced visor and cast downward, with the index finger of the right hand placed on the lips. Less subtle than the "Slaves," the "Thinker" has received more ample admiration, and has been the object of much resonant oratory. But the presence indwelling in the statue chides idle words with authority and invokes silence.

"Day" and "Night".—The opposite wall of the mortuary chapel serves as a background for the remaining tomb, on the entablature of which are sculptured in reclining poses the figures of "Day" and "Night." These accompany the statue of the "Warrior," symbol of the active life, as "Dawn" and "Twilight" amplify the significance of the "Thinker." The feminine figure, "Night," like all others (if youthful) of its sex created by the same master, can be passed over in silence. The "Day," on the contrary, is rightly criticized by the most uninstructed observer for its faults in anatomy. Together with other details of the entire composition, it was never finished, but its incompleteness fails to account for its departure from all that is normal. Its trunk is so swollen as to dwarf the head and the extremities and to defy the laws of nature. That this challenge was made voluntarily must be admitted, for Michelangelo was the first draftsman and the first artistic anatomist of his time. Therefore, his irrepressible desire to set forth the intense, individual, necessarily secret anguish incident to human life must have overpowered his sculptural vision. It has been suggested that he expanded the seat of the vital organs in order to express a grief too great to be borne by normal man.

Michelangelo's affinities with the Greek poets and philosophers were strong, in common with those of many other Italians of his time, but they lay more deeply and obscurely in his being. His purpose, never for a moment abandoned, was to deprive art of its power to produce sensuous pleasure. As a consequence, he but lightly esteemed painting. He worshiped form as conveying an idea denuded of everything foreign to its nature. By infinite variations of line he expressed differences in thought which make his compositions comparable to the throngs of a populous city. Logically, therefore, he was a solitary man seeking only to incarnate the

crowding concepts of his brain. His energies and his time thus absorbed, he developed no pupils. Nor, had he sought these, could he have formed them, since receptivity for what he offered would have been lacking in those who might have attempted to learn from him.

Influence of Michelangelo. Upon all artists of Latin race who were his immediate successors, Michelangelo's influence was nothing short of baleful. The most talented of them, such as John of Bologna (1530–1608), comprehending at least the former's mastery of the human figure, produced admirable studies of pose and poise, mere physical expressions of the joy of living, like the "Flying Mercury" and the "Rape of the Sabines" (both preserved in Florence). But none of them was moved to interpret a thought, an emotion, or a state of being, purely by line or by the presentment of a specialized muscular condition. In the 17th century, to overemphasize and overelaborate became the chief purpose of Italian sculptors, among whom Bernini holds the first place.

Bernini. He is remembered, above all, for his group of "Apollo and Daphne" in the Villa Nazionale (Borghese) Rome. The sculptor has here treated with great delicacy the myth of the nymph pursued by the god and of her transformation into the laurel tree; making to the impossible occurrence the slightest allusion that is compatible with the universally known tale. And further, his group is clearly a study of line based upon late Hellenic treatment, rather than upon the work of his epoch-making predecessor. It is regrettable that the taste shown by Bernini in the just mentioned group was not one of his stable qualities. In his sacred subjects he was wont to represent, in the heavy substance of marble, clouds and draperies symbolizing the vaporous dwelling places and diaphanous garments of angels. Such inanities multiplied rapidly in Italian sculpture until at the middle of the 18th century it had lost, not only its grandeur, but even its serious qualities.

Renaissance Sculpture in France. In the other continental countries the development of sculpture during the Renaissance was influenced by Italy to a greater or less degree. In France the beautiful Gothic architectural subsidiary figures continued to be created until far into the 16th century, culminating in the work of Ligier Richier (1506–67), whose last piece, a free standing "Entombment" (Church of Saint Stephen, Saint Mihiel, near Verdun), derives almost equally from the French and from the Italian schools, adding a German element in the faces of the personages represented.

Jean Goujon. This truly racial style died, it may be said, by strangulation, and under the so-called Italianate a sculptor of genius appeared in Jean Goujon (about 1515–66), whose still existent works maintain today an almost popular admiration. As court sculptor to Henry II, he collaborated with the celebrated architect, Pierre Lescot, in transforming the feudal castle of Charles V (1364–80) into the palace of the Louvre. Under this commission he executed the four superb "Caryatides" of the tribune in the Hall of the Renaissance, which many critics have regarded as Hellenic in spirit, although in Goujon's time the treasures of the Acropolis at Athens were unknown to the French. It is certain that his knowledge of such figures was derived from the Roman architect Vitruvius, who, in his great treatise, devotes an entire chapter to their proper treatment. But to the antique theory Goujon, in practice, added a flexibility, a fluidity of line, characteristic of his own genius.

Germain Pilon. Among the artists of the French Renaissance, Goujon is numbered with the strict classicists, while his gifted contemporary, Germain Pilon, is reckoned as a descendant of the naturalistic native carvers (*imagiers*). True to his artistic ancestry, the latter sculptor preferred the individual to the type, and excelled in portrait statues. These he executed in bronze for monumental tombs, and, while giving the faces striking resemblance to their originals, in disobedience to the spirit of antique art, he rendered the draperies with a stylistic elegance gained from the Italian masters of his own period. To this division of his work belongs the imposing, kneeling figure of the persecutor of the Huguenots, the "Cardinal René de Birague," which is now in the Louvre, together with his beautiful mortuary piece, known as the "Three Christian Graces" (Virtues). Recalling vividly the Greco-Roman statue, at Naples, called "The Farnese Flora," Pilon's "Graces" are lighter of limb and more suggestive of agile motion. Their draperies are rhythmically disposed, and a contrast to their marble bodies is offered by the bronze casket, balanced on their heads, which was destined to receive the heart of Henry II of France and that of his queen, Catherine de' Medici.

Judged by the characteristics of his work, Pilon is associated in the mind of the student with the architect Philibert Delorme, designer of the palace of the Tuileries, which was destroyed by the Paris Communists of 1871. Consequently, in the third quarter of the 16th century there were two highly distinguished Frenchmen who, had they lived three hundred years later, would have ranged themselves on the side of the Romanticists in the artistic-literary controversy which in 1830 began to divide Paris. Both refused to accept the brilliant generalities of external form which then represented the classic. The architect anticipated modern structure and reached out toward new combinations of materials. The sculptor recognized the claims of individuality as superior to a formula by which an insipid, monotonous beauty, falsely called antique, could be given to all statues.

The Versailles Sculptures. Within the following century, this significant, incipient romanticism was blighted for a season by the political development of France. Art became, as in Imperial Rome, a governmental instrument, the principal use of which was to glorify the ruler. The absolute monarchy expressed itself through all æsthetic mediums, especially during the fifteen years (1670–85) when Mansart, Le Nôtre, and Lebrun were concentrating their efforts at Versailles. The last-named of the three, endowed with surprising versatility, designed much of the ornamental sculpture there required, but the relief of the "Bathing Nymphs" of François Girardon (1628–1715) shows the unmistakable touch of an artist who thought in terms of solids. In this work the gradations of relief, marking the various figures, the rocks, water, and aquatic plants, indicate the study of the Italian *quattrocento*; while the drawing, developed beyond that period, is without exaggeration and has the French realism. The scene is a possible one, yet it is abundantly provided with poetry emanating from sheer line.

Another sculptor of the Versailles group was Antoine Coysevox, the mention of whose attainments cannot be omitted from any history of his art. Born in Lyon, he possessed the vivacity associated with the natives of that city of France, and by his assertive originality he forms a link in the chain of those self-reliant exponents of his art, who have rejected the binding traditions of the French school. He worked in both marble and bronze, modeling portraits in the latter medium with the Florentine spareness suggestive of "plain living and high thinking."

This spirit of analysis and penetration rarely found utterance under the reign of Louis XIV. It was the natural language of the talent of Coysevox, but, as an artist favored at Versailles, he expressed himself admirably in decorative sculpture, as is witnessed by the winged horses mounted by Fame and Mercury, which are now in the gardens of the Tuileries. The same spacious open area also contains the widely known "Horse Tamers" ("*Les Chevaux de Marly*") of Guillaume Coustou (1677–1746), pupil of the previously mentioned sculptor

These are two spirited groups, each composed of a man and a horse, placed facing each other at the entrance from the Place de la Concorde to the Avenue of the Champs Elysées. The nude youths are so posed that one displays a superbly modeled back with outstretched arms, while the other presents a straining profile, as he grasps the cords of the bit in the mouth of his rearing animal, which is evidently of Spanish breed.

Pierre Puget. In contrast to this official art, polished as the elaborated, balanced prose of the writers of the "great century," the gifted sculptor, Pierre Puget (1622–94), stands alone. Born of humble parentage at Marseille, he became a wood carver of figureheads, and later worked at the actual construction of ships. He appears to have been equally talented in the three arts of form, but his modern reputation rests upon his sculpture, to which a room, bearing his name (*Salle Puget*), is devoted in the museum of the Louvre. Strictly classical in subject, the statues in this collection are rendered in the style of Michelangelo, but with greater exaggeration. Into all his figures Puget infused a certain boastful quality peculiar to the populace of Marseille, and his models would seem to have been chosen from among the sailors frequenting the docks of that city.

True to that type is his "Gallic Hercules" and, above all, his "Milo of Crotona," which represents, according to the legend, an aged athlete of Magna Græcia trying, with his ebbing strength, to rend asunder the trunk of a tree. Having inserted his hand into a yawning crevice, the wood has suddenly closed upon him, and all efforts to free himself prove unavailing. Then, alone in the forest, he is attacked and dismembered by beasts of prey. Skillfully condensing the story into a single attitude, Puget has thrown the head and torso of the man into the pose of one of the "Slaves" of Michelangelo; while the tree trunk and the lion lacerating the thigh of his victim afford necessary support, without confusing the composition. This group, still often reproduced in statuettes, is regarded as the masterpiece of perhaps the greatest French sculptor of his time, who was a realist and did not disdain to flavor his art with the crudities of his region and of his original station in life.

The careers of the three preceding sculptors being ended, their art was continued worthily, to some degree, by their immediate pupils, who resembled them, as in painting Boucher resembled Lebrun. But, as a consequence of social conditions and in common with the other arts, French sculpture declined, until the great Revolution (1789–1800) fanned it into new flame. In truth, the 19th century witnessed in all countries a new departure in the fine arts. But, before considering this general movement, we have briefly to follow the progress of sculpture in Spain, Germany, and the Netherlands, from the end of the middle ages to the first effort of the common people toward "liberty, equality, and fraternity."

Spanish Renaissance Sculpture. As might be inferred, the Spanish sculpture of the Renaissance was submitted to many influences. Elements of the Moorish (*mudejar*) ornament were still strong in the 15th century, when there also developed the plateresque (*plata*, silver) style, resembling metal smithing in precious substances and finely adapted to architecture. Through political and commercial relations, Flemish, Dutch, and German art became most highly esteemed, and much of the fine wood carving of altarpieces, screens, and stalls was executed by foreigners from the North; while marble and alabaster were freely used by the Italians—principally Florentines and Milanese—who worked on altarpieces and tombs at Valencia, Saragossa, Granada, and Seville.

Among the native sculptors, the greatest were those of northern origin, under the primacy of the school of Burgos, which gave three masters to the specialized art of the altarpiece (*retablo*) and the tomb of the sovereign or grandee. The earliest of the three was Gil de Siloa, whose work (1489–99) in the Carthusian monastery at Miraflores (near Burgos) is that of an artist occupying the border line between the Gothic and the Renaissance. An almost contemporary work by Felipe de Borgoña is the very important altar screen in the Cathedral of Burgos, which includes several hundred figures, arranged with perfect clearness; one of the panels—the "Crucifixion"—constituting a superb emotional piece.

The third sculptor, regarded as the greatest of the Spanish Renaissance, Alonso Berruguete (1480–1561), studied at Rome under Michelangelo, and, on his return to Spain, worked in the Italian style, although emphasizing and exaggerating the characteristics of his master. His marble tombs gave him a high rank among his contemporaries, but modern opinion gives preference to his wood carving in the choir stalls of the Cathedral of Toledo.

The influence of Berruguete, spreading from Castile into Aragon, dominated the Iberian peninsula before the end of the 16th century. Late in the 17th, Spanish sculpture was oppressed by the overelaboration introduced from Italy, which, long raging like a virulent pestilence, subsided, to be succeeded by the mannerisms of affected simplicity then prevailing in the art of France.

The German Renaissance. In Germany the liberation of sculpture from architecture was slowly accomplished, but it was attended with many happy intermediate results. Such, for example, is the Tabernacle or Sacrament-House of Adam Krafft (about 1455–1507), in the Church of Saint Lawrence, Nuremberg. If judged too lightly, the classification of this work under the period of the Renaissance would seem to be an error. Yet it came into being during the early youth of Michelangelo, and it must be remembered that the northern development was much slower, the temperament less sanguine, than in the Tuscan and Lombard regions.

Nor was the sculpture of the German Renaissance unmolested in its growth. It was first blighted by the Reformation and then thrown into premature decadence by the Thirty Years' war (1618–48), which began as a religious struggle among the peasants of Bohemia. But during a brief period of bloom the schools of Franconia and of Swabia were fruitful in good works. The former, besides Adam Krafft, produced Veit Stoss (1440?–1533) the wood carver who delighted to represent the Tree of Jesse as appropriate to the Altar of Mary (Cathedral of Cracow), or to frame the Virgin with the Angel of the Annunciation in a wreath of roses (Church of Saint Lawrence, Nuremberg). And if by the emphasis placed upon these details he, at times, seems to retire to the class of expert craftsmen, just as clearly he elevates himself to the title of sculptor by his treatment of the figure and the face.

Somewhat younger than Stoss, and of much broader artistic vision, was the metal smith, Peter Vischer (1455–1529), whose masterpiece, or that of his school, is the statue of the Celtic King Arthur. This work stands in the Franciscan church at Innsbruck in the Tyrol, and is one of 28 bronze statues surrounding the sarcophagus (vacant) of the Habsburg emperor of Germany, Maximilian, who died in 1519. Of all these figures, "King Arthur" is beyond comparison the finest, and, in technique, it ranks as one of the best ever produced in its substance. In pose, however, it is ungraceful, and, in contrast to the lifelike quality of the magnificent head and torso, the legs suggest museum pieces of armor.

Later in the 16th century the school of Swabia produced masters working in both metal and wood, who showed strong affinities with the earlier Burgundian sculptors of France. Such resemblances are especially evident in the choir stalls of the Cathedral of Ulm and in the splendid oaken busts of the Abbey of Weingarten, one of which presents a workman whose features and expression are those of many northern French peasants of the present day.

The Baroque Style. From this robustness of style and an informing love of nature manifested in the introduction of realistic specimens of fauna and flora, German sculpture declined, to experience, a century later, a period of revived activity. Unhappily, the new movement cannot be described as an awakening. It was rather a nightmare which, sweeping over Europe, destroyed the balance of the artistic mind and gave birth to the malformed, abnormal Baroque. While everywhere pompous and abounding in ill-adapted ornament, this style assumed in Germany a violence which is most displeasing when displayed in the resistant substances of stone and metal. Therefore, the Baroque disfigured the public monuments of the time and blinded to its glaring faults highly gifted artists, such as Andreas Schlüter, sculptor of the monument at Berlin to the "great elector" of Brandenburg (ruler of the nucleus of territory which in 1701 became the kingdom of Prussia).

This unhappy influence exhausted itself after the middle of the 18th century. Its overemphasis was succeeded by a style lacking in masculine qualities, dominating all the arts and derived from France, the country in which, after a few decades, was destined to begin the third great period of sculpture in all history.

Canova and Thorvaldsen. The modern point of departure was not, however, fixed by Frenchmen. The honor of making this definite step belongs almost equally to two men of widely differing nationality. The elder of these, Antonio Canova, born in 1757, was a Northern Italian descended from several generations of fine marble cutters. The younger, of even more humble parentage, was the Dane, Bertel (Albert) Thorvaldsen, born in 1770, and in his boyhood a carver of figureheads in Copenhagen. The former, reared in surroundings favorable to his development, possessed untiring diligence and an unusual capacity for labor. He applied himself persistently to the study of anatomy, which he regarded as "the secret" of his art, as also to that of pose and expression, as they were demonstrated in the theaters which he constantly frequented. At length, formed as a sculptor largely by his absolute reliance upon nature, the young man came to realize the absurdities offered in the work of his older contemporaries and to emphasize in his own a long neglected simplicity. The reinstatement of that quality so accentuated by the 5th and the 4th pre-Christian century Greek and the 15th century Italian masters is now recognized as Canova's contribution to modern sculpture. By a change of taste resulting from political events, as well as from a satiated, cloyed artistic palate, not only Italy, but all cultured Europe, accepted his point of view.

Throughout the range of his works, mythological, heroic, and sepulchral, Canova has best expressed himself in the chaste figure of Psyche, who symbolizes the immaterial part of man. Praxitelean in type and pose, she bends her head over a butterfly, which she balances on her left hand, while she restrains it with her right by pressing together its wings. Many cognate figures he produced either singly or in groups of two or three, as also statues of heroes in combat with animals. By means of his tombs for the popes Clement XIII and XIV and the archduchess Maria Christina of Austria at Vienna and by his portrait bust of Napoleon, Canova widened his reputation and amassed a considerable fortune, the whole of which he expended in gracious and unusual acts of charity.

As one who returned to the stable principles of his art and, at the same time, pointed a new and safe direction for its further development, his name will never be forgotten. But seen through the perspective of a century the greatest of his works appear artificial. The same censure can be applied to those of Thorvaldsen, whose career, in all that concerns honors and recognition, closely paralleled that of Canova. But for the Dane the spirit of the classic was an acquisition, not a heritage; so that his renderings of the Greek pose and balance are often faulty.

On the contrary, his touch is of the lightest and his humor sparkling in his reliefs which relate the pranks of Cupid. His chief monumental work resides in the dignified but lifeless models for a frieze symbolically named the "Triumph of Alexander," which was destined to adorn a hall in the Quirinal palace, on the occasion of a visit to Rome purposed by Napoleon in 1812. He gave also the design for the memorial lion which was afterward cut in the living rock at Lucerne, Switzerland. Finally, he restored, for the king of Bavaria, the Hellenic marbles which were removed from the island of Ægina in 1811, and he erected them in the Glyptothek, at Munich, in a rigid arrangement which has since been greatly improved.

French Realism; Houdon. Thus, through the influence of Canova and Thorvaldsen, sculpture in all Europe had become classical in both subject and treatment. It remained for the French to render it vital and emotional. And it is but just to state that in France the reversion from the Baroque to realism was begun by a sculptor even older than Canova, although the new spirit is evidenced in but one phase of his art.

To illustrate the awakening of marble to life beneath a metal tool, a single example from the works of Jean Antoine Houdon (1741?–1828) will suffice. This is the seated statue of the aged Voltaire (now in the *foyer* of the *Comédie Française*), whose body beneath a loose robe is felt to be almost a skeleton. The legs from the knees to the ankles and the feet flatly posed on the base suggest the heavy slowness of old age. But the hollow chest appears to stir with life; the personalized hands grasp the chair, as if with feverish effort; while the head, although of marble, if compared with those of passing persons, seems more alive than theirs. The play of the facial muscles, the structure of the hands, are technically of such value as to serve as models in the art schools. But this accuracy is their minor excellence. As a study of the controlling, directing mind they are unique. Irrespective of time or country, Houdon's "Voltaire" is one of the greatest of statues.

François Rude. This power to penetrate a soul and then to render it visible was lost after Houdon, until it reappeared late in the 19th century in Auguste Rodin. In the intermediate time, however, several distinguished French sculptors made advances which can never be ignored in the history of their art. The first of these, François Rude (1784–1855), was a modern Scopas, a sculptor of passion, differing from the Greek in presenting emotion in a more objective, concrete form. His masterpiece, the relief of the southeastern pier of the Napoleonic Arch of Triumph, is known as the "Marseillaise" or the "Departure." Judged by its power of expression, it is a collective monosyllable. Within its pyramidal contour there is no single detail contributory to a secondary effect. In line, in light and shade, it vibrates, like the sentiment of patriotism visualized in the figures of three generations of Frenchmen, who are garbed symbolically as Romans, in order the more clearly to announce them as republicans.

Jules Dalou. The careers of Houdon and Rude added immeasurably to the glory of French sculpture, but the natural gifts of these men were such as to awaken despair rather than the spirit of emulation among their immediate successors. The analyzing power of the one, the communicable passion of the other, could never again be possessed. In compensation, Jules Dalou (1838–1902), as a man of the 19th century, made a contribution to his art such as would have been earlier impossible. At first a decorative sculptor in the style of the Renaissance, he abandoned work of this character, to choose his models among men and women of the people. He represented them in their acts of toil and in their working-day garments. From their bodies strained in useful effort, he derived results

more significant to a truly modern eye than the gestures of a Greek athlete or of a hero of romance. Under his plastic hand the ill-fitting clothing of the humble acquired an intensity of meaning, which of late years has been denied to the mantle and the peplos.

Dalou in his figures of peasants and artisans expressed himself purely as a sculptor, as did the Belgian, Constantin Meunier (1831–1905), in his industrial types, the "Stevedore" and the "Smith." But younger Frenchmen with the chisel and mallet began to plead the cause of the proletariat. And how effective is their language one may judge from the paired figures of the group named "Cold" by Roger Bloch in the gallery of the Luxembourg. For, with a power instantaneous in its action, but denied to the writer and even to the painter who deals with optical illusions, the sculptor, with his three dimensions, presents an entire tragedy, requiring no time for its comprehension. The faces, the quivering outline, the very folds and creases of the garments of the figures, express a despair appalling even to witness.

Auguste Rodin. By works such as this, French sculpture reached what may be called a climax of clear statement. But in the last quarter of the 19th century it suddenly advanced to a new phase developed by the art of Auguste Rodin (1840–1917). At the very beginning of the period just named died the greatest of the pupils of Rude, Jean Baptiste Carpeaux (1827–75), who in sculpture paralleled the naturalist painter Courbet, except that his art was less gross. Scorning the smooth surface treatment and the formulas of modeling employed by the French classicists, he delighted to indicate the reaction of the human body to impressions received through the senses. In this one aspect of his art he prepared the way for the genius whose existence was not recognized by French authority until he himself had passed from life.

But Rodin, poor, unschooled, deprived of guiding artistic counsels, developed in his long period of neglect and from sole observation a system of modeling which, in homely terms, he named the "art of the lump and the hole." Translated into conventional speech, these words explain that a muscle, called into action by the brain, expands so as to alter temporarily the outline of the member in which it is placed; also, that, by the act of rising, it causes depression in the adjacent region of tissue. In thus following nature, Rodin proved that he followed the ancient Greek sculptors, the undulating surfaces of whose marble figures Michelangelo, when blind, craved daily to caress with his groping hand. Pursuing this system, Rodin might often be surprised in his studio, circling his clay model, and bombarding it from a distance, after moments of deep study, with handfuls of wet material which he afterward kneaded into proper form.

However, in the formation of an adequate judgment of this sculptor, his surface treatment is a minor, almost negligible element. He was, above all, subjective, as compared with Houdon, Rude, and Carpeaux. And it was this quality that often forced him to neglect what he estimated as "a toe or a curl," but which, in truth, extended to leaving almost undetached from the marble important members of the frame. Rodin was an impressionist. He was satisfied with his work, if it but shadowed forth the concept of his theme. The workings of his spirit are most clearly revealed in his statue of Balzac, which certain critics regard as stirring and majestic, while it has been denounced by others as grotesque, revolting, almost base. Happily the latter opinion is passing, as the interest in psychology increases. A thinker may see in the statue the wraith, the disembodied spirit of the man who, throughout his life, wrestled with his own genius for expression and with the world for a bare subsistence. The sensual mouth is eloquent of the mortal struggle; the pose is that of a figure moving forward as if hypnotically controlled; the robe is without definite form, wholly concealing the form beneath it and, with a few long spiral folds, guiding the eye of the observer to the tragic countenance above. The genius of Rodin has fixed in this, its own creation, some reflection of the soul of Balzac, as the modern telephone reacts to the individual voice. Such impressionism is phenomenal. Its recurrence is not to be desired in sculpture, whose terms are too definite to be affronted save in exceptional instances. Therefore, in spite of Rodin, the traditional French school has continued for 40 years to develop as a hardy growth, which has nourished to an adult, independent state of existence our North American art.

Early American Sculpture. That Americans in Colonial days liked to carve and whittle is shown by their gravestones, ship figureheads, weathervanes, door portals, ornamentally carved furniture, and other examples of anonymous folk art. Talented as some of these early craftsmen were, they had little opportunity to learn the fine art of formal sculpture, as there was a lack of competent instructors in the country at that time. It was not until the nineteenth century that the United States began to produce sculptors worthy of the name.

The earliest of these pioneers were Horatio Greenough (1805–52), Hiram Powers (1805–73), and Thomas Crawford (1814–57), all of whom studied at Rome. As a result of the academic training they received there, these Americans became creators of many figures dealing with classical or sacred subjects.

Following these strict conservatives came Thomas Ball (1819–1911), who, at the age of 35, transferred his residence to Florence, but still devoted himself to patriotic subjects. He was the author of the equestrian statue of Washington in the Public Gardens, Boston, the "Daniel Webster," in New York, and the "Emancipation Group" in Washington, all of which are well studied and dignified, although not great productions. A contemporary of Ball, and like him of long residence in Italy, was William Wetmore Story (1819–95), a classicist in art, a lawyer by education, and gifted as a writer of prose and verse. His art is scarcely fresher than that of the first American sculptors, and the same reproach of dryness can be extended to the ideal subjects of William Henry Rinehart of Baltimore (1825–74), whose reputation as a monumental sculptor is heightened by his seated statue of the much revered Chief Justice Taney (Annapolis and Baltimore). Finally, within this group may be mentioned Harriet Hosmer (1830–1908), whose graceful talent brought forth the "Will-of-the-Wisp" (Boston Museum of Fine Arts) and its companion piece "Puck."

American Memorial Sculpture. The work of the American classicists, necessarily imitative and therefore weak to some degree, was yet thoroughly refined. These sculptors were followed, as a consequence of the Civil War (1861–65), by a generation of commercial makers of monuments, whose commissions were obtained largely through political favor. But this censure cannot be applied to all the patriotic memorials erected in the decade 1865–75. For even apart from several undeniable masterpieces among those of later production, a number of the earlier ones witness the excellent training, as well as the talent, of their designers.

So to be distinguished are the figures of military and naval heroes by Launt Thompson (1833–94), an Irishman by birth, but American by the artistic education which he received almost equally in the office of a doctor of medicine and the studio of the sculptor Erastus Palmer, at Albany, New York. Another Irishman, Martin Milmore (1844–83), a pupil of Thomas Ball, was the author of the Soldiers' and Sailors' monument, standing on the declivity of Beacon Hill, Boston Common. Admirably proportioned and of a design understood at a first glance, it has served, since its erection in 1874, as a model for most frequent imitation.

Although of slightly earlier birth than either Thompson or Milmore, John Quincy Adams Ward (1830–1910) belonged to the same group of monumental sculptors. Less talented, perhaps, than the Irishmen, this native American, who received no foreign training, attained technical excellence, as is shown in the draped body of his Washington, erected on the steps of the Subtreasury, New York City, and in his treatment of the nude in his "Good Samaritan" (monument commemorative of the discovery of ether as an anesthetic) of the Public Garden, Boston. He was a sculptor of simple lines and quiet gesture. Like his chief instructor, Henry Kirke Brown (1814–86), he must be numbered within the older school, but also like the former, he was among the best progressives of his time.

Augustus Saint-Gaudens. With the Centennial exposition at Philadelphia in 1876 new æsthetic influences reached us. In sculpture, France was discovered to be the leading force, and thereafter American youth gifted for that art turned to her. Then succeeded in our country a generation of sculptors, numbers of whom produced works of great distinction, while one, at least, has taken rank with the geniuses who belong to the world, rather than to any segregated portion of it. This exceptional man was Augustus Saint-Gaudens (1848–1907), who, born in Dublin of French-Irish parentage, was brought to the United States in infancy and at thirteen apprenticed to a cameo cutter. For six years he followed the minor art, throughout the period receiving evening instruction in drawing. At twenty he entered the Ecole des Beaux-Arts, Paris, and submitted for three years to the hard, practical, persistent work there demanded of students. The Franco-Prussian war of 1870-71 was responsible for ending his residence in Paris, and after another three years of study and labor in Rome he returned to New York, there to enter upon his remarkable career. His fame rests principally upon three monumental works, the first of which advanced him to the first place in American sculpture.

This piece is the "Admiral Farragut" of Madison square, New York City: a single statue standing on a high plinth which is itself the center of an exedra or widely extended seat. Rectangular, strongly accented, harmonious, and in effect tranquilizing, the composition by these qualities recalls the Parthenon, while the study of the figure does honor to the French training of the sculptor, and the delicate low reliefs, although of modern line, are founded upon study of 15th century Italian ornament.

For the fine architectural mass of this monument Saint-Gaudens was much indebted to the designer of the exedra, one of the most talented of American architects, the late Stanford White. With the latter, the sculptor also collaborated to the same degree in his great "Lincoln" in Lincoln park, Chicago, which has been too widely and authoritatively discussed to require further comment, as is true of the "Shaw Memorial" under the old elms of Beacon street, Boston. But the monument to General Sherman, Central park, New York City, cannot be so dismissed. In this work the concurrence of the elements—so different one from another—is marvelous. There is a single direction of line. The Victory, the man, and his mount appear to be drawn forward by a Divine, irresistible force, and the mere observer of their action wishes to follow them.

Daniel Chester French. The second place in American sculpture of the third period belongs without question to Daniel Chester French (1850–1931), a New Englander of the strong, original type. His matured art, broad, simple and serene, less profound, less ecstatic than that of Saint-Gaudens, has rendered him the most widely appreciated sculptor of our national school. Like the French master, Rodin, he was largely self-taught, not however because of poverty, but consequent upon the somewhat late manifestation of his talent and the lack of adequate art instruction in even the most cultured portions of the United States a half century ago. For the latter reason, his early works may be passed in silence and left to play an important part in the elevation of children to ideals of patriotism. But the statues and reliefs produced in the fullness of his powers have in them a heroic or a humanitarian quality that removes one who contemplates them from the actual world of contention and bolshevism. Moreover they show the technical education of the sculptor to have been based upon sound principles and unerring taste.

To this class belong the "Gallaudet Group" in Washington, which is a monument to the French doctor who devoted his life to bettering and making happier the existence of deaf-mutes. This work for the many is but a tribute to humane service. For the more thoughtful minority it is a suggestion, both strong and subtle, of psychic control, reflected in the countenance and the pose of the man who is seeking to bring to birth the struggling powers of the undeveloped child. The response equals the appeal. The face of the little girl is inspired with effort and expectation; while her forearm and her hand, the latter clenched to form a letter, reach a climax of expression.

Pathos of a more lyric quality resides in the design of Mr. French for the memorial to Martin Milmore, known as "Death Staying the Hand of the Sculptor." Its characteristics are strength of line, breadth of surface treatment, and, as a resultant, exquisite play of light and shade. It is worthy of the Hellenic art of the 4th century B. C., but, unlike that art, it has no flavor of decadence. Restraint is present in every element of the composition and the faces are left uncertain. That of "the sculptor" is turned in profile; while that of the majestic, yet gracious "Death" is darkened by overhanging drapery, like the head of the "Niobid" of Scopas and the brow of Saint-Gaudens's "Grief."

Frederick MacMonnies. While the two men just discussed are as yet the greatest of American sculptors, several others of native birth and Parisian training are but secondary to their distinction. Such is Frederick MacMonnies (1863–1937), the master of bronze technique, as seen in his figure of "Nathan Hale," in the City Hall park, New York, and the "Bacchante" of the Metropolitan Museum. Masterpieces of pose they both are, and, in this essential of sculpture, the first-named would appear to have no prototype. The youthful patriot is presented as bound, at the arms and ankles, for execution, yet the constrained attitude is aristocratic and even graceful; while the slightly drawn facial muscles offer the most delicate suggestion of torture. The statue is the performance of a virtuoso.

Far less original than the "Nathan Hale," the "Bacchante" is a brilliant study of line, tension, and balance. And, as the former statue has the refinement of certain phases of French art, this exuberant figure recalls the bronzes of Pompeii, but above all the female form in John of Bologna's "Rape of the Sabines." As a display of sculptural knowledge and skill, the "Bacchante" does singular honor to its author, who received no censure from the council that declined to place it in the interior court of the Boston Public Library. In that gravely cloistered atmosphere it would have struck a note of joy too acute and shrill.

George Barnard. In contrast to MacMonnies, American sculpture possesses in George Barnard (1863–1938) an artist akin in spirit to Rodin. This relationship is expressed in the varied treatment of marble aiming at a wide range of effects, as when the more distant members of a figure in relief or portions of a drapery or of some other accessory are left in the rough or even are barely indicated. But, beyond this material resemblance of Barnard to Rodin, a more subtle, intangible likeness exists between the "Count Ugolino" of the French sculptor and "The Two Natures" of the American. In these allied pieces there is the same tragic presentment of triumphant

animal instinct, coupled with what, at a first glance (but only apparently), is a defiance of the artistic laws of balance and symmetry. In another figure of his youthful years, "The Hewer" (1902), Mr. Barnard suggests a Hellenistic combatant, like the "Fighting Persian," who might have been transformed into a modern toiler by the touch of a Dalou. Yet the conception itself has nothing of the reasoned submission to racking labor which, but yesterday, was characteristic of Europe. It breathes out the freedom of wide spaces and of liberty belonging to a new world.

Lorado Taft. In contrast with the militant, struggling figures of Barnard, Lorado Taft (1860–1936), a sculptor of the Middle West, expressed in several groups and single figures and in hopeful, joyous terms the spirit of his native region. Among such groups the one named "The Great Lakes' is the most widely familiar. But the talent of Taft was not restricted to idyllic subjects, as he has shown in his colossal statue of the Indian "Black Hawk."

For his accomplishments as a sculptor, Taft was honored in 1911 with full membership in the National Academy of Design. Furthermore, his standing as both artist and man raised him to the directorship of the transformation into a superb boulevard of the Midway plaisance at Chicago.

A notable contribution toward the fulfillment of this ambitious plan was the erection on the Midway of this sculptor's own monumental "Fountain of Time," with its imposing procession of figures.

Paul Wayland Bartlett. The subjective and the abstract in sculpture give place to the objective in the work of Paul Wayland Bartlett (1865–1925), who has been able with vital force to recreate historical personages in his "Lafayette," his "Columbus," and his "Michelangelo." The equestrian statue of Lafayette stands in the court of the Louvre, Paris, and there is a replica in Hartford, Conn. The original was paid for by the school children of America as a gift to France. The sculptor delayed so long in executing the commission that, as a commentary on his slowness, he placed a plodding bronze turtle near the left hind foot of the horse. His "Columbus" and "Michelangelo" are in the rotunda of the Congressional Library, Washington.

Herbert Adams. In characterization lies also the strength of Herbert Adams (1858–1945), whose best works are portrait busts of women interpreted with intimate yet reverent sympathy. Of these pieces, the most noted and one of the earliest (1890?) is the bust of Miss Pond, who afterward married the sculptor. The portrait, it would seem, was called into being under the control of Houdon and of Rodin, yet the marble has plasticity and tonal effects that are all its own. The bony structure of the neck and face appears to be covered with yielding, elastic flesh, and the eyes illuminated with the life of the spirit.

Cyrus E. Dallin. A strong contrast to these busts and reliefs, with their delicate aroma of tradition resides in the American Indian types of Cyrus E. Dallin (1861–1944), easily the best among our sculptors who have devoted themselves to the portrayal of the Red race. Born in 1861, in the Far West, he grew to adolescence among the primitive people whose life, both material and psychical, he has reflected in "The Medicine Man," "The Scout," "The Hunter," and, most clearly, perhaps, in the "Appeal to the Great Spirit." In this equestrian statue the rider and the horse show equally the sound technical training received by the artist from Parisian studios. The lithe anatomy of the Indian, the structure of his head, and his manner of bestriding his mount instantly awaken admiration. On the other hand, the location of the work is deplorable. It has been placed before the entrance of the Boston Museum of Fine Arts, although its subject and treatment demand the environment of a spacious park, such as is enjoyed by its companion piece, "The Medicine Man," in Philadelphia.

The Borglums. Devoted also to the delineation of aboriginal American types, but episodical in choice of subject, Solon Borglum (1868–1922), the younger of the two Danish brothers opened to his admirers a romantic life of perilous adventure. His earlier works portray scenes of frenzied movement, such as the "Stampede of Wild Horses"; while his later productions, "Burial on the Plains" and the "Last Roundup," show the sympathy of a Virgil or a Saint Francis with primitive man and Nature.

The elder of these brothers, Gutzon Borglum (1867–1941), through long study in France, learned to drape his thought with impressionism. In common with the French master Rodin, he presents to the student a concept of his subject, rather than a counterfeit of its semblance. Unconscious of imitation, he has, in the opinion of an authoritative critic, approached Rodin's "Burghers of Calais" in his Apostles for the Cathedral of Saint John the Divine, New York. But he is best remembered for his mammoth Mount Rushmore Memorial in South Dakota.

Anna Vaughn Hyatt. In pure animal sculpture, a number of contemporary Americans have excelled, in several instances beginning their careers in this branch of their art, later to develop into students of the human figure. Among such is Anna Vaughn Hyatt (1876–), whose finely studied descending "Panther" and "Butting Goats" were but a technical prelude to her "Joan of Arc," which invites comparison with the equestrian types of the great modern Frenchmen, especially with the statue by Frémiet, best known of all these from its commanding position in Paris. In the latter the face and pose of the Maid are consistent with her condition as a peasant; while the horse, regarded as one of the finest in the whole history of sculpture, is specialized as of historic French breed. In Miss Hyatt's work, the figure is more slender, lithe, and tense, and the highly intellectual face is seen to be obedient to a heavenly vision. Again, the control of the horse by the rider is admirable and the union between them complete. Finally, the animal anatomy is rendered with a masterly, virile hand, and the head, excepting the mane, is conventionalized after the Greek manner of Phidias.

Malvina Hoffman. Another American woman of great talent, Malvina Hoffman (1887–), has been signally honored in the acceptance of her group, "The Russian Bacchanale," as a gift from a wealthy amateur for the garden of the Luxembourg, Paris. The two figures of the composition are intended to perpetuate the impression made by Pavlowa and Mordkin, as they entered upon their interpretation of the dance which, in the infancy of civilization, fixed the basis of the Greek drama. Her studies of world ethnic types are striking in their realism. Through her books, *Heads and Tales* and *Sculpture, Inside and Out*, she provides the general reader with an excellent guide to an appreciation of sculpture.

Like painting, sculpture, which has been called the orphan of the arts, has been influenced largely by modern European art, and has shown great diversity and freedom of expression, particularly in the field of abstraction. New materials never dreamed of in the philosophy of the older sculptors have been used by the younger men, sometimes with extremely interesting results. All this has led to more attention being paid to sculpture and the organization of numerous exhibitions.

It is impossible in a brief survey to mention all the men and women devoted to this branch of art whose work would deserve extended notice in any history of art. But among contemporary masters are the following, with the works which have brought them fame. Paul Manship (1885–), "Centaur and Dryad," "Dancing Girl and Fauns," "Little Brother;" Jacob Epstein (1880–1959), "Adam," "Christ," "Duchess of Hamilton;" Robert Laurent (1890–), "Pearl;" William Zorach (1887–), "Mother and Child."

ART TERMS AND SUBJECTS

THE material in this section comprises a dictionary of the more frequently used terms belonging to the arts of painting, architecture, and sculpture, together with a reference list of noted works in these arts. The general discussions in the preceding sections are thus supplemented by more explicit definitions of the terms which are there used, and by brief descriptions of many masterpieces in addition to those works treated in the longer articles.

Each paragraph devoted to a painting or to a piece of sculpture contains the name of the artist, the collection or the locality in which the work is to be found, and a brief characterization of the subject. The list represents the great schools of art and the principal art galleries of the world. It is especially valuable because it includes a large number of the masterpieces, of both American and foreign artists, that are accessible in the numerous excellent and growing American galleries and museums of art.

Abacus (*ăb′ȧ-kŭs*). A tablet placed horizontally upon the capital of a column. By increasing the upper surface of the capital, it enables the column to afford better support to the architrave.

Abigail Meeting David with Presents. Rubens; Museum of Art, Detroit, Mich. A picture which tells vividly the biblical story, with an oriental richness of costumes and coloring.

Abutment. A solid piece of masonry used to support a body which has a tendency to thrust outward. Examples of the abutment are the solid pier, against which an arch of a building abuts, and, in bridge construction, the supports which connect the bridge with the river bank.

Accessories. Theoretically speaking, the accessories of a picture are all those details which are necessary for the realization of a scene, but which at the same time play a secondary part in the composition. In a portrait, for example, the drapery, the furniture, and the ground on which the subject is represented are accessories.

Acropolis (*ȧ-krŏp′ô-lĭs*). The name applied to the citadel in ancient Greek towns. The most famous acropolis is that of Athens, on which stood the Parthenon, the Erechtheum, the Propylæa, and the temple of Nike Apteros.

Adobe (*ȧ-dō′bē*). Sun-dried bricks, such as are in use in Egypt and in other countries of warm and dry climate. The use of such bricks was introduced into Spain from Africa. In Mexico and in the southwestern United States, the name is applied both to the bricks and to the clay from which they are made, as well as to structures composed of these materials.

Adoration of the Kings. Quentin Massys; Metropolitan Museum, New York City. The Madonna, holding the Child Jesus, is on the left. One king kneels; the other two, bearing jeweled vessels, stand behind him.

Age of Innocence, The. Sir Joshua Reynolds; National Gallery, London. A charming picture of a child, by one of the greatest of portrait painters.

Alhambra, The. A fortified Moorish palace on a hill near Granada, Spain. Built in the 13th and 14th centuries. The structure is notable for its elaborate architectural decoration, which is chiefly of wood and plaster rather than of more durable materials.

Alice. William M. Chase; Art Institute, Chicago, Ill. Portrait of a young girl, remarkable in treatment of figure and in technique.

Alice Freeman Palmer Memorial. Daniel Chester French; Wellesley College chapel, Wellesley, Mass. A marble relief representing a mature woman, the college, sending forth with her benediction a younger woman, the student. The student bears a lamp, lighted at the altar in the foreground.

All's Well. Winslow Homer; Museum of Fine Arts, Boston, Mass. A sailor, the lookout, stands beside the ship's bell, calling his signal.

Amicitia. Charles Keck; Rio de Janeiro, Brazil. A statue surmounting a monument; the entire memorial being a gift of the United States to the people of Brazil on the first centennial of Brazilian independence.

Anatomy Lesson, The. Rembrandt van Rijn; Royal Museum, The Hague. Dr. Tulp is explaining the action of muscles and tendons in the human arm. This picture, painted in 1632, brilliantly marks the close of the first of the three periods constituting the artist's career.

Anchor. In religious art, the anchor is employed as the symbol of hope.

Angel Heads. Sir Joshua Reynolds; National Gallery, London. A group of five lovely faces, studies of one little child, Frances Gordon.

Angels. In devotional art, angels are represented with the following characteristics: They are human in form, winged, always young, of the male sex, and generally draped in white. They are the messengers of God, the rulers of the stars and the elements, the guardians of the just, and the choristers of heaven. In this last function, they are frequently represented with various musical instruments.

Angelus, The. Jean François Millet; the Louvre, Paris. The peasant man and woman pause in their work in the field and stand with bowed heads, while a church bell rings in memory of the greeting of the Angel Gabriel to Mary, announcing the birth of the Savior. This picture has been criticized for its suggestion of sound.

Annunciation, The. A favorite subject in early Italian art, a widely known example of which is the mural painting by Fra Angelico (1387–1455), in the Museum San Marco, Florence. At the right of the picture kneels the Virgin and at the left stands the angel, facing her; both figures being set against the background of an arcade most interesting to the student of the history of architecture.

Antique (substantive and adjective). This term was originally applied to Greek and Roman works of art, such as statues, bas-reliefs, engraved gems, and medals. By extension of sense it now includes all objects of æsthetic value having the minimum age of a century.

Apollo Belvedere. A marble copy of a probable bronze original, now in the Museum of the Vatican, Rome. The statue bears the marks of the latest, or Hellenistic, period of Greek art. It was found in 1455, at Frascati, near Rome, among the ruins of an ancient villa. It is named from its present location in the *belvedere* (open-gallery, literally, "fair view") of the architect Bramante (1444–1514). It is the most famous of all Apollo statues and represents the god in successful conflict with a python or dragon. Reduced to a symbol, it signifies the sun triumphing over pestilence.

Appliqué (*ȧ′plē′kā′*). A general designation for ornament which is let into or fixed upon the surfaces of objects. For example, a wood panel may be thus treated with *appliqués* of bronze.

Apse (*ăps*). The semicircular or polygonal projection of the end of a church, behind the choir. In Roman Catholic architecture, when the long axis of the church extends from west to east, the apse is at the eastern end

Arabesque (*ăr′ȧ-bĕsk′*). Ornament in which garlands of foliage and realistic or fantastic figures are combined in a capricious style, delicately interlaced and describing graceful curves. Arabesques are painted, inlaid, or carved in low relief.

Arch. Fundamentally, an arch is a structural device for spanning an opening and supporting an overlying wall by means of a number of wedge-shaped units arranged in a curve convex upward. The name is extended to any structure or ornament having the form and appearance of an arch.

Architrave (*ăr′kĭ-trāv*). In classical architecture, the architrave is the lowest of the three divisions of the entablature, that portion which rests directly upon the capitals of the columns. The name is applied also to the moldings around a doorway, especially if the opening is rectangular in form.

Ashlar (*ăsh′lẽr*). The name applied to stones hewn and squared for use in buildings, in distinction from rough, undressed stones.

At the Shrine of Venus. Alma-Tadema; Mendelssohn collection, Berlin. An excellent example of the artist's ability to paint marble, silk, and other beautiful materials.

Attic. That part of the entablature of a building above the cornice. Its purpose is to hide the roof and thus add dignity to the design.

Aureole (*ô′rê-ōl*). This word, derived from the Latin (*corolla*) *aureola*, "golden crown," refers to the luminous golden circles placed by painters about the heads or figures of deities in order to indicate their divinity. It was so used by Egyptian and Greek painters. Christian artists extended its use to indicate also the glory of angels and saints.

Aurora. Guido Reni; Rospigliosi Palace, Rome. Painted on the ceiling of the garden-house of the palace in 1609, this famous picture represents Aurora, goddess of dawn, preceding the advancing chariot of the sun god. The hours, as nymphs, accompany the chariot.

Autumn. Anton Mauve; Metropolitan Museum, New York City. A flock of sheep are being driven along a road over brown moors.

Autumn Oaks. George Inness; Metropolitan Museum, New York City. A group of oaks in red, brown, and yellow foliage; cattle in the foreground.

Avenue of Middelharnis. Meindert Hobbema; National Gallery, London. A roadway, bordered by tall trees, leading from the foreground into the distant background of flat country.

Aviator, The. Charles Keck; Charlottesville, Va. A sculptural work erected at the University of Virginia in 1919, the gift of Paul G. McIntyre.

Baby Stuart. Detail of the picture of the three children of Charles I of England by Antoon Van Dyck, in the Royal Gallery, Turin. The portrait here indicated is that of the child who became James II and was copied from the original by the Italian painter Canevari.

Bacchantes (*bȧ-kăn'tēz*). The female worshipers of Bacchus, the wine god, and equivalent to the mænads of Greek mythology. They were popular subjects in every branch of ancient art.

Background. The term applied in painting to the portion of space in a picture which is so rendered as to appear to be farther from the spectator than the principal object or group of objects in the composition.

Baldachin (*bȧl'dȧ-kĭn*). A structure in the form of a richly ornamented canopy, supported by columns, suspended from the roof, or projecting from the wall of a building,—for example, above an altar.

Bambino (*bäm-bē'nō*). Italian word for "child." In art, this name is given to representations of the Infant Christ wrapped in swaddling clothes and bound by ligatures, according to the custom prevailing in southern Europe.

Baptistery (*băp'tĭs-tĕr-ĭ*). A circular or polygonal building anciently placed near the basilica, or church, and used for the performance of the rite of baptism. Among separate buildings serving as baptisteries that at Florence must be placed first. It is celebrated for its bronze gates designed by Andrea Pisano and Ghiberti.

Baroque (*bȧ-rōk'*). A term applied in architecture to grotesque or whimsical ornamentation.

Basilica (*bȧ-sĭl'ĭ-kȧ*). The name, among the early Greeks, for a royal palace. Later it designated a court of law and place of assembly. It was a large oblong building with double colonnades and a semicircular apse at the end. Buildings of this type were frequently consecrated for religious uses by Christian emperors of Rome, so that Christian churches were often called basilicas.

Bas-Relief (*bä'rê-lēf'*; *bȧs'rê-lēf'*). See *Low Relief.*

Bayeux (*bȧ'yû'*) **Tapestry.** A roll of canvas over 70 yards long and more than half a yard wide on which is embroidered a representation of the conquest of England by the Normans. It is in the public library of Bayeux, Normandy, France. Tradition ascribes it to Matilda, the queen of William the Conqueror. She is said to have presented it to the cathedral of Bayeux.

Beaching the Boat. Sorolla y Bastida; Metropolitan Museum, New York City. A group of brown oxen standing in the white surf. A sailboat in bright sunlight is in the background.

Bismarck. Franz von Lenbach. In the painter's studio, Munich. A famous portrait that reveals the very character of the "Iron Chancellor."

Black. In medieval art, black symbolized darkness, death, mourning, evil, falsehood, and despair. In heraldry, black is termed sable.

Black Hawk. Lorado Taft; near Oregon, Ill. A heroic statue of the famous Indian chief, Black Hawk.

Blue. In the symbolism of early Christian art, blue, as suggesting the sky, represents heaven and eternity, as well as piety and faith. It is commonly the color used by painters for the Virgin's mantle, her tunic or underrobe being red.

Blue Boy, The. Gainsborough; H. E. Huntington estate, Pasadena, Cal. This picture of a youth in blue satin is said to have been painted to disprove Reynolds' opinion that the predominance of blue in a picture is incompatible with good color effect. It was purchased from the duke of Westminster, London, in 1921, for about $650,000 by H. E. Huntington.

Bolivar. Sally James Farnham; New York City. A statue of the great South American liberator, a gift from the government and people of Venezuela.

Boston Public Library. Boston, Mass. Architects: McKim, Mead and White. A granite structure in the Italian Renaissance style, inspired by the Library of Sainte Geneviève, Paris, and built around a central court. The interior is richly decorated with colored marbles, with statues, and with mural paintings by Abbey, Sargent, Puvis de Chavannes, and John Elliott.

Boyhood of Lincoln, The. Eastman Johnson; University of Michigan, Ann Arbor, Mich. The boy Lincoln, seated on a rude stool, is reading by firelight.

Boyhood of Raleigh, The. Sir John E. Millais; Tate Gallery, London. Two lads, Raleigh and a companion, seated by the sea, listen with rapt attention to a sailor's story.

Breaking Wave, The. Winslow Homer; Worcester Art Museum, Worcester, Mass. An excellent example of this painter's power to interpret the moods of the sea.

Bringing Home the Calf. Jean François Millet; Art Institute, Chicago, Ill. Two men are entering a farm gate, carrying a newborn calf on a litter, followed closely by the mother.

Bronze. Antique bronzes are works of art of the highest value. Whatever be their form or their dimensions, they invariably give evidence of extraordinary science and widely extended practical knowledge. After them must be noted the bronzes of the 12th and 13th centuries, as well as those of Florentine artists of the 14th century, such as Ghiberti and Donatello, who produced absolute masterpieces. In the time of Louis XIV (1643–1715), immense vases, such as those in the garden at Versailles, were cast in bronze; while the best examples of the art during the last two centuries are equestrian statuettes and Chinese and Japanese bronzes, in which the arts of founding and chiseling the metal have reached their highest limit.

Buhl (*bōōl*). A kind of furniture which was invented and made by André Charles Boulle, or Buhl (1642–1732), cabinetmaker to the court of Louis XIV. It is richly inlaid with gold, copper, and tortoise shell, under the last named of which a crimson fabric is often placed.

Bunker Hill Monument. Charlestown, Mass. Memorial on the site where General Warren fell in the battle of Bunker Hill. It is a plain granite shaft, 220 feet high and 31 feet square at the base. The corner stone was laid by Lafayette in 1825, and the monument was completed in 1843.

By the River. Henri Lerolle; Museum of Fine Arts, Boston, Mass. A stream in the background; in the foreground, two women walking along a path.

Calvary. A cross of stone or iron, generally richly decorated and sometimes raised upon a platform which is reached by steps. Some calvaries, especially those of Brittany, are ambitious monuments supported by arcades and surmounted by numerous statues. The term is applied also to pictures representing the scenes of the Passion.

Cameo. A gem upon which a figure or an ornament is cut in relief.

Campanile (*kăm'pȧ-nē'lā*). A bell tower. As built in Italy, the campanile is usually placed near a church but not actually attached to it. The most famous example of this type is the campanile built by Giotto in Florence. The term is applied also to certain lofty towers which form parts of buildings. In America, conspicuous examples of the campanile are found in the new Old South Church, Boston, at Cornell university, at the Iowa State college, and at the University of California.

Capital. The head, or crown, placed at the summit of a column, pillar, or pilaster, and usually ornamented with various projecting moldings. As an architectural member, the capital immediately supports the entablature

Capital, Composite. A combination of the acanthus ornament of the Corinthian capital with volutes or scroll-like patterns closely resembling those of the Ionic capital, with the difference that the four sides of the composite capital are absolutely symmetrical. The composite capital occurs in typical form on the Arch of Titus, Rome, erected toward the end of the 1st Christian century.

Capital, Corinthian. The characteristic of the Corinthian capital is the pattern of rows of acanthus leaves placed one upon the other, with volutes above them, one at each corner, supporting the projecting abacus. The Corinthian is the richest of the pure orders of architecture. The Greek type was produced in the 4th century B. C., and was later much simplified in the Tower of the Winds (100 B. C.), Athens. In this second form, it often appears in modern concrete buildings. The Roman type is of looser composition than the Greek. It reached its finest form in the Temples of Castor and of Mars Ultor erected in the Roman Forum during the 1st Christian century.

Capital, Doric. The Greek Doric capital is the simplest of the classical orders. It consists of an *abacus*, or block, an *echinus*, a swelling, bowl-shaped member, and *annulets*, or rings, just above the neck of the shaft.

Capital, Ionic. This capital is characterized by spiral volutes placed immediately underneath the abacus.

Capitol, The. Washington, D. C. An imposing building of mingled classic and Renaissance design. Fronting the east, it stands on an eminence, 97 feet above the Potomac

"THE ALBA MADONNA"

RAPHAEL (1483-1520)

National Gallery of Art
Washington, D. C.
(*Mellon Collection*)

"MUSIC AND LITERATURE"

WILLIAM M. HARNETT
(1848-1892)

Courtesy of Albright Art Gallery, Buffalo, N. Y.

River level. The entire length of the building is 751 feet, 4 inches; the width, 350 feet. The colossal statue of Freedom, surmounting the lantern which crowns the dome, rises 307½ feet above the ground level.

The central structure is of Virginia sandstone, painted white; the extensions are of Massachusetts marble. A hundred and twenty-four Corinthian columns, the shaft of each a monolith 30 feet high, adorn the porticoes of the fronts and ends of the building.

The corner stone of the central building was laid by President Washington, September 18, 1793. The wings, completed in 1811, were partially burned by the British in 1814. In 1827, the entire central building was completed, crowned by a low dome. The extensions were first occupied in 1857 and 1859. The present dome was completed in 1865.

The Capitol is occupied chiefly by the hall of Representatives and the Senate chamber. Many works of sculpture and painting adorn these halls as well as the splendid staircases and corridors of the building.

Caricature (*kăr'ĭ-kà-tûr*). A representation in which the peculiarities of a person or of an object are so far exaggerated as to produce a grotesque effect.

Caritas. Abbott H. Thayer; Museum of Fine Arts Boston, Mass. The painting of a gracious female figure standing with arms extended above two children who cling closely to her.

Carmencita. John S. Sargent; Luxembourg Gallery, Paris. A brilliant portrait of the famous Spanish dancer, contrasting with another of the same subject by William M. Chase.

Cartoons. A name given to the studies made by artists before they undertake the execution of pictures or frescoes. Since frescoes have to be executed on a fresh ground, retouching is impossible. Therefore, fresco painters are obliged to make full-sized designs which have only to be traced upon the ground. The paper used for this purpose was called in Italian *cartone*. Thence arose the application of the term cartoon to all preparatory sketches of pictures.

Caryatides (*kăr'ĭ-ăt'ĭdz*; L. *-ĭ-dēz*). Sculptured female figures which, in some classical and Renaissance buildings, serve as supports, taking the place of columns or pilasters. The most noted of such figures stand in the ruins of the Erechtheum, Athens, and in a hall of the Louvre, Paris, devoted to French art of the 16th century.

Catacombs (*kăt'à-kōmz*). Underground burial places. The most famous catacombs are those at Rome, in which the early Christians interred their dead, and in which they took refuge to celebrate their services. There Early Christian art took its rise. Catacombs exist also at Syracuse, at Palermo, and in Tuscany.

Cathedral. A cathedral is a church in which the *cathedral* or bishop's throne, is placed. Architecturally speaking, however, a cathedral need not differ in any respect from an, ordinary parish church.

Cathedral. City of Mexico. One of America's largest and richest churches. The edifice is 426 feet long and 203 feet wide. It was begun in 1573 and completed in the 19th century, at a cost of over $2,000,000. The interior, of Doric style, is richly ornamented.

Cathedral, Saint Patrick's. New York City. The Roman Catholic cathedral, located on Fifth avenue, between 50th and 51st streets, is one of the most noted structures in America. The corner stone was laid August 15, 1858, and the building was dedicated May 25, 1879. Its greatest length is 398 feet; its width, 174 feet; the towers are 330 feet high. The cathedral is built upon the plan of a Latin cross, in Gothic style. Its architect was Renwick, who gave also the design for Grace church, at Broadway and 11th street.

Cathedral of Saint John the Divine. New York City. The Protestant Episcopal cathedral on Morningside heights. The corner stone was laid December 27, 1892. In 1911, the choir and crossing were completed in Romanesque style. For the construction of the nave a modified Gothic style was later adopted. The plans called for a total length of not more than 520 feet, a width of 290 feet, and a height of 425 feet to the top of the spire. Its directing architect for years was Ralph Adams Cram, of Boston.

Cathedral of Saints Peter and Paul. Washington, D. C. Protestant Episcopal cathedral on Mount Saint Albans. The plans for this church present a Gothic structure, 500 feet in greatest length, with towers 262 feet high. Its elevated situation is said to be more beautiful than that of any other existing cathedral.

Cathedral of the Assumption. Moscow. One of the several notable structures in the Kremlin. It is built in the Lombardo-Byzantine style, although its cupolas are of Indian pattern. The interior is richly adorned with gems. The church was erected in the 15th century by the architect Aristotele Foraventi.

Cattle. Constant Troyon; Institute of Art, San Francisco, Cal. The group of cattle in pasture occupy the center of the picture; a splendid background of sky distinguishes this painting.

Charles I and His Horse. Antoon Van Dyck; the Louvre, Paris. A picture portrait, presenting a masterly treatment of the English king with his horse and attendants.

Chiaroscuro (*kyä'rô-skōō'rô*). Distribution of light and shade so effected in a picture that these elements are of mutual aid. This term is applied especially to the devices by which a figure or any object is made to appear as if enveloped in atmosphere. Among the masters of *chiaroscuro* must be mentioned Correggio (School of Parma, 1494–1534), regarded as its inventor, and Rembrandt, who developed it to its farthest limits.

Children of the Shell, The. Murillo; Prado Museum, Madrid. The Child Jesus is represented giving Saint John water from a shell.

Christ at Emmaus. Rembrandt van Rijn; the Louvre, Paris. The moment is that in which the two disciples recognized the risen Christ at the supper table.

Christ with the Doctors. Hofmann; Royal Gallery, Dresden. The youthful Christ, in the center of the picture, commands the attention of the learned men.

Church at Old Lyme. Childe Hassam; Albright Art Gallery, Buffalo, N. Y. A white New England church amid the lacelike shadows of slender trees.

Classical. This adjective in the strict sense is applied to the best periods of ancient Greek art, when great architects and sculptors united in their works ideality and imagination, close observation of nature, and the power to incorporate in clear terms their conceptions or impressions of grandeur and beauty. The term classical is also extended to later works of art whose excellence has caused them to be regarded as standards and models of special styles or schools. At the present time the same term is used to denote the character of any composition, either artistic or literary, in which the principal stress is laid upon structure and form.

Cloth Syndics. Rembrandt van Rijn; Royal Museum, Amsterdam. The group in the picture includes the five directors and the secretary of the Amsterdam cloth makers guild. The canvas was painted in 1661 and is ranked as the masterpiece of the artist.

Colonel Thomas Cass. Richard E. Brooks; Boston, Mass. Bronze memorial in the Public Garden. A fine example of the "quiet, soldierly figure."

Colors, Primary. The colors which cannot be produced by mixture of others; they are three,—red, yellow, blue.

Colors, Secondary. Three colors, each produced by mixing two others: orange, a mixture of red and yellow; green, of blue and yellow; purple, of red and blue.

Columbus at the Court of Ferdinand and Isabella. Vacslav von Brozik; Metropolitan Museum, New York City. A room crowded with courtiers; the king and queen are about to sign the contract with Columbus, April 17, 1492.

Column. In architecture, a vertically placed support, consisting generally of three parts: the base, the shaft or cylindrical portion, and the capital.

Coming of the White Man, The. G. A. Reid; privately owned. A group of Indians amid trees watch the approach of Champlain's fleet.

Coming Storm, The. George Inness; Albright Art Gallery, Buffalo, N. Y. Level fields against a background of trees and threatening sky.

Communion of Saint Jerome, Last. Domenichino; the Vatican Rome. The central figure is the aged Jerome, realistically portrayed. A symbolic lion reclines at the feet of the saint.

Composition. The harmonious combining of all the parts or elements in a work of art. The composition of a statue or that of a picture is good or bad in proportion as the lines are rhythmical in arrangement, the attitudes probable and the scene free and apparently unstudied. A view of a town, for example, *composes* well when the succession of buildings exhibits a graceful and picturesque outline. A landscape is well *composed* when the trees, the distances, and the foreground represent masses well balanced and pleasant to the eye.

Corcoran Gallery of Art. Washington, D. C. A white marble building in the Neo-Grecian style of architecture, which houses the art collections and the art school founded by William Wilson Corcoran.

Cornice. In classical architecture, the highest of the three parts of the entablature, so molded as to project beyond the frieze. The term is applied generally to the highest portion of a wall, when treated as a crown or finish.

Creation of Man. Michelangelo; Sistine Chapel, Rome. The recumbent human form awakens to life under the touch of the outstretched hand of God.

Cubism. A kind of drawing associated particularly with Braque and Picasso, in which the artist looks beneath the surface and seeks to bring out the essential character of an object. This technique shows planes advancing or receding, superimposed almost transparently upon one another or interpenetrating, in order to give an interpretation of the object's real form or hidden qualities. Braque's picture, "The Violin," is an outstanding example.

Cumæan Sibyl. Michelangelo; Sistine Chapel, Rome. The ancient sibyl, said to have prophesied the Nativity, is consulting her book.

Dance of the Nymphs. Corot; the Louvre, Paris. Background of trees and sky; in the foreground are groups of dancing maidens. Also called "Matinée." This is a famous picture in Corot's "first manner," or the period in which he introduced figures into his landscapes.

Dante. Ettore Ximenes; Washington, D. C. A memorial statue, the gift to the United States from the Italians of the country.

Dante, Portrait of. Giotto; National Museum of the Bargello, Florence. Perhaps painted from life. The picture formed part of a large fresco painted by Giotto early in the 14th century, long hidden by whitewash but recovered about 1840.

Dash for Timber, A. Frederic Remington; Museum of Fine Arts, Saint Louis, Mo. A group of horsemen, pursued by Indians, riding toward a clump of trees.

Deer in the Forest—Twilight. Rosa Bonheur; Metropolitan Museum, New York City. A sheltered nook in woodland. Glow of sunset is seen between blue-gray trees in the background.

Descent from the Cross. Rubens; Cathedral, Antwerp, Holland. A painting especially notable, technically, for the white light that bathes the dead body of the Christ as it is lowered on a stretch of linen.

Design. An outline or pattern, which serves as the basis of a composition and indicates the more important points in it. Specifically, the term means the preliminary sketch of a picture.

Diaper. A term used to denote an architectural decoration which consists in the continued repetition of a geometric pattern or a conventionalized floral design.

Dignity and Impudence. Sir Edwin H. Landseer; National Gallery, London. A large, dignified dog and a little, saucy one in the door of a kennel.

Distemper. A method of coloring surfaces, such as walls or panels. The colors for the process are mixed with a solution of water and size, or, for small surfaces, of water and gum or the albuminous matter of eggs.

Dome. A roof formed by a series of arches springing from consecutive points on a circular or polygonal plane base and crossing one another at the summit. The solid figure thus formed may be roughly described as hemispherical. If, for example, the plane base were a true circle, and the arches true semicircles, the dome would then be a true hemisphere. During the Renaissance period, this structural device was made more or less pointed in section, following the precedent of Brunelleschi, the architect and engineer of the dome of the Cathedral of Florence.

Doric. An order of ancient architecture, characterized by simplicity of ornament. In Greece, this order combines strength and elegance, but the Roman Doric style appears heavy and inert. The Doric column has no base; toward the middle of the shaft it shows a swelling or entasis.

Dove. In Christian art, the dove is the symbol of the Holy Spirit, as well as the emblem of love, innocence, purity, and peace.

Dryness. The name applied to the quality of painting in which the outlines are hard and formal, the modeling stiff, and the color harsh.

Dry Point. A sharp steel needle with which an engraver draws directly upon a copper plate. In proportion to the pressure used, the dry point sinks more or less deeply into the metal. The name "dry point" is used also of the engraving made by this method and of a print from such an engraving.

Dying Gaul. The original figure in marble is in the Capitol, Rome. The name of the ancient sculptor of this work is unknown.

Earl of Clarendon, The Second. Sir Peter Lely; Institute of Art, Minneapolis, Minn. An attractive portrait of a little child with a dog as companion.

Echinus (*ê-kī'nŭs*). The convex member placed beneath the abacus of the Doric capital. The artistic function of the echinus is to afford a transition between the verticals of the columns and the horizontals of the entablature.

Elgin (*ĕl'gĭn*) **Marbles.** The collection of ancient sculptures brought together by the earl of Elgin about the beginning of the 19th century, and now preserved in the British Museum. It represents the finest work of ancient Greek sculptors, including the greater part of the surviving sculptured decorations of the Parthenon, together with fragments of the Erechtheum, Athens, and of the Mausoleum at Halicarnassus, Asia Minor.

Elizabethan. The style of architecture transitional between Gothic and Renaissance, which prevailed in England in the Elizabethan era. The best examples of this style are found in the great country houses built during that queen's reign. Characteristic features of these mansions are long galleries, large windows, and tall decorated chimneys.

Emancipation Group. Thomas Ball; Washington, D. C., and Boston, Mass. The work represents President Lincoln and a kneeling slave.

End of the Trail. James E. Fraser; Golden Gate park, San Francisco. A statue depicting an Indian warrior bowed in deep dejection, seated on a weary pony, which crouches forward in dumb dismay. It typifies the American Indian driven to the wall by a stronger race.

Engraving. The art of representing objects by incised lines on wood, metal, or stone. Engraving, as it is understood today, dates probably from the 15th century, in the early part of which woodcuts are known to have been produced.

Entablature (*ĕn-tăb'lă-tûr*). In classical architecture, the entablature is the portion of wall resting upon the columns and supporting, at the ends of the building, the pediment or, at the sides, the roof plate. It consists of an architrave, a frieze, and a cornice. Its height is from four to five times the diameter of the shaft of the column.

Entasis (*ĕn'tă-sĭs*). The swelling at the middle of the shaft of a column. Entasis is one of the characteristics of the Doric order; the swelling of the columns gives an effect of lightness to a structure.

Etching. A process of engraving, in which the incised lines are obtained, not laboriously by working directly upon metal with the graving tool, but by the action of acid. The metal plate to be etched is covered with an etching ground, such as a varnish, which resists the action of acid. Great care must be taken to lay this ground equally over the whole plate. The drawing or picture to be reproduced is then traced with an etching needle, which, wherever it is applied, removes the ground and so exposes the plate. The plate is then put into acid, which corrodes the exposed parts. The design is thus bitten into the metal. The prints in ink, also taken from this etched plate, are called etchings.

Evolution of the Book. John W. Alexander; a series of six mural paintings in the Library of Congress, Washington, D. C. The subjects are "The Cairn," "Oral Tradition," "Egyptian Hieroglyphics," "Picture Writing,' "The Manuscript Book," "The Printing Press."

Façade (*fă-säd'*). A term applicable to any important face of a building. It designates usually, however, the principal front, which is the most exposed to view and is more richly decorated than the rest of the edifice. The chief entrance to a building is usually placed in this façade.

Fates, The. Pitti Gallery, Florence. Probably drawn by Michelangelo and painted by Rosso. The three figures are said to have been studied from a single model.

Feeding Her Birds. Jean François Millet; Museum, Lille, France. A woman is pictured seated on a stool, feeding from a long spoon three children ranged on the doorstep.

Feeding the Sheep. Charles Jacque; the Louvre, Paris. A flock of sheep grouped about a feeding rack and a tub of water.

Fighting Téméraire, The. J. M. W. Turner; National Gallery, London. The famous ship, about to be broken up, is being towed to a berth at Deptford.

Figure. A drawn, painted, or sculptured representation of a human being or of an animal.

Figurine. A small molded figure or statuette, generally in terra cotta or similar material less durable than marble. The term is applied especially to little figures, decorated in color or gilt, found in ancient tombs. The finest of these are the Tanagra figurines, from Tanagra, Greece.

First Burial, The. Louis Ernest Barrias; Palais des Beaux-Arts, Paris. A nude marble group, representing a man carrying a dead child, accompanied by a mourning woman. The figures of the group are usually identified as those of Adam, Eve, and the dead Abel.

Fish. An elliptical symbol frequently found on Early Christian monuments and tiles. It is the emblem of Christ, and the usual explanation of its use is that the letters in the Greek word ἰχθυς, meaning "fish," are the initials of the words, Ἰησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτήρ, that is, "Jesus Christ, Son of God, Savior." Used without the inscription, the ellipse is an emblem of baptism.

Flying Buttress. In Gothic architecture the organ of the transmission of thrust. It is an arm of masonry rising from the buttress or exterior support of an aisle arch and springing over the aisle roof to meet the support of the loftier nave and add resistance to the greater disruptive force there active. The flying buttress is the only new principle introduced into the building art by the men of the middle ages. Its development is most interesting. It began in Normandy when the monkish builders of Caen threw a half barrel vault over the aisles to counteract the thrust of the nave. This device proving successful, it was in principle transferred to the exterior and isolated in space, as in the church of Saint Martin at Laon, France. In this edifice the flying buttress reached the limit of its functions, but in a later structure, the Cathedral of Reims, it was given two stories and a double flight.

Fog Warning, The. Winslow Homer; Museum of Fine Arts, Boston, Mass. A fog bank looms on the horizon. A fisherman in his boat pulls sturdily for his ship.

Foreground. That portion of a picture, and sometimes of a relief sculpture, on which the objects nearest to the spectator's eye are represented.

Foreshortening. The term applied to the apparent diminution in the length of an object in proportion as the direction of its length coincides with the observer's line of sight. The word is used also of the method of drawing by which objects in a picture are made to conform to this law of perspective.

Forge of Vulcan, The. Velasquez; Prado Museum, Madrid. Vulcan, at his forge, is listening to Hermes, who is delivering a message from the gods.

Forging the Shaft. John F. Weir; Metropolitan Museum, New York City. A foundry, where workmen are drawing a white-hot shaft from the furnace.

Fountain of Time, The. Lorado Taft; Chicago, Ill. An imposing sculptural work erected on the Midway, representing ninety colossal figures passing before the veiled figure of Time. The material used is a kind of concrete.

Fresco. In its strict sense, a fresco is a mural painting executed on a fresh, damp ground of plaster. The ground soon becomes unfit to paint on, and therefore retouching is impossible. This is the chief difficulty in the process. On the other hand, as the color combines with the lime in the ground, it is of great durability in pure, dry air. The term fresco is now used loosely to designate any manner of painting on plaster.

Frieze. The part of the entablature placed, in the ancient orders of architecture, between the architrave and the cornice. In the Doric order, the frieze is decorated with metopes and triglyphs; in the Ionic and Corinthian orders, it is ornamented with bas-reliefs which form a continuous design.

Galahad, Sir. George Frederick Watts; Eton college, England. The knight of the pure heart is represented standing by his horse, at the moment when he has caught the vision of the grail.

Garfield. Charles H. Niehaus; Cincinnati, Ohio. An excellent portrait statue of James A. Garfield. The president is represented as speaking, a manuscript in his right hand, his left hand raised in an impressive gesture.

Gargoyle (*gär'goil*). A term derived from a French word meaning throat, and applied to the spouts placed usually on the roof gutters of Gothic buildings for the purpose of carrying the rain water far from the walls. Gargoyles came into use about the end of the 12th century. From the 13th to the 16th century, they were commonly carved fancifully, terminating in grotesque shapes of animal or human heads.

Genre (*zhäN'r'*) **Painting.** This French term was formerly preceded by the word "*bas*"; the whole denoting the low or domestic as distinguished from the religious or the historical style. Under it are classed all those pictures in which subjects taken from everyday life are treated realistically.

Giralda Tower. Seville, Spain. A beautiful square tower, 330 feet in height, the upper 100 feet being a belfry. A statue of Faith crowning the structure moves in the wind like a vane, in Spanish *giralda*, whence the name.

Gleaners, The. Jean François Millet; the Louvre, Paris. Bent figures of three toiling women are represented in the foreground of a harvest field.

Golden Stairs, The. Sir Edward Burne-Jones; privately owned. A procession of tall, slender figures of women on a curving staircase. Called also "The King's Wedding" and "Music on the Stairs."

Gothic (*gŏth'ĭk*). Originally a term of reproach, synonymous with "barbarous," first used by the Italian artists of the Renaissance. The style of architecture, determined by the use of the pointed arch, which was developed in western Europe between the second quarter of the 12th and the end of the 15th century. The sculpture contemporary with this structural style was a subservient art. It followed the lines of the building, the figures being cramped between emphasized verticals and horizontals. But, as Gothic architecture approached its climax, figure sculpture attained great expressiveness, especially in the portrayals of the Christ and the Virgin. At the same time and to an equal degree this quality marked the grotesques surcharged with symbolism, which were set in a profusion sufficient to people the roofs and the tower-balconies of the Gothic church.

Grand Canal, Venice. J. M. W. Turner; Metropolitan Museum, New York City. A picture famous for its color effects. Painted about 1834.

Grant, Ulysses S. H. M. Shrady; Washington, D. C. A heroic equestrian statue, forming the chief feature of the imposing Grant memorial.

Great Lakes, Fountain of the. Lorado Taft; Chicago, Ill. Sculptured female figures, symbolical of the five lakes, form the principal part of this important work, placed at the south front of the Art Institute.

Greek Slave. Hiram Powers; Corcoran Gallery of Art, Washington, D. C. A nude marble figure, representing a girl captive taken by the Turks during the Greek revolution of 1821.

Grief. Also called "Death" or "Peace of God" or "Mourning." Memorial to Mrs. Henry Adams; Rock Creek cemetery, Washington, D. C. One of the masterpieces of Augustus Saint-Gaudens. Bearing no inscription, the countenance of the bronze figure, seated, with closed eyes as in a dream, is mysterious and awe-inspiring.

Groin. The edge, or arris, formed by the intersection of two barrel vaults.

Group. In art, this term implies two or more figures or objects so placed and related as to form a unit. The groups in a picture should present well balanced masses. In sculpture, a group is a collection of figures, each of which is necessary to the effect of the whole The outline and arrangement of such a group should present a harmonious effect.

Gulf Stream, The. Winslow Homer; Metropolitan Museum, New York City. A broken-masted sailboat lies in the trough of the waves; a Negro is prone on the deck. Sharks appear in the foreground; at the right, a waterspout; at the left, on the horizon, a sailing vessel. The sea is blue-green, under a copper sky.

Gypsy. Murillo; Crocker Art Gallery, Sacramento, Cal. A masterly character sketch of a gypsy woman, revealing Murillo's genius as a *genre* painter.

Hard. A term applied to pictures which exhibit stiffness of drawing and harshness of outline.

Harp of the Winds. Homer D. Martin; Metropolitan Museum, New York City. A view of the Seine; a row of tall poplars on a flat shore. In the distance is a town.

Harvest, The. Léon L'Hermitte; Museum of Fine Arts, Saint Louis, Mo. A realistic picture of peasants harvesting grain by hand.

Harvesters at Rest. Léon L'Hermitte; Wilstach collection, Philadelphia, Pa. A peasant woman is bringing a midday meal to two men who are seated on the ground. A similar group, by the same artist, under the title "Harvesters' Meal," is in the Institute of Arts and Sciences, Brooklyn, N. Y.

Hatchings. Lines, either parallel or crossed, by means of which the modeling of objects is indicated in engraving. By these lines, according to their size and closeness, the engraver is able to suggest tones, to render the effect of vibrating lights, and to mark distinctly the form and even the texture of an object.

Hay Wain, The. John Constable; National Gallery, London. A wagon is being driven through a shallow stream in the foreground; cottage and trees beyond.

Heart. In Christian symbolism the heart represents the greatest of the three Christian virtues, charity; the symbols of faith and hope are, respectively, the cross and the anchor.

"Herringbone and Dots." A very frequent *motif* found in Oriental rugs. It is a simplified representation of a reptile from which all features have been eliminated except the indication of the spine and the scales.

Hewer, The. George Grey Barnard. A heroic, kneeling figure in marble, representing a primitive man hewing wood with a stone hatchet. In conception and execution, this is one of the best productions of American sculpture.

High Light. In a picture, the high light is that spot which appears to the eye to be of the greatest brilliance. Since this high light is always a reflected light, it is found only on such surfaces as reflect and do not absorb the light. A high light, for instance, may appear upon a burnished metal plaque or in an eye, but it is never seen upon materials of dull, heavy texture.

High Relief. A piece of sculpture executed upon a flat or curved surface, from which it projects more than half

the apparent total thickness of the figures, or so far as to resemble a sculpture in the round.

Hille Bobbe. Frans Hals; Berlin Museum, Berlin. Portrait of a fishwife of Haarlem, with an owl perched on her shoulder. A work which well illustrates this artist's comic power. A similar portrait of this woman, the work of Hals or one of his pupils, is in the Metropolitan Museum, New York City.

Historic Painting. The painting of historic scenes, or of scenes in which historical personages are represented.

Holy Family. Murillo; the Louvre, Paris. The Virgin, robed in blue, seated in the center of the picture, holds the Infant on her knees before the adoring Saint Elizabeth and the child Saint John.

Holy Night. Correggio; Royal Gallery, Dresden. Bright light in the center of the picture radiates from the Christ Child lying upon a bed of straw. The morning is just breaking over the hills in the distance.

Hope. George Frederick Watts; Tate Gallery, London. A single figure, seated on a segment of a great globe, eyes blindfolded, all but one of the strings of her harp broken is represented as clinging alone to a deserted world.

Horse Fair, The. Rosa Bonheur; Metropolitan Museum, New York City. Heavy white and sorrel Percheron horses are being led or ridden by men in blue blouses.

Horses of Achilles, The. Henri Regnault; Museum of Fine Arts, Boston, Mass. The horses, conscious of their master's approaching death, resist the charioteer's attempts to harness them.

Immaculate Conception. Murillo; the Louvre, Paris. This is accounted one of the greatest of Spanish paintings. A graceful figure in blue mantle, with the crescent moon beneath her feet, surrounded by throngs of cherubs, is gazing into heaven.

Impasto (*ĭm-päs'tō*). The application of very thick oil color to the surface of a canvas. The purpose of impasto is to give the effect of relief, force, and solidity to the objects represented.

Indian Hunter. John Q. A. Ward; Central park, New York City. A fine bronze group of an Indian and his dog, both in alert attitude.

Inlaying. A method of decorating objects, such as weapons or furniture. It consists in incising patterns on the surface of the object and filling the spaces thus formed with pieces of variously colored wood, ivory, metal, or mother-of-pearl.

In Pasture. Jules Dupré; City Art Museum, Saint Louis, Mo. A background of field and trees. In the foreground a cow is straining at the rope held by a peasant.

Interior of a Cottage. Josef Israëls; Corcoran Gallery of Art, Washington, D. C. Light from the cottage window bathes the figures of a sleeping child and a woman sewing.

January Day, A. W. Elmer Schofield; Museum, Cincinnati, Ohio. A canvas of tall gray trees, mingling with evergreens; on the ground, broken patches of snow, the sky blue and cloud flecked.

Joan of Arc. Anna V. Hyatt; Riverside drive, New York City. Replicas of this statue have been erected at Gloucester, Mass., and at Blois, France. It is a work worthy of comparison with the best of modern French sculpture.

Joan of Arc. Julien Bastien-Lepage; Metropolitan Museum, New York City. Joan stands in listening attitude by a tree. In the background, vague figures suggest her vision of Saint Michael, Saint Catherine, and Saint Margaret.

Joan of Arc at Domremy. Chapu; the Louvre, Paris. Marble statue. The maid is seated on the ground, hands clasped on her knees, spiritual exaltation expressed on her upturned face.

Keokuk, Chief. Nellie V. Walker; Keokuk, Iowa. A notable heroic bronze statue of the famous Indian, erected on a high bluff overlooking the Mississippi river.

King Lear. Edwin A. Abbey; Metropolitan Museum, New York City. Cordelia stands in the center with the king of France; Goneril and Regan at the left. At the right, Lear, with his dog, is being led away.

Lake, The. Jean Baptiste Corot; the Louvre, Paris. The shore of a lake, overshadowed by great trees. Three human figures in the foreground. This canvas is sometimes called "Spring."

Landscape. A picture which represents natural scenery, and in which the interpretation of nature is the predominant feature; figures of men or of animals being introduced only as accessories, to give a tone of reality to the scene or to furnish a scale of dimensions.

Landscape with Windmill. Jacob Ruysdael; Royal Museum, Amsterdam. The masterpiece of this artist; counted by many as the finest landscape painting of the 17th-century Dutch school.

La Source. Jean A. D. Ingres; the Louvre, Paris. A painting of a young girl standing by a rock, while a stream of water pours from a jar on her shoulder into a pool at her feet.

Last Day of the Condemned Man. Munkácsy; Wilstach collection, Memorial Hall, Philadelphia, Pa. The picture illustrates the old Hungarian custom of allowing visitors to visit a prisoner on the day before his execution. This painting first brought fame to the artist.

Last Judgment. Michelangelo; Sistine Chapel, Rome. First exhibited on Christmas Day, 1541. The great fresco, lacking in unity of design, is filled with clouds and human figures, and centers about the Christ, who sits in judgment. It is literary rather than artistic in character. It declares itself as the work of an aging and fatigued man and it lacks the inspiration of the ceiling pictures.

Last Supper. Andrea del Sarto; in the refectory of the monastery of San Salvi, Florence. A treatment of this subject, surpassed only by that of Da Vinci.

Last Supper. Leonardo da Vinci; Church of Santa Maria delle Grazie, Milan. This famous picture embodies a wonderful character study of the apostles. In order, from left to right, the faces are those of Bartholomew, James the Less, Andrew, Judas, Peter, John, the Christ, Thomas, James the Greater, Philip, Mathew, Thaddeus, Simon. The moment is that when Jesus said, "One of you shall betray Me."

Latona and Her Children. William H. Rinehart; Metropolitan Museum, New York City. A marble group representing the queen mother bending over her children.

Law, The. Edwin H. Blashfield; mural painting in the Federal building, Cleveland, Ohio. The central figure symbolizes law; at the sides are portraits of personages notable in legal history.

Leonardo Loredano, Portrait of. Giovanni Bellini National Gallery, London. One of the greatest of painted portraits. The subject, who was doge of Venice 1501–21, is posed wearing his official robe and cap of cloth of gold.

Lewis and Clark. Charles Keck; Charlottesville, Va. A monumental group of sculpture erected at the University of Virginia in 1919, the gift of Paul G. McIntyre.

Library of Congress. Washington, D. C. A monumental building in the style of the Italian Renaissance, begun in 1887 and completed in 1897, at a cost of over $6,000,000. Other than being one of the best planned and equipped library buildings in the world, it contains valuable examples of painting, sculpture, and mosaic.

The building forms a rectangle 340 feet by 470, enclosing a cross; the exterior walls are of granite. Many artists have contributed to the ornamentation and the enrichment of the interior in the mediums of marble, bronze, and color.

Lincoln. Augustus Saint-Gaudens; Chicago, Ill. A bronze statue in Lincoln park. This work is called "the greatest portrait statue in the United States." President Lincoln is represented standing in front of a great chair, as if about to address a multitude.

Lincoln Memorial. Washington, D. C. An imposing building, in the form of a Greek temple, constructed of a Colorado marble of extraordinary whiteness. The edifice, which was 10 years in building, stands upon a platform 204 by 134 feet wide, and rises 122 feet above the level of the Potomac. The memorial contains a colossal seated figure of Lincoln, by Daniel Chester French, cut in Georgia marble. The mural decorations are by Jules Guérin.

Lincoln Monument. Springfield, Ill. A granite structure 120 feet high, surmounted by a bronze statue of Lincoln, and flanked by bronze groups representing arms of the government service. Erected in 1874, at a cost of $200,000.

Line of Beauty. A term applied, in accordance with certain artistic theories, to a graceful curved or undulating line, which is held to be absolutely beautiful in itself. Such a line is commonly represented as a double curve, resembling an elongated letter S.

Lithography. A branch of the art of engraving in which the drawing to be reproduced is traced upon a stone with oily ink or crayon. The surface of the stone is wetted, and the printer's ink, which contains oil, adheres only to those portions of the stone where the design is drawn. Prints are struck off in the usual manner.

Loggia (Italian, "balcony"). Development of the antique bema and the rostrum. In medieval Italian towns a structure of considerable dimensions, roofed, slightly elevated, and open on three sides, from which orators addressed the people on the conduct of the city-states. Of such structures the best existing example is the *Loggia dei Lanzi*, Florence, with its imposing round arches, forming one side of the great square, on which fronts also the Old Town Hall (Palazzo Vecchio), erected in the early years of the 14th century.

Long Pond. Henry W. Ranger; Museum of Fine Arts, Syracuse, N. Y. A quiet sheet of water seen through openings in a fringe of trees.

Lost Pleiad (*plē'yăd*; *plī'ăd*). Randolph Rogers; Art Institute, Chicago, Ill. A marble figure of a girl, posed as if intently gazing into the distance.

Lotus. The Egyptian and Asiatic water lily. The first plant-form to be used in decorative design. It was introduced by the Egyptians into the mural painting of their tombs and temples (Old Kingdom, about 3400–2400 B. C.), not by reason of its beauty, but because, as a perennial, it represented to them the principle of immortality. In their art it was colored blue, like the Nile lily (*Nymphæa cerulea*), but, when it passed into Buddhistic symbolism, it imitated the white variety (*Nymphæa alba*), indigenous to India. As is true of the acanthus, its course may be traced without break through the history of ornament. From it was developed the honeysuckle pattern (anthemion) of Greek architecture and Greek ceramics, while numerous other derivatives appear in modern wall-decoration and in textiles.

Low Relief. A piece of sculpture so executed, upon a flat or curved surface, that the figures project less than half their apparent total thickness.

Luke, Saint. Tradition says that Luke, the disciple and companion of Saint Paul, was a physician and also a painter. Portraits of the Virgin were ascribed to him in the early Christian centuries. He has, therefore, always been regarded as the patron saint of artists. In pictorial art he is often represented as an evangelist, holding the book of his gospel, and with an ox at his side. In pictures of the Byzantine school and the schools derived from it, he appears as a youthful painter, with a portrait of the Virgin in his hand.

Luxembourg, Palace of the. Paris. Now the meeting place of the French Senate. The structure was built in the Florentine style by Jacques Debrosse for Marie de' Medici, widow of King Henry IV. It was erected 1615–20 and occupied the site of the old palace of the dukes of Luxembourg, from which it takes its name.

Macabre (*mȧ-kä'b'r*). A term applied to subjects, either painted, sculptured, or engraved, in which a representation of Death figures. Death may be delineated under either the form of a skeleton or that of an *écorché*, that is, a figure representing a body from which the skin has been removed.

Madame Lebrun and Her Daughter. Madame Lebrun; the Louvre, Paris. A noted and charming portrayal of motherhood and childhood.

Madame Récamier. Jacques Louis David; the Louvre, Paris. A portrait distinguished by its purity and simplicity. The lady, in white gown, reclines on a couch of pale yellow.

Madeleine, Church of the. Paris. A structure in the form of a Roman temple; resembling the Maison Carrée at Nimes, France. It has no windows, the gorgeously decorated interior being lighted through three cupolas. The exterior is distinguished by a colonnade of 54 massive columns. It was erected in the early years of the 19th century, the last directing architect being Vignon.

Madonna, The (Our Lady). Since the 6th Christian century, the mother of the Christ, accompanied by the Divine Infant, has been one of the most frequent subjects of religious art. At the time of Francis of Assisi (1182–1226) this theme received a further impetus through the highly spiritual and gentle character of the saint. It was he who established the ringing of the Angelus, commemorative of the Angel Gabriel's salutation to Mary, and who showed a truly maternal love for all created things, as is manifest in his canticles to the various forces of nature.

For purposes of identification, a madonna may be named from its original or later location, as the "Sistine," painted for the monastery of San Sisto, or the "Cowper," long in Cowper house, England. Some accessory in the picture may give it a title, as the "Madonna of the Harpies," named from figures of harpies on the pedestal upon which the Madonna is standing.

The following are among the most famous Madonnas:

"Alba Madonna," Raphael; Mellon Collection, National Gallery of Art, Washington, D. C. It was in the Hermitage Gallery, Leningrad, from 1836 to 1931, when it was purchased by Andrew W. Mellon from the Soviet government for $1,166,400.

"Madonna of San Sisto" (Sistine Madonna). Raphael; Dresden Gallery, Dresden.

"Madonna of the Goldfinch." Raphael; Uffizi Gallery, Florence.

"Madonna of the Chair." Raphael; Pitti Gallery, Florence.

"Madonna of Burgomeister Meyer." Holbein; museum at Darmstadt (copy in Dresden Gallery).

"Madonna of Murillo." Murillo; Pitti Gallery, Florence.

"Madonna of the Sack." Andrea del Sarto; S S Annunziata, Florence.

"Madonna, *La Belle Jardinière*." Raphael; the Louvre, Paris.

"Virgin of the Rocks." Leonardo da Vinci; the Louvre.

"Madonna." Bodenhausen; Leipzig Museum.

"Virgin in the Carpenter Shop." Dagnan-Bouveret.

"Madonna of the Carpenter Shop." Edward Simmons.

"Madonna of Bruges," group in sculpture; Cathedral of Bruges, Belgium.

"Madonna of the Candelabra." Raphael and certain of his pupils; Walters Gallery, Baltimore, Md.

Maison Carrée (*mâ'zôn' kȧ'râ'*). Nimes, France. A beautiful Roman temple of the rectangular Greek model. The building is 45 feet wide by 85 feet long; 30 Corinthian columns are spaced along the sides of the cella and around the entrance porch. Dating probably from the early years of the Christian era, the structure was long used as a church. It now serves as a museum.

Man with the Glove. Titian; the Louvre, Paris. A famous and powerful portrait in the artist's "first manner."

Marriage. Gari Melchers; Institute of Art, Minneapolis, Minn. A bride and groom standing, as if at the marriage altar.

Marriage à la Mode. William Hogarth; National Gallery, London. A series of six paintings, illustrating the agitated, unhappy married life of a wealthy citizen's daughter, wedded to the dissipated son of a peer.

Marriage at Cana, The. Paul Veronese; the Louvre, Paris. Painted in 1563. A very large canvas in which several of the figures are portraits of 16th-century sovereigns, among which are those of the emperor Charles V, Francis I of France, and the sultan.

Marriage of Saint Catherine. Correggio; the Louvre, Paris. The Holy Child is placing the ring upon the saint's finger as a symbol of spiritual union. The attendants are Saints Catherine and Christopher.

Massasoit. Cyrus E. Dallin; Plymouth, Mass. A bronze statue of the famous Indian friend of the New England colonists.

Mater Dolorosa (*mā'tĕr dō'lō-rō'sȧ*). The Latin phrase means "mother of sorrows." It is applied to the Virgin, when she is represented as sorrowing for her crucified Son. In art, the Mater Dolorosa is generally represented alone, sometimes with one sword in her breast, sometimes with seven, in allusion to the seven sorrows which she endured.

Medicine Man, The. Cyrus E. Dallin; Fairmount park, Philadelphia. A bronze work representing an Indian medicine man on horseback in an attitude of authority. It is a companion piece to the admirable equestrian statue "The Appeal to the Great Spirit" by the same sculptor.

Meeting of Air and Water. Isadore Konti; New Orleans, La. A fountain of stone and bronze erected in Audubon park, 1919.

Member of the Humane Society, A Distinguished. Sir Edwin H. Landseer; National Gallery, London. The subject is a large dog lying on a pier by the waterside.

Metope (*mĕt'ô-pē*). The space between two triglyphs in the frieze of the Doric order. In the primitive wooden structure this space was left open. In the later stone temple the window so formed was blocked by a panel (Greek *meta*, upon; *opé*, aperture). Metopes were decorated with either paintings or bas-reliefs. The term is applied also to the bas-reliefs found on metopes.

Mezzanine (*mĕz'ȧ-nĭn'*; *-nēn*). Synonym of the French *entresol*. A small story placed midway between two floors of a building. Generally a mezzanine is found between the first and second higher ones. The term is applied also to the small windows, generally of greater length than height, which light an intermediate story.

Michelangelo. Paul Wayland Bartlett; Library of Congress, Washington, D. C. An impressive bronze representation of the great sculptor, standing with chisel in hand, as if meditating upon some great conception.

Middle Distance. Terms used to designate that part of a picture lying between the background and the foreground.

Milton Dictating Paradise Lost. Munkácsy; Public Library, New York City. The blind poet, seated in an armchair, dictates to his daughter, who is writing at a table in the foreground.

Minuteman, The. Daniel Chester French; on the battlefield at Concord, Mass. This sculptor's first important work, modeled from a cast of the "Apollo Belvedere." It represents a young patriot standing, alert, one hand on his plow, the other grasping a musket, as if awaiting a summons.

Modeling. In the art of sculpture, the process which consists in constructing, in clay or wax, the model which is to be reproduced in plaster, terra cotta, bronze, marble, stone, or wood. The term has also another meaning. The modeling in a painted portrait is good, when the painter has successfully indicated the various planes of the figure.

Mona Lisa (*mō'nä lē'zä*). Leonardo da Vinci; the Louvre, Paris. The portrait of the wife of Francesco del Giocondo. The picture is remarkable for its firm, pyramidal structure and for the finest hands painted during the Italian Renaissance. The painting was stolen in 1911 and was recovered at Florence, Italy in 1913.

Monochrome. A painting, drawing, or print executed in one color.

Mormon Tabernacle. Salt Lake City, Utah. A remarkable elliptical building, 150 feet in extreme width by 250 feet in extreme length. The roof of the structure, shaped somewhat like a turtle's shell, is self-supporting. The auditorium seats 8000 people.

Motive. In music the word "motive" is a synonym of "musical phrase." In architecture it applies to a subject or theme of ornament. So also in decorative design. In the vocabulary of sculpture and painting it is less significant and less frequently used.

My Mother. James A. McNeill Whistler; Luxembourg Gallery, Paris. Called by Whistler "The Mother—Arrangement in Grey and Black."

Napoleon, 1814. Jean L. E. Meissonier; the Louvre, Paris. Napoleon returning from the battle of Laon. Behind him, on lower ground, appears a group of officers.

National Museum. Washington, D. C. A massive white granite structure with a frontage of 561 feet, a lateral extension of 365 feet, and a height of 82 feet. It is designed as part of the new grouping of public buildings in Washington. The museum contains the government collections and laboratories of natural history.

Nebraska State Capitol. Lincoln, Nebr. Architect, Bertram Grosvenor Goodhue. A notable innovation in American state edifices. A broad, low main building, 400 feet square, is constructed around four courts. In the center rises an impressive square tower, 400 feet high. The façade, with its setback, suggests that of the Pitti Palace at Florence (1430); while the tower indicates modern German influence, recalling, at the same time, the turreted structure over the crossing in the older cathedral at Salamanca, Spain.

Neutral. A vague color which does not present any predominant tone is said to be neutral. The term denotes particularly a gray of bluish violet tint used in water colors. Neutral tints form excellent grounds for pictures, since they increase the value of striking colors and cause the latter to stand out with peculiar brilliance.

New Mexico Art Museum. Santa Fe, New Mexico. A unique adaptation of Spanish-Indian Pueblo architecture. With the co-operation of the artist colony at Santa Fe and Taos, the building and its furnishings have been made representative of the art and life of the Southwest.

Night Watch. Rembrandt van Rijn; Royal Museum, Amsterdam. Called also "The Civic Guard" and "The Day Watch." This picture marks the "second manner" of the painter and is remarkable for its treatment of light and shade.

November Morning. Dwight W. Tryon; John Herron Art Institute, Indianapolis, Ind. Landscape in rich brown tones, in which the summer's green is still felt.

Nydia. Randolph Rogers; Art Institute, Chicago, Ill. A graceful marble figure, representing the blind girl of Bulwer-Lytton's *Last Days of Pompeii*.

Old Woman Cutting Her Nails. Rembrandt van Rijn. Altmann collection, Metropolitan Museum, New York. This homely subject is painted with great luminosity and renders with wonderful vitality the pose and action of the figure. Its attribution to Rembrandt, until recently unquestioned, is now disputed by Professor John Van Dyke of Rutgers college, New Brunswick, New Jersey. This critic, who is not without authority, asserts that the picture is the work of Nicolaes Maes (1632–93), a younger contemporary of Rembrandt, who for years employed a single model. The same face, the writer further affirms, appears in the later artist's "Sleeping Woman," Brussels Museum; "Praying Woman," Royal Museum, Amsterdam; and finally in "A Dead Woman," Brussels Museum.

Order. The term applied to the three principal styles of Greek architecture. They are entitled *Doric*, *Ionic*, and *Corinthian*. A combination of the Ionic and Corinthian is known as the composite order. In Roman times another and simplified order, the Tuscan, was developed from the Greek Doric.

Original. A term used to designate a picture, a drawing, or a statue from which copies or reproductions have been made.

Ornament. The term applied to a painted or sculptured motive, enclosed by regular or irregular lines, which contributes to the richness and effect of a work of art.

Oxen Going to Labor. Constant Troyon; the Louvre, Paris. In the foreground of a broad expanse of land, oxen are walking sturdily and calmly.

Oxen on the Beach. Sorolla y Bastida; Memorial Art Gallery, Rochester, N. Y. A yoke of oxen in the foreground, ready to haul the boat at the right of the picture to the stretch of sand above.

Palette (*păl'ĕt*). The palette is one of the principal requirements of the painter. It consists of a thin oval or rectangular board or tablet, generally of walnut or pear wood. It is hollowed out at one end, and provided with a hole through which the thumb is passed, in order that the palette may be held conveniently. Upon the palette the artist lays and mixes his colors.

Pan-American Building. Washington, D. C. A beautiful marble structure, the headquarters of the Pan-American Union. This edifice, designed by Albert Kelsey and Paul Cret, was completed in 1910, at a cost of $1,000,000. Among its many artistic features are the typical Latin American *patio* and the hall of the Americas, the latter said to be the most beautiful room of its kind in the United States.

Panel Picture. A picture painted upon a wooden tablet or panel, rather than upon a canvas. Altar pictures were so painted by the earliest medieval artists, and many specimens are to be seen in modern galleries.

Pastel (*păs'tĕl*; *păs-tĕl'*). A process of drawing in color by the use of crayons. The drawing is made upon paper having a rough surface or upon a canvas covered with a kind of distemper. The colors are laid on with hard crayons, while the lights, masses, and planes are indicated with soft crayons, which can be crushed and spread with the finger or stump. Drawings in pastel are easily effaced, since the whole surface may be destroyed with one stroke of the brush. They should be set, therefore, with a special fixative, and carefully shielded from air or dampness.

Patriotism Guarding the Flag. Paul Wayland Bartlett; Duluth, Minn. A statue carved in red Minnesota granite and erected at the foot of a great flagstaff designed by Cass Gilbert, architect.

Pediment (*pĕd'ĭ-mĕnt*). In classical architecture, the triangular portion of wall, above the entablature, forming the gable at the end of a building. The term is applied also to rounded construction having similar position and use. The façades of ancient temples were always crowned by pediments, the two sides of which marked the slope of the roof.

Perseus with the Head of Medusa. Benvenuto Cellini; bronze statue in the Loggia dei Lanzi, Florence. The hero stands over the body of the Gorgon, with a sword in his right hand and the severed head in his left.

Perspective. The art of representing, upon a plane surface, objects as they appear to the eye of the spectator viewing them from one fixed point.

Philip II, Portrait of. Attributed to Titian; Museum, Cincinnati, Ohio.

Philip IV of Spain. Velasquez; Metropolitan Museum, New York City. A full-length, life-size figure of the artist's royal patron.

Photo-Engraving. The general name for a variety of processes in which advantage is taken of the action of light upon sensitized surfaces to produce plates from which facsimiles of drawings and photographs may be printed. Photo-engraving processes all depend upon the preparation of metal plates for etching. The etching ground is a coating of gelatin or similar substance sensitive to the action of light. Exposed to light through a properly prepared photographic negative, portions of the coating become insoluble. When the soluble portion has been removed by washing, the etching of the unprotected portions of the plate with acid produces the desired printing surface.

In the *half-tone process*, a plate, usually of zinc or copper, is so treated that a printing surface composed of fine dots *in relief* is secured. The *photogravure process* consists in producing upon a copper plate an *incised* or intaglio pattern from which the picture is printed. The recently developed *rotogravure* is an adaptation of the photogravure to the rapid processes of the rotary printing press.

Pietà (*pyā-tä'*). The Virgin Mother mourning for the dead Christ. The incident is represented as occurring at the foot of the cross. The most famous example of this frequently treated theme is the marble group by Michelangelo, in Saint Peter's, Rome. The technical excellence of this work resides in the study of the living body as contrasted with the cadaver.

Examples in painting are: by Titian, in the Academy, Venice; by Fra Angelico in Museum San Marco, Florence; by Carlo Crivelli, in the Metropolitan Museum, New York City.

Pilgrim, The. John Q. A. Ward; New York City. A heroic bronze statue in Central park.

Pilgrims Going to Church. George H. Boughton; Public Library, New York City. A group of Puritans in a snow-covered forest clearing; the men of the party are armed and watchful. Called also "Puritans Going to Church."

Pioneer, The. A. Phimister Proctor; Eugene, Oregon. A bronze statue erected on the grounds of the University of Oregon, 1919.

Plein Air. The term "plein air" is applied to a school of modern French painters because of their practice of painting in the open air.

Polychrome. A term applied to art works in which several colors are used. Greek sculpture was polychrome, that is to say, gilded and painted in a variety of tones, principally blue, green, and red.

Ponte Vecchio di Firenze, Il (The Old Bridge at Florence). Title of a sonnet written in both Italian and English by the poet Longfellow. In these few lines the Bridge, imaginatively endowed with life and speech, relates the history of the city of Florence, whose two parts, separated by the river Arno, it has joined since the middle of the 14th century. Considered as a work of architecture, this bridge is interesting, since, supporting shops at either end of the central arcade, it shows the economy of space practiced in the medieval walled town. Bridges with houses, like the superposed stories of the roofs in buildings north of the Alps, were the modest ancestors of the American skyscraper.

Pot of Basil (*bŏz'ĭl*), **The.** John W. Alexander; Museum of Fine Arts, Boston, Mass. A picture inspired by the story told in the poem "Isabel" by Keats, which was itself derived from the Italian of Giovanni Boccaccio (1313–75).

Reading from Homer. Alma-Tadema; privately owned. The faces of the listeners reflect the enchantment of the tale from the ancient poet, read from a scroll by a youth seated on a dais at the right of the picture. The figure of the woman with luxuriant auburn hair is a portrait of the second wife of the painter.

Relief. The term relief as applied to painting designates the apparent projection of objects, an effect produced by modeling or by a gradation of tints. In sculpture, a relief is a work executed on a flat ground, from which the figure or series of figures projects in a greater or less degree. According to their degree of projection, the sculpture is said to be in high or low relief. In architecture, the moldings and systems of ornament which project from the surface of a wall are termed reliefs.

Republic, The. Daniel Chester French; Chicago, Ill. A heroic, ideal sculptured figure, erected in Jackson park.

Retreat from Moscow. Paul Gustave Doré; Metropolitan Museum, New York City. A group of Napoleonic soldiers seated in a cart are being followed by a squad of Russian cavalry.

Rising Storm, The. George Inness; Art Institute, Chicago, Ill. Clouds darkening a broad landscape; in the right foreground a man driving a horse and cart.

Rococo (*rō-kō'kō*). (French *rocaille*, "shell-work.") A decorative style popular in Europe in the 17th and 18th centuries. It was characterized by a profusion of riotous ornament, consisting of scrolls, foliage, and fantastic animal forms, intermingled and often confused.

Rood Screen (rood, or rod, signifying the Cross of the Crucified). A low wall of stone or an iron grill used to separate the clergy in the apse from the laymen in the nave. It sometimes supports a gallery from which portions of the service are read, and it is capped by a Crucifix with the attendant Virgin and Saint John the Evangelist.

Roosevelt, Theodore. A. Phimister Proctor. An equestrian statue erected in Portland, Oregon, 1922.

Saint Anthony and the Infant Christ. Murillo; Berlin Museum, Berlin. The saint is kneeling, and holds the Christ Child in his arms.

Saint Mark's Basilica. Venice. This structure is called the most splendid piece of polychromatic architecture in Europe. It is 250 feet long, and measures 170 feet from north to south at the transepts. Byzantine in style, its construction, alteration, and reconstruction date from successive periods between the 12th and the 16th century. The basilica is especially famous for its mosaics representing scenes from the Bible and ecclesiastical history.

Salon (*sȧ'lôN'*). The exhibition of the works of living artists held annually in Paris, by the Society of French Artists. The title *salon* comes from the *salle carrée* of the Louvre, in which exhibitions were formerly held.

Scarab (*skăr'ăb*). A stone carved in a conventionalized form of the scarabæus, or dung beetle, which was regarded by the ancient Egyptians as a symbol of resurrection and immortality. Scarabs were prized among the Egyptians as seals and amulets.

Scottish Rite Temple. Washington, D. C. A notable building modeled after the Mausoleum erected by Queen Artemisia at Halicarnassus, Asia Minor, in the 4th century B. C., and accounted one of the wonders of the ancient world.

Scumbling. The process of softening the colors of a picture by blending them with a neutral tint, applying this neutral tint over the colors with a nearly dry brush.

Shade. That part of a picture, a drawing, or an engraving representing objects which, not being struck by luminous rays, are relatively obscure. The term is used also to denote the result of the mixture of several colors, with special reference to the degrees of luminosity produced by mixing black or white with pure color.

Shadow, Cast. A shadow projected upon a surface by a body interposed between it and a source of light.

Shaft. The part of a column, of cylindrical form, between the base and the capital. The surface of the shaft is sometimes smooth, sometimes decorated with flutings or with foliage patterns arranged in spirals. Half the diameter of a shaft, measured at its base, is called a *module*, and serves as the scale, according to which the other parts of the column and the entablature are proportioned.

Shakespeare. Frederick W. MacMonnies; portrait statue in the Library of Congress, Washington, D. C.

Shaw Memorial. Augustus Saint-Gaudens; Beacon street opposite the Statehouse, Boston, Mass.. Bronze relief group representing the colored regiment commanded by Colonel Robert Gould Shaw in the Civil War. The marching men form a background for the figure of Colonel Shaw on horseback.

Siddons, Mrs. Gainsborough; National Gallery, London. The great actress wears a blue gown and the typical Gainsborough hat.

Siddons, Mrs., as the Tragic Muse. Sir Joshua Reynolds; Huntington Museum. The pose and action of the figure recall the Sibyls of Michelangelo in the Sistine Chapel, Rome.

Singing Tower. A delicately tapered tower, octagonal at the top, in an exquisite landscape setting at Mountain Lake sanctuary, near Lake Wales, Florida, the creation and burial place of Edward Bok. Built of pink Georgia marble and coquina rock, it rises 205 feet from a base 51 feet in diameter to a richly ornamented crown 37 feet across. It was dedicated on February 1, 1929, by President Coolidge as a gift of the builder to the American people. The tower was designed by M. B. Medary.

Slave Ship, The. J. M. W. Turner; Museum of Fine Arts, Boston, Mass. A storm-driven ship on a luridly lighted sea strewn with human bodies. This picture has occasioned much controversy.

Song of the Lark, The. Jules Breton; Art Institute, Chicago, Ill. A girl, on her way to work in the fields, pauses to listen with rapt attention to the song of a lark.

Sower, The. Jean François Millet; privately owned. Often said to be Millet's most successful picture. It represents a vigorous figure of a man, striding across a field, broadcasting the grain with his hand.

Spirit of '76. Archibald M. Willard; Town hall, Marblehead, Mass. Painted in 1876. The old man in this familiar picture is said to be a portrait of the artist's father.

Spring. Anton Mauve; Metropolitan Museum, New York City. In the foreground a shepherd with his dog facing a flock of sheep in green pasture; a row of young trees at right.

Spring. Botticelli; Academy Florence. An allegorical picture founded upon a literary theme first treated by the Latin poet Lucretius and, during the Renaissance, by the Florentine Poliziano. It contains the figures of Flora, the Graces, and the god Mercury. It was produced as a wedding gift for Lucrezia Tornabuoni, daughter of a powerful family of Florence.

Statehouse, Massachusetts. Conspicuously located on Beacon Hill, Boston. The design of the original Georgian and central portion of the building is the work of Charles Bulfinch. The structure is distinguished by its large gilded dome.

Stele (*stē'lē*). An upright stone used by the Greeks as a monument commemorative of persons or historical events. Certain relief sculptures found on Athenian stelæ take high rank among the remains of Hellenic art.

Stenciling. A simple method of executing decorative paintings. A piece of stiff card in which the desired pattern has been cut is laid upon paper. Color is then applied, reaching the paper only where the card has been cut away.

Still Life. A term applied to pictures which have for their subjects fruit, flowers, vases, and such other inanimate objects as usually form the accessories rather than the main interest of pictures.

Stippling. The process of executing a painting, a drawing, or an engraving by a series of small touches, strokes, or dots, instead of long strokes or hatchings.

Summit of the Sierras. William Keith; Institute of Art, San Francisco, Cal. A foreground of green slopes and storm-twisted trees; snowy summits rise in the distant background.

Sun Vow, The. Hermon A. MacNeil; privately owned. A bronze group, said to be the most perfect production of this artist. "An old Indian, seated, watches the effort of a boy who shoots an arrow toward the sun."

Surrealism. A kind of painting associated with Dali and others which surprises the viewer by its use of the artist's irrational experience, either dreaming or imagining. A fur-lined teacup, beautifully painted, is an example.

Swastika (from the Sanskrit, "fortunate"). A cross with equal arms, each having its end turned backwards at right angles to the arm. It is one of the most universal and widespread of art forms among primitive peoples, regarded among some as a symbol of polyandry or fertility and more generally as a promise of good luck. It was adopted as the emblem of the Nazi government of Germany.

Sycamore Hill. Edward W. Redfield; Carnegie Institute, Pittsburgh, Pa. An excellent example of this artist's power in painting winter landscapes. Promise of new life lurks in the stream and the trees.

Symbol. In art, a conventional representation of figures or objects, which serve as the signs of ideas.

Tanagra (*tăn'ă-grä*) **Figurines.** Small terra cotta figures made in classical antiquity, the most beautiful specimens having been found at Tanagra in Bœotia. Figurines from this place, either painted or gilded, are highly prized by collectors for delicacy of execution and their inexpressible charm. They represent divinities, ladies of fashion, or animals.

Technique (*tĕk'nēk'*). This term, in painting and sculpture, denotes manipulative skill, mastery of material, and all those qualities of hand and eye which contribute to the achievement of excellence in a work of art.

Tempera (*tĕm'pâ-rä*). See *Distemper*.

Terra Cotta (*tĕr'a kŏt'ä*). A baked clay, specifically that of a brownish red color, which has always been used by sculptors for their less important works. In the 15th century, when variously colored and glazed, it was used with great success by the Della Robbia family of Florence.

Texture. A term applied to the arrangement of neighboring tones, or of different shades of the same color in alternation or juxtaposition. The word texture is used also to denote the quality of the surface of textiles.

Thrust. The force exerted by an arch against a supporting pier.

Tone. A term applied to a variation of color or tint, produced by admixture of white or black. The same hue is retained, but it becomes lighter or darker when white or black is added. The word is applied also to the brilliance, the intensity of tint, or the dominant effect observable in the colors of a picture. In this sense, we speak of warm tones, cold tones, or energetic tones.

Tottenham Church. John Constable; Metropolitan Museum, New York City. An expanse of green lawn, beyond which the square church tower rises.

Transfiguration, The. Raphael; the Vatican, Rome. Two scenes, that on the mount and that in the valley, are presented with a very evident lack of unity.

Tribute Money, The. Titian; Dresden Gallery, Dresden. Jesus answering the questions of a Pharisee regarding the justice of paying tribute to Rome.

Triglyph (*trī'glĭf*). An ornamental element in the frieze of the Doric order. It consists of a block with two complete vertical grooves, or glyphs, incised in its face. The two beveled vertical edges each form half of the third groove. Hence the name, meaning three-grooved. The stone triglyph recalls the ends of the ceiling beams in the primitive wooden cabin.

Trinity Church, Boston, Mass. Noted church standing in Copley square. Designed by H. H. Richardson in French Romanesque style, with the tower inspired by that of the older cathedral of Salamanca, Spain. The interior wall decorations are by John La Farge, one of the first American mural painters. The stained-glass windows represent the best artists of the modern American, French, and English schools.

Tuscan. An order of architecture of the Etruscan style, called also the Rustic order. The Tuscan order is generally regarded as differing from the Doric only in being less refined in its proportions

Two Natures, The. George Grey Barnard; Metropolitan Museum, New York City. A group of two figures; "a victor, half erect, half bending over a prostrate foe."

Valley Forge. Edwin A. Abbey; mural painting in the Pennsylvania State capitol, Harrisburg, Pa. Baron Steuben is drilling a squad of troops. Washington's headquarters can be seen in the background.

Values. The term applied to the relationships of light and dark parts and color intensities in a picture.

Vehicle. In the art of painting, the liquid with which pigments are diluted in order to render them of a usable consistency is termed the vehicle. In water color, the vehicle is water; in oil painting, oils of various kinds; while wax is the vehicle in encaustic painting.

Venus and Adonis. Correggio; Crocker Art Gallery, Sacramento, Cal. Venus admonishes the huntsman Adonis to avoid danger.

Venus of Melos. A Greek original statue discovered on the island of Melos in 1820 and now in the Louvre, Paris. It is a descendant of the nobler type of Aphrodite (Latin, Venus), created in the 4th century B. C., and dates most probably from approximately 100 B. C.

Vibrating. A term applied to a strongly marked, nervous, living effect of color in pictures.

Victory of Samothrace. Sculptor unknown; the Louvre, Paris. This statue of a female figure is said to be the most exquisite expression of movement left to us by antique art. It was executed to celebrate a naval victory of the Macedonian ruler Demetrius Poliorcetes over the Egyptian general Ptolemy in 306 B. C. The statue was discovered in Samothrace in 1863.

Washington. John Q. A. Ward. Bronze statue in front of United States Subtreasury building, New York City.

Washington. Thomas Ball; Boston, Mass. A bronze equestrian group which is a conspicuous feature in the Public Garden.

Washington Crossing the Delaware. Emanuel Leutze; Metropolitan Museum, New York City. A large historical canvas, depicting Washington and his forces on their way to surprise the Hessian troops at Trenton, N. J., December 25, 1776.

Washington Monument, The. Washington, D. C. An imposing obelisk, interior of granite, exterior of white marble, erected as a national memorial to the first president of the United States. It is one of the loftiest masonry structures of the world, having a height of 555 feet, 5½ inches. The shaft alone is 500 feet, 5⅛ inches high, 55 feet square at the base, and 34 feet at the summit. The pyramid surmounting the shaft is 55 feet high, with a cap of aluminum.

The architect was Robert Mills. In 1848, the corner stone was laid, and during the next seven years the walls rose to a height of 152 feet, but, in 1855, work was suspended for lack of funds. The money, until this time, had been raised by popular subscription. In 1878, Congress having appropriated funds for the purpose, work was resumed, and the completed monument was dedicated in 1885. Robert C. Winthrop, who 37 years before had delivered the oration at the laying of the corner stone, was the orator at the dedication.

Washington, Portrait of. Gilbert Stuart; Metropolitan Museum, New York City. Painted in 1795. This picture represents a life-size figure, seen almost to the waist, and turned slightly to the right. It is known as the Gibbs-Channing-Avery portrait.

Willows, The. Corot; Cleveland Museum of Art, Cleveland, Ohio. A small canvas, with a cottage at the left, pollard willows at the right and in the background.

Windmill, The. Jules Dupré; Cleveland Museum of Art, Cleveland, Ohio. Landscape with windmill in center; background of cloudy sunset.

Woodcut. An engraving made upon wood; the term is applied also to the prints made from such an engraving.

Woodcutting. The art of woodcutting consists in drawing, or photographing, a design on the flat surface of a block of wood, generally boxwood, and in cutting away all that portion of the block upon which the design does not appear. The part of the block which is left in relief is covered with ink, and impressions of it are taken.

Wood-Gatherers, The. Corot; Corcoran Gallery of Art, Washington, D. C. A group of peasants at work on the edge of a forest. The picture was signed by Corot only a few days before his death.

Wood Sawyers. Horatio Walker; City Art Museum, Saint Louis, Mo. Two men in a farmyard are working with saw and sawbuck. Wood is piled against a fence behind the figures. The subject and the treatment have been described as those of an American Millet.

Young Bull, The. Paul Potter; National Museum, The Hague. A picture of powerful realism, held by many critics to be one of the greatest of animal paintings.

Young Woman with Water Jug. Jan Vermeer; Metropolitan Museum, New York City. An interior, lighted through a casement. On a table a brass basin, in which a young woman places a jug of the same metal.

TEST QUESTIONS

Point out the relation of the play-impulse to the rise of the fine arts 1503
How may the fine arts serve in furthering the development of democracy? 1503
Explain the advantage of the method used in this department in treating the history of painting 1504
Characterize the four historic styles of architecture 1504
Discuss the method of treating in this department the history of sculpture 1504

MUSIC

Summarize the styles and development of music in its various stages of growth . . . 1505
Characterize the uses of music among the Egyptians 1505
Discuss the use of the musical scale in the East 1505
State a distinguishing characteristic of Hebrew music. What kind of musical scale did the Arabs develop? 1505
What was the chief musical instrument of ancient Egypt? How is this instrument referred to in the Bible? 1505
Name two of the chief musical stringed instruments used by the ancient Hebrews; four of the principal wind instruments . . . 1505–06
Characterize the typical ancient Greek lyre. Name several forms of this instrument . . 1506
What two wind instruments were important among the ancient Greeks? 1506
Indicate the esteem with which the Greeks regarded music 1506
Name one of the earliest treatises on polyphonic music 1506
What grouping of notes was the foundation of the Greek music system? 1506
Give the name of a famous composition of the early 13th century in England . . 1507, 1533
Outline the career and indicate the importance of Orlandus de Lassus 1507
What is meant by the secularization of Church music? Point out the bearing of this process upon the career of Palestrina. Indicate the character of his work 1507
Summarize the important work of Adrian Willaert in Venice 1508
Describe the origin of the opera in Florentine school 1509
Discuss the rise of troubadours and minstrels in Europe 1509
Indicate the importance of the strolling players in the development of music in medieval times 1509
Explain why J. S. Bach is called the "father of modern music." 1510
Compare the careers and powers of Handel and J. S. Bach 1510
What place does Gluck occupy in the history of modern opera? Give the titles of several of his operas. How many operas did he write? 1511
Name the two most famous oratorios by Haydn 1511
Indicate the variety of musical composition in which Mozart excelled 1511
Who was César Franck? 1512
Point out two distinguishing characteristics of Beethoven's music. Name one opera and one oratorio by this master 1512
Name two groups of Schubert's most popular compositions 1512
In what type of music is the work of Weber of greatest importance? What other composer was largely indebted to Weber for the style of his productions? 1512
Characterize the work of Mendelssohn-Bartholdy. Enumerate several of his most important works 1512
Define Schumann's position in musical history. In what kind of composition is his best work found? 1512
For what instrument chiefly did Chopin write? 1512
State the most important contribution of Berlioz to musical art. Enumerate several of his most successful compositions . . . 1512
Describe the type of piano playing and the musical form originated by Franz Liszt . . 1512
What is the notable characteristic of Rossini's most celebrated compositions? Enumerate the most famous operas by Donizetti. Account for the mastery of art shown by Verdi in "Aida" and "Otello." 1513
Indicate the relation of Brahms to romanticism and classicism in music 1513
Name three famous operas by Meyerbeer; two by Saint-Saëns 1513–14
Indicate the place in musical history assigned to Richard Wagner. Characterize Wagner's use of the orchestra. Point out the position of "The Flying Dutchman," "Tannhäuser," and "Lohengrin" in the growth of Wagner's art 1514
Around what fairy tale did Humperdinck write a famous opera? 1514
Characterize the compositions of Tchaikovsky 1515
Describe the program music of Richard Strauss. Name three of Strauss's more important works 1515
Name two modern composers whose work resembles that of Tchaikovsky 1515
Who was the pioneer of the Russian nationalistic school? Give the title of one of his operas 1515
For what is Mussorgsky most widely known? 1516
Give the names of two pupils of Rimski-Korsakov and describe the works of each . . 1516
Characterize the work of Shostakovich . . . 1516
How did oppression affect the music of Czechoslovakia? 1516
To what nation did Dvořák belong? Name two of his best works 1516, 1519
Describe the unusual characteristics introduced by Grieg into his shorter compositions 1516
Name a leading composer in each of the following: Brazil, Mexico Argentina, Cuba . . . 1517
Describe some of the radical changes that have taken place in music in modern times . 1517
Characterize the work of Debussy. Indicate two of his greatest works 1517
What is atonalism and who is acknowledged to be its chief exponent? 1517
With what performances and with what date is American appreciation of serious secular music said to have begun? 1518
Who were the first three native composers of American music? 1518
How did the New England Puritans regard the pipe organ? 1518
Where and when was the earliest concert of record presented in America? 1518
What effect did the Revolutionary War have on the musical life of America? 1518
What type of music did Stephen Foster produce? Give the titles of three of his compositions 1518
Describe briefly the work of John Philip Sousa; Victor Herbert; Irving Berlin 1519
Who wrote "Showboat"? "Oklahoma"? . . . 1519
What type of music did Paul Whiteman and Ferde Grofe develop? 1519
What influence has jazz exercised on the serious art-music both in America and Europe? 1519
Give the name of one of the oldest choral societies in the United States 1520
Outline the work of Theodore Thomas . . . 1520

Name two national organizations which are working together to develop curricular standards in music education 1520
What is folk music and how does it differ from primitive music? 1521
What important part did the folk songs of Italy play in developing their 19th century music? 1521
What is the oldest known English folk song? 1521
Tell something of the history of the music of Ireland and Scotland. How did the ancient Irish regard their minstrels? 1521
Discuss the music of the North American Indians 1521
What can be said of the origin of folk music in the United States? 1521
What is the origin of the melodies which the Negro adapted to his "spirituals"? 1522
Summarize the contributions of Helmholtz to the theory of music. What are overtones? 1522
Distinguish between musical tones and mere noise 1522
Define pitch, intensity, timbre 1522
Describe the manner in which the ear receives and records sounds 1523
Describe the origin of the neumes. In what respect were they found unsatisfactory? . 1524
Explain the way in which Guido of Arezzo used the neumes. Show how the musical staff developed from his device 1525
Indicate the origin of the word clef. What clefs are now in common use? 1525
Who is credited with having first assigned definite time values to the neumes? . . . 1525
Name the notes used in 12th century music . 1526
Enumerate the ecclesiastical modes 1526
What is a key signature? 1526
Distinguish between normal minor, harmonic minor, and melodic minor scales 1527
Of what are rhythmic groups in music composed? What is duple rhythm? triple rhythm? simple rhythm? 1527
Define syncopation. Point out the meaning of a time signature 1527
Distinguish between one part forms and two part forms. Describe the song form with trio 1528
Define musical form; motive; phrase. Describe a musical period 1528
What is a rondo? 1529
Describe the usual structure of a march . . 1529
Outline the structure of a musical suite . . . 1529
Into how many classes is the song divided? . 1529
Name three great composers of overtures. Describe the three types of overture that are recognized today 1530
Outline the structure of the modern sonata cycle 1530
From what form was the symphony developed? Name two composers who contributed most to its development 1530
What is a symphonic poem and who first made use of this term? 1531
Trace the origin of the concerto. For how many instruments is this form written today? . 1531
Describe the form of composition known as a mass 1531
Point out the services of Pope Gregory the Great 1531
Name the first oratorio. Describe its structure 1532
Of what parts does the present day cantata consist? 1532
Define the term aria 1532
Characterize the vocal manner called recitative 1532
What is the contrapuntal style? In what musical form did it originate? 1533
What was the *organum*? 1533
Describe the musical form known as canon. What is double counterpoint? Indicate the distinctive characteristic of the fugue. How are fugues classified? Who is the greatest master of the fugue? 1533–1534
Describe the equipment of a modern pipe organ 1534
Discuss the following keyboard instruments: Clavichord; harpsichord; spinet 1534
Name three classes of modern musical instruments 1535
Describe the modern pianoforte and tell how it ranks with other musical instruments . 1535
What two composers have made notable use of the pianoforte in orchestral compositions? 1535
Discuss some of the varied musical effects that may be produced on the violin. Indicate the characteristic timbre of the strings of the viola 1535
For what scenes and ideas is the music of the harp especially appropriate? Outline some of the tonal effects produced by various combinations of the stringed instruments of the orchestra 1535–1536
Characterize the tone qualities of the flute; of the oboe 1536
For what musical effects is the English horn appropriate? the bass clarinet? the bassoon? 1536
Indicate the musical capacity of the tenor trombone 1536
Describe the saxophone 1537
What kind of drumsticks are used with kettledrums. Characterize the emotional effects of the kettledrums 1537
Discuss the development of the modern orchestra 1537–1538
Name several composers who have developed the range and the capacities of the orchestra 1538
Discuss the manner in which modern composers write for the orchestra 1538
How are symphony orchestras in the United States supported? 1539
Differentiate between a concert band and a symphony orchestra 1539
What is a choreographer? Name three ballets 1540
Describe microtonal music; the Theremin . . 1541

OPERAS

What famous historical character is the central figure in Meyerbeer's opera "L'Africaine"? Describe the conduct of the island queen, Selika 1549
How does "Aïda" rank in popularity among Verdi's operas? Where is the location of the story? Describe the final scene of the opera. 1549
Summarize the story of "Andrea Chénier". . 1549
Outline the plot of "The Barber of Seville" . 1550
Name the characters in "The Bartered Bride" 1550
In what setting is the story of "La Bohème" placed? 1550
Tell the story of "The Bohemian Girl" . . . 1550
How was "Carmen" first received by the public? Recount the story of this opera. . 1550
From what source is the plot of "Cavalleria Rusticana" derived? Upon what dramatist's work is the opera of "Le Cid" founded? 1550
By whom was the music of "The Daughter of the Regiment" composed? Summarize the plot of the story 1550–1551
Tell how fate overtakes Don Giovanni in the opera of that name 1551
What motive prompts the suicide of the hero Ernani? 1551
Who wrote the music of the opera "Faust"? What fact indicates the popularity of this opera? Recount the story of the opera . . 1551
Characterize the opera of "Fidelio" by Beethoven. Outline the story 1551
Whence is the plot of "Der Freischütz" derived? What character represents the supernatural element in the story? 1551–1552

In what country is the setting of "Lakmé" placed? 1552
Describe the leading scenes in "Lohengrin" 1552–1553
Who wrote the music for "Lucia di Lammermoor"? 1553
Name the leading characters in "Madame Butterfly." Summarize the plot of "Manon" 1553
Tell the story of "Martha" 1553
Upon what work is the plot of "Mignon" based? 1553–1554
Who were the authors of "The Mikado"? . 1554
Indicate the position of "Orpheus and Eurydice" among operas 1554
Recount the story of "Parsifal" 1554–1555
Who wrote the opera "H. M. S. Pinafore"? . 1555
Who is the prophet in Meyerbeer's opera of that name? What fate overtakes him? . . 1555
Name the operas included in "The Ring of the Nibelung." Tell the story of each . 1555–1556
Upon what play is Strauss's opera of "Salome" based? 1556
Outline the opera "Tales of Hoffman" . 1556–1557
Recount the story of "Tannhäuser" 1557
Summarize the story of Athanael in the opera "Thaïs" 1557
Describe the final scene of "Tristan und Isolde" 1557–1558
What is the rank of "William Tell" among Rossini's operas? 1558
Characterize Mozart's opera, "Die Zauberflöte" 1558

PAINTING

Define the art of painting 1559
Describe the use of color in the decorative system of the Egyptians 1560
Estimate the character of the paintings of Zeuxis, Parrhasius, and Apelles in ancient Greece. Name a famous Greco-Roman copy of Greek painting 1560
For what purpose were mosaics employed by Byzantine artists? In what period did this type of art flourish? 1560
In what Italian cities did the art of painting take its rise? 1560
Compare the work of Duccio with that of Cimabue 1561
Who was the founder of the Florentine school? Where are the best examples of Giotto's work to be found? 1561
What reason prompted general acceptance of Giotto's murals in his own time? 1561
Estimate the influence of Giotto on modern painting 1561
Estimate the service of Masaccio to the development of painting 1561
What results were achieved by Paolo Uccello? 1561
What influences favored the introduction of the nude into painting in the 15th century? 1562
Characterize the treatment of the nude just before the High Renaissance 1562
What two commissions given by Pope Julius II signalize the High Renaissance? 1562
Describe the theme and style of Michelangelo's frescoes in the Sistine Chapel 1562
What themes did Raphael treat in the study of Pope Julius? Describe his method of presentation 1562
Characterize the genius and the work of Leonardo da Vinci 1562–1563
In what respect is Leonardo's "Last Supper" different from the portrayal of the scene by preceding painters? 1563
By what circumstances was the use of color in Venetian painting of the 16th century influenced? Illustrate by examples the meaning of the term "mood-picture" applied to some Venetian paintings 1563
Describe the style of painting called Mannerism. Give an example of experiments . . 1563
Name two painters whose works exhibit the chief characteristics of the Baroque . . . 1563
Describe the training and character of Caravaggio. What is said of his influence in the history of painting? Name one of his famous pictures 1563
Who were the founders of the primitive Flemish school of painting? Characterize the Flemish choice and treatment of subjects 1563–64
In what points is Albrecht Dürer compared with Leonardo da Vinci? Name his most famous and characteristic works 1564
For what work is the younger Holbein famous 1564
Describe some of the works of Lucas Cranach . 1564
Indicate the rank of Rubens in the art of painting. Discuss the rise of the Dutch school . 1564
Describe the methods used by Hals in the guild picture 1565
Name three Dutch painters of interiors, and characterize their methods 1565
Who was known as El Greco and when did he live? 1565
Discuss the genius and the historical position of Velasquez. Give the names of three other famous Spanish painters 1565
In what century did the first truly French painters appear? 1565
Describe the paintings of Nicholas Poussin and Claude Gelée and tell what influenced their work 1566
Describe the chief qualities of the art of Watteau 1566
What classes of subjects did Boucher paint? . 1566
How did the work of Chardin differ from that of Boucher? 1566
Discuss the influence of the painting of David 1566
Who was the leader of the Romantic movement in French painting? 1566
In what paintings did Courbet exhibit his realism? 1566
Characterize the spirit of Jean François Millet 1567
Whose work paved the way for "impressionism"? 1567
Explain the use of the term "impressionism" in painting 1567
Characterize the work of William Hogarth . 1567
Compare the painting of Reynolds with that of Gainsborough 1567
What influence did the work of Constable and Turner have on other artists of their time? . 1568
Who were the Pre-Raphaelites? Describe the work and the artistic influence of Burne-Jones and William Morris 1568
Name the first three notable American painters. What type of paintings did Trumbull produce? 1568
Outline the work of Gilbert Stuart 1568
Who was the founder and who were the leading artists of the Hudson River school of painting? 1568
Who were the first notable Americans to produce mural decorations? 1568
Along what lines has American art developed during the 20th century? 1568–1570
Define Cubism and name three members of the Cubist movement 1569
What is frequently called "non-objective" painting? 1569
Name some of America's leading regional painters 1570

ARCHITECTURE

In what respect does the origin of architecture differ from that of the other fine arts? . . . 1571
Describe the structure of the primitive Egyptian cabin; of the Mesopotamian oven. Distinguish between the lintel principle and the domical principle in architecture 1571

Characterize the achievements of the Egyptians in the use of the column-and-lintel structure as exemplified in the Temple of Karnak 1571
Upon what type of buildings did the Persians expend their best efforts? 1571-1572
Point out the notable features of Persian porticoes. Summarize the architectural gifts of Persia and Egypt to Greece 1572
Of what material were the earliest Greek temples constructed? When was the first temple of stone erected in Greece? Where are the oldest architectural remains of Greek civilization to be found? 1572
In what age did the climax of Greek art appear? 1572-1573
Who was the director of the building of the Periclean Parthenon? What other architects were engaged in the work? 1573
Describe the architectural features of the colonnade of the Parthenon. For what purposes was color used on the building? . . 1573
Enumerate the chief aims of Greek architects in the Periclean age 1573
Indicate the importance of "hut urns" in the study of Roman architecture 1574
In what year was the Pantheon erected? To what origin is the dome form of the Pantheon traced? What two claims are made as to the importance of this dome in the history of architecture? 1574
State the evidence for the primitive form of the Pantheon dome 1574-1575
Describe the general dome scheme of the mosque of Santa Sophia. What is the principal contribution of Byzantine builders to architecture? 1575
What was the object of the dome set on a drum, as it appeared in Florence? 1575
Upon what building did Brunelleschi model his dome for the Cathedral of Florence? . 1575
Describe the lantern as built by Brunelleschi and his successors. Indicate the weaknesses of the dome of the Renaissance period . . . 1576
State the purposes of Pope Julius II with respect to art in the city of Rome 1576
Criticize Bramante's plans for the Tempietto. What large commission did Pope Julius give to Bramante? 1576-1577
What type of dome did Bramante plan for Saint Peter's? How much of the construction did he carry out? 1577
Indicate the changes made by Michelangelo in the plans for the dome of Saint Peter's. Point out the errors by which he weakened the dome. Who supervised the completion of the dome after Michelangelo's death? . . 1577
State the influence of the Petrine Construction upon later building 1577
What method has been used to prevent the disruption of Saint Peter's dome? 1578
When was artistic supremacy in Europe transferred from Rome to Paris? 1578
What two architects of one family built notable domes in the reign of Louis XIV? 1578
Estimate the architectural quality of Soufflot's dome of the Pantheon in Paris . . . 1578-1579
Summarize the work of Sir Christopher Wren in respect to old Saint Paul's before the Great Fire of 1666. How does the new Saint Pauls' rank among the European cathedrals? 1579
What plan did Wren first submit for the new church? What requirements led to a change of plan? Describe the construction of the dome erected by Wren 1579
Enumerate some instances of the use of arch forms in ancient times 1579-1580
What two architectural forms were combined in the Colosseum? 1580
Under what Lombard queen did the Lombards begin to build churches? What name attaches to the Lombard builders? 1580
Name the elements of the Lombard style of architecture 1580
Describe the structure of the early basilica . . 1580
Discuss the architectural interest of the Lombardic façade 1580-1581
Compare the façades of Notre Dame, Amiens, and Reims 1581
What is required to insure the stability of an arch? 1581
Trace the development of Gothic construction through the barrel vault to the flying buttress 1581
Point out the functions of the ribs in a Gothic structure 1581-1582
In what century did the Gothic system reach its climax? 1582
Discuss the development of the Gothic style in France and its spread to England, the Rhineland, and Spain 1582
Estimate the distinctive qualities of English cathedrals 1582
Illustrate the slow growth of English cathedrals. Show how Canterbury exhibits the work of successive ecclesiastical architects. 1582
Explain what is meant by corporate effort in French cathedrals 1583
Compare French and English cathedrals. State the Gothic legacy to architecture . . 1583
Enumerate some of the predecessors of the American skyscraper 1583
What effect has the new space concept had on the building of modern schools and churches? 1584
Describe the geodesic dome 1584
What contributions did Frank Lloyd Wright make to modern architecture? 1584

SCULPTURE

Describe the ancient Egyptian sculptured figure called "The Sheik." Point out notable qualities of the two statues known as "The Scribe" and "The Dwarf" 1585
Discuss the colossal sculpture of ancient Egypt. Point out its influence upon the art of Greece 1585
In what arts did the Mesopotamian peoples excel? Describe a splendid example of Assyrian animal sculpture 1585
Discuss the relation of the Olympic games to the genesis of Greek sculpture 1586
From what source was the early female draped figure of Greek sculpture derived? 1586
Point out the characteristic features of the early Apollo type of sculpture; of the archaic Ionian figure 1586
Characterize the art of Myron. To what position in the history of sculpture is he assigned? 1586
Indicate the range and quality of the genius of Phidias 1586
Describe the location and the composition of the Parthenon frieze 1587
Indicate the rank of the Parthenon pediment among ancient works of sculpture. Upon what two works does the popular fame of Phidias rest? 1587
Name two sculptures representing the development of the early Apollo type by Polyclitus. 1587
Describe the important innovation in the pose of the sculptured figure introduced by Polyclitus 1587
Characterize the statue of Hermes attributed to Praxiteles 1588
Discuss the relation of several famous statues to Praxiteles' treatment of the female figure. 1588
Compare the sculpture of Scopas with that of Praxiteles and his school. What was the greatest labor of the career of Scopas? . . . 1588
Indicate the place of the "Niobe Group" in the history of Greek sculpture 1588

In what type of figures did Lysippus excel? What was his relation to Alexander the Great? 1588–1589
Discuss the origin and the quality of the statue known as the "Dying Gaul" 1589
Describe the scenes portrayed on the so-called "Altar of the Gods" at Pergamum 1589
To what type of statue is the "Venus of Melos" said to belong? 1589
Describe the general style of sculpture with which Greek art came into contact in Rome. Discuss the purpose for which sculpture was employed under Augustus 1590
Compare the sculptures on the Arch of Titus with those on the Column of Trajan . . . 1590
Outline the development of symbolic sculpture after the decline of Rome 1590
Describe the use of sculpture as tributary to architecture 1590–1591
Indicate the significance of the figure of the Virgin in the porch of Notre Dame, Paris, in the history of medieval sculpture 1591
Point out the extent of French influence in the sculpture of Germany and Spain 1591
Describe the use of sculpture on the façades of medieval English cathedrals 1591
Describe the statue "David" by Donatello. Indicate its place in the development of modern sculpture 1592
State the places of the "Pietà" and the "David" in the early development of Michelangelo 1592
Why are Michelangelo's "Slaves" said to mark a new era in the history of sculpture? Discuss his statue of "Day" 1592
For what sculpture is Bernini chiefly famous? . 1593
Discuss the work of Jean Goujon; that of Germain Pilon 1593
Describe the notable work of Girardon at Versailles. Indicate the attainments of Coysevox 1593
State the leading characteristics of the sculpture of Pierre Puget. Describe his "Milo of Crotona" 1594
Indicate the sources of foreign influences in Spanish Renaissance sculpture 1594
Name the three most notable Spanish sculptors of the 15th century. Point out the general character of their work 1594
What subjects were favorites with the German wood carver, Veit Stoss? Name the masterpiece of Peter Vischer 1594
Review the training of Canova which prepared him for his unique work. What is his contribution to modern sculpture? 1595
Name the most important sculptural works of Thorvaldsen 1595
Describe Houdon's realistic statue of Voltaire. 1595
Characterize the masterpiece of François Rude. 1595
To what class of subjects did Jules Dalou devote his art? 1595–1596
Explain the meaning of Rodin's phrase "art of the lump and the hole" 1596
Estimate the qualities of Rodin's statue of Balzac 1596
Name the first three American sculptors. What notable works were produced by Thomas Ball? 1596
What monument constitutes Martin Milmore's most conspicuous work? 1596
Outline the training and preparation of Augustus Saint-Gaudens for his work. Name four notable monumental works by Saint-Gaudens 1597
Describe the distinguishing features of two of the mature works of Daniel Chester French. 1597
Compare the work of Frederick MacMonnies with that of George Barnard. What notable statues of historical personages has Paul Wayland Bartlett produced? 1597–1598
Name the most successful of Cyrus E. Dallin's figures of Indians 1598

ART TERMS AND SUBJECTS

What is adobe? Where is this material used? . 1599
Who painted "The Anatomy Lesson"? "The Angelus"? 1599
Define the following terms: apse; arch; architrave 1599
What are the chief objects and figures in "Autumn" by Mauve? in "Autumn Oaks" by Inness? in "Avenue of Middelharnis" by Hobbema? 1599–1600
To what type of buildings is the term basilica applied? 1600
What is the "Bayeux Tapestry"? 1600
Where are the following pictures to be found: "The Boyhood of Lincoln" by Eastman Johnson? "The Boyhood of Raleigh" by Millais? 1600
What is a campanile? Locate some American examples of this kind of structure 1600
Distinguish four styles of architectural capitals 1600
What are cartoons? caryatides? catacombs? . 1601
Compare as to dimensions the following cathedrals: Saint Patrick's, New York City; Saint John the Divine, New York City; Saints Peter and Paul, Washington 1601
Define *chiaroscuro* 1601
Describe the "Cloth Syndics" by Rembrandt. 1601
What is the meaning of the term composition in works of art? 1601
Who painted the "Creation of Man" and the "Cumæan Sibyl" in the Sistine Chapel at Rome? 1601–1602
For what is Rubens's "Descent from the Cross" notable? 1602
To what art works does the term "Elgin Marbles" apply? 1602
Point out some characteristic features of Elizabethan architectural style 1602
Describe the process of etching 1602
What is a flying buttress? Point out the origin of this type of construction 1603
Indicate the meaning of the term foreshortening. What is fresco? 1603
What figures are seen in "The Gleaners" by Millet? in "The Golden Stairs" by Burne-Jones? 1603
Explain the application of the term Gothic in art 1603
Describe the following pictures and sculptures: "Greek Slave"; "The Gulf Stream"; "Harvesters at Rest"; "The Hay Wain"; "The Hewer" 1603
Describe the grouping of figures in Murillo's "Holy Family" 1604
Define impasto; inlaying 1604
Characterize the pose of Joan of Arc in the picture by Bastien-Lepage; in the statue by Chapu 1604
In what style is the Library of Congress built? the Lincoln Memorial? 1604
Describe the process of lithography 1604
Point out the uses of the lotus in decorative design 1605
Indicate an unusual feature of the Church of the Madeleine in Paris 1605
Enumerate several famous paintings of the Madonna 1605
What characteristics of the following buildings are interesting: the Mormon Tabernacle? Nebraska State Capitol? New Mexico Art Museum? 1606
What story inspired John W. Alexander's picture, "The Pot of Basil"? 1607
Characterize the style of Saint Mark's Basilica. For what mosaics is it famous? 1607
By whom was the "Shaw Memorial" in Boston produced? Who painted the picture, "Spirit of '76"? 1607
Who painted the historical canvas of "Washington Crossing the Delaware"? 1608

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EDUCATION
KNOWLEDGE IS POWER

EDUCATION

INTRODUCTORY

An organized educational system, carried on by professional teachers and provided with suitable material equipment, such as special school buildings, textbooks, maps, and scientific apparatus, is a product of modern civilization. Primitive peoples and societies in the earlier states of civilization had no institution such as the school which we know today. They did, indeed, give their youth some preparation for the later activities of adult life, but this training was acquired through imitation of the older members of the family or tribe, and the process of education was in no wise separated from the general life of the group. The savage boy learned to use the implements of war and the hunt by being a part of the tribal group that engaged in these activities. Girls were trained in domestic duties by the older women. There was no special body of knowledge that required for its transmission an institution and a teacher.

Beginnings of Special Education. The first demand for a definite type of education, which appeared as civilization advanced and as the earlier unsystematic type of education became inadequate, was the demand for religious training. Primitive tribes frequently organized elaborate ceremonies at the time when the boy became a candidate for admission to adult society, and through these ceremonies initiated him into the secrets of tribal religion. Special education of the girls was never as fully organized as was the special education of boys. Indeed, even in modern times, the informal imitative type has more commonly prevailed in the training of girls than in the training of boys.

The special ceremonies which were developed in primitive tribes for the education of boys were usually reserved for the privileged classes. In those primitive societies where the distinction between the ruling class and the slaves was marked, it was only the upper class that enjoyed the advantages of initiation into tribal practices. The sons of the warriors who were to become the priests or the military leaders of the tribes were the ones who were given special education, and this instruction was usually imparted by the priests.

Development of Secular Education. From institutionalized education under the supervision of the church to public education under the control of the state is a step which can readily be understood. One has only to recognize the fact that, as civilization became more complex, special bodies of knowledge accumulated, which were not religious in character and were not susceptible of transmission through simple imitation. As soon as any nation began to develop a literary language which was more complex than the primitive language of the semibarbarous tribe, it was natural that there should be set aside a certain group of individuals to cultivate and transmit the literary traditions of the nation.

Throughout the history of educational systems, the transmission of literary material has been one of the main functions of the school. The result is that the content of the course of study in schools of all grades is very largely literary. Training in industry and instruction in the ordinary practices of social life are, even in modern times, left very largely to the family or to the intimate social group in which the child grows up; but the family is not able to give to the child the amount of attention which is necessary to provide him with the full knowledge of language, history, literature, and other similar literary subjects.

Growth of Public Education. What originated as the practice of the nobility has gradually come to be the general practice of the community. Schools have been set up by all modern communities, and their children have been brought together under the supervision of teachers trained to handle large groups and thus relieve parents of the necessity of individual training or private tutoring of their own offspring. So significant has it become for modern society that children be properly introduced to the special bodies of knowledge necessary for successful living, that the state has finally taken over the whole matter and has even gone so far as to prescribe that every child must be in attendance at a public school. All modern nations have educational laws of more or less complete compass, and are prepared to enforce these laws in such a way as to provide, with a high degree of certainty, that no child shall escape training in the fundamentals necessary for social intercourse.

For example, it is intolerable in modern society that any considerable number of persons shall be unable to read. Reading is necessary in order that there may be ready communication between a government and its citizens.

What has been said with regard to reading can be repeated with reference to the ability to use numbers. Modern society cannot be carried on unless its members are able to count and to execute with accuracy some of the simpler calculations which are necessary for commerce and trade. Here, again, it is not possible to depend on the individual family to prepare its children in the use of numbers. Consequently, society has provided by law that every child shall attend the organized school long enough to acquire at least the rudiments of number.

Expansion of the Curriculum. One must be able to write, as well as to read and perform correctly simple calculations. A century ago these activities, commonly known as "the three R's," were all that society demanded as essential to an elementary or common education; but the commercial relations into which every one must now enter and the social activities which every citizen must share are gradually making it necessary that every citizen shall have knowledge that extends far beyond the rudimentary branches. One must know something about geography if he is to be an intelligent member of a community such as we have in the United States. One must know something about the history of one's country. For these and like reasons, we find that state legislatures have been prescribing in recent years a large number of subjects to be taught in the schools.

American and European Schools. A study of the schools of the United States will bring out characteristics which most Americans do not know to be unique. It is proper therefore at the outset to call attention to the important fact that the schools of this nation have characteristics which could appear only in a democratic educational system.

First European University. The European schools took on their present form during the late medieval period. As late as the 12th century there

were in Europe no educational institutions other than the monasteries within the Church, where the clergy received such training as was held to be necessary for their calling. During the 12th century the first great schools of Europe were organized. These were not schools for the common people nor for the training of youth for any of the common activities of life. Special institutions were not regarded as necessary for the training of ordinary children. The first schools were intended only to give that special type of education which would raise the individual to a position of unusual influence and power.

The first of these institutions was a law school at Bologna, Italy, chartered in 1158. One Irnerius had succeeded in translating the codes of law of the northern Italian cities. He lectured on these codes to students who came from all parts of Europe to prepare themselves to maintain their places as members of the governing classes of the nations to which they belonged. This was the beginning of the first of the great medieval universities.

It will be seen from this brief description that the institution was what we call in modern terms a higher professional institution. Other similar institutions were organized for instruction in medicine and theology.

Preparatory Schools. In connection with these great centers of learning, there grew up in the provinces preparatory schools, where boys who were going to attend the universities acquired a knowledge of the Latin language, which was necessary in order to understand the university lectures. These preparatory schools had to secure their teachers from the only educated class that was in existence at the time, namely, the clergy. The Church, therefore, exercised throughout the educational scheme a very large influence. Many of the clerical orders of the Roman Catholic Church were established for the purpose of organizing and conducting schools.

The preparatory schools, like the universities, received only boys from the upper classes of society. They were schools for the aristocracy, not for the common people. The courses of study which they offered were also determined by the special purpose for which they were organized. There was in these schools no disposition to deal with the common facts of ordinary life. Like the universities, they were highly restricted in spirit and in content of instruction.

Origin of Common Schools. Schools for the common people were not organized until much later than the universities and the preparatory schools. These schools grew up in part under the control of the Church. There were so-called cathedral schools, which were gradually organized at the great centers of population, within the cathedrals themselves for the purpose of training the boys who were to serve in the choir. The boys who were to render such service were sons of the common families. They had to be trained in reading and music in order to take part in the Church services. Sometimes a charitable priest would extend instruction in these cathedral schools beyond reading and music, so as to give the boys some special help in preparation for their relatively simple lives. A little arithmetic was added to the other lines of teaching. The catechism also was taught in these schools. Indeed, the clergy frequently taught the catechism to the common people in direct connection with the Church services and in special classes. The catechism classes became the nuclei of schools for the boys and girls who were in no wise related to the higher schools.

These religious schools gradually were extended, and, at the time of the Reformation, the leaders of that movement saw the importance of giving religious instruction to all the common children. They therefore organized numerous schools in connection with the religious centers even in the smaller communities. The common school, which thus grew up, frequently had the support of some intelligent ruler who recognized the desirability of giving religious and general instruction to the common people in his province. Common schools were not intended, however, to raise the common people above the level of their ordinary lives. None of the common schools led into the universities or into the professions.

Dual European School System. From what has been said, it will be understood why Europe in the modern period has two distinct types of schools,—one for the aristocracy and one for the common people. Just as society in Europe is divided into distinct classes which are perpetuated by heredity, so the schools of that continent are divided. Indeed, the perpetuation of the class system is dependent on the continuation of a class school system. We see here a very striking illustration of the parallelism between general civilization and the schools which grow out of it. In England, which is the most democratic of the European countries, a slight modification of the general class system of education has been devised, which again reflects the special spirit of a nation's civilization. A system of examinations has been developed which allows bright pupils to pass into the higher schools from the common schools.

Early Division in American Educational System. American practice differs from that of Europe. Originally, the schools of the United States were so organized that there was a common school for the ordinary people and a higher school for the clergy. When Harvard college was first organized in Massachusetts, it was a school for the upper classes, that is, for the boys who were going to enter the ministry. A preparatory school in connection with Harvard was organized in the Boston Latin school, which, like the college, was not intended for the training of the ordinary boys and girls of Boston, but was an exclusively classical school preparatory to college.

The common school which grew up in Massachusetts and the other colonies was a semireligious institution with a much less pretentious curriculum than that of the Latin school. The reading matter used in the common school was the catechism and extracts from the Bible. Indeed, the common school was described in the early statutes of the Massachusetts colony as an institution set up for the purpose of training children in reading, so that they might come into direct contact with the Scriptures.

The dual school system thus inaugurated in early colonial days broke down in the course of time, because the small groups of migrating families who went westward to what then was the frontier were so democratic in spirit and organization that they could not maintain any of the distinctions which had been common in Europe between the upper classes and the common people. The small villages which grew up in Massachusetts and Connecticut could maintain only a single school. This situation was due in part to the expense of maintaining schools, but in a larger measure it was occasioned by the absence of distinctions between the different classes of people of these village communities.

After the single school system was started in the villages of the colonies, it was natural that its expansion should be along lines that would maintain the democratic character of the original organization. When the community grew rich enough to set up a higher school, this also was open to all classes of boys and girls. The result has been that in the United States the common school and the higher schools have been organized with a unit plan of education for all the people. The American high school is an institution which follows directly upon the common school and is open to all comers, without regard to social classification. In the same way the colleges and universities of this country, especially the state universities which have grown up in the Western commonwealths, are expressions of the democratic demand for a universal higher education. The spirit of class division is thus eliminated in the schools of the United States.

HISTORY OF EDUCATION

The practices of modern schools can be understood only in the light of history. Enough has been said in the introductory section to make it clear that the administrative units of modern American and European schools are descended directly from earlier forms of organization which grew up in various nations in response to the needs of the special types of civilization cultivated by these nations. But we may go much further than was indicated in the introduction. The details of instruction, including the materials in the course of study and the methods of classroom instruction, are dependent in all educational systems on the traditions which have come down from earlier times. Striking examples of this fact can be seen in the high respect in which the classics are held in American higher schools. This pre-eminence of the classics can be understood only when reference is had to the educational traditions of Europe. Furthermore, the methods of teaching in American and European schools are alike while the methods of Oriental schools are of a wholly different order.

In treating the history of education, it becomes necessary to draw a distinction between the school as an institution and certain personal influences which from time to time have appeared and have operated to reform institutional practices. The school as an institution tends to be conservative. Once its practices are established, it is natural for each succeeding generation of teachers to follow the examples of those who trained them. Progress or change in methods of teaching and in the courses of study usually depends on the vigorous efforts of some reformer who sees the inappropriateness for a later period of the educational procedures which have been brought down from an earlier age.

Reformers are seldom able to overcome altogether the conservatism of established institutions. The history of education is accordingly the account of a series of compromises between new ideas of what ought to be done and traditional practices which are thoroughly established.

For the purposes of our treatment, it is legitimate to treat in separate subdivisions first the institutions which have appeared in various countries at different times, and second the reformers who have labored to improve these institutions.

EDUCATIONAL INSTITUTIONS

Ancient systems of education must be understood as parts of the religious and governmental organization of the nations to which they belonged. Numerous glimpses into the educational system of Egypt are given by passages in the Old Testament. It is recorded that Moses was trained in all of the wisdom of the Pharaohs. This means that Moses, as a member of the royal family, was given the benefit of such knowledge as the governmental officials and priests of the day were able to accumulate and transmit.

Egyptian Education. Moses was in this respect absolutely separated from the other Hebrews, who, as slaves, enjoyed no privileges of education whatsoever. Moses was a member of the ruling class. His associates were the priests and princes. The priests had a body of knowledge which the common people did not possess. A curious and striking illustration of this can be given in the fact that these priests apparently knew enough about the science of optics to project from concave reflectors images of people on the walls of their temples and on the columns of smoke which rose from their altars. The projected images appeared to the common people like apparitions of their gods. The priests who knew how to make these projections are not to be charged with insincerity. They, undoubtedly, regarded these scientific secrets as gifts from the Deity, given them for the purpose of maintaining their control over the common people. They transmitted their knowledge of optics and other sciences, such as astronomy and architecture, to the rulers of the nation and to the members of their own priestly class, the training of princes and of novices for the priesthood being an important part of the work of every clerical community.

The educational system of Egypt was thus strictly a religious and royal institution carried on through the priests. The records show that schools for the young noblemen were organized in the palaces. Here discipline was severe and flogging was common. Instruction dealt largely with good manners, with ethical and political principles, and with such sciences as the priests and other teachers could command. The measurement of land was one subject taught. This was especially important in view of the necessity of relocating property after the inundations of the Nile. The boys were also taught swimming and gymnastics.

Greek Education. Greek education was of a somewhat different type. There had been developed in the Greek states a form of government which called for participation on the part of all the members of the aristocracy. Public debates among the members of the aristocracy were the common form of procedure in arriving at public decisions. Anyone who wanted to be a leader in the state must accordingly be prepared to speak in public and to maintain himself in an argument with his contemporaries. Training in rhetoric was, therefore, essential to the youth of the Greek states, and we find that special teachers of this subject exercised great influence in public affairs. Socrates (469–399 B. C.) was charged with having corrupted the youth of the land by the special form of logic and debate which he inaugurated. He was a philosopher and a teacher. He gathered about him a group of the younger men, taught them morals, and prepared them for participation in public life. Following his example, Plato (429–347 B. C.) and Aristotle (384–322 B. C.) conducted training classes for the young men of the aristocracy. The records of the sayings and teachings of these philosophers constitute a major contribution to European intellectual life. Again we must recognize the fact that these teachers were not connected with any public institution, but were influential because they gave a special type of training which was needed by the upper classes to maintain their social and political positions.

There was another important aspect of Greek education; it consisted in physical training in preparation for participation in the great national Olympic games. The Greeks prized perfection of bodily development most highly. They celebrated this perfection in the plastic art which still remains the wonder of the world. The youth of Greece were trained to run and to participate in other forms of physical exercise, and thus to perfect their bodies. In this way they were prepared to become formidable soldiers when they grew to be men. The prizes awarded at the Olympic games were regarded as great civic honors and were eagerly contested for by the young men from all the Grecian states.

Although the institutions which grew up among the Greeks were not perpetuated in the later periods of European education, the writings and teachings of the Greek philosophers exercised an enormous influence, furnishing in no small measure the materials which were used in all the higher schools of medieval and modern Europe. Thus the writings of Aristotle were the basis of scholastic education. The system of logic laid down by him was perfected until it became the chief subject of attention on the part of scholars.

The University of Alexandria. A part of the Greek influence came into Europe indirectly through the University of Alexandria where many great scholars worked. It was here that Euclid formulated about 300 B. C. the system of geometry which set forth in the form of strict Aristotelian syllogisms the

principles of land measurement which had been developed in Egypt and Greece. The Euclidean geometry which is still taught in our modern schools is a combined product of Greek and Egyptian education.

In theology as well as in the mathematical sciences, the influence of the University of Alexandria and the Greek schools was strong. Plato as well as Aristotle was accepted by many of the medieval scholars as an authority on matters of government and philosophy. His theory of the state which included a definition of education has been cited even in modern times as a proper basis for social organization. Plato was one of the authorities much studied in Alexandria and his doctrines were there worked over into a system of religious dogma.

Chinese Education. If we go to the Orient and consider the development of education in China, we find something which is a cross between the type of education found in Egypt and that which appeared in Greece. The great philosopher and teacher of China, Confucius (551–478 B. C.), laid the foundation for the political system of the Chinese state. His writings came to be of the greatest importance to anyone who intended to share in the government of China. Hence, the educational system of China centered about the writings of Confucius, and the young men of the country sought to make themselves masters by a process of merely memorizing all the maxims laid down by the great teacher.

There was a peculiar difficulty in the transmission of the maxims of Confucius, because the written language of the Chinese is clumsy and requires the very highest degree of specialization in order that the student may learn to read. Chinese written symbols were never simplified into a single alphabet, as were the written symbols of the Greeks. Each Chinese word is represented by a separate symbol. The labor of learning to read is, therefore, very considerable.

In recent years the Chinese schools have undergone a radical change through the stimulus of European and American models. The old formal scholastic training in Confucianism has rapidly given way. Since the People's Republic of China was formed, education has been designated as a responsibility of the provisional government under the general control of a Ministry of Education and Culture in the central government. Schools are organized at three levels: primary, secondary, and the University. In 1952 a standard five-year primary school was introduced. Children enter this school at seven years of age. Secondary education covers a period of six years and is divided into junior and senior secondary education with three years in each section. Technical and vocational schools are organized also. A 5-3-3-4 plan of organization is in effect with all students completing secondary education, eligible for the University. However, only a few of the secondary school graduates attend the University. In 1952 there were approximately 49 million children in primary schools, 3 million in secondary schools, and 220 thousand students enrolled in institutes of higher education.

Education in India. There has been a long tradition for education in India. When Europe was in the infancy of its culture, the Universities of India were flourishing and their scholars were respected throughout the then-known world.

In the past two hundred years English schools served as models for the schools of India, and Western ideas permeated education. After 1947 India engaged in a nation-wide attempt to develop education. There now is a central ministry whose main function is to plan, guide, and co-ordinate education for the entire country. An attempt is made to provide free schools at the primary and secondary levels for all children who want to attend them. At present, more than 24 million pupils are enrolled in primary and secondary schools, and approximately 400,000 students attend institutions of higher education. Education at the primary and secondary levels is financed by the State government, local bodies, and private organizations. Higher education is financed by private groups, the state, and the central government

The entering age for primary schools is usually six years. The medium of instruction in the primary school is usually the mother tongue or the regional language. Secondary education has two stages: the middle school and the high school. The middle school follows the primary school and the length varies from two to four years. Subjects of the middle school, generally, are: the mother tongue, English, mathematics, geography, history, hygiene, nature study, classics, drawing, music, modern Indian languages, and physical training. The medium of instruction in some states is English and in others hindi or the regional language. The medium of instruction in most universities is English. Arts are most common in the University although science, technology, and professional subjects are gradually becoming more popular.

Roman Schools. The Roman boy of the earliest period was educated by his father. After 300 B. C. he was generally educated by a Greek slave. When the Roman state came into ascendancy and conquered the European provinces, Greece was gradually breaking up, and in 146 B. C. she became a conquered state. Learned Greeks came to Rome, in many instances as slaves of rich families. These learned Greeks were able to read; they knew the ancient literature of their race, and had some equipment in scientific knowledge. The Roman aristocracy was made up chiefly of warriors. There was, at the outset, no Roman literature to compare with the perfection of the writings of Homer and the other Greeks. The Greek slave was, therefore, a great asset in the Roman home. He took the boy in hand and gave him a type of knowledge which the father did not possess. From time to time, groups of families united in employing some especially competent Greek to instruct their boys.

Apparently, from the records, the boys in the Roman state were not especially eager to take on the training which the learned Greeks were prepared to offer them. Like the boys of all generations—but it seems in an unusual degree—the Roman boys were unruly and disorderly. Furthermore, from the conditions that have been described, it will be seen that the course of study which could be offered by the Greek was hardly suited to the taste and the future activities of most of the Roman boys. We have here one of the first examples of an imported education.

There were other forms of education in Rome, especially the military types of training. The boys were prepared for the army by strenuous physical exercises and by games, through which they were made vigorous in body and skillful in the use of all sorts of weapons. Physical education was, therefore, an important part of the training of the Roman youth. As contrasted with the Greek physical education, it aimed less at æsthetic development, and sought more to produce powers of resistance.

Charlemagne's Palace School. With the disintegration of the Roman state, Europe broke up into a number of half-civilized nations and tribes. As any one of the rulers in the early medieval period succeeded in enlarging his state and solidifying his government, he was compelled to set up some of the institutions of civilization. The most notable example of the establishment of a school in these early days is to be found in the Palace School of Charlemagne. Charlemagne had conquered a very large part of the western countries of Europe. He employed an English monk named Alcuin (735–804) to conduct a school which was attended by his sons and by the other princes of the royal group.

Alcuin prepared material for this school, and we have some curious examples of the textbooks which were used at that time. One of these is an arithmetic. The numbers were all expressed in Roman

numerals. It is not easy to carry on the more complex arithmetical operations if one uses Roman numerals. For example, if one tries to state a problem in multiplication in these numerals, one will readily see the difficulty that was encountered by Alcuin and his pupils. Take the problem, XXVII multiplied by XLIV; the multiplication thus expressed suggests no regularity of relations between the different numbers. As a matter of fact, Alcuin found it necessary to devise an elaborate system of addition which would give the results that the modern boy, who has the advantage of the Arabic numerals, can readily work out according to the modern multiplication tables. Alcuin gave the princes of Charlemagne's court, in spite of the difficulties which he encountered, the best training in arithmetic and in letters that his broad knowledge could command.

It is probably true also that at about this period some of the art and wisdom of the Arabs, who came into Europe by way of Spain, began to influence the intellectual life of the European nations. At all events, it is certainly true that, after the withdrawal of the Moors from Spain, literature and the sciences of mathematics and medicine developed more rapidly than they had in earlier years, and that schools of the higher type, referred to in the introduction as medieval universities, began to develop.

MEDIEVAL AND MODERN EUROPEAN SCHOOLS

The latter period of medieval education in Europe exhibits a number of different kinds of schools. There were the schools for knights, in which the younger members of the aristocracy learned to ride and hunt and to carry on the arts of war; there were medieval universities, which were schools of law, medicine, and theology. Later, various reform movements arose within and without the Church, yielding in many cases organized systems of education.

Jesuit Schools. Notable among the later systems of this type were the Jesuit colleges which flourished for centuries and are influential even in modern times, especially in Roman Catholic countries. These schools were maintained by the religious order established by Loyola, who was born in 1491. They were highly organized, with a carefully planned course of study designed not only for the training of novices who were to enter the religious order but also for the training of boys of the better families, who were to be governors and military leaders. The course of study always included liberal quantities of the Latin language, which was in universal use among the educated classes in the medieval period.

Latin. The Latin language had a unique place in medieval Europe, and the whole history of European education revolves around this subject. Not only was Latin taught because of its utility as a medium of communication, but it was the bearer to the medieval world of the older and vastly influential Roman civilization, which dominated the religious, legal, and military organization of every European state. The great cultural movement known as the Renaissance can be understood only when it is remembered that the nations of northern Europe were very dependent for their culture upon the art and literature of an earlier age.

The enthusiasm for the study of Greek and Latin during the 14th and 15th centuries reflects the dependence of the northern European nations upon the culture of the South. There are many indications that the intellectual awakening of the northern nations was accomplished by devoted study on the part of the clergy, as well as on the part of those who had literary tastes and who were not satisfied with the intellectual life provided by the Church. In a poem entitled "The Grammarian's Funeral," Browning has given a picture of the enthusiasm of the Renaissance for knowledge of Greek and Latin. The Grammarian is pictured as an old man who has devoted himself in his later years to the arduous studies necessary to master the Greek language. He had gathered about him a group of enthusiastic students, who, in the poem, are represented as following their master to his grave and celebrating in this ceremony their appreciation of the intellectual world which his studies had opened up to them.

The Classical Traditions. Classical and theological subjects were the chief studies in the higher schools of Europe. The establishment of the classical course was so complete that, throughout all of the later generations of European civilization, this course has been the characteristic feature of the higher schools. For example, in England it is only within recent years that the modern languages have had any adequate attention. In Germany, it required the personal influence of the former kaiser Wilhelm II to give standing in the higher schools to subjects other than the classical languages. The best higher schools of Europe today are still devoted to the classical traditions, and the classical languages have been brought over to the United States as important elements of the high school and college curriculum.

Secondary Education and the Classics. What is true of the universities is true of the schools which prepare students for the universities. Such schools are commonly called, following the French terminology, secondary schools. This term has come to have very general use. We speak of the American high school as a secondary school. In like fashion we speak of the French *lycée* and the German *Gymnasium* as secondary schools.

The development of secondary schools in Europe was first a succession of efforts to organize instruction in the classical languages, afterwards a slow growth of additional subjects, such as mathematics, and, at length, science and the modern languages. The various periods of this development are characterized by recurrences of enthusiasm for the content of Greek and Roman culture. The enthusiasm for the classics degenerated from time to time into mere attention to the grammatical and rhetorical forms of Latin authors. The periods of devotion to the content of classical culture are called periods of humanism.

There was a period, for example, during which the teachers of Latin were more interested in the use of a vocabulary and a style copied from Cicero than in the facts of Roman life or the facts of Greek culture. Formalism in expression dominated this period. It made very little difference what were the subjects of discourse so long as most of the phrases were of the Ciceronian type.

After each period of interest in form, there came a period of interest in the content of that which was read. For example, in Germany in the latter part of the 18th century the intellectual leaders of the nation, such as Goethe (1749–1832), Herder (1744–1803), and their contemporaries, rebelled against instruction in the mere forms of expression and inaugurated a reform which is known as "neo-humanism." This neo-humanism sought to find serenity and balance of life in a revival of Greek art and an imitation of Greek literature.

Similar alternations of interest in form and content have marked the whole history of the study of the classics. Even in modern times this same contrast appears. There are some teachers who defend Latin today on the ground that it is a perfected form of expression; while there are others who point out that a study of the classics is justified only in the degree in which it makes students acquainted with the experiences of earlier and highly developed nations.

New Secondary Subjects of Instruction. The later periods of secondary education have been complicated by the fact that many new subjects have been developed and are demanding a place in the scheme of education. The natural sciences developed rapidly after the 17th century, and it has

become increasingly important in modern times for every student who is going to be a leader in social and political life to know something of the natural sciences. Within the last century, the scope of scientific inquiry has vastly increased through the development of the biological as well as of the physical sciences. Commercial and industrial life have been modified and reorganized through the influence of these sciences, with the result that a higher education is altogether incomplete if it does not include a generous amount of training in natural science. Moreover, within the last two generations, the social sciences have been added to the natural sciences, and it has become apparent that in a complex society, such as that in which we live, it will be necessary, even in the lower schools, to give instruction in economics and the theory of government.

Among the purely literary subjects, also, there has been competition. Modern languages and the culture of modern nations, as well as the earlier civilizations of Rome and Greece, have come to be important for students. Secondary schools have accordingly adopted modern languages into their curriculum, and in some instances the effort has been made to substitute the modern for the ancient languages.

Slow Change in Traditions. Whatever have been the changes in the curriculum and in the organization of the secondary schools, these institutions have maintained their place in Europe as entirely separate from the schools for the common people. Thus, in England there are a number of famous and ancient endowed schools which still continue to train the aristocracy and still maintain the traditions of the medieval educational system. These schools are called "public schools." This name was adopted in the early history of such institutions as Rugby, Winchester, and Eton, because these schools differed from the tutorial system that was practiced in many of the homes of the aristocracy. Furthermore, it was common for the patrons who endowed these schools to give certain scholarships and to permit bright boys from among the common people to enjoy the advantages of a special education without cost to themselves. The institutions are not public in the sense in which free schools are public. Indeed, all European secondary schools charge a tuition. Furthermore, the so-called public schools of England continue to give a formal, classical course of study. It is the traditional theory of these English schools that, by studying Greek and Latin, boys can acquire the type of mental concentration and moral discipline necessary to make them competent officers in the army and satisfactory members of the civil service corps.

It has been the contention of many reformers, on the other hand, that the same ends could be much more advantageously attained if science and modern literature were substituted for the classics. Such a substitution, it is argued, would provide mental discipline and, at the same time, give the information necessary for intelligent participation in the activities of modern society. One writer whose essays have been a very large influence in promoting reform in English and American education in the direction of science and modern literature is the philosopher Herbert Spencer (1820–1903). His essays on education, published in 1861, were a vigorous attack upon the traditional classical system and a powerful plea in favor of science in secondary education.

The English municipalities have in recent years contributed to the reorganization of secondary education by establishing a new type of higher schools. These schools are known as municipal secondary schools. They are maintained by the industrial cities of England, such as Liverpool, Leeds, Birmingham, and Sheffield, and they give instruction in the sciences that are necessary for the maintenance of the industries in these various centers. They are open also, on a much more liberal scale than are the traditional schools, to the boys of the cities who are going into the industries and commercial life.

European Universities and Scholasticism. The European university has been from the first typically a professional school. At the outset, as was indicated in the introduction, each university center had its characteristic course. It was a school of theology or a school of medicine or a school of law. Later each institution set up a number of branches. The branches which were most common were those which have been mentioned, namely, theology, law, and medicine. There was also a general branch, known as the philosophy division of the university, in which a miscellaneous collection of literary and scientific subjects was provided. In this division of the university most of the new developments have taken place.

The universities of the medieval period were the homes of so-called "scholasticism." This word is often used as a term of reproach, from the point of view of modern educational thinking. It is commonly implied that scholasticism means mere formalism in thinking, as a substitute for productive originality.

There is ground for this notion that scholasticism was altogether formal. The common type of instruction was that which emphasized logical forms. The Aristotelian syllogism was the pattern which was adopted for all thinking. A science of logic was cultivated to the exclusion of interest in any real facts. The scholastics often debated purely artificial questions with a view to increasing their critical knowledge of the possible uses of the syllogism. Given certain premises for an argument, it made no difference to them whether the argument was practically productive or not. They merely wanted to make sure that the consequences of the premises assumed were carefully worked out. History tells of debates, between great leaders in this scholastic period, which continued day after day, and the debater who received the highest academic awards after one of these debates was the logician who was most competent in the use of syllogistic forms and in the exercise of criticism which attached to these forms.

While, however, there is ample ground for the statement that scholasticism was excessively formal, it should not be overlooked that this period devoted to the study of logic was of great significance in the development of the power to think in fine distinctions. The scholastics created, in the languages which they developed, an instrument for a later type of discriminating scientific thinking.

They also established the practice of research, that is, they set aside a group of people whom society was prepared to support for the purpose of developing an intellectual life which had no immediate practical bearings. There has always been some prejudice on the part of practical people against university organization, because it has been felt that the universities are in many instances remote from practical life; but the later history of higher institutions has shown that it is altogether to the advantage of society that science be cultivated for its own sake. The scholastics furnished the example which has been followed in later academic organization, and developed communities where intellectual life was pursued, first of all for its own sake and secondarily for the applications of science and letters to the needs of civilization.

Academic Freedom. One of the great struggles carried on in the universities of Europe was the contest for academic freedom. The patrons who supplied resources for the maintenance of universities tried from time to time to dominate the thinking of the teachers in these institutions. Great theological controversies sometimes arose in the universities. It will be remembered that Luther was in the University of Wittenberg when he first made his attack upon the theological doctrines which became the issues of the Reformation. Political issues also arose from time to time when some ruler objected to the teachings of those who were connected with the universities. But from the earliest

periods it was the contention of the universities that the teacher must be entirely free to follow the truth wherever he sees it, and the tradition has finally come to be thoroughly established that universities are to be free from any outside control.

English Academic Social Life. The English universities, in addition to the establishment of the right of the teacher to think freely, developed a social life of the most intense sort. One of the reasons why American students under the Rhodes scholarships find it advantageous to go to Oxford in England is that they are brought into close contact with a group of students who, during their university lives, are intimately associated in the dining halls and living quarters of the colleges of that university.

The English universities go so far in their emphasis on social life that they are hospitable to students who pursue their studies with such leisure that they are called mere "pass students." It is not uncommon for members of the wealthier classes to look upon the university life chiefly as a social opportunity. As distinguished from the "pass students" there are "honor students" who are looking forward to professional or academic careers which require rigorous scholarly preparation. It has been suggested by students of American higher institutions that a similar distinction to that made in English universities might advantageously be adopted in this country. It is asserted that there would then be a frank recognition of what is now in fact the true condition. It would relieve college authorities also of the necessity of living under the shadow of the pretense that all American students are hard-working scholars.

American Colleges. As compared with the European universities, the American college is a somewhat detached institution. It does not aim to give professional training, but is higher in its scholastic requirements than the secondary schools. We shall have occasion later to discuss more fully the development of this unique American institution, but it is to be noted here that the American college is in part borrowed from the English university. It is the social life of the American college which is frequently emphasized when one attempts to describe its relation to its students and its importance in our educational system.

Common Schools as Missionary Enterprises. The European school for the common people was in all of its earlier stages a missionary enterprise. As indicated in the introduction, the common school began as a result of the desire on the part of the Church authorities to train choir boys or to give general religious instruction to the common people. Luther and his colleagues in the Reformation recognized the importance of making the common people independent in their religious faith. Luther's translation of the Bible is a clear indication of his desire that they should have access to the means of religious independence. The training of the people to read the Bible was quite as important as the making of the translation. We find, therefore, that the leaders of the Reformation were in favor of schools and exercised their influence in the direction of the development of schools on a large scale for the common people.

What is true of the Reformation applies also to the efforts of later religious sects which developed in Europe and England, and it is true also in the Roman Catholic Church from which these various bodies separated. A few illustrations will serve to indicate the character of these movements for the establishment of mission schools for the common people. One of the most noted of these institutions was the school established at Halle by Francke (1663–1727). In 1695, Francke, who had had a broad academic and theological training, established in a suburb of the city in which he lived an evangelical organization which conducted as one of its major enterprises an orphan asylum and training school for teachers.

Francke was a member of the sect known as the Pietists. This religious group held to certain austere doctrines with regard to human nature, not unlike the doctrines held later by the Puritans. They believed that all children are born with an evil nature inherited from Adam and Eve and that it is necessary to change this nature by the most rigorous discipline, if the child is to be saved from eternal damnation. The rigor of Francke's discipline is illustrated in the following statement which he makes about children's play:

"Play must be forbidden in any and all of its forms. The children shall be instructed in this matter in such a way as to show them, through the presentation of religious principles, the wastefulness and folly of all play. They shall be led to see that play will distract their hearts and minds from God, the eternal Good, and will work nothing but harm to their spiritual lives. Their true joy and hearty devotion should be given to their blessed and holy Savior and not to earthly things, for the reward of those who seek earthly things is tears and sorrow."

In France, the common school was promoted by the activities of the religious order known as the Christian Brothers. This was an order of monks, founded in 1684 by Jean Baptiste de la Salle (1651–1719), which devoted itself to the betterment of the poor children of the country by giving training in the rudiments of knowledge to the boys and girls of the common people. The rule of the schools conducted by this order was that both pupils and teachers should keep silent throughout all of the day. Corporal punishment was common. The curriculum consisted in the rudiments of reading, writing, arithmetic, and religion.

In England, similar movements were carried forward, and led to the organization of schools which were, as will be seen by their very name, efforts on the part of philanthropic organizations to provide for the poorer people. The common schools of England were known as "pauper schools" or as "ragged schools." They were supported by various societies, such as the British and Foreign Missionary Society, and the Society for Bettering the Conditions and Increasing the Comforts of the Poor. A number of interesting experiments in the conduct of cheap schools were made under the auspices of these societies.

The so-called "monitorial" system was developed under the auspices of the society first mentioned above. In 1797, Dr. Andrew Bell (1753–1832) had suggested that the older boys in the orphan asylums could be used as instructors for the younger boys. At about the same time, Joseph Lancaster (1778–1838) organized a school in which a series of gradations was introduced, by which the teacher could come into direct contact with the older pupils, who in turn carried to the lower classes the instruction which they received from their teacher. Each child was provided with a knapsack in which he kept such books and material as he needed. A huge room was fitted with benches on which the children could sit, and in this way the teacher sometimes was able to take care of 1000 children

The Lancastrian movement, as it is called, is of special interest because it was brought to New York and contributed to the early stages of development in American education. It provided one great advantage over schools which had preceded it. It compelled the grading of the children. The older groups, who were more mature and able to take instruction directly from the teacher, constituted the upper grades, and the younger children were organized in groups of different levels to receive instruction from these monitors.

Common Schools under Civil Patronage. A second type of development, acquaintance with which is of the greatest importance for an understanding of the history of common schools in Europe, is that which flourished first in Germany. Here, the rulers of political states very frequently united with the Church authorities in maintaining schools for

the training of the common people. The advantages of this combined action soon began to make themselves apparent in both the economic and the political life of the state. The taking over of the function of education by the political government was an innovation which ultimately exercised very great influence in the life of the nation.

In 1763, at the close of the Seven Years' war, Frederick the Great (1712–86) gave this general movement of state education a great impetus by issuing what is known as *The General School Regulation*. This order established for the first time the principle of compulsory attendance on the part of the children. It also provided that the teachers who conducted the schools should be specially trained for their duties and adequately compensated, and that the state would assume responsibility for this compensation. A policy of religious tolerance also was proclaimed in the *Regulation*. It is to be noted that religious instruction was not eliminated from the school curriculum by this proclamation of tolerance, but it was provided that families of different types of religious affiliation should be allowed to receive in public institutions the type of religious training which conformed to their beliefs.

The *Regulation* of Frederick drew the most violent opposition from the clergy and from many people who had come to think of the schools as strictly religious institutions, but it marked the beginning of a new era in educational matters. Because of their adequate support and strong organization, the Prussian schools have been the model for all other European school systems; and in many respects they furnish also the pattern for American schools.

The Influence of Prussian Schools. The direct influence of these Prussian schools on the other systems of Europe can be traced through a report which was prepared in 1833 by a French commissioner named Cousin (1792–1867). The French schools, as indicated in an earlier paragraph, were first maintained by religious orders, but at the time Cousin made his report there was great interest in the organization of public support for schools which should admit children of all classes. Cousin went to Prussia, and made an exhaustive report on the organization and course of study of the common schools. This report was widely distributed in France. It was translated into English, and had a large influence in England and the United States in bringing about a new type of organization of public schools.

The Prussian school for the common people had at this time come to be a school which took charge of the children from six to fourteen years of age. It is interesting to comment on the reason for the adoption of fourteen years of age as the upper limit for school attendance. The original practice in German schools was to leave to the pastors the decision as to when children were mature enough to leave the school and be confirmed in the Church. Pastors gradually found that the age of fourteen was approximately the age at which they could approve the conclusion of the training course in the schools and could admit children to the Church. Throughout the civilized world, compulsory education laws have been passed, following the example of these German pastors in setting the age of fourteen years as that at which common school training is regarded as completed. Many of the reforms which are being suggested at the present time in American school organization will be more clearly understood if it is remembered that the upper limit of the common school was thus determined through a European organization which is in fact wholly different in character from the common school of the United States.

The secular organization of education in Germany prepared the way for a modern development which has been of great importance. These schools were among the first to be supplemented by a system of industrial education. The secular ruler was naturally much interested in the economic welfare of his people. Accordingly, he was willing to provide for the training of children in the trades.

The tendency to provide practical education was further powerfully re-enforced by the writings of some of the educational reformers who will be discussed in another section.

EDUCATION IN AMERICA

The educational system of America, during the Colonial period, was in part an imitation of the European system. Three grades of schools were to be found in the American colonies. There was, first of all, the highest institution, or college. The three institutions of this type which have exercised the greatest influence in American education are Harvard (founded in 1636), Yale (founded in 1701), and Princeton (founded in 1746). These institutions were organized by the clergy for the purpose of training boys to become members of their own profession. Closely connected with the colleges were the Latin grammar schools. These were modeled on the European secondary schools which administered a classical course of study and accepted pupils of the better social grades from the families which could afford to pay tuition. Finally, there was a common school which in its organization was influenced from the beginning by the European people's school.

Local Control of American Schools. The American common school differed from the European school in that it was from the outset an expression of the desire on the part of the American colonies to develop a type of intellectual freedom not prevalent in Europe. There are two further characteristics of the American common school which have distinguished it from its European predecessors. In the first place, the school was, from the beginning, controlled by local authority. Communities were indeed compelled by early legislation in the colonies to maintain an educational institution of some kind for the young people, but the details of organization were left to the communities.

We find that there was the greatest variety in the method of controlling these schools. In New England the town meeting determined the policy of the school. It set the salary of the teacher, and very frequently went so far as to select the teacher, although it commonly delegated supervision of the school to a trustee or to a committee. This committee often included the pastor of the church and one or more of the leading citizens.

The southern colonies differed from the New England colonies in their attitude toward education. To these southern colonies, especially to Virginia, had come Englishmen who brought with them the traditions of the English aristocracy. They usually lived on plantations so large that their neighbors were far removed, and the demand for any community life was, accordingly, much reduced. Virginia, therefore, did not have any town meeting which could control the school, and, because of the great distances between families having children of the same social level, schools were not organized. The young people were sent from the Virginia plantations back to England for their education, or they were trained by tutors at home.

In New York, the Dutch company which had large concessions sometimes provided schools as part of the inducement to immigrants to settle its lands. In Pennsylvania, William Penn (1644–1718) saw the importance of providing education for the children as a part of the general scheme of social organization. In these cases, however, the schools were left to the control of the community to a degree unknown in the European countries.

American Schools, Reading Schools. A second distinguishing fact about American schools is that they were reading schools. Instruction in the European schools was given orally by a teacher who was professionally trained and authorized to instruct the children. The colonies, unprovided with skilled teachers and unable to equip these teachers

with any technical preparation for their work, were satisfied to conduct schools as best they could, employing anyone to teach who could be secured for the relatively small wage which the community was able to provide. But there was one ambition which prompted the organization of the schools, especially in the New England colonies. It is clearly expressed in the preamble of the school laws of these colonies. A quotation from the school law of Connecticut, adopted in 1650, and resembling very closely the early law of Massachusetts, adopted in 1647, will make clear the purpose of the colonies in establishing their first common schools.

"It being one chief project of that old deluder, Satan, to keep men from a knowledge of the Scriptures, as in former times, keeping them in an unknown tongue, so in these latter times, by persuading them from the use of tongues, so that at least, the true sense and meaning of the original might be clouded by false glosses of saint-seeming deceivers; and that learning may not be buried in the grave of our forefathers," (the court decreed that whenever a township increased to fifty householders they should employ some one) "to teach all such children as shall resort to him, to write and read."

The influence of this legislation has been of great importance in the American schools. Throughout our history, emphasis on reading has controlled the form of organization of all classroom instruction. Reading books have been provided, in contrast to the oral instruction which is typical of European schools. The method of instruction has included preparation of lessons at home out of books, and the recitation has been from the first the typical form of classroom exercise in these schools.

Industrial Training. There was one further ambition in the minds of the New England colonists as to the training of their young people. It is expressed in the statute adopted at about the same time as that quoted above. This second statute aimed to provide training in industry for all of the children. The statute is as follows:

"All parents and masters do breed and bring up their children and apprentices in some honest lawful labor, or employment, either in husbandry or some other trade profitable for themselves and the commonwealth, if they will not nor cannot train them up in learning, to fit them for higher employment, and if any of the selectmen, after admonition by them given to such masters of families, shall find them still negligent of their duty . . . the said selectmen, with the help of two magistrates, shall take such children or apprentices from them, and place them with some masters for years, boys until they come to be twenty-one, and girls to eighteen years of age complete."

This statute did not exercise any large influence, because it did not provide adequate administrative machinery for enforcement. It is not until a relatively late period in the history of American education that industrial training reappears as an important part of the system.

Early Methods of Paying for Schools. In the matter of support, there was great variety of practice in the different colonies and in the different grades of schools. In the main, it may be said that higher education was never free, and in many instances the elementary schools were supported in part by payments made by the pupils. There was practically no full community support of schools until long after the establishment of the present Federal government of the United States. Indeed, as late as 1873, the last of the Northern states to abandon pupil payment was still receiving some support for the teacher from so-called "rate bills" paid by the pupil. Even in colonial times, however, partial support of the school out of the community treasury had begun. Accordingly, common schools have been from the first, so far as the public could make them so, free schools.

Early Schools and Lack of Organization. By way of negative statement, it may be pointed out that the early colonial schools were not graded. They were one-teacher schools, and in the form of their organization were of the type known even in modern times as "the district school." The teacher organized such classes as he or she was able to conduct, and the pupils were distributed according to their various abilities in the different subjects. The school term was often very short. Sometimes, the school year was divided into a winter term and a summer term; the latter was attended by the younger children, and the former by the older children. The original school laws of the northern colonies very frequently prescribed 4 to 21 as the ages for attendance on school. Later the European model of closing the elementary schools to students at about 14 years of age came to be adopted, but the original plan of American school organization was at once loose and comprehensive.

Early Schools, Religious but Secular. The schools of the American colonies were secular; that is, they were set up by the law of the colonies and were governed by the community rather than by the church. They were at first, however, religious in the content of their teaching. The reading books were full of quotations from the Bible and the catechism. The religious content of instruction reflects the main interest of the community. Nevertheless, the control and organization were secular. The consequence of this has been that, in modern times, the separation of the public school and the Church has been complete, and religious teaching has gradually disappeared.

The development of parochial schools in this country reflects the desire on the part of certain religious bodies to control, more completely than is possible in the public schools, the religious and moral education of their children.

Schools in the Early National Period. Between the Colonial period and the present, there is a pronounced break in the history of American schools. The Revolutionary War left the colonies in many cases financially weak and detached from the sources of their earlier social life and traditions. The Constitutional Convention, which established the national government, did not include education as one of the matters to be dealt with by the new Federal government. There was in fact so much disagreement between the practices of the northern and the southern colonies in matters of school organization that it was deemed wiser to leave schools to local control. The tendencies toward decentralized organization which appeared in the colonies thus became a part of the national policy. It was not until the middle of the last century that the Federal government made any provision for the consideration of educational problems. In 1867 an office of education was established, first as an independent department and in 1868 as an office of the department of the interior. This office, however, has no authority of any kind whatsoever over the schools in the different states. It is merely an agency for collecting information. The fact that the Federal Constitution does not mention education leaves the control of public schools to the states.

Since, during the early years of American history, the states were busily engaged in developing the material resources necessary for the life of the people, education was carried on in a somewhat irregular fashion, in accordance with the plans which had been set up during the Colonial period; but it was very meager. The United States office of education has estimated that in 1800 the average American citizen was not receiving more than 82 days of schooling in his lifetime. Many communities had no schools, sometimes because families were so isolated, and sometimes because teachers could not be found. The educational situation during the first decades of American national life was wholly chaotic.

A Typical Report. A report prepared by the committee which visited the schools of Taunton, Massachusetts, in 1801 throws so much light on the general situation early in the last century that parts of it may be quoted as exhibiting the conditions common at that time:

"The committee chosen by the town to inspect the schools beg leave to report their situation and examination . . . " January 6th, 1801. Your committee visited a school kept in Rueben Richmond's house instructed by Mrs. Nabby Williams of 32 scholars. This school appeared in an uncultivated state the greater part of the scholars.

"On the 26 of Feb. visited Mrs. Nabby Williams' school the second time and found that the scholars had made great proficiency in reading, spelling, writing and some in the grammar of the English language.

"On Nov. 10th, the committee visited and examined two Schools just opened: one kept in a school house, near Baylies works, of the number of 40 scholars, instructed by Mr. Philip Lee. This School we found to have made but small proficiency in reading, spelling and writing, and to be kept only six or seven weeks; upon inquiry why it should be taught no longer, we were informed that the ratio of school money for this School was and had been usually expended in paying the Master both for his service and board, and in purchasing fire wood which is contrary to the usual custom of the town.

"The other School, visited the same day, was kept near John Reed's consisting of the number of between 30 and 40 Scholars instructed by Mr. William Reed; This School, being formed into regular classes, appeared to have made a good and pleasing proficiency in reading, spelling, writing, some in arithmetic and others in the Grammar of the English language. This School's share of school money is expended to pay the Master for his service only, so that the School will be continued three months.

. . . . .

"Feby. 26th, visited Mr. Dean's School 2 time, the Scholars were crowded into a small room, the air was exceedingly noxcious. Many children were obliged to tarry at home for want of room and though the school was kept only a few weeks they were deprived of its advantages. A want of books was the complaint. The committee were anxiously desirous that this evil might have a remedy and were of opinion it may be easily done. The Scholars appeared to increase in knowledge & claim our approbation.

"March 5th, visited two schools, one kept at Mr. Aaron Pratt's of the number of 30 scholars, instructed by Mr. Philip Drown. This school appeared quite unimproved and uncultivated in reading and spelling, some of them did better in writing.

"This uncultivated state did not appear to be from a fault in the children but, as your committee were informed, from the disadvantage of having had masters illegally qualified for their instruction; of which class is their present master unauthorized by law."

Beginnings of State Supervision. Shortly after the appearance of Cousin's report, the English translation of which was distributed in this country in 1835, a movement was started in Massachusetts and the other New England states and in Ohio—the first state to be organized out of the Northwest Territory—for a better organization of common schools. In 1837, the state of Massachusetts organized a state board of education and appointed as secretary of this board Horace Mann (1796–1859). In the meantime, Connecticut was moving in the same direction, and in 1838 appointed Henry Barnard (1811–1900) secretary of the state board of education. Ohio, under the influence of a group of organized educators in the city of Cincinnati, appointed a state superintendent of schools in 1837.

These were the beginnings of state supervision of public education. The local districts had found it impossible to give proper training to teachers, and even the selection of teachers, when left to local authorities, was carried on in a fashion that frequently led to complete failure in school organization. The state now began to assert its rights to insure good schools by establishing normal training classes and by compelling the various communities to employ teachers who had the approval of the state department and to submit to supervision by a central state authority.

Beginnings of Compulsion of Pupils. After the organization of state boards of education, came the movement to control attendance through the exercise of central state authority. In 1852, Massachusetts passed a compulsory educational law which differed from the earlier laws adopted in this country, in that it not only compelled communities to provide schools but also compelled pupils to attend school. The other states in rapid succession followed the example of Massachusetts,—the District of Columbia in 1864, Vermont in 1871, and other states later. It was not, however, until the '80's that even the most advanced compulsory educational laws began to be enforced. Since that time, compulsory education has been the accepted practice in the Northern states. The Southern states have been much slower in adopting compulsory education. Indeed, until after the Civil War the South had practically no public school system. It was not until very recently that the last Southern state adopted compulsory education, and in many cases the laws which are now in force are relatively weak.

The situation in the South is seriously complicated because this section of the country, in its effort to deal with this matter, maintained two school systems—one for the whites and one for the Negroes. The Southern states are handicapped also because of lack of resources, with the result that most of the developments in common school education have been slower in the Southern than in the older Northern states of the country.

Segregation. On May 17, 1954, the Supreme Court of the United States handed down its historic decision that public school segregation laws are unconstitutional because they violate the Fourteenth Amendment, which guarantees equal protection of the laws to all American citizens.

The decision, which was unanimous, overruled the case of Plessy *vs.* Ferguson, decided in 1896, which held that the states could provide "separate but equal" schools for white and Negro children. On this point Chief Justice Earl Warren said:

"We conclude that in the field of public education the doctrine of 'separate but equal' has no place. Separate educational facilities are inherently unequal. . . Today, education is perhaps the most important function of state and local governments."

Some 21 states in the North and South with segregation laws are affected by the decision, but the court left open for later determination the question of how and when the ban should be enforced.

Grading and Better Organization. As soon as the state boards of education began to deal with the problems of school organization, there appeared a tendency to grade the pupils better and to provide more definite courses of study for the common school. There was great interest during the decades between 1830 and 1850 in the example of Prussia. Many of the leading educators of this country visited the Prussian schools. Calvin Stowe (1802–86) of Cincinnati was compensated by the state legislature of Ohio for preparing a report highly favorable to the Prussian common school. Mann and Barnard also visited Germany and reported vigorously in their state documents on the virtues which they had observed in those schools.

There was also going forward in Europe a series of reforms, which will be referred to in later sections, under the stimulation of the writings of Pestalozzi (1746–1827) and Rousseau (1712–78). These reform movements in Europe were brought to America during the early years of the century, and encouraged the better arrangement of the course of study and the improved organization of the pupils.

Furthermore, there were growing up during the middle of the last century a number of municipalities which could afford to maintain better schools than those which had been possible in the rural districts prior to 1840. All these influences were operative at about the time that state departments were organized. The result in point of organization was that the common school of the United States took on its present form as an eight-year graded school during the decade between 1840 and 1850. The graded school has not yet entirely superseded in all parts of the country the native district school; but, in the main, the district school has disappeared, and the eight-year elementary school is the typical form.

In the South, where resources were meager, a seven-year school was adopted after the Civil War,

as the typical organization of the elementary grades. In New England, there are some exceptional school systems which conduct a nine-year elementary school. These departures from the rule, however, merely go to emphasize the importance of the general movement which resulted in the eight-year organization of elementary education.

Academies and Union Schools. Parallel with the development of common schools and of state control in these schools, was the development of secondary education. The early years of the 19th century saw the establishment of numerous private academies. There had grown up also in some of the larger communities in Massachusetts and in the other states so-called union schools, which offered a higher grade of education than did the common district school. There emerged slowly out of this development of secondary education an institution which did not begin to appear in any large numbers until after the Civil War, but which is one of the unique creations of the American educational system, namely, the public high school.

Characteristics of the Public High School. The public high school differs from the secondary schools of Europe in that it follows the elementary school. As has been shown in earlier paragraphs, the common school of Europe is separate from the secondary school. In this country, the high school takes the graduates of the eighth grade and continues their training through a period of four years. Furthermore, the American high school is free, the cost of maintenance being paid by the community in the same way in which the community pays for the maintenance of elementary education.

The high school began to flourish after 1870, and its history from that date has been one of phenomenal growth. Statistics in regard to this development will be presented in a later section. The curriculum in these schools began as a classical course modeled closely after that of the secondary schools of Europe, but in this respect also there has been a tremendous expansion in the years since 1870. The modern American high school offers a very wide range of courses and makes numerous adjustments to the students who enter the institution.

In 1893, a committee of the National Education Association, known as "The Committee of Ten," rendered a report on the organization of the high school curriculum, which defined the practice in these schools in a way which has been of the greatest influence in determining the development of the institution. Since that date, the high schools of the United States have followed a fairly uniform path. There is in recent years some indication that the standard pattern will undergo a modification in the direction of an expansion of its lower and upper grades; but the high school, as a typical institution in American life and altogether different in its organization and character from any secondary institution to be found in Europe, may be said to have been finally established in the early '90's.

City Superintendencies. One other line of development in American public educational systems may be commented on briefly. The cities of the United States have gradually developed a complex organization for the control and supervision of schools. In 1837, the cities of Buffalo, New York, and Louisville, Kentucky, each appointed a school officer known as a superintendent of schools. In 1839, Saint Louis, Missouri, and Providence, Rhode Island, did the same. Since that time it has become altogether common for the larger and even the smaller cities to support such a supervisory officer. Today, cities commonly organize their school systems under separate charters granted them by the state, and these independent school districts confer on their chief educational executive various powers and duties which differ greatly from city to city and are still in most cases in process of complete definition. The main fact for us to notice at this time is that a group of technical officers has been created for the management of the larger school systems of the country. In some instances these officers have had jurisdiction over both the elementary and the high schools. In other cases their jurisdiction has been limited to the elementary schools.

With the appearance of the graded elementary school, the high school, and the modern system of organization presided over by a superintendent, the modern American school system may be said to be launched.

Normal Schools. Standing somewhat apart from the elementary and high schools of the country are the institutions which provide the teachers for the elementary schools, namely, the normal schools. During the early periods of American education no special provision was made for the training of teachers. It was assumed that anyone who was educated was competent to take care of little children and to give them appropriate instruction. Indeed, during the Colonial period and the Early National period, it was altogether common to assume that very little training was necessary for any adult to qualify as a school-teacher. Accordingly, the public esteem for the pedagogue was relatively slight, and the social and literary traditions of our people have reflected the attitude that the teacher is an individual who cannot succeed in the competition of the business or professional world and is therefore assigned to the trivial task of caring for little children.

A different tradition grew up in Europe, especially after the development of a group of followers who attempted to put into practice the principles of some of the educational reformers. The school established by Francke in Halle became a center for the training of teachers, and the old castle at Yverdun, where Pestalozzi gathered about him a group of followers, became a center for educational reform in a new and important sense. These schools devoted much attention to the training of teachers, and set the example which in Europe and America has led to the organization of special institutions for this purpose.

The first moves in the United States for the training of teachers were in New England and New York. In 1823, the Reverend Samuel R. Hall conducted classes for the training of teachers in Concord, Vermont, and afterwards in Andover, Massachusetts. In 1827, James Carter opened at Lancaster, Massachusetts, a normal institution which he conducted privately. At about this same time Governor Clinton recommended to the legislature of New York state the establishment of a seminary for the education of teachers. Governor Clinton was especially interested in developing through such an institution the monitorial system which had been imported to this country with the Lancastrian schools. It was, however, the European influence which ultimately led to the development of normal schools as public institutions. The publication of Cousin's report in 1835, together with the enthusiasm of Mann and Barnard and Charles Brooks for German education, led to the acceptance in 1839 by the legislature of Massachusetts of a gift of $10,000 to be devoted to the establishment of a normal school. This school was opened at Lexington, Massachusetts, in the town hall, with one teacher and three pupils. From this date, normal schools were established in the various Northern states, as follows:

1839 Massachusetts (1st)	1854 Massachusetts (4th)
1839 Massachusetts (2d)	1854 Rhode Island
1840 Massachusetts (3d)	1855 New Jersey
1844 New York	1857 Illinois
1849 Connecticut	1859 Pennsylvania
1849 Michigan	1860 Minnesota

The normal schools thus established were supported by the states. In later years some of the large city systems have found it necessary to supplement the state normal schools by city training schools for teachers. Conspicuous examples of such institutions are to be found in New York City, Philadelphia, Saint Louis, and Cleveland. In some cases the state normal school is located in a city, and serves the double purpose of a state normal school

and a city training school. Examples of this type are to be found in Montclair, New Jersey; in New Britain, Connecticut; and in Milwaukee, Wisconsin.

The curriculum of the normal school ordinarily consists of a review of the subjects taught in the elementary school, such as arithmetic and spelling. This review is intended to prepare teachers to give instruction in these subjects. There are also courses entitled "methods," which deal with the best modes of presenting the various school subjects. Finally, there are certain general professional subjects, such as psychology and history of education. These strictly professional subjects are treated in a great variety of ways. Sometimes the psychology is of a general type, corresponding closely to the ordinary academic treatment of this subject. In some cases the effort is made to apply psychology directly to the study of the school subjects. The history of education has been very largely a history of the theory of education, and has been not infrequently replaced in recent years by more practical studies of classroom management and of the school laws of the state in which the student is preparing to teach.

Teachers' Colleges. The normal school has usually been a highly independent institution, its character being determined by its president and faculty. In some instances the normal school has taken on the character of a people's college. This is especially true in the Western states where no other institution of higher learning is easily accessible from the section of the state in which the normal school is located. In recent years, normal schools have been transforming themselves into teachers' colleges and have extended their curriculum from two years, which has traditionally been the length of the normal school training, to four years.

Most of the Western normal schools are permitted by their charters to give degrees, and many of them have taken advantage of this provision. More than one hundred normal schools of the country are at the present time classified as teachers' colleges. The curriculum ordinarily covers four years, the first two years being devoted to the typical normal professional training, but including a liberal amount of general training; the last two years being in many cases given largely to general training like that provided in the ordinary college.

Colleges. American colleges were originally established, as was pointed out in an earlier paragraph, for the purpose of training the clergy. The first of these institutions was Harvard which was founded in 1636. This institution was an imitation of Emmanuel college in Cambridge, England. William and Mary followed in 1693. Yale was established by a group of Congregational ministers in 1701. The charter granted to Yale, like that granted to Harvard, indicates a desire to uphold and propagate the Christian Protestant religion. Both charters express also the wish that the youth of the country may be instructed in the arts and sciences and may through the blessing of God be fitted for employment in both church and state.

The University of Pennsylvania claims 1740 as the date of its origin. This institution has special significance because it grew out of a somewhat more secular motive than the earlier institutions. About 1740 Benjamin Franklin published a pamphlet entitled *Proposals Relating to the Education of Youth in Pennsylvania*. Soon after its appearance 24 public-spirited citizens of Philadelphia took over the charter and property of a charity school established in 1740, and organized an academy largely, though not wholly, on the lines suggested by Franklin. The University of Pennsylvania, chartered in 1755 as the "College, Academy and Charitable School of Philadelphia," was built on this foundation. Its curriculum, including history and civil and international law, went beyond the original curriculum of most American colleges. In 1746 Princeton was founded; in 1754 King's college in New York, afterwards known as Columbia university.

These institutions were followed in late years by a group of public foundations. Perhaps the most famous—and certainly one of the most influential—of these, was the University of Virginia, which was established in 1817, when Thomas Jefferson was elected rector of the board of an institution which had been in existence as an academy since 1803. The board authorized in 1817 the purchase of a farm of 200 acres near Charlottesville, Virginia. The corner stone of the building of the so-called Central college was laid in October of the same year. Jefferson was very eager to have this institution adopted by the legislature as the state university. The example thus set has been of great influence in determining the practices of communities which in later years have developed, especially throughout the Central and Western states of the country, state-supported institutions.

The early colleges were by no means large institutions. As late as 1815, Harvard graduated a class of 66; Yale, of 69; Princeton, of 40; Williams, of 40; Pennsylvania, of 15; and the University of South Carolina, of 37. It was not until after 1820 that the rapid development of American colleges began.

Denominational Colleges. During the decade between 1820 and 1830 a large number of institutions were established, especially by the independent religious denominations, which began to feel the necessity of providing themselves with trained ministers to carry on the work of their churches. So vigorous has been the energy of churches in setting up these institutions of higher learning, that they may be said to have dominated the development of American higher education, in spite of the efforts of Jefferson and of later organizers to bring higher institutions under the control of the state. The statement has been made that, of the 750 institutions of higher learning in the United States and Canada nominally termed colleges, at least two-thirds were originally under the control of religious denominations.

College Graduates and the Professions. The purposes of colleges can be clearly defined in terms of the professions taken up by their graduates. For many years after the founding of Harvard the largest percentage of its graduates went into the ministry. During the early years, more than 70 per cent of all the graduates entered this profession. Later the profession of law became important, and, finally, medicine, engineering, and the modern profession of business took their places, both in society in general and in the colleges, along with the ministry.

A bulletin published in 1912 by the United States bureau of education has canvassed the gradual change in the character of professional choices by college graduates, and summarizes the whole matter as follows. Between 1642 and 1780 the ministry was the chief profession for which the colleges prepared. Up to 1720, the percentage of graduates entering this profession was somewhat more than fifty. After this time a rapid decline is shown in the number of graduates entering the ministry, and in 1780 the percentage fell to about twenty. The percentage of graduates entering that profession during the last period of the 19th century was only five and nine-tenths. Though surpassed by law between 1780 and 1820 in the number of college graduates entering, the ministry again led between 1820 and 1840. It is significant of the final decline of the interest among college students in preaching, that at the close of the 19th century the ministry is overtopped by teaching, commercial pursuits, law, and medicine.

During the first century of higher education in this country, training for law received scant attention, inasmuch as the governing class came directly from England, where they received their legal training. Between 1745 and the period of the Revolutionary War there was a slight increase. This increase was greatly accelerated immediately after the Revolution by reason of the change in government, which removed the English-trained lawyers

and created a demand for lawyers trained in American institutions. Law, accordingly, was in the ascendancy in the colleges during the early part of the 19th century, and once more between 1840 and 1885, perhaps because of litigations growing out of the Civil War. For a hundred years after the Revolution the law attracted a greater percentage of graduates than any other profession except the ministry. At the close of the century, however, it is surpassed by teaching and commercial pursuits.

Before 1705 medicine was an extremely variable profession. From 1705 to 1745 the percentage of college students entering medicine is approximately seven, rising to about twelve per cent from 1745 to 1780. While law was attracting many college graduates after the Revolutionary War, medicine fell off slightly, with an average percentage between 1781 and 1805 of about nine. Since 1850 this average has been further reduced by the growth of teaching and the commercial pursuits, with the result that this profession closed the century with an average of only six and six-tenths per cent of the graduates of colleges, a lower percentage than that of any other five-year period since 1735. Medicine has been the most constant of all the professions.

Recent Changes in Professions. Within one hundred years the profession of teaching has grown from about one-twentieth to about one-fourth of the graduates of colleges. Previously to 1835 it was outnumbered by the ministry, law, and medicine, but after this date the curve for medicine is lower. Since 1880 the line for teaching has crossed that of the ministry, and since 1890 that of law. At present it is the dominant profession into which college graduates go with business as its closest competitor.

The general trend of the curve for college graduates entering commercial pursuits since 1825 has been upward. At present, the commercial group takes approximately ten per cent of the graduates, and is exceeded only by the group of teachers. The general rise of this curve is one of the most striking facts brought out by a study of the colleges, and one to which too little attention has been given.

The profession of engineering scarcely appears until after 1825. Its rise from that time until the present time has been steady. At present, the profession has attained a percentage of about nine. A larger proportion of the graduates of the collegiate departments of institutions maintaining special engineering schools enter this profession, but the aggregate percentage is kept down by the small colleges, only a very small percentage of whose graduates, as a rule, pursue this vocation. At the present time, many liberal arts colleges which do not offer engineering as a course in the curriculum have arrangements with engineering schools. These arrangements enable the student to enroll in "pre-engineering" courses which have credits transferable to co-operating engineering schools.

In spite of the comparatively large number of agricultural courses, farming does not attract and never has attracted a very large number of college graduates; the present percentage is about two. The rapid development of the land-grant colleges, however, has greatly stimulated enrollments. Although the number of graduates entering agricultural pursuits is increasing, it is not increasing so rapidly as the number entering other professions.

Prior to 1830, the profession of letters did not take more than one per cent of the graduates. Between 1830 and 1855 the percentage rose from one to two per cent, and by 1885 it had touched its maximum of three and three-tenths per cent. Many men do not adopt the pen as a means of livelihood until comparatively late in life, and the result is that this series of records stops before the date at which a number of the more recent college graduates can have qualified for inclusion in this group.

Degrees granted by institutions of higher learning in 1950–51 and 1961–62 indicate the change in tendency in major fields of study:

Field of Study	Men 1961–62	Women 1961–62	Men 1950–51	Women 1950–51
Agriculture	4,378	89	8,924	118
Architecture	1,719	55	2,556	88
Biological Sciences	12,189	4,825	6,725	2,072
Business and Commerce	47,937	3,972	52,320	5,917
Chemistry	6,371	1,175	7,036	1,222
Dentistry	3,189	20	2,768	35
Economics	7,645	760	.....	.....
Education	26,191	71,316	18,898	32,633
Engineering	34,610	125	41,386	87
English	9,901	16,686	6,829	8,076
Fine Arts	6,047	7,573	2,487	3,119
Foreign Language	2,778	5,255	1,597	2,671
Forestry	1,426	1	.....	.....
Geography	910	157	.....	.....
History	11,429	5,976	9,000	3,321
Home Economics	50	4,253	55	7,848
Journalism	1,348	826	2,684	1,019
Law	9,333	294	13,926	412
Library Science	417	1,625	.....	.....
Mathematics	10,355	4,255	4,311	1,442
Medicine, M.D. only	6,791	392	5,563	451
Merchant Marine	232	0	.....	.....
Music	1,246	1,695	3,740	3,983
Nursing	65	6,305	.....	.....
Pharmacy	3,250	459	4,622	411
Philosophy	3,254	471	2,333	321
Physics	4,624	188	2,671	117
Political Science	6,481	1,909	4,698	884
Psychology	5,817	3,821	4,836	2,983
Religion	7,302	1,550	3,329	135
Social Sciences	40,213	19,133	4,722	2,339
Sociology	3,629	4,544	3,395	3,925
Speech and Dramatic Arts	1,781	2,231	2,254	2,030
Trade and Industrial Training	1,509	10	.....	.....
Total	284,417	171,946	223,665	87,659

Growth of Colleges. The development of colleges during recent years has been extremely rapid. The following summary from a bulletin of the United States Office of Education shows this development during the last five decades:

During the 50-year period 1889–90 to 1939–40 the total number of administrative and instructional staff members at institutions of higher education increased more than eightfold, from 15,809 to 131,552. In 1941–42 the number stood at 134,137, which was 8.48 times the 1889–90 figure. The number of women members of staffs increased more than twelvefold, from an estimated 3,105 in 1889–90, to 37,886 in 1941-42. In 1889–90, women constituted 19.6 per cent of college and university faculties; in 1939–40, 28.1 per cent; and in 1941–42, 28.2 per cent.

Since 1890, and possibly an earlier date, enrollment of students in higher education has been steadily on the increase, not only in absolute numbers, but also in proportion to the total population of the country, and in proportion to the total number of persons of college age (18-21 inclusive). In 1889–90, the enrollment of 156,756 was 0.25 per cent of the total population and 3.04 per cent of the population 18-21 years of age. The enrollment increased steadily until the economic depression period of the thirties, when it suffered a temporary setback. It quickly rallied from this loss, and increased to about 1939–40. The outbreak of the war in Europe soon started another decrease.

In 1941–42, the nonmilitary resident college enrollment was 1,398,981, which was 1.07 per cent of the estimated population of the nation, and 15.66 per cent of the nonmilitary population 18-21 years of age.

Expenditures increased from $377,903,377 in 1929–30 to $572,465,437 in 1941–42.

Since the close of hostilities of World War II in 1945, college enrollment has increased by leaps and bounds. Approximately 2,000,000 students were enrolled during 1946–47, and an additional 475,000 students were turned away because of lack of college facilities.

In 1963 the enrollment in colleges and professional schools in the United States was 4,800,332. This was an increase of approximately 46.9 per cent over the college enrollment of 1953.

HISTORY OF EDUCATIONAL REFORMERS

Along with the development of educational institutions, there have appeared from time to time educational theorists and writers who have exercised an influence upon the course of subsequent school organization, through their criticisms of existing practices and their suggestions of new types of organization which should be set up. In general, it may be said that these educational reformers reflect the thinking of their times only indirectly. Usually they are significant in the history of the world because they recommend radical departures from tradition and from ordinary views about education. In many instances they have been teachers who have seen from their experience the fallacy of existing methods and have, therefore, thought out new modes of school organization. Very frequently their suggestions are so far removed from the possibilities of realization that the reform suggested is nothing but a theory. Even in such instances, however, the extreme theory has often operated to modify existing methods, and, while the plan proposed by the reformer has never been fully achieved, the modifications which have been attained have been sufficiently radical to justify his efforts.

In a few instances the writings of the educational reformer have led to the organization of a group of disciples who have carried his ideas into effect. Sometimes, indeed usually, the disciples have not followed exactly in the steps of their masters. For example, when Froebel developed the philosophical plan for the training of little children, which led to the organization of the kindergarten, he set in operation a movement which, especially in recent times, has developed in directions other than those implied in his suggestions. The kindergarten has had an independent history reaching far beyond the writings and immediate teachings of its founder. At the same time there can be no doubt that Froebel's writings were the source and original inspiration of the whole movement. The question has arisen within the kindergarten group from time to time whether Froebelian doctrines should be adhered to closely, or should be accepted as mere suggestions of a general type of thinking to be worked out by practical teachers who have to deal with the training of little children. In the course of this discussion, kindergartners have separated into conservative and radical groups.

Similarly, various groups of modern educators have attempted to interpret the general ideas which were laid down by Herbart. In many instances, these interpreters have been in disagreement with each other, but have expressed full acknowledgment of their dependence upon the original teachings of Herbart.

In considering, therefore, the life and writings of any reformer, it is necessary, first, to refer briefly to the conditions under which he did his work. It is then essential to summarize his views on education. Finally, it is important to estimate, as far as possible, the type of influence which he exerted on subsequent periods.

Socrates (469–399 B. C.). One of the earliest educational reformers was Socrates, the Greek philosopher who lived in the 5th century B. C. He was a teacher of morals, logic, and political philosophy; and he attempted to lead the young men of Athens to a clearer conception of their duty to the state, to their parents, and to their associates. His fundamental belief was that knowledge leads to virtue.

His system of teaching consisted in a series of questions which, step by step, followed up any assertion made with regard to any fundamental matter of conduct. The so-called Socratic method consists in drawing out from the individual the necessary consequences of any statement made by him. The teacher is not supposed to contribute directly any information; his business is to stimulate the student to think for himself and to be thoroughly critical o every conclusion at which he arrives.

Socrates did his teaching in a small state in which the young men to whom he appealed were members of the aristocracy which governed the state. The effect of his teaching was to spread broadcast among these young aristocrats skepticism in regard to contemporary practices and forms of social thinking and organization. So influential was this skepticism that in many instances the followers of Socrates became political radicals who sought, not only to criticize existing governmental policies, but to modify them in actual legislation and in the interpretation given to the laws of the state and to the customs of their times.

At length, aroused by the radical tendencies of Socrates' followers, the conservative party in Athens brought about his execution as a false teacher.

Socrates never wrote out any of his own views with regard to the state. It was his followers who gave expression to his doctrines. The writings of Plato and Aristotle, therefore, have been among the chief vehicles through which the influence of Socrates has been brought to the modern world.

Plato (429–347 B. C.). Plato wrote on philosophy, on social subjects, and on government, developing ultimately a general theory of the state. This theory distinguishes between the different classes of society, and defends the general position, which he borrowed from Socrates, that knowledge and clear thinking are the only possible bases of good conduct. Practical writers have sometimes criticized Plato by pointing out that knowledge is not always immediately expressed in action. A man may think clearly on social matters and yet not be just in his social behavior. Plato, on the other hand, emphasized very explicitly the relation between knowledge and action, and devoted his writings and teachings to the development of this theory.

Plato's doctrine of the state distinguishes between the slaves who are to carry on the ordinary activities necessary to provide society with the necessities of life, the warriors who are to defend the state, and the philosophers who through meditation develop a system of laws and practices which shall embody all of the principles of justice.

His influence was very great over a large group of followers, whom he taught in the school which he founded and called the Academy. Here he taught not only his system of philosophy but the higher branches of mathematics, which he deemed an important part of the mental equipment of youth.

Plato's writings and teachings were accepted in the later medieval period as the chief authority on educational organization.

He divides higher education into four main branches—arithmetic, geometry, astronomy, and music. This subdivision of the subjects of instruction, known in the medieval period as the quadrivium, was long the basis of study of the school curriculum. Plato's discussion emphasizes, not only the importance of these particular subjects, but also the necessity of developing a unity and symmetry of thought which can be arrived at only by mastering the full round of the curriculum.

Plato was an idealist—an ardent advocate of the æsthetic and the moral in education. He was especially congenial to the religious leaders of the medieval period and to the later thinkers who, in the Renaissance, sought to restore Greek culture with all its artistic accompaniments.

Aristotle (384–322 B. C.). Aristotle was a much more practical and scientific teacher than was Plato. He was the instructor of Alexander the Great, and in later life he received from his royal pupil many additions to his materials of knowledge. It is said that Alexander sent to Aristotle, from all parts of the world into which he carried his expeditions, samples of the things which he found He sent, for example, actual specimens of strange animals, with the result that the science of zoology de-

veloped in Aristotle's hands. In like fashion, other natural sciences were opened up by Aristotle because of the breadth of material which he found available.

Aristotle organized the Lyceum as a place where he trained the young legislators and statesmen of Athens. It became a center of research in biology, history, and the science of government. Aristotle developed numerous systems of knowledge which were of great influence during the medieval period, and his discussions on the nature of the mind were the bases of the psychology and of much of the theology of this time. He formulated the principles of logic, which were taken over to the great school at Alexandria and were later utilized by Euclid in the formulation of geometry. Through geometry the Aristotelian logic was carried into the medieval schools and became the most important subject of higher education in Europe, both in the medieval and in the early modern period. The disputes of the scholastics are based upon the principles of this logic.

Aristotle advocates the beginning of education when the child is seven years of age. He mentions and evaluates the various subjects to be taught, namely, reading and writing, gymnastics, music and drawing. He lays great stress on physical training and on reading and music.

Aristotle's theories about education were much less completely formulated than were those of Plato. He contributed new content for education rather than new methods of giving instruction.

Quintilian (35–100? A. D.). Quintilian was a teacher of rhetoric in Rome. He formulated a theory of education for the orator, which became the classic of subsequent organization of training in language and letters during the medieval and modern periods. Quintilian may be regarded as the father of classical education. In his day classical education meant, of course, the transfer of Greek learning to Roman soil. He pointed out quite explicitly that the study of Greek is not so important in its content as in the training which it gives to the young orator.

Quintilian wrote his educational works late in life, after a period of successful experience as a teacher of Roman boys. It was his theory that the proper training of the orator must begin with infancy. He therefore devotes much of his writing to the theory of training the child from infancy up. He wrote a series of books entitled *De Institutione Oratoria*, in which he gave in great detail the methods of literary training. For example, he discussed the teaching of writing, and advocated teaching the forms of letters by requiring the child to trace letters which had been written for him. He afterwards discussed in equally great detail the method of teaching Greek grammar and the methods of teaching literary style. Quintilian favored also, as had Plato, the teaching of geometry and music as parts of a liberal education. He discussed the matter of corporal punishment, and advocated an abandonment of frequent floggings, on the grounds that the child's individuality must be respected.

Quintilian's influence in formulating the modern classical curriculum is perhaps greater than that of any other single writer.

Alcuin (735–804). Alcuin has been mentioned in the earlier paragraphs. He was educated in the Cathedral of York in England, and came to the continent as educational adviser of Charlemagne. In this capacity he exercised a great influence, not only over the princes who were his pupils, but in the political matters with which his master was always engaged. His influence was felt in the more vigorous and systematic organization of education and of the intellectual side of civilization wherever his pupils went.

Anselm (1033–1109). Anselm has been called the father of scholasticism. He was archbishop of Canterbury in England. For a time he did his work in the monastery of Bec, which he made the chief center of learning in western Europe. His teachings were chiefly upon religious doctrines. His fundamental principle was that Christianity can be founded on stable grounds only if reason guides. He trained his followers, therefore, to cultivate methods of correct and vigorous thinking. From Bec there issued, as a result, the most vigorous disputants of the age.

Peter Abelard (1079–1142) was the most famous teacher of the 12th century. Like all teachers of that day he was trained for theology, and his fame rests in large part upon his ability as a disputant on theological topics. He was an opponent of William of Champeaux, whom he seriously worsted in theological debate. He became a hermit in Champagne but hundreds of students flocked to him and were influenced by his liberal and spirited teachings. He is one of the important forerunners of the school of theology which afterwards became the great University of Paris. Much of the teaching which he did in his early years was at Notre Dame in Paris.

Saint Thomas Aquinas (1225–1274). Aquinas was undoubtedly the greatest and most influential philosopher of the middle ages. He adopted the method of teaching which later came to be universal in European universities, namely, the so-called commentary. He read Aristotle's works to his students and followed the reading by critical comments. This method is reflected in the lecture method of instruction which is common today in all higher institutions of learning in Europe and America.

Aquinas was a voluminous writer on theological and philosophical topics. His writings, like his oral methods of teaching, have exercised a lasting influence. No single authority has contributed more to the fixed teachings of the Roman Catholic Church and its schools than Aquinas.

Erasmus (1466–1536) was one of the leaders in the Northern Renaissance. He was educated in the schools of the Brethren of the Common Life in France and later was himself a teacher of the classics in various parts of Europe, and the author of many of the textbooks used in the teaching of Latin. He was the author of several treatises on education. In these he points out the importance of beginning education early and developing the powers of the child in the natural order. He also maintains that it is the business of the Church and state to see that there is an adequate number of properly qualified teachers. He himself exemplified throughout his life devotion to the profession which he thus aimed to promote in these writings. He was at home in all parts of Europe because of his command of the classical languages and is said to have been known in all of the schools of his time and during the century following his life.

Martin Luther (1483–1546). Luther was the father of the Reformation in Germany. The essentials of Luther's teaching were independence of religious belief and reliance on individual faith. Luther championed the cause of the common people and by his writings strove to improve the intellectual condition of his fellow citizens. He and his followers, like many of his lay and clerical contemporaries, were friendly to the classics, but he advocated the establishment of vernacular schools for the common people. He combated vigorously the pseudo-science of astrology.

The main subject of Luther's interest was religious teaching, and he is regarded as the pioneer of Protestant household instruction. His influence has undoubtedly been of prime importance in keeping in the curriculum of the common schools of Germany, even though they are under secular control, instruction in religion.

Ignatius Loyola (1491–1556). Loyola was a Spanish youth brought up in the court of Ferdinand and Isabella. He was wounded while engaged in military operations against the French. During the period of his convalescence he read certain religious treatises and resolved to give his life to the Church.

He became the leader in a movement for reform within the clergy. With a number of his followers, he founded, under a charter granted by Pope Paul III, the Order of Jesus, which has been throughout its history a teaching and missionary order.

The object of the order is described as "The progress of souls in good life and knowledge of religion, the propagation of faith by public preaching, spiritual exercises, and works of charity, and particularly the instruction of youth and ignorant persons in the Christian religion."

In the accomplishment of this purpose, the order established schools and colleges, and developed the so-called *Ratio Studiorum*, or plan of studies, which prescribed a rigid training in the classics and in religion. Latin and Greek were the backbone of the curriculum, but science and mathematics were also included. Where the order undertook missionary enterprises, the scope of the curriculum was enlarged to include instruction in the vernacular and in rudimentary subjects. The characteristic of all the teaching was its systematic and carefully planned organization.

Ignatius Loyola was not a reformer in the sense that he revolted against earlier ideals; he aimed rather at realizing ideals for which the Church already stood. His companion Peter Canisius strove to check the progress of Luther's social and religious teaching in Germany. Loyola's labors gave to the Catholic Church the order which has continued to exert the greatest influence over its educational activities. See *Jesuits*, page 2051.

Johannes Sturm (**1507–1589**) was a German educator of the extreme classical type. He was educated in the school of the Brethren of the Common Life at Liege. His chief work was carried on in the Gymnasium at Strasbourg. He was a rigid disciplinarian and a devoted classicist. He was an organizer of large ability and, by virtue of the fact that he wrote extensively on methods of education and organization of secondary education, his influence spread to other cities and to other countries. The modern organization of the German Gymnasium is to be attributed in very large measure to the influence of the school which he conducted in Strasbourg.

Roger Ascham (**1515–1568**) wrote in 1570 an educational work entitled *The School Master*. It is one of the most representative Renaissance writings in England. It is full of a liberal spirit and exhibits a large interest in physical education as well as intellectual training. In this book Ascham describes the method of teaching Latin which is known as the method of double translation. The Latin author is to be translated first into English and afterwards to be translated back again into Latin. Ascham's book on school teaching is interesting, not merely because of the liberal reforms he suggested in teaching, but also because of its literary style and because of the insight which it gives into the social and political life of the day in which he wrote.

Francis Bacon (**1561–1626**) was an English philosopher, statesman, and man of letters. He was one of the brilliant group who gathered around Queen Elizabeth. He advocated the development of science through observation and direct contact with objects as distinguished from the acceptance of statements made by writers of books.

His educational influence is general rather than specific. He inaugurated the period of sense-realism. His methods of scientific investigation were indeed much less productive than those of some of his contemporaries, but his writings were of such an impressive character as to attract the attention of readers and to give prestige to his theory that education should be based on direct observation.

John Amos Comenius (**1592–1670**). Comenius, or Komensky if the Bohemian form of his name is used, ushered in the change in attitude which came naturally after the long period of formal classical education. He was interested in making knowledge concrete and definite. He criticized the schools in the most severe terms, pointing out that they dealt in words rather than in useful forms of knowledge. He characterized the schools as "the slaughterhouses of the mind where ten or more years are spent in learning what might be acquired in one." "They are," he said, "places where minds are fed on words." These criticisms he made because of his experiences in the gymnasium in Prerau and his observation of the attitude of his fellow pupils in that and other schools which he attended.

He began his work as an educational reformer by preparing new materials for the teaching of Latin. He selected the names of common objects and arranged this selected vocabulary in simple sentences which the pupils could understand. Later he added to the concreteness of his teaching by preparing a pictorial encyclopedia called *Orbis Pictus*, in which lists of words are given. Each word is defined and accompanied by an illustration.

In order to change the practices of the schools, he organized a school at Sarospatak near Tokay. Here he made education thoroughly interesting to his pupils by instruction that was concrete rather than abstract.

He is to be described as the father of realism in modern education. He ushered in a period in which education was to cease being austere and remote and was to become sympathetic and helpful to the pupil, interesting and congenial to the child's native tendencies.

John Locke (**1632–1704**). Locke was one of a group of essayists who wrote on education though their chief interests were in other matters. He was an English philosopher who spent his time and energy chiefly in discussing the issues of philosophy. His great work is his *Essay concerning Human Understanding*. This, together with his political writings, gave him an influential position among the serious readers of his day.

His book entitled *Thoughts on Education* is a protest against too close devotion to books and bookish knowledge. He would have the young English gentleman, on whom his "thoughts" are concentrated, travel and become acquainted with things rather than merely learn languages.

Locke was a modern realist in every sense of the word. He belonged to a period when natural science was flourishing in England. His philosophical system was realistic in its interests, and he was thus one of the early advocates of a new type of education which breaks away from the severely classical traditions of an earlier period.

Jean Jacques Rousseau (**1712–1778**). Rousseau wrote at a time when education was dominated by the idea that the younger members of the court of France must be trained in the social arts which would make them acceptable in court life. The strictly court type of training which had been evolved was not primarily a system for the training of the intellects of the pupils. It was a course in manners. The breach between the common people, who had to work, and the aristocracy, who idled about the court and cultivated artificial manners, was daily growing wider; and Rousseau, as he wrote on education, was writing also on political issues.

Indeed, his two great works deal, one with political theory, the other with the theory of the training of the individual. We may, perhaps, gain a better view of his educational theory by referring first to his chief political essay, entitled the *Social Contract*. Rousseau held, in this essay, that the rights of the sovereign arise from the consent of society. In a primitive state men are at war with one another; but seeing that war is destructive they come together and form a group, agreeing each in his turn to surrender some of his individual rights to the group as a whole. The social contract thus formed is held to be the basis of civilized government. Rousseau's doctrine of the social contract was a

powerful influence in the French Revolution. It has been said that this book helped more than anything else to precipitate the Revolution.

On the side of individual training, Rousseau held that all of the false institutions which have grown up in modern society must first be eliminated if the individual is to come to the full development of his powers and personality. He wrote a book entitled *Emile*, in which he expressed his educational doctrines in the form of a life history of a boy who is supposed to have been properly educated. This book begins with the famous statement that all things are good as they come from the hand of the Creator. It is man who has destroyed the natural goodness of everything. Rousseau advocates, therefore, a return to nature. The boy who is to be properly educated must be taken away from association with society. He must never see a book until he is sufficiently mature to escape all the evil consequences which result from the use of books. Freed, in this way, from contact with society and books, the child must wander in the woods and open country and gather up knowledge which will satisfy his natural curiosity. In order that this boy may have the advantage of such knowledge as the race has accumulated, he is to be accompanied by a sympathetic tutor whose business it is merely to help him answer the spontaneous questions which arise in his mind. After the child has reached a certain stage of maturity, he should be led to see the importance of cultivating some type of skill which, in case of necessity, will provide him in later life with the means of livelihood. Still later, he may be brought back into the society from which he has been separated during the earlier period, and may now be introduced to books and men. He will be able to adjust himself to the social conditions which he thus encounters, because of the intelligence and the strength of physique which he has cultivated through his early training.

Rousseau's *Emile* was so fascinatingly written that it was accepted by Europe as a philosophy of life as well as a scheme of education. His teachings have also been of influence in subsequent generations where the general principle of the return to nature has seemed most attractive to those who are critical of modern society and the modes of life which modern education has developed. There are constant references to Rousseau's doctrine of education in such modern theories as that developed by Madame Montessori.

In many quarters of Europe, immediately following the appearance of his book, the education of children was organized on the free plan suggested by Rousseau. Not only were children taken out into the open fields and woods, but mature individuals attempted to give themselves a freedom of life and a detachment from the difficult problems of modern society by accepting Rousseau's doctrine as a philosophy of life.

From the nature of the case, Rousseau's teachings did not lead to the organization of a school system or a group of teachers. His writings tended, however, to modify the practice of existing schools in the direction of greater freedom and the recognition of natural impulses of children.

Johann Basedow (1723–1790). Basedow is the educational reformer of the post-Reformation period who is to be compared in general character with Comenius of the pre-Reformation era. Basedow, like Comenius, conceived of education as an appeal to the natural interests of children. He sought to promote nature study and contact with objects.

He devoted himself assiduously to the preparation of suitable textbooks for use in schools. In order to secure the funds for the preparation and publication of these books, he made an appeal to men of property for a public subscription and received a generous response. His movement was termed from this time on Philanthropinism.

The influence of Rousseau is very marked in the writings of Basedow. His motto was, "everything according to nature." A description of the new type of school which he established is given by Herr Schummelas as follows:

"I have just come from a visit with my father to the Philanthropin, where I saw Herr Basedow, Herr Wolke, Herr Simon, Herr Schweighauser, and the little Philanthropinists. I am delighted with all that I have seen, and hardly know where to begin my description of it. There are two large white houses, and near them a field with trees. A pupil—not one of the regular scholars, but of those they call Famulants (a poorer class, who were servitors)—received us at the door, and asked if we wished to see Herr Basedow. We said 'Yes,' and he took us into the other house, where we found Herr Basedow in a dressing gown, writing at a desk. We came at an inconvenient time, and Herr Basedow said he was very busy. He was very friendly, however, and promised to visit us in the evening. We then went into the other house, and inquired for Herr Wolke."

By him they were taken to the scholars. "They have," says Fred, "their hair cut very short, and no wigmaker is employed. Their throats are quite open, and their shirt-collar falls back over their coats." Further on he describes the examination. "The little ones have gone through the oddest performances. They play at 'word-of-command.' Eight or ten stand in a line like soldiers, and Herr Wolke is officer. He gives the word in Latin, and they must do whatever he says. For instance, when he says *claudite oculos*, they all shut their eyes; when he says *circumspicite*, they look about them; *imitamini sartorem*, they all sew like tailors; *imitanini sutorem*, they draw the waxed thread like the cobblers. Herr Wolke gives a thousand different commands in the drollest fashion.

"Another game, 'the hiding game,' I will also teach you. Some one writes a name, and hides it from the children—the name of some part of the body, or of a plant, or animal, or metal—and the children guess what it is. Whoever guesses right gets an apple or piece of cake. One of the visitors wrote *intestina*, and told the children it was a part of the body. Then the guessing began. One guessed *caput*, another *nasus*, another *os*, another *manus*, *pes*, *digiti*, *pectus*, and so forth, for a long time; but one of them hit it at last. Next, Herr Wolke wrote the name of a beast, a quadruped. Then came the guesses: *leo*, *ursus*, *camelus*, *elephas*, and so on, till one guessed right—it was *mus* Then a town was written, and they guessed Lisbon, Madrid, Paris, London, till a child won with St. Petersburg. They had another game, which was this: Herr Wolke gave the command in Latin, and they imitated the noises of different animals, and made us laugh till we were tired. They roared like lions, crowed like cocks, mewed like cats, just as they were bid."

Johann Heinrich Pestalozzi (1746–1827). Pestalozzi is one of the world's greatest educational reformers. He was born in Zurich, Switzerland, and did his work in the little Alpine republic, but his influence has spread to every civilized country on the globe.

He was in temperament and behavior erratic and unsystematic. He failed to hold together the schools which he founded, and so far as his personal affairs were concerned he was always unfortunate. But in his insight into the needs of the common people, in his sympathy for children, and in his genius for devising methods of teaching, he is one of the foremost leaders of modern times.

After drifting from one enterprise to another, Pestalozzi wrote and published in 1781 the work on which his fame chiefly rests, a book entitled *Leonard and Gertrude*. In this book the author gives first a picture of the deplorable condition of a poor family in a Swiss village. The picture shows how the family lacked all the comforts of life and all prospects of securing even the barest living necessities. In the midst of these squalid conditions, the brave mother, Gertrude, takes up the task of teaching her children. Gertrude turns out to be such a genius in getting her children to carry on the simple industrial and domestic activities to which she directs their attention that, through their co-operation, she relieves the condition of the family and ultimately the poverty of the whole village.

Gertrude's method is that of organizing the children's activities and at the same time instructing them in the intelligent comprehension of all that is about them. She reads to them as they work. The language of her school concerns itself with the commonplace facts of everyday life, and yet it raises these facts to the level of understood and clearly

explained matters. The moral tone of the home and of the village is raised through this intellectual clarification of the facts of life. Skill which is cultivated at the same time that minds are trained makes it possible for the children to develop comfortable and wholesome surroundings.

Pestalozzi's message came as a great inspiration to an age which was impoverished by wars and by the lack of trained workers in industry. All over Europe the effort was put forth by rulers and religious leaders to bring the common people up to the level described in *Leonard and Gertrude*.

His teachings were brought to America and were eagerly accepted, especially at the normal school at Oswego, N. Y. Under the leadership of its principal, Edward Austin Sheldon (1823-97), this school became a great center for the dissemination of the doctrine of sense training, observation, and the cultivation of practical knowledge.

Charles Maurice Talleyrand-Périgord (1754–1838) was a French statesman. To his influence may be attributed the compact organization of the educational system of France. Napoleon adopted the suggestions which he made with regard to the organization of the educational system, and made it in this way a part of the public policy of France. To Talleyrand himself the organization of the educational system was a mere side issue. He was engaged in important diplomatic and political missions at different times during his life and seems not to have been seriously interested in carrying out the reforms which he had suggested in his writings. His personal influence, therefore, is relatively slight, although his statesmanship appears in the organization which he suggested and which was adopted by the French state.

Johann Friedrich Herbart (1776–1841). Herbart was a German philosopher and teacher. He was the first educational reformer to enunciate clearly the idea that education must be organized on the basis of carefully ascertained scientific principles. There are two sciences, he pointed out, on which education must be based—psychology and ethics. The first supplies an analytical account of the nature of the human mind which is to be educated; the second works out the social goals toward which educational systems must direct their efforts.

Herbart had experience as a tutor of boys in the home of the governor of Interlaken, and he was thoroughly acquainted with the sciences on which he proposed to base education. Indeed, his occupation was that of professor of philosophy in various German universities.

The system of psychology of which he was author stimulated the empirical studies of the last century which resulted in the establishment of laboratories for the development of an experimental and physiological science. The system was not in itself especially productive for education. The pedagogical writings of Herbart seem to have grown more out of his practical experience than out of his system of psychology.

Herbart laid great stress on the importance of arousing the pupils' interests and then extending these interests in many directions, until there should result what he calls many-sidedness of interest.

Herbart's doctrine of apperception is another of his leading contributions to educational theory. All experiences, in order to be clear, must be introduced into the learner's experience in such a way as to be fully assimilated.

In order that ideas may be apperceived, teachers must have a regular method of getting ideas into the pupil's mind. The method involves five steps, which are known as formal steps because they can be adopted as the proper form for any content whatsoever. These steps are preparation, presentation, assimilation, generalization, and application. Put in other words, the experience of the pupil must be so marshaled that the mind is ready to take in the new idea. This must then be presented in clear form. The mind must have time to receive the idea and put it into its proper relations. The mind must then contemplate it until the general nature of the new idea is recognized. Finally, the mind must carry over what it has absorbed into all productive new relations or applications.

Herbart's influence has been very great in America. Through the school at the University of Jena in Germany, over which Professor Wilhelm Rein (1847–1929) for many years presided, a great many Americans, notably Charles DeGarmo and Frank and Charles McMurry, were introduced to Herbartianism. They have been prolific writers on educational methods.

Friedrich Froebel (1782–1852). Froebel was the founder of the kindergarten. He was powerfully influenced on the one side by Pestalozzi, whose school at Yverdun he visited for a period, and on the other side by the idealistic philosophy of Schelling and Fichte.

Unlike Pestalozzi, he was not especially interested in the practical aspects of human training, but he was absorbed in the attempt to bring into complete harmony the inner experience of the child and the natural world in which the child lived. Prompted by his idealistic philosophy, he sought to bring about this harmonizing of the inner and outer worlds by finding the universal principles in nature and exposing the child to these at the earliest possible age.

There is much mysticism in Froebel's thinking and writing. This fact has led to confusion in the development of the institution which he founded. Indeed, it has permitted a certain sentimentalism to come into the kindergarten, which has tended to inhibit the careful study of children and their needs.

Froebel's Principles.—A number of extracts from Froebel's writings will serve to bring out the leading principles of his educational philosophy:

"A life of more than thirty years with nature, often, it is true, falling back and clouded for great intervals, has taught me to know this, especially the plant and tree world, as a mirror, I might say, an emblem of man's life in its highest spiritual relations; so that I look upon it as one of the greatest and deepest conceptions of human life and spirit when in Holy Scripture the comparison of good and evil is drawn from a tree. Nature, as a whole, even the realms of crystals and stones, teaches us to discriminate good from evil; but, for me, not so powerfully, quietly, clearly, and openly as the plant and flower kingdom.

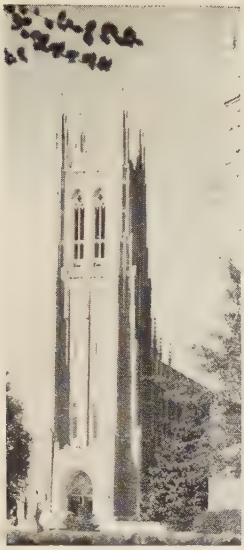
"The child . . . perceives in the ball the general expression of each object as well as of itself (the child) as a self-dependent whole and unity . . . so the child likes to employ himself with the ball, even early in life, in order to cultivate and fashion himself, though unconsciously, through and by it, as that which is his opposite and yet resembles him.

"The cube is to the child the representative of each continually developing manifold body. The child has an intimation in it of the unity which lies at the foundation of all manifoldness and from which the latter proceeds.

"The pleasure with which the children play these games and others of a similar kind may therefore have its ground in a presentiment of what is symbolic and significant in them. May not their delight in these encircling movements, for example, spring from the longing and the effort to get an all-round or all-sided grasp of an object? . . . I am convinced that the exalted and often ecstatic delight of children in their simple movement plays is by no means to be explained through the exertion of mere physical force—merely bodily activity. The true source of their joy is the dim premonition which stirs their sensitive hearts that in their play there is hidden a deep significance; that it is, in fact, the husk within which is concealed the kernel of a living spiritual truth.

"Experience and history, too, teach that men truly and effectively promote human welfare much more by what they put forth from themselves than by what they may have acquired. Every one knows that those who truly teach, gain steadily in knowledge and insight . . . Again, to learn a thing in life and through doing is much more developing, cultivating and strengthening than to learn it merely through verbal communication of ideas. Similarly, plastic material representation in life and through doing, united with thought and speech, is by far more developing and cultivating than the merely verbal representation of ideas.

"The young growing human being should, therefore, be trained early for outer work, for creative and productive activity . . . play, building, modeling are the first tender

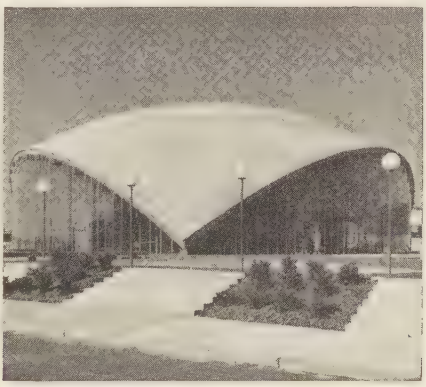


Above Chapel at Duke University in Durham, North Carolina. The university was founded in 1838.

Above Timothy Dwight College, Yale University, New Haven, Connecticut. One of the numerous colleges on the campus which serve as dormitories for male students.

Right Taylor Gate at Vassar College, Poughkeepsie, New York. An institution for women, Vassar was founded in 1861.

Below Striking in its modern architectural design, the Kresge Auditorium of the Massachusetts Institute of Technology, located in Cambridge, Massachusetts, combines simplicity with efficiency.
MIT Office of Public Relations



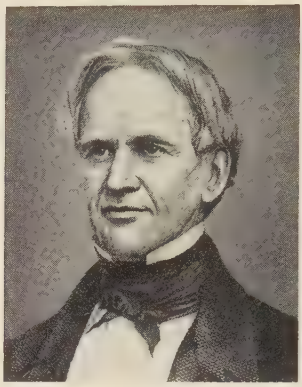
Below Hoover Tower at Stanford University, California. This building, named for former president Herbert Hoover, a Stanford alumnus, contains the Hoover Institute and the Library on War, Revolution, and Peace. The university was founded in 1885.

NOTABLE COLLEGES

Below Dunster House of Harvard University in Cambridge, Massachusetts. This house is one of the seven dormitories for the students. Harvard is one of the country's oldest educational institutions and was founded in 1636.

AMERICAN EDUCATORS

Mark Hopkins



Horace Mann

Mary McLeod Bethune

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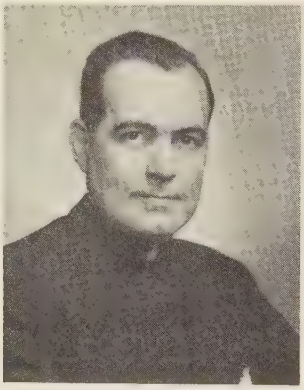


Rev. Theodore M. Hesburgh, C.S.C.

James B. Conant

David Starr Jordan

John Dewey

blossoms of youth . . . Every child, boy and youth, whatever his condition or position in life, should devote daily at least one or two hours to some serious activity in the production of some definite external piece of work. It would be a most wholesome arrangement in schools to establish actual working hours similar to the existing study hours; and it will surely come to this.

"A universal and comprehensive plan of human education must, therefore, necessarily consider at an early period singing, drawing, painting, and modeling; it will not leave them to an arbitrary, frivolous whimsicalness, but treat them as serious objects of the school. Its intention will not be to make each pupil an artist in some one or all of the arts, but to secure to each human being full and all-sided development, to enable him to see man in the universality and all-sided energy of his nature, and, particularly, to enable him to understand and appreciate the products of true art.

"This school (he said) will be based on the interdependence of doing and thinking, representation and knowledge, art, and science . . . on the student's personal efforts in work and expression, making these again the foundation of all genuine knowledge and culture. Joined with thoughtfulness, these efforts become a direct medium of culture; joined with reasoning, they become a direct means of instruction, and thus make of work a true subject of instruction."

Thomas Arnold (1795–1842) was head master of Rugby for 14 years, from 1828 to 1841. During this period he exercised on the organization of secondary education in England an influence which was of the greatest importance. He assumed in an intimate way the social and intellectual leadership of Rugby. He contributed very largely to the establishment of the type of discipline which has come to be regarded as characteristic of the English so-called public schools. He was in favor of classical studies but he also provided, in the curriculum of his school, for modern history and modern languages and mathematics. In all these subjects he maintained the highest standards of scholarly exactness. The integrity of his character and the great influence which he exercised over the boys who attended Rugby is reflected in Thomas Hughes's *Tom Brown's School Days*. The influence of his methods of administration spread to the other schools of England.

Horace Mann (1796–1859). Mann was the first secretary of the state board of education in Massachusetts. In this position he exercised an enormous influence during the critical period of reconstruction which brought into being the American graded elementary school as a substitute for the older district school.

Mann was an indefatigable worker and a prolific writer. His annual reports deal with all kinds of problems, such as illiteracy, school buildings and sanitation, the training and employment of teachers, methods of teaching, methods of local school control, and public financing of education.

He was greatly impressed by the organization of German schools, and advocated the conservative importation of some of the practices which he observed there. He pointed out fearlessly the faults which he found in existing schools and suggested many reforms.

His criticisms aroused much animosity among the schoolmasters, especially those in the Boston schools, and brought him into sharp controversies. However, he was able to secure the establishment of the first normal school to have a continuous existence in his country. He modified the district school; he greatly improved public respect for education; and he fundamentally changed the methods of teaching in the schools.

Henry Barnard (1811–1900). Barnard was successively the head of the school systems of Connecticut and Rhode Island. He was also the editor of the *American Journal of Education*, which during the period of its publication in the middle of the last century was one of the leading factors in bringing about far-reaching reforms in American education. With Mann, Stowe (1802–86), and others, Barnard labored for the more definite organization of instruction, especially in elementary schools. He visited the schools of Europe, helped to acquaint American educators with the teachings of Pestalozzi, and contributed through his administrative activities to the improvement of elementary education.

Herbert Spencer (1820–1903). Herbert Spencer conceived early in his career the idea of preparing a comprehensive statement of the philosophy of the world. In order to develop this complete system of philosophy he began with an investigation of biological science, and from this point progressed through a study of society and its nature and of the individual and his nature to a treatment of the problems of ethics, or human conduct. Spencer laid the foundation for sociology and the modern studies of society. In the course of his inquiry he naturally came upon the problems of educational organization.

He found the English higher schools devoted to classical training, which had been traditional throughout the medieval and modern periods, on the theory that, through this type of training, the discipline of the mind can be secured more effectively than by any other means. Against this classical scheme of education Spencer rebelled. His interest in the sciences was so keen that he defended scientific training as superior to classical training for all purposes, even for the discipline of the mind. His discussion of education was embodied in four essays which were published in 1861 and have been widely read. They were perhaps more effective in the United States than in England, because in this country the classical tradition was less firmly established.

The first of Spencer's educational essays was entitled *What Knowledge is of Most Worth?* His answer to the question is that scientific knowledge is much more significant than any training in mere letters. In the course of his discussion he mercilessly criticized existing schools as utter failures in preparing children for the practical duties of life. Especially he points out that in such important matters as preparation for parenthood the school curriculum is silent. Science, he contends also, is even more useful than the classics for the discipline of the mind.

The second essay lays down the proper principles of *Intellectual Education*, such as progression from the simple to the complex and from the concrete to the abstract. The third of his essays is on moral training, and expresses the general view that punishment is justified only when it follows the pattern of nature and gives the child the training which will improve his adaptation to the world about him. The fourth essay advocates a better physical training for pupils.

Spencer's essays have done much to promote the development of the modern scientific curriculum in American high schools and colleges. His influence has also been large in the development in higher institutions of the social studies, such as sociology and political science.

William Torrey Harris (1835–1909). Harris contributed to educational reform through his work in the city of Saint Louis, where he was for years superintendent of schools, and in the Federal bureau of education where, during the later years of his life, he was commissioner.

In Saint Louis he introduced the kindergarten, reorganized the elementary schools and their curriculum, set up an eight-year graded system in the elementary schools, and promoted secondary education.

In the bureau of education, he elaborated the reports and laid the foundation for the most complete system of school statistics published by any government.

In his contributions to education, Harris labored to accomplish three great purposes. The first was to psychologize education. Along with other leaders in the school world, he showed the futility of the old-time psychology, with its so-called "faculties of the mind," and demonstrated the worth of the new. His second purpose was to establish faith in the school as an institution having sociological functions and value. In the *Report of the Committee of Fifteen*

he discussed four bases for the correlation of studies: (1) the logical order of topics and studies; (2) the symmetrical whole of studies in the world of human learning; (3) psychological symmetry; (4) the pupil's natural and spiritual environment. His final purpose was to place education upon an enduring foundation. He subjected the whole field to critical analysis, interpreting and justifying the school and assigning to it its proper place in the scheme of institutional life.

Alfred Binet (1857–1911). Binet was a French psychologist and director of the laboratory of physiological psychology at the Sorbonne. Prior to 1905, he had made numerous investigations of the deficiencies exhibited by children in the course of their development. At this date he was asked by the school authorities of Paris to undertake the study of children in the public school systems, for the purpose of detecting the various forms of mental deficiency which interfered with school work. He devised a series of tests, with the co-operation of Thomas Simon. These tests have been very widely used in Europe and in the United States as a means of determining the intellectual possibilities of children. The characteristic of these tests is that they are arranged in such a way as to determine the intellectual age of the child. By a series of trials, Binet assembled those tests which should be passed by a child three years of age if he is entirely normal in his mental development. Other series were developed for other ages, so that it is possible by means of this scale to compare any given child with other children of his chronological age. Various revisions of the Binet scale have been made by Terman and others who have taken up the work, especially in the United States.

Granville Stanley Hall (1846–1924). Hall was an American psychologist and writer on education. In 1881 he established at Johns Hopkins university one of the earliest psychological laboratories in the United States. He was the chief leader in the child study movement. In 1888 he became president of a university established in Worcester, Massachusetts, and named after its chief patron, Clark university. This institution was devoted entirely to graduate work, and, during the first two decades after its establishment, developed chiefly research in education under Hall's personal leadership. Hall was a severe critic of formalism in the schools. He advocated the abandonment of the ordinary types of teaching in the primary grades and a substitution, for the academic training in those grades, of physical education and observation of natural objects.

For the higher schools, he advocated a complete reorganization of the curriculum on the basis of studies he made of the adolescent period. His most influential work is a treatise on *Adolescence*, in which he describes this period as a distinct phase in the child's development, analogous to the periods of evolution which have led from time to time to the production of new species in the animal kingdom. The great emphasis which Hall laid upon the fundamental change which comes with the adolescent period in human life made him one of the chief exponents of the doctrine of periodicity in education.

During the later years of his presidency at Clark university, Hall's influence distinctly diminished, because of the lack of scientific methods in his work and the development in other quarters of more productive lines of educational research.

Charles William Eliot (1834–1926). Eliot became president of Harvard college in 1869. He found a conservative institution devoted chiefly to classical instruction. He reconstructed the college and transformed it into a great university.

Among his most notable educational reforms is the development of an elective system. Through this system, which has now become universal in American colleges and high schools, a student can so select subjects of study as to give himself the specific training which he needs for the calling in life which he intends to take up.

Eliot also labored for the enlargement of the college curriculum. He brought about the introduction of a great variety of subjects. The result is that a college is no longer the home of a small group of selected students who are intending to enter the learned professions,—it is the resort of all classes.

As the chairman of the Committee of Ten of the National Education Association, Eliot contributed to the organization of the American high school.

He retired at seventy years of age from the active presidency of Harvard, universally recognized as the Nestor of American education.

John Dewey (1859–1952). Dewey is first of all a teacher of philosophy. His contributions in the fields of logic and ethics have been of major importance in determining the trend of current thinking. His philosophical system is characterized by its devotion to the accomplishment of practical ends. Thus, in his theory of logic he points out that it is the solution of problems which in all cases stimulates human intellectual effort. In the field of ethics he has shown himself to be interested in practical social reforms of all types. Especially has he emphasized the influence of industrial and economic life on human conduct.

In the field of education he has been an untiring critic of formalism of every type. He began by objecting to the type of reading matter which is taken up in the schools, where very frequently words are substituted for fruitful ideas. Teachers, he points out, have been content to carry children through many series of exercises which have no meaning to the children themselves. Education ought to deal with the living interests of children and ought to use books only when children, of their own initiative, see the importance of going to this source of information.

In order to make concrete his educational doctrines, Dewey established a school which was entirely unconventional in its form of organization and in its practice. In this school the ordinary forms of discipline were abandoned, and the children were allowed freedom to ask questions as they occurred to them and to move about without restraint in seeking materials with which to answer these questions. For example, the children were given opportunity to cook their own meals, in order that they might come into contact with practical problems of social institutions. They were, for the same reasons, given training in the woodworking shop and in the garden.

Charles Hubbard Judd (1873–1946). Through energetic use of his outstanding abilities as teacher, orator, writer, and college administrator, Judd became one of the most influential leaders in American education. He was trained to be a psychologist, and during the early years of his professional career he taught psychology and completed many renowned researches in that subject. During his later years his interest shifted to education. He believed that the problems of education could be attacked scientifically, and he became the nation's greatest protagonist of the scientific movement in education. In his classroom instruction he insisted that his students buttress their opinions with objective data and that they meet the highest standards of scholarship in every other manner.

Most of his professional career was spent at the University of Chicago where he was professor and head of the department of education from 1909 until he retired in 1938. He served at least one term as president of several nationally prominent educational organizations. He was a remarkably effective platform orator and was more frequently than any other educator of his generation called upon to address professional and lay groups in all sections of the United States. He was the author of numerous books and of many other works on psychology and education.

RECENT EXPANSION IN AMERICAN EDUCATION

Since 1870, American education has expanded so rapidly that a special section may with propriety be devoted to the discussion of this period. Furthermore, it is possible to make very exact statements with regard to this development because, for the past 80 years, the United States Office of Education has kept careful statistical records of the various phases of educational activity in the country. Our knowledge of educational institutions prior to 1870 is based largely on the facts which are known with regard to certain typical educational institutions. Subsequently to this date a full body of statistics is available.

INCREASE IN AVERAGE SCHOOLING

One of the striking facts about education in the United States is the large numbers of the population who attend school. According to the 1960 census report of population, there were nearly 44 million persons 5 to 34 years old who were enrolled in regular public and private schools and colleges at the time of the census. About 3 million of these persons were enrolled in colleges and universities and more than 97 per cent of children ages 7 to 13 were enrolled in school. Ninety-four per cent of those 14 and 15 years old and 81 per cent of those 16 and 17 years old likewise were in school.

The significance of these figures may be pointed out in the following terms. As late as 1840 the American school taught the ordinary pupil practically nothing but "the three R's." The school term was very short, and attendance was very irregular. The result was that the ordinary man got his preparation for adult life chiefly through the domestic activities which he encountered as a child in the home and in which he participated to a greater or less extent. Since that date the average schooling demanded for intelligent participation in the commercial and industrial activities of ordinary life has been increasing more rapidly than in any other period in the world's history. The use of machinery in all phases of life and the rapid expansion of transportation are the important economic causes which have developed this situation. The school may be said to have contributed in some measure to this general change in the character of public life; in some degree it has merely followed the development of civilization and has endeavored to prepare young people for participation in commerce and industry.

Each U.S. census since 1940 has gathered statistics on the amount of schooling completed by the adult population of each state. The data found in census reports are extremely significant. They show the cumulative effect of mass education in recent years by the median of 10.6 years of school completed by the population 25 years of age or older in 1960 as compared with only 8.4 for this age group of the population in 1940.

Reading. Whatever is assigned as the cause of the development of the school, it is altogether clear from an examination of the facts that instruction has come to be in recent years a very much more important part of the individual's life than it was in

FALL SCHOOL ENROLLMENTS 1950, 1955, 1960

Age	1950		1955		1960	
	Number Enrolled	Per cent Enrolled	Number Enrolled	Per cent Enrolled	Number Enrolled	Per cent Enrolled*
Total 5–34	30,276,000	44.2	37,426,000	50.8	46,259,000	56.4
5 years	1,410,000	51.7	2,060,000	58.1	2,561,000	63.7
6 years	2,649,000	97.0	3,460,000	98.2	3,877,000	98.0
7 years to 9 years	7,803,000	98.9	10,175,000	99.2	11,281,000	99.6
10 to 13 years	8,852,000	98.6	10,853,000	99.2	14,340,000	99.5
14 to 17 years	6,953,000	83.3	7,970,000	86.9	10,242,000	90.3
18 to 19 years	1,190,000	29.4	1,232,000	31.5	1,817,000	38.4
20 to 24 years	959,000	9.0	1,010,000	11.1	1,350,000	13.1
25 to 29 years	358,000	3.0	475,000	4.2	514,000	4.9
30 to 34 years	100,000	0.9	192,000	1.6	278,000	2.4

Source: *Dept. of Commerce, Bureau of Census, Current Population Reports.* * Of total population.

PUBLIC SCHOOL ATTENDANCE, TEACHERS, EXPENDITURES*

School Year Ended in	Pop. 5 to 17 Yrs.	Pupils		Teachers			Total Expend.
		Enrolled	Av. Attend.	Male	Female	Total	
1900	21,404,322	15,503,110	10,632,772	126,588	296,474	423,062	$ 214,964,618
1905	23,410,800	16,468,300	11,481,531	110,532	349,737	460,269	291,616,660
1910	24,239,948	17,813,852	12,827,307	110,481	412,729	523,210	426,250,434
1915	26,425,100	19,693,007	14,964,886	118,449	485,852	604,301	605,460,785
1920	27,728,788	21,578,316	16,150,035	95,654	583,648	679,302	1,036,151,209
1925	29,705,264	24,650,291	19,838,384	131,164	646,781	777,945	1,946,096,912
1930	31,571,322	25,678,015	21,264,886	141,771	712,492	854,263	2,316,790,384
1940	29,805,259	25,433,542	22,042,151	194,725	680,752	875,477	2,344,048,927
1945	.....	23,225,784	19,671,398	127,102	699,271	826,373	2,638,665,908
1946	28,943,947	23,299,941	19,848,507	138,209	692,817	831,026	2,906,886,441
1947	29,317,000	23,659,158	20,448,656	153,297	680,215	833,512	3,419,993,597
1948	30,171,000	23,945,000	20,910,000	161,913	698,765	860,678	4,311,176,011
1949	.....	24,476,658	21,495,819	172,720	706,084	878,804	4,992,185,000
1950	30,730,000	25,111,427	22,283,845	194,968	718,703	913,671	5,837,643,000
1952	31,379,000	26,563,000	23,257,000	234,727	727,000	962,684	7,344,237,000
1954	34,540,000	28,836,052	25,644,000	253,578	778,620	1,032,138	9,092,449,000
1956	37,262,000	31,162,843	27,740,149	294,170	838,923	1,133,093	10,955,047,000
1958	40,164,000	33,538,591	29,722,275	331,826	906,023	1,237,849	13,569,163,000
1960	43,927,801	36,146,846	32,468,772	367,850*	999,950*	1,369,800*	15,643,519,000

Source: *Office of Education, U. S. Department of Health, Education, and Welfare.* * Estimated

the middle of the last century. A concrete illustration of this is to be found in the changes which have taken place in respect to the ability of the common man to read and write.

Since the invention and the development of printing, reading has become the greatest intellectualizing agency in the world, and, thanks to the schools, the people of the United States have become the most avid readers in the world. According to N. W. Ayer's *American Newspaper Annual and Directory*, more than 22,130 different newspapers and magazines were published in the United States in 1964. This number far exceeds that of any other country; in fact, it approximates one-third of the periodical publications of the whole world. There are few homes in the United States that do not subscribe for at least one newspaper and for at least one magazine.

Some of the more important reasons for the tremendous development in periodical publication and circulation in the United States are stated as follows by the author of a special census report on newspapers and magazines:

"This sketch of the rise and development of the American newspaper has now reached the period of time which marks the commencement of the third and present era in its history. It is not possible to assign the beginning of this era to any particular year or event, its coming being due to a variety of causes, which may be enumerated in the following order: First, the establishment of the penny press; second, the development of railroads as a means for the distribution of newspapers, the transmission of news reports, and the reduction of heavy postage rates; third, the discovery of telegraphy, and its immediate application to the purposes of journalism; and fourth, but not less important than other causes, the improvements of the printing press, which have rendered it possible to print large editions of newspapers in a short time."

Writing. Before commenting on the significance of these facts for education, it will be well to include in our discussion certain statistics which show that the more general use of reading has been accompanied by an equal demand for the mastery of the second of "the three R's," namely, writing.

A very definite knowledge of the extent to which writing has gained ground as a common art in the last three-quarters of a century can be obtained from an examination of the statistics of the post office. If we take all of the money paid for letter postage in 1843 and assume that it was spent for the cheapest letter that could be forwarded through the mails, it will be found that the average letter writing of each inhabitant of the United States during the full year amounted to less than four letters of one sheet each. This estimate is altogether extravagant, because the lowest letter postage of that date, namely, 6 cents, would carry only one sheet of paper within a radius of 30 miles. If letters went more than 30 miles, or were made up of more than one sheet, the cost was greater, reaching a maximum at 400 miles or more, when each sheet cost 25 cents. Letters sent at rates of postage higher than the minimum would reduce the average computed. It is fair to assume, therefore, that letter writing in 1843 was not a common practice.

Other facts of the same import are as follows: In 1840 the revenue of the post office for all classes of mail was 27 cents a year for each inhabitant of the United States. This amount had not doubled in 1870, when it was 49 cents. It rose to the point where in 1890 it was $0.97; in 1900, $1.34; in 1910, $2.43, and in 1946 more than $5. Not all of this was for letters, but the figures show that reading and writing are much more commonly used today than a generation ago. This conclusion is overwhelming when account is taken of the steady reduction of rates which until recently characterized the history of the post office.

Overcoming Illiteracy. Such statistics emphasize the fact that our modern life is utterly dependent on means of communication. This social fact is not merely an external material fact; it has to do with human habits and human education. It has to do with the common expectations of life. Not very far back in the history of this nation writing was not thought of as essential to the practical equipment of a man. Indeed, if we consider only the most highly authentic figures on this matter, we find that, in 1880, 17 per cent of our population could not write or read. Back of this date, the statistics are largely matters of speculation, but it is certain that the percentage increases rapidly. We find, for example, in a message of Governor Campbell to the legislature of Virginia in 1839, the statement that "almost one-quarter part of the men applying for marriage licenses were unable to write their names." If we go a little farther back, the fraction of illiterates undoubtedly puts in the majority those who did not command the art of writing.

The attitude of modern society is such that a percentage of illiteracy even as high as that of 1880 is wholly intolerable. Today no man willingly admits that he cannot read or write. The expectation of the nation is that all its members are to go to school long enough to be part of a common social whole which is held together by written and printed means of communication.

With regard to reading, modern expectations are even more far-reaching than are those with regard to writing. Public signs are used on every hand, on the assumption that all who make use of the streets will be able to follow written directions. The man who cannot read can hardly take care of himself in a crowded city.

Inadequacies of Early Schools. If one stops to translate these various expectations into definite terms regarding education, one begins to realize that the modern school has a task which the old-fashioned school with its simple expectations never faced. The school of 1840, with its brief period of contact with the pupils, with its untrained teachers, with its meager supply of books, and with its inadequate schoolrooms, was not in most cases a place where the type of fluent reading and writing demanded by modern society could be imparted.

Such statements about the schools of the last century can be abundantly verified by reference to contemporary literature. Thus, in 1838 Horace Mann, in his second report to the Massachusetts board of education, wrote:

"I have devoted especial pains to learn, with some degree of numerical accuracy, how far the reading, in our schools, is an exercise of the mind in thinking and feeling, and how far it is a barren action of the organs of speech upon the atmosphere. My information is derived, principally, from the written statements of the school committees of the respective towns,—gentlemen who are certainly exempt from all temptation to disparage the schools they superintend. The result is, that more than eleven-twelfths of all the children in the reading-classes, in our schools, do not understand the meaning of the words they read; that they do not master the sense of the reading-lessons; and that the ideas and feelings intended by the author to be conveyed to, and excited in, the reader's mind, still rest in the author's intention, never having yet reached the place of their destination."

The major part of the report from which the foregoing passage is taken is devoted to a discussion of the reasons for this deficiency in reading ability. Mann finds that one important reason for the failure of pupils of that day is to be found in the emphasis laid on formal spelling and mere pronunciation. A quotation from a later part of the report reveals the practices of that time and also one important reason why instruction in reading was ineffective. The quotation is as follows:

"Another device to fill vacuity by pouring in vacuity, is this:—a book is prepared, in which the spelling and reading lessons alternate. First come a few columns of words, and then a page of apothegms and synopses of universal truths, not occupying, perhaps, more than a line each; some one word in the spelling columns being incorporated into each of these short sentences. The force of the reasons against the preceding mode is but little abated when applied to this. This motley company of sentences repels all interest on the

part of the learner. Topics more alien from each other, and more bewildering to the mind, could not be found, if one were to stick a pin through all the leaves of a book, and then to read continuously all the sentences through which the puncture was made. As many-colored and diverse-shaped objects, flitting swiftly before the eye, will make no stable impression upon the retina; so a multitude of incongruous ideas and feelings, trooping hurriedly before the mental vision, can leave no enduring traces of outline, aspect or quality upon the mind. A rapid succession of discordant images will inflict distraction upon the mind of an adult;—how much more certain are they to do it upon that of a child! The power of passing abruptly from one subject of thought to another, without mental disturbance, requires long habit and familiarity with the matters presented. Children can have neither.

"Another reason is to be found in the inappropriate character of the reading exercises offered to children.

"And yet, in many of the reading-books now in use in the schools, the most pithy sayings of learned men; the aphorisms in which moralists have deposited a life of observation and experience; the maxims of philosophers, embodying the highest forms of intellectual truth, are set down as First Lessons for children;—as though, because a child was born after Bacon and Franklin, he could understand them of course. . . . Using incomprehensible reading-books draws after it the inevitable consequence of bad reading."

Shortly before Horace Mann wrote his second report on reading, an educational event of major importance had occurred in the Middle West. William Holmes McGuffey, a professor of ancient languages in the small college of Miami at Oxford, Ohio, had published the earliest volumes of the series of Readers that were to make his name a household word throughout the country for more than three quarters of a century. His First Reader and Second Reader appeared in 1836, and the Third and Fourth Readers in 1837. The Fifth and Sixth Readers, which are really anthologies of good literature, were published originally as "*The Rhetorical Guide,*" having been prepared by William's brother, Alexander McGuffey. They were added to the series to round out the McGuffey line and to include instruction in such subjects as Articulation, Inflection, and Accent and Emphasis. In their beginning William McGuffey's Readers were the outgrowth of experiments in a private school which he conducted at his home in Oxford. Because the selections studied represented not only high literary quality but also a wholesome ethical tone, the Readers exerted a cultural and social influence that is an important part of the American heritage.

Demand for Reading Ability. Other passages might be quoted from the second Mann report, but perhaps enough has been repeated to indicate the fact that in the middle of the last century the pupils who went out from the schools were not fluent, intelligent readers. The expectations of society with regard to the attainments of the individual were slight, and the use of the art of reading in after life was correspondingly meager.

It would, of course, be out of keeping with the facts to assert that defects of the kind described by Horace Mann made no serious difference in the lives of men and women in 1840. But such a statement is much more nearly true of that time than would be a statement that today we can look with complacency on the crudities of our treatment of reading in the schools. In 1840 the average citizen was called on very little to read. His political affiliations were fairly direct; he usually voted for representatives whom he knew. His correspondence was very light; and the contacts of his daily life were simple. It is not unqualifiedly true that it made no difference whether he could read or not, but it is true that he used the art very little in his ordinary routine.

In contrast with all these facts, are the expectations of modern society. Today one must read if he is to share in the life of his times. Correspondingly, there has been an enormous increase in the amount of attention given to the education of the common man.

GENERAL EXPANSION

From 1870 to 1920, the number of schoolhouses more than doubled. Since 1920, the number has constantly decreased, due primarily to the merging of one-room schools with other schools. While the number of one-room schools was decreasing, the number of school districts also was decreasing. In 1931 there were 127,422 school districts in the United States. By 1959 this number had been reduced to 40,605, a decline of 68.1 per cent. From 1870 to 1944, the number of days the schools were in session increased from 132.2 to 175.9. The average number of days attended by each pupil enrolled increased from 78.4 to 147.9. In 1960 more than 90 per cent of all children of school age were enrolled in schools.

During the years of economic depression in the 1930's, school attendance showed a decline owing to the falling birth rate. But the increase in the birth rate immediately before and after World War II shattered all previous enrollment records. For the past ten years, enrollments have increased at an average of about one million pupils per year. Enrollments have increased 40.5 per cent since 1948–49 and a continued increase is expected by the United States Bureau of the Census until 1980.

A recent bulletin of the U.S. Office of Education reports the following: "The United States has gone a long way toward providing universal elementary and secondary education for its citizens. While regulations differ somewhat from one jurisdiction to another, it may be said in general that free public education is available to all and that school attendance is compulsory between the ages of 7 and 16. Approximately two-thirds of our 5-year olds are now enrolled in school; from the ages 6 to 13, 99 per cent of our children are attending school; in the 14 to 17 age group, 91 per cent are enrolled in educational institutions. Approximately two-thirds of the young people graduate from high school today, and one-third of the young adults may be expected to enter college."

The result of this increase has been a teacher shortage and a school building shortage. In a chang-

TOTAL NUMBER OF COLLEGE GRADUATES AND NUMBER PREPARED TO TEACH, 1951-62.

Totals	1951	1953	1955	1957	1959	1961
Receiving Bachelors Degree	384,352	304,857	287,401	340,347	385,151	410,000
Prepared to teach in High School	73,015	54,013	49,697	65,062	71,585	77,322
Prepared to teach in elementary school	33,782	37,430	37,712	44,029	47,836	51,866
Grand total prepared to teach	106,797	91,443	87,409	109,091	119,421	129,188
Per cent of graduates prepared to teach	27.8	30.0	30.4	32.1	31.0	31.6

Source: *N.E.A. Research Report, 1962-R8. April, 1962.*

NUMBER OF SCHOOLS OF SPECIFIED TYPES BY STATES—1960

Region and state	Public schools (excluding kindergartens)		Nonpublic schools (excluding kindergartens)		Institutions of higher education		Schools of Nursing
	Elementary	Secondary	Elementary	Secondary	Public	Private	
United States	91,853	25,784	13,574	4,061	701	1,307	889
North Atlantic	15,127	4,474	4,478	1,494	130	439	350
Connecticut	781	214	207	90	6	24	17
Delaware	146	55	39	18	2	2	6
Maine	1,006	178	77	60	7	13	5
Maryland	810	258	359	95	17	22	17
Massachusetts	1,691	679	510	230	17	70	51
New Hampshire	397	92	81	48	5	6	11
New Jersey	1,646	329	490	140	9	29	35
New York	3,654	1,471	1,300	430	42	122	94
Pennsylvania	4,179	1,006	1,224	299	16	108	102
Rhode Island	284	66	100	30	2	8	5
Vermont	402	85	35	25	4	11	3
District of Columbia	131	41	56	29	3	24	4
Great Lakes & Plains	37,546	8,017	5,322	1,191	189	394	287
Illinois	3,528	931	1,054	176	20	85	65
Indiana	1,896	749	360	60	6	36	17
Iowa	3,806	762	353	110	19	31	24
Kansas	2,648	680	219	47	21	24	20
Michigan	4,035	893	699	240	34	35	23
Minnesota	3,369	612	484	97	15	28	17
Missouri	2,500	640	450	100	14	45	22
Nebraska	3,500	453	246	66	10	13	10
North Dakota	1,411	352	72	22	11	1	9
Ohio	3,024	1,113	639	153	9	58	53
South Dakota	3,583	266	86	20	7	9	7
Wisconsin	4,192	566	660	100	33	29	20
Southeast	21,473	7,386	1,476	670	148	285	160
Alabama	2,173	1,292	125	40	9	19	10
Arkansas	1,115	590	79	16	8	11	6
Florida	1,327	533	280	109	19	16	9
Georgia	1,682	598	53	30	21	28	12
Kentucky	2,743	434	268	89	8	31	13
Louisiana	1,207	659	219	114	10	12	6
Mississippi	1,338	606	63	46	25	18	7
N. Carolina	2,019	900	90	45	16	44	30
S. Carolina	1,003	416	50	31	6	25	12
Tennessee	2,507	525	100	50	7	39	12
Virginia	1,888	461	90	75	8	33	28
W. Virginia	2,471	372	59	25	11	9	15
West & Southwest	17,707	5,907	2,298	706	225	189	92
Arizona	519	92	165	40	5	2	3
California	4,647	876	900	280	77	75	25
Colorado	885	385	125	40	13	8	5
Idaho	420	215	42	7	5	3	1
Montana	1,513	193	66	19	8	3	3
Nevada	171	45	17	2	1	. . .	. . .
New Mexico	506	173	79	23	7	2	1
Oklahoma	1,866	930	75	25	23	11	8
Oregon	1,071	275	123	34	9	18	4
Texas	3,780	1,888	415	120	51	48	27
Utah	401	153	20	9	4	4	3
Washington	1,166	455	150	49	15	12	10
Wyoming	460	123	16	2	5	. . .	. . .
Alaska	136	45	23	9	1	. . .	. . .
Hawaii	166	59	82	47	1	3	2

ENROLLMENT IN GRADES 9–12 COMPARED WITH POPULATION 14–17 YEARS OF AGE 1889–90 TO 1961–62

School year	Enrollment, grades 9–12	Population 14–17 years of age	Total number enrolled per 100 persons 14–17 years of age
1889–90	359,949	5,354,653	6.7
1899–1900	699,403	6,152,231	11.4
1909–10	1,115,398	7,220,298	15.4
1919–20	2,500,176	7,735,841	32.3
1929–30	4,804,255	9,341,221	51.4
1939–40	7,123,009	9,720,419	73.3
1941–42	6,933,265	9,749,000	71.1
1943–44	6,030,617	9,449,000	63.8
1945–46	6,237,133	9,056,000	68.9
1947–48	6,305,168	8,841,000	71.3
1949–50	6,453,009	8,404,768	76.8
1951–52	6,596,351	8,516,000	77.5
1953–54	7,108,973	8,861,000	80.2
1955–56	7,774,975	9,207,000	84.4
1957–58	8,869,186	10,139,000	87.5
1959–60	9,599,810	11,154,879	86.1
1961–62	10,800,000	12,004,000	90.0

ing picture the trend has been constantly toward greater disparity between the number of pupils on the one hand and facilities and teaching personnel on the other. For any typical period, studies by the U. S. Office of Education have shown that even apparent gains in some directions have been offset by losses in others when all the principal factors are considered. For example, when the number of graduates from teacher training institutions rose from 25,000 in 1948 to 35,000 in 1950, this seemed to be an encouraging development. Closer investigation revealed that the increase was no more than enough to fill the normal number of vacancies caused by death, retirement, marriage, and change of occupation. Later statistics show a more favorable picture. The graduating class of 1964 produced approximately 173,846 graduates eligible to teach. This is an increase of 44,658 over 1961.

School Plant Needs. The school building shortage is due, not only to the great increase in enrollments, but also to the postponement of new construction during the war years, when the lack of building material and manpower made it difficult to build or even to maintain school buildings properly. During most of the 1930 decade, school plant maintenance and building upkeep were neglected because of lack of funds. Consequently, from about 1931 through 1945, there was not much new construction, maintenance was neglected, and depreciation continued at an increasing rate. Some buildings became so dilapidated and obsolete that remodeling was impracticable. Then, before the postwar programs got under way, the schools were overwhelmed with increased enrollments, and the Korean War resulted in shortages of building

PER CENT OF POPULATION 5–17 YEARS OF AGE ENROLLED IN SCHOOL, 1910–1963

Year	Age 5–13 Years	Age 14–17 Years
1910	73.7	58.9
1930	83.5	73.1
1950	85.8	83.7
1963	95.4	92.9

KINDERGARTEN, SCHOOL, AND COLLEGE ENROLLMENT 5 TO 34 YEARS OF AGE: 1960 (in Thousands)

Type	Number Enrolled				Per Cent Enrolled			
	Kindergarten	Elementary School	High School	College or Professional School	Kindergarten	Elementary	High School	College or Professional School
Total	2,092	30,349	10,249	3,570	100.0	100.0	100.0	100.0
Public	1,691	25,814	9,215	2,307	80.8	85.1	80.9	64.6
Private	401	4,536	1,033	1,262	19.2	14.9	10.1	35.4

Source: *Department of Commerce, Bureau of the Census.*

material. School facilities are still far behind the rising demand.

The percentage of school revenue provided by the state has gradually increased, while the percentage provided by the local school districts has gradually decreased. In 1952, the percentage provided by the state was about 43, while the local districts furnished about 55 per cent.

An examination of the expenditure for education shows for a few years following 1930 the effects of the economic depression which began in 1929 and continued until about 1934. By 1940, recovery was complete as measured by total expenditures. Since 1940, expenditures have increased at a very rapid rate, reaching a total of almost $2.5 billion in 1944. The total expenditures for public elementary and secondary schools in the school year of 1961–62 was more than $18.1 billion. Because of increased interest in education, the demands being made on schools to meet requirements of an atomic age, and the tendency to give more education to more people, educational expenditures will continue to rise for several years to come.

Growth of High Schools. Excepting the remarkable growth in college enrollment following the close of World War II, the most rapid growth among American educational institutions is that of the public high school. Of persons who entered high school in 1870, the girls were, for the most part, preparing to become teachers, and the boys were expecting to enter one of the professions. Only the larger communities supported high schools in those days, and only about one per cent of the children of high school age attended this school.

Following 1890 both small and large communities began to establish high schools, and high school enrollment increased rapidly. Enrollment approximately doubled each decade from 1910 to 1930; the increase from 1930 to 1941 was slower and after 1941 enrollment decreased for several years. Since 1947 there has been a steady increase in enrollment, which rose to 11,847,783 in the Fall of 1960. The United States Office of Education predicts that high school enrollment will reach 12,300,000 by 1965.

According to the United States Office of Education, 1,627,060 were graduated from public high schools in 1960. That office also reports that in 1880 fewer than 3 out of every 100 persons of high school age were in public high schools, with approximately 1 of these 3 graduating. At present about 90 per cent of youth of high school age attend high school.

Whereas in 1870 the average man found it possible to enter upon his life work with a little knowledge of reading and writing, the modern boy finds that it is quite impossible for him to secure any advantageous position in the commercial or industrial world without a knowledge which extends very far beyond the rudimentary subjects taught in the elementary schools. If he is going to enter industry, he must know something of the source of the raw materials with which his industry deals; he must understand something of the scientific principles on which his industry depends. As a result of this and other forces boys and girls are remaining in school longer. Increasing numbers are using the high school as preparatory to college.

Increasing Complexity of Civic Relations. Citizenship has also come to be a more complex matter than it was in former days. Formerly, where communities were small and every one knew personally the man who was sent to the legislature, voting was a matter of choice among acquaintances. As communities expanded, however, the problem of government became more complex, and the selection of the individual who should serve as a representative in the legislative assembly became infinitely more complicated, because of the lack of direct contact between voter and legislator. As a result, public intelligence with regard to governmental policies must today be cultivated through a broader knowledge of history and civics.

To be sure, American schools have not always developed these broader forms of knowledge as fully as they might, but we have come to the belief that they must if our citizenship is to be intelligent. At the same time the conviction has certainly gained general acceptance that it is quite impossible for a modern state to be conducted on the basis of an elementary school training. As a result, pupils in ever increasing numbers have left the elementary school with the expectation of going on to higher institutions. Especially has it been true that after every great economic and social disturbance attendance in the high schools has increased. It may be said, almost literally, that the high school sprang into existence after the Civil War. Later panics and depressions in the economic world have driven people to seek a broader education Finally, World War I made the importance of intellectual and technical training so obvious that, since 1918, the higher institutions of the country have been flooded with students seeking better training than that which could be afforded by the elementary school.

THE NUMBER AND PER CENT OF PUPILS TRANSPORTED TO SCHOOLS 1929–30 TO 1959–60

School Year	Number of Pupils Transported	Per Cent of Pupils Enrolled	Expenditure for Transportation
1929–30	1,902,826	7.4	$ 54,823,000
1931–32	2,419,173	9.2	58,078,000
1933–34	2,794,724	10.6	53,908,000
1935–36	3,250,658	12.3	62,653,000
1937–38	3,769,242	14.5	75,637,000
1939–40	4,144,161	16.3	83,283,000
1941–42	4,503,081	18.3	92,922,000
1943–44	4,512,412	19.4	107,754,000
1945–46	5,056,966	21.7	129,756,000
1947–48	5,854,041	24.4	176,265,000
1949–50	6,947,384	27.7	214,504,000
1951–52	7,697,130	29.0	268,827,000
1953–54	8,411,719	32.8	307,437,000
1955–56	9,695,819	35.0	353,972,000
1957–58	10,861,689	36.5	416,491,000
1959–60	12,225,142	37.6	486,338,000

Source: *United States Department of Health, Education and Welfare, Office of Education.*

ENROLLMENT IN VOCATIONAL CLASSES, 1938–1963

Year	Total	Agriculture	Home Economics	Trades & Industry
1938	1,810,082	460,876	627,394	685,804
1940	2,290,741	584,133	818,766	758,409
1942	2,624,786	605,099	954,041	850,597
1944	2,001,153	469,959	806,605	543,080
1946	2,227,663	510,331	911,816	630,844
1948	2,836,121	640,791	1,139,766	762,628
1950	3,364,613	764,975	1,430,366	804,602
1952	3,165,988	746,402	1,391,389	793,213
1954	3,164,851	737,502	1,380,147	826,583
1956	3,413,159	785,599	1,486,816	883,719
1958	3,629,339	775,892	1,559,822	983,644
1960	3,768,149	796,237	1,588,109	938,490
1962	4,072,677	822,664	1,725,660	1,005,383
1963	4,286,000	847,000	1,803,000	1,056,000

Source: *Office of Education, U.S. Department of Health, Education, and Welfare.*

DEGREES CONFERRED BY INSTITUTIONS OF HIGHER EDUCATION 1947–48 TO 1961–62

Year	Degrees Conferred				Percent of all Degrees		
	All degrees	Bachelor's or first professional	Master's except first professional	Doctor's	Bachelor's or first professional	Master's except first Professional	Doctor's
1947–48	318,749	272,311	42,449	3,989	85.4	13.3	1.3
1948–49	422,511	366,698	50,763	5,050	86.8	12.0	1.2
1949–50	498,373	433,734	58,219	6,420	87.0	11.7	1.3
1950–51	456,822	384,352	65,132	7,338	84.1	14.3	1.6
1951–52	403,194	331,924	63,587	7,683	82.3	15.8	1.9
1952–53	374,189	304,857	61,023	8,309	81.5	16.3	2.2
1953–54	358,699	292,880	56,823	8,996	81.7	15.8	2.5
1954–55	354,445	287,401	58,204	8,840	81.1	16.4	2.5
1955–56	379,495	311,298	59,294	8,903	82.0	15.6	2.3
1956–57	411,058	340,347	61,955	8,756	82.8	15.1	2.1
1957–58	440,304	365,748	65,614	8,942	83.1	14.9	2.0
1958–59	464,095	385,151	69,584	9,360	83.0	15.0	2.0
1959–60	479,215	394,889	74,497	9,829	82.4	15.5	2.1
1960–61	490,628	401,784	78,269	10,575	81.9	16.0	2.1
1961–62	516,996	420,485	84,889	11,622	81.3	16.4	2.2

Source: *Office of Education, U.S. Department of Health, Education, and Welfare.*

Expansion of the Colleges. What has been said with regard to the expansion of the secondary schools can be repeated with regard to the expansion of the college. Mounting enrollments have been most noticeable in the country's largest universities, fourteen of which reported 16,000 or more students in 1957, but proportionately, increased attendance has also been the rule in the so-called "small colleges," which have not been permitted to remain small. As numbers have increased, creating housing problems as well as crowded classrooms, some large institutions have opened branch units similar to those long used by the University of California.

Higher Education and Democracy. The final conclusion to be drawn is that the school system of the United States has been seeking to attain the general democratic ideal of a higher education for everyone who is willing to spend the time and effort in securing such an education. The distinction which has been maintained historically in Europe between the upper classes of society and the common people is being entirely eliminated in this country through an expansion of the upper schools. It required a long period of development in American national life to bring even the common schools to the level where the average man could be trained in subjects other than the rudiments of "the three R's." Once the common school reached its development, however, the demand for a higher education has grown with phenomenal rapidity. Of the persons 25 years of age or older who reported on their educational attainments under the 1940 census, 4.6 per cent had four years of college or more. In the 1960 census 7.7 per cent of the population in this age bracket had 4 or more years of college. It appears that the percentage of college graduates of America will continue to increase because in 1961 3,891,000 persons were enrolled in colleges. This is approximately one and one-half million more than in 1950.

REORGANIZATION OF EDUCATION

There are certain natural consequences which issue from these expanding ideals of a democratic school system. In the first place, there is a growing impatience with any delay in the introduction of useful subjects, such as natural science and civics. Formerly, the elementary schools did not attempt to teach the common people very much science or very much about the principles of government. These subjects were first introduced in the higher institutions of the American educational system. It was assumed that only people of the higher degrees of intellectual maturity could understand them.

Now that even the common people are sharing in a higher education, however, there is a disposition to introduce science and civics and all of the other subjects at the earliest possible moment. The result is that a reorganization of the curriculum of the lower schools is being carried forward very rapidly.

The Elective System. The administration of this broader course of study requires some flexibility in the arrangement of the program of individual pupils. Not all pupils will want the same type of training. Some of them are preparing to enter professions, while others are attending the higher schools with the expectation of entering upon industrial or commercial careers. The enriched course of study includes material appropriate to all of these different expectations, but no single individual can take advantage of all the different opportunities offered. The common practice in all higher institutions is, therefore, to allow the student to select those types of training most directly related to his individual needs. This is perhaps the most radical change which has taken place in the relations of the student and the school administration.

HISTORICAL SUMMARY OF PUBLIC ELEMENTARY AND SECONDARY SCHOOL STATISTICS: UNITED STATES, 1899-1900 TO 1961-62

	1899–1900	1909–10	1919–20	1929–30	1939–40	1949–50	1959–60	1961–62
POPULATION, PUPILS, AND INSTRUCTION STAFF								
Total Population (thousands)	75,995	90,492	104,512	121,770	130,880	148,665	179,323	183,043
Per cent of total population ages 5–17	28.4	26.5	26.4	25.8	23.0	20.3	24.5	24.7
Total enrollment in elementary and secondary schools (thousands)	15,503	17,814	21,578	25,678	25,434	25,111	36,087	38,253
Nursery, Kindergarten, and grades 1–8 (thousands)	14,984	16,899	19,378	21,279	18,833	19,387	27,602	28,686
Grades 9–12 and postgraduates (thousands)	519	915	2,200	4,399	6,601	5,725	8,485	9,566
Per cent of total population enrolled	20.4	19.7	20.6	21.1	19.4	16.9	20.1	20.9
Per cent of population 5–17 years enrolled	71.9	74.2	78.3	81.7	84.4	83.2	82.2	84.5
Per cent of total enrollment in High Schools (grades 9–12 and postgraduates)	3.3	5.1	10.2	17.1	26.0	22.7	23.5	25.0
High School graduates (thousands)	62	111	231	592	1,143	1,063	1,627	1,678
Average daily attendance (thousands)	10,633	12,827	16,150	21,265	22,042	22,284	32,477	34,682
Per cent of enrolled pupils attending daily	68.6	72.1	74.8	82.8	86.7	88.7	90.0	90.7
Average length of school term (in days)	144.3	157.5	161.9	172.7	175.0	177.9	178.0	179.1
Average number of days attended by each pupil enrolled	99.0	113.0	121.2	143.0	151.7	157.9	160.2	162.3
Total Instructional Staff (thousands)	.....	.....	678	880	912	962	1,464	1,588

FALL ENROLLMENT IN HIGHER EDUCATIONAL INSTITUTIONS: 1962

Type of Institution	Fall Enrollment		
	1962	1957	1956
All institutions	4,206,672	3,068,417	2,946,985
Men	2,603,072	2,003,424	1,927,863
Women	1,603,600	1,064,993	1,019,122
Universities	1,724,905	1,373,089	1,345,998
Men	1,166,702	983,561	692,607
Women	558,203	389,528	383,391
Liberal Arts College	1,190,975	826,731	776,559
Men	644,409	462,929	434,203
Women	546,566	363,802	342,356
Teachers Colleges	445,308	294,688	278,025
Men	214,905	141,200	132,845
Women	230,403	153,488	145,180
Technological Schools	125,398	97,830	94,590
Men	114,466	92,057	89,212
Women	10,932	5,773	5,378
Theological Schools	44,713	35,554	35,190
Men	34,804	29,284	28,821
Women	9,909	6,870	6,369
Other	83,045	70,562	68,340
Men	60,650	56,288	54,022
Women	22,395	14,274	14,318
Junior Colleges	592,328	369,963	348,283
Men	367,136	238,105	226,153
Women	225,192	131,858	122,130

Source: *Office of Education, U.S. Department of Health, Education, and Welfare.*

The Lengthening Period of School. Related to the reorganization of education and partially resulting from it has been an increased length to the period of school for greater numbers of children. Indeed, the goal for America now seems to be that all children will not only have an elementary school and high school education but also will go to college or an institute of higher education for at least a year. Evidences pointing in this direction can be found in the accompanying tables. These tables show that increasing numbers of children are attending schools and colleges and staying longer in an educational setting. In 1963 there were enrolled in schools 95.4 per cent of children aged 5 to 13 years and 92.9 per cent of children 14 to 17 years. This is in sharp contrast to the year 1910 when 73.7 per cent of children aged 5 to 13 years and only 58.9 per cent of children 14 to 17 were enrolled in schools.

In addition to keeping children in school until they are older, the school term has been lengthened from an average 144.3 days in 1900 to 179.1 days in 1962. At the present time schools are reorganizing so as to have even longer terms. Summer schools are being instituted and students, especially at the secondary school level, are encouraged to take certain subjects in summer and others during the regular academic year. Thus are being organized year-round schools. Also, within the framework of the period of schooling, devices are being created to make the learning program as flexible as possible. Students in elementary schools may enroll for high school subjects if they are capable of learning them. Also, high school students can enroll in special college classes, either in summer or during the academic year. This flexibility has served to encourage students to continue their studies.

At each of the normal ends of the period of schooling—the first grade and college graduation—there are programs which encourage children and students to be in school. Nursery school and kindergarten programs are becoming more important and enrolling greater numbers of children. Also, graduate schools of universities are appealing to larger numbers of scholars, and students who previously would have left school after college graduation now continue into professional programs of graduate school.

THE SCIENCE OF EDUCATION

THE beginnings of the scientific study of education are to be traced to the German philosopher and educator, Herbart (1776–1841), who did his work between 1800 and 1841. He pointed out the fact that educational operations must be guided by scientific principles derived from the study of human nature, or psychology, and from the study of that science which deals with the rules of proper conduct, namely, ethics.

EXPERIMENTAL PSYCHOLOGY

The movement which Herbart inaugurated was effective in Germany in stimulating a number of lines of scientific inquiry. In the first place, it gave rise to a more careful study, in laboratories designed for that purpose, of the mental processes of adults and children. The development of the science of psychology during the last century is in a very large measure to be traced directly to the influence of Herbart. The movement was accelerated and augmented by the contributions of the physiologists and of those who were interested in measuring the processes of sensation.

The Child Study Movement. In 1881 G. Stanley Hall, who had just returned to Johns Hopkins university from a period of training in the psychological laboratory in Leipzig, Germany, began to collect and publish material on child psychology. He attracted a great deal of attention among teachers and school administrators for the views which he developed in regard to the reorganization of schools.

The "child study movement," as it was called, was carried forward vigorously by Hall and his students for a period of twenty years, and was one of the important sources of the present scientific study of education.

This movement suffered, however, because its methods of investigation were somewhat unsystematic and likely to lead to erroneous conclusions. The chief method of this school was that which has been called the "questionnaire" method. Various series of questions in regard to different aspects of children's mental lives were formulated. These were sent to parents and teachers in different parts of the country, and their answers were tabulated. Conclusions were drawn from these answers without very serious regard to the validity of the answers themselves. The results of the use of this method were numerous collections of interesting material about the development of children; but it was found that educational practice could not rely upon the relatively loose information thus collected.

Culture Epochs Theory. Herbart's influence was effective along lines other than those briefly traced in the foregoing statements about psychology. Numerous practice schools were set up in Germany, and theories in regard to education were tried out in these schools. One important theory of this sort was known as the "culture epochs theory." It was held that the line of development followed by children parallels closely the line of development which has been followed by the race. Thus, the race began with no ability to write and gradually evolved this ability. The race began with very crude graphic art and gradually refined this art through the cultivation of taste in color and through studies of form and perspective. Children's drawings show the same crudities as do those of primitive peoples, and the same stages of gradual development appear as children refine their taste for color and their knowledge of form. Such analogies as these encouraged the followers of Herbart to reach the general conclusion that they could lay out a course of study appropriate for the schools, provided they could find by a careful study of the history of the race the different stages or epochs through which civilization has passed. A vigorous effort was accordingly made in Germany and in this country to prepare natural courses of study on this pattern. The result was an interest in such matters as the habits and abilities of children and primitive peoples, and much new and stimulating study was undertaken both of human nature and of materials to be used in instruction.

The culture epochs theory, like the child study movement, spent itself because of its crude generalizations; but, before it was abandoned, it had stimulated so much skepticism about the older traditional methods of teaching and had aroused so much interest in the possibilities of a new course of study that later generations of teachers and supervisors have profited greatly by its impulse.

Studies of Teaching Methods. Furthermore, the experimental schools which were set up by the followers of Herbart gave a great deal of attention to methods of teaching and developed new formulas to guide teachers in their work. The Herbartian movement came to the United States in very vigorous form during the '80's and led to the organization of a society of educators who called themselves the Herbart Society. The members of this group produced numerous books on methods of teaching and aroused the teachers of the country to the realization of the possibilities of improving their work.

Encouragement of Scientific Studies. In addition to the suggestions looking toward a science of education which can be traced directly to Herbart, there were natural forces at work in American civilization tending in the same direction. In the first place, as has been pointed out in an earlier section, great expansion was going forward in the American school. The secondary school was developing rapidly, and teaching was becoming a more and more highly specialized type of activity. By the early '90's, therefore, everything was ready for the launching of a movement which gradually gained impetus during the decades between 1890 and 1910, and which has gone forward rapidly since that time.

The Tests of J. M. Rice. In the early '90's an editor, Mr. J. M. Rice, began to collect for the magazine called *The Forum* a series of descriptive accounts of the great school systems of the country. He found such wide differences in the methods of work and in the achievements of the school systems which he visited that he ultimately decided to undertake a measurement of results secured in some of the subjects of instruction. He went to the leading cities of the United States and asked for permission to test the pupils in spelling and arithmetic. This he did during the years 1894 and 1895. The results were very astonishing. He found in his tests in spelling that, while there were the greatest differences in the amounts of time devoted to this subject in the school systems of different cities, the results seemed to show uniformly that children of a certain age can spell correctly about the same percentage of words. That is, it makes no difference how much time is given to instruction in spelling, children of the sixth grade will always show about the same degree of efficiency. Mr. Rice concluded that spelling develops as the child matures, almost independently of the work in the school.

His tests in arithmetic were no less astonishing in their results. They showed that children are by no means so well trained in this subject as their teachers had been in the habit of assuming. Furthermore, he found that the personality of the teacher is much more significant than any other factor in determining the success of instruction.

School people thought that the methods of testing were inadequate. But the facts were so impressive that, from that time on, numerous other investigators were led to devise tests and to examine in detail the results of instruction, not only in arithmetic, but in other subjects as well. Mr. Rice's investigation constituted, therefore, in a very definite sense, the starting point in the measurement movement, which in recent years has included all the subjects of the curriculum of the elementary school, and is now rapidly spreading into the high school and even into the field of college education.

Superintendent Maxwell's Reports. Superintendent Maxwell of New York City was another of the pioneers in the scientific movement in education. In the early years of this century, he called attention to the fact that numerous assumptions with regard to the progress of children through the grades of the elementary school were entirely without support in fact. His most striking pronouncement in regard to this matter was a statement that in New York schools a very considerable percentage of the pupils, instead of being in the grade in which they should be, according to their ages, were very far behind. To be exact, he said that 39 per cent of the children in the schools of New York City were below the grade in which they might normally be expected to be found.

The statements made by Superintendent Maxwell, with the tests which had been made by Rice and others who immediately followed him, proved to school people and to students of psychology and related subjects that there must be a very much more definite knowledge with regard to the actual success or failure of schools than that which could be gathered from the assumptions of teachers about the effectiveness of their work. Studies began to be made with regard to all of these matters, and the modern scientific movement was launched.

Biological and Anthropological Measurements. The scientific movement in education was influenced very early in its course by a parallel type of scientific development which was going on in biology and anthropology. Students of biology and of anthropology, who in the early stages of their sciences had depended on mere observation of the facts of life, began, about two decades ago, to realize that they must be much more exact in their information regarding plants and animals and human beings, if their sciences were to develop. They therefore began to measure and to make comparisons which were based on these exact measurements. They soon reached certain generalizations which have proved to be of very great importance in the study of education, as well as in the study of phenomena of other types. An example will serve to illustrate the type of measurement to which reference is here made.

The Normal Distribution of a Group. If, in a given large group of people, measurements of the heights of the individuals are made, it will be found that there are in the group a few very tall and a few very short persons. Between these two extremes, there is a distribution of the people, such that a gradual increase in the number of each class appears as one passes from the extremes, made up of very tall and very short people, toward the middle group, which is made up of those who are of average height. That is, while there are a few exceptionally tall people, there are a somewhat larger number who are very tall; there are a still larger number who are tall enough to attract attention but are neither exceptionally tall nor very tall. When we come to the average group, we find that it includes the largest number of individuals. Facts of this sort appear in any field in which a biological characteristic is measured.

Mental characteristics, like physical characteristics, seem to follow the same law of distribution. There are a few geniuses in the world and a few idiots: between these two extremes, the average members of society group themselves around the average ability.

This general discovery that individuals of a group distribute themselves around a center, or average, according to a definite law, has served to guide in a very important way the measurements which have been made in education. In measuring the ability of children to read or spell, it is found that members of any large group exhibit a tendency to collect around the average ability.

Stimulated by the early studies of the workers in the sciences and by the criticisms of schools made by Maxwell and other school people, students of education began to gather all of the available facts about school situations. They began to collect and compile school statistics on various matters. It may be well to follow their work in some detail.

Studies of Retardation. The term "retardation" was devised, by those who measured the progress of children through the schools, to indicate the fact that certain children fail of promotion in their school work, and hence fall behind the grades in which they ought to be if they had progressed steadily and successfully each year of their school lives. Thus, a child who is six years of age and just entering school may be accepted as a normal individual. If he fails to complete the work in the first grade satisfactorily, he becomes what is known as a "repeater," and he will be, not seven years of age, but eight, when he enters the second grade.

Acceleration. Acceleration is the opposite of retardation. If a child who is ten years of age and is in the fourth grade is allowed to pass directly into the sixth grade, thus gaining a year over children of like age, he is said to be accelerated. Theoretically, if the course of study administered in the elementary school were of average difficulty, bright children ought to be able to complete it in less time than dull children, and there ought to be as many accelerants as there are retards. The school, however, is not so organized as to push forward those who can do the work rapidly, and in most systems retardations accumulate without any balancing accelerations.

Grouping. For many years the schools were concerned more with acceleration of pupils than with the retarded child. Recently, however, efforts have been made to group children so that they will progress most effectively through the school program and retardation will be minimized. As a result several types of grouping have been effected. In one type the children are grouped according to their intellectual ability as demonstrated on intelligence tests. Schools often have what are termed "track" programs and students proceed through the school program on a "track" along with other children of the same intellectual capacity. Generally the tracks are of three levels: one for the children with the highest I.Q.; another for the average child; and a third for the child with the below-average I.Q. The classroom activities are designed for the level of ability of the students. The achievement of the students, therefore, varies at the end of the program according to the track in which they have been placed. Studies made recently have shown the desirability of using several kinds of evidence to determine the grouping of students. Still further studies question the desirability of separating students into groups based on ability.

One of the outcomes of the "track" system o grouping has been the advanced placement program Children selected early in the elementary school program are allowed to progress as rapidly as they desire through the elementary and secondary school programs. Many students take college level work in secondary schools and on entering college are enabled to enroll in advanced college classes. Some educators are now advocating the teaching of subjects in the elementary schools which have been considered high school or even college level subjects.

ACTUAL AND ESTIMATED ENROLLMENTS IN PUBLIC SCHOOLS ACCORDING TO GRADE GROUPS*

School Year ended	Total	Kindergarten and grades 1-8	Grades 9–12 and post-graduates
	000 omitted	000 omitted	000 omitted
1930	25,678	21,279	4,399
1940	25,434	18,833	6,601
1950	25,111	19,388	5,725
1952	26,563	20,681	5,882
1954	28,836	22,546	6,290
1955	29,998	23,579	6,419
1956	31,143	24,503	6,640
1957	32,159	25,283	6,876
1958	33,436	26,037	7,399
1959	34,717	26,927	7,790
1960	35,961	27,876	8,805
1961	37,152	28,876	8,276
1962	37,718	28,741	8,977
1963	38,461	28,864	9,597
1964	39,233	29,005	10,228
1965	40,023	29,206	10,817

Source: Office of Education, U.S. Department of Health, Education and Welfare. *These enrollment figures are for the continental United States only. Projections as of February, 1957.

Elimination. When a child leaves school he is said to be eliminated, especially if he leaves before completing the eighth grade. Elimination is heaviest among retarded pupils. These retarded pupils often reach the legal limit of compulsory education while in the lower grades. Thus a child who has lost two or three years through non-promotion may be found in the fifth or sixth grade at the time when he is fourteen years of age. Under the laws of many of the states, he is now allowed to leave school and enter upon some industrial task. A very large proportion of the children who are retarded and allowed under the law to leave school at fourteen years of age do so.

The present average age of completion of the eighth grade is 14.7 years. This average would be much higher if all who are eliminated remained in school.

Some of the most productive scientific studies carried on in the field of education in the early part of this century were studies of retardation and elimination. Great practical interest is attached to these studies E. L. Thorndike and L. P. Ayres were leaders in this movement. Ayres prepared in 1909 a book entitled *Laggards in Our Public Schools*, as a summary of the studies which had been made up to that time. The influence of this book has been very large indeed. Most school systems now publish in their annual reports tables known as "age-grade tables," setting forth the number of children of different ages in each of the grades. Such a table calls attention to the retardation in the schools and stimulates teachers and administrators to try to improve the situation. So great has been the influence of such tables and studies of this matter, that the number of children who now complete the eighth grade is double that which it was before these scientific studies began.

DEVELOPMENT OF STANDARDS

A second type of scientific study in education is that which issued in the creation of scales and standards of school work. One of the earliest standards prepared was that which was worked out by E. L. Thorndike in 1909 in the form of a handwriting scale. Thorndike collected a large number of specimens of children's handwriting. These he submitted to competent judges, asking them to arrange the specimens in order of excellence. By a mathematical calculation of the judgments which he thus secured, Thorndike arranged the specimens in a series of equal steps from the poorest handwriting to the best. He then reproduced the selected specimens, which were separated from each other by equal steps of excellence, and published them as samples with which teachers could compare the work of their pupils. Any specimen of handwriting which was to be rated by the teacher could be held near the scale which had been prepared by Thorndike, and its relative position in the scale could be readily determined. The scale was marked with certain figures which made it possible to describe any given specimen in numerical terms.

The Handwriting Scale in Use. The importance of the handwriting scale consists in the fact that teachers no longer need to make the assumption that children in the different grades can write perfectly. It has long been known, of course, that third-grade children cannot equal the copy of the writing books, but just how far third-grade children commonly depart from that copy was not easily decided before the handwriting scale was perfected. It is now possible to compare the work of the third-graders, or that of any other children, with the standard scale, and to determine quite definitely the level of excellence which in general can be expected from pupils of the grade in question.

It may be remarked in passing that some people think of standardization as the reduction of all school work to absolute uniformity. That is not the significance of the term. School work can never be made absolutely uniform. One child's handwriting will differ in many ways from the handwriting of other children, but school work can be standardized in the sense that the teacher can ascertain the degree of excellence which has been attained and can govern his or her methods of instruction with this knowledge clearly in mind.

After Thorndike prepared the handwriting scale, numerous other workers perfected this and other scales for the study of children's work. There are scales for the measuring of excellence in English composition, scales for the measurement of various kinds of drawings, scales for the study of reading, and so on.

Courtis Arithmetic Tests. One of the early instruments of educational measurement was the series of Courtis tests for the measurement of ability in arithmetic. By an ingenious composition of various number groups, S. A. Courtis prepared a series of exercises in the fundamental arithmetical operations of addition, subtraction, multiplication, and division. These were presented in such form that the pupils were asked to carry out at as rapid a pace as possible the various operations. The ability of any given child was measured by the number and accuracy of the operations which he could complete in a given period of time. The achievement of the whole grade could be measured by ascertaining the ability of the average child.

Spelling. In the field of spelling, early practices of schools were to teach it by resorting to the dictionary and selecting words in alphabetical order, arranging them in groups of gradually increasing length and complexity and making the children learn them. There was no limit to the number of words that the schoolmaster attempted to use in his drill of children

Ayres conceived the idea of attempting to determine what words are needed in ordinary life. To this end he brought together the results of various studies of words. He ascertained what words recur in business correspondence by going through numerous business letters and tabulating the words which he found. The same thing was done with the Sunday newspaper and with the Bible. When all of these different lists of commonly used words were brought together, the astonishing result appeared that about one-half of the ordinary usage of words is limited to 50 common words, and the first 1000 words en-

countered in such a list exhaust the ordinary probabilities of use.

Ayres established, therefore, a list of 1000 most commonly employed words. He then gave these words to children in 84 school systems and found how far children of different grades are likely to be in error in spelling these common words. Through these measurements of error, he was able to arrange the words in ascending order of difficulty and to prepare a scale which can be used by any teacher to determine whether a given child or a given class has ordinary ability to spell common words.

Development of Scales and Tests. The preparation of scales and standards has gone forward very rapidly in recent years. Scales and tests have been developed in a wide variety of subjects and for many purposes. In educational circles great interest has been developed in the use of tests as devices to place students in the school program, to determine achievement, and to indicate qualifications for or interest in areas of study. More than 800 different standardized types of tests have been introduced for use in the schools. Because of the large number available and the claims of their supporters, efforts have been made to give information about the uses and misuses of tests to identify the better tests, to eliminate poor ones, and to compel test makers to produce tests which are more valid.

Classification of Tests. One of the important types of tests is the Achievement Battery. This is a series of tests designed primarily to survey achievement in the basic academic skills of children in the elementary schools, secondary schools, and colleges. As shown in the following table, there are wide variations in Achievement Batteries. They are designed also for special vocational skills. In these types of Achievement Batteries, there are subtests of the skills related to the vocation. Achievement Batteries are being used with considerable effectiveness when they are used to improve the curriculum or to aid in the development of the students. They can be harmful when they are used to limit the curriculum or to hold students to standards set by the test.

REPRESENTATIVE ACHIEVEMENT TEST BATTERIES

1. American School Achievement Tests. Grades 1, 2–3, 4–6, 7–9.
2. California Achievement Tests. Grades 1–14.
3. California Basic Skills Tests. Grades 4–6, 7–9.
4. California Tests in Social and Related Sciences. Grades 4–8, 9–12.
5. Contemporary Affairs: Every Pupil Test. Grades 7–12.
6. Co-operative General Culture Test. College.
7. Co-operative General Achievement Tests. Grades 12 and College entrance.
8. Current Affairs: Every Pupil Scholarship Test. High School.
9. General Scholarship Test For High School Seniors. Grade 12.
10. Graduate Record Examination: Area Tests. Sophomore through Graduate School. College.
11. Gray-Votaw-Rogers General Achievement Tests. Grades 1–3, 4–6, 5–9, 7–9.
12. Group Achievement Test: Dominion Tests 1934 Edition. Grade 8.
13. Group Achievement Tests: Niagara Edition Dominion Tests. Grade 8.
14. High School Fundamentals Evaluation Test. Grades 9–12.
15. Iowa Tests Of Basic Skills. Grades 3–9.
16. High School Placement Test. Entering High School Freshmen.
17. Iowa Tests Of Educational Development. Grades 9–13.
18. Municipal Battery: National Achievement Tests. Grades 3–6, 6–8.
19. National Achievement Tests. Grades 4–6, 7–9.
20. National Merit Scholarship Qualifying Test. High School Junior and Senior.
21. S.R.A. Achievement Series. Grades 2–4, 4–6, 6–9.
22. S.R.A. High School Placement Tests. Grades 8.5–9.5.
23. Scholastic Achievement Series. Grades 1.5–2.5, 2.5–3, 4–6, 7–9.
24. Sequential Tests Of Educational Progress. Grades 4–6, 7–9, 10–12, 13–14.
25. Stanford Achievement Test. Grades 1.9–3.5, 3–4, 5–6, 7–9.
26. Test For High School Entrants: National Achievement Tests. High School Entrants.
27. Tests Of Educational Development. High School and College.

Another type of test is that which examines Character and Personality. In tests of this sort, attempts are made to identify and measure character traits such as honesty, generosity, persistence, endurance, frustrability, and other qualities which make a personality. Widespread use of tests in this area is questionable at the present time because evidence is inadequate to support any contention for or against their validity as measures of total personality.

Many tests have been made to measure achievement and aptitude in the various individual subject areas of the school curriculum. Tests which have had extensive use are in English language, grammar, vocabulary, composition, poetry, and English literature; Mathematics including algebra, arithmetic, general mathematics, geometry, and trigonometry; the sciences of astronomy, biology, botany, chemistry, general science, nature study, physics, and zoology; foreign languages including French, German, Latin, and Spanish; the social studies of civics, current events, history, geography, economics, and political science; the commercial subjects of accounting, bookkeeping, business education, clerical ability, commercial law, and typewriting; fine arts of music and art. In the vocations there are accepted tests in agriculture, auto mechanics, industrial arts, mechanical aptitude, mechanical drawing, home economics, and occupations. In addition to these tests of the various subjects, there are others which test such things as handwriting, etiquette, religious education, safety education, academic aptitude, athletic ability, health and hygiene, general interests, logic, social manners, moral knowledge, reading readiness and achievement, reflective thinking, and study habits and skills. Tests have been developed to measure achievement or aptitude in nearly all forms of human endeavor. However, great care must be given to the selection of the proper test, administering it properly, and interpreting the results. There has been much misuse of tests which has caused harm to the individuals tested.

Other types of tests which are widely used are intelligence tests and sensory tests of motor ability, hearing, and vision. Thus it can be seen that in almost every area where there is need to determine mental growth some sort of test has been devised.

A Silent Reading Test. An example of a standard test may be found in the scale for the measurement of silent reading published by the Russell Sage Foundation of New York City. The directions for the tests and three examples of the reading passages used are given herewith:

DIRECTIONS

Giving the Tests.—1. See that each child has a pencil and that the teacher has a watch. 2. Distribute scales, face down. 3. Have children write on backs of sheets their names, grade, and date. 4. Tell children they are to have a test in reading. Hold scale up and explain that each paragraph tells them to do something to the picture above it with their pencils. They must read carefully, to make sure just what they are to do. They are to read and mark the paragraphs in order, starting at the top and working down, through the first, second, and third. They must do as many as they can in five minutes. 5. Make sure that the pupils understand; then tell them to turn papers over and begin. Allow exactly five minutes. Collect papers.

Marking the Papers. Count every paragraph correct in which the marking, no matter how crude it may be, exactly follows instructions. Count every paragraph wrong in which the marking does not exactly follow instructions. Remember this is a test of reading, not of drawing. The pupil's score is the number of paragraphs correctly marked. Write this number at the top of the paper.

Giving Credit. The credit to be assigned in each grade for each number of paragraphs correctly marked is shown in the table given below. A third-grade child having ten paragraphs right should be marked 80, a fourth-grade child having seven right, 50, and so on. Credits in table are for February 1. To adjust for other periods add or subtract from each child's mark as follows:

Grade 3	Oct. 1, +6	Dec. 1, +3	April 1, −3	June 1, −6
Grades 4–8	+2	+1	−1	June 1, −2

Give no marks less than 0 or more than 100. Write the credit the child receives at the top of his paper.

Results Usually Found. In the diagram shown under the table, columns show per cent of children in the average grade receiving each mark from 0 to 100. Figures below columns show marks or credits, and figures above columns show per cents of children commonly receiving those credits. Thus 12 per cent usually receive a mark of 50, eight per cent one of 68, and so on. The lowest third in the average class receive marks of from 0 to 38; the middle third, from 44 to 56, and the best third, from 62 to 100.

SPECIMENS OF TEST PASSAGES

1. This naughty dog likes to steal bones. When he steals one he hides it where no other dog can find it. He has just stolen two bones, and you must take your pencil and make two short, straight lines, to show where they are lying on the ground near the dog. Draw them as quickly as you can, and then go on.

2. This man is an Eskimo who lives in the far north where it is cold. There has just been a big storm, and all the ground is white with snow. The man has been walking and has made many footprints in it. With your pencil quickly make four of these in the snow just behind him.

3. This book is lying on the desk, but it is hard to make it stay open. With your pencil draw a single straight line to represent a ruler lying across the book to hold the pages open. Be sure to make the line from one side to the other, across the book, instead of making it go up and down.

Methods of Employing Tests. Such tests as have been described are used in various ways by different school officers. Teachers very frequently succeed in discovering by their use those pupils who are in need of special attention. They can then direct instruction to the remedy of the defects thus found. Such a use for the diagnosis of school difficulties is perhaps the most productive to which tests can be put.

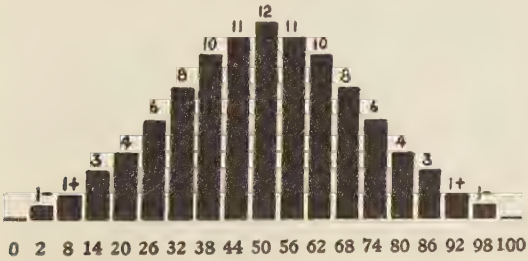
Sometimes the superintendent of schools uses tests to find out whether teachers are getting on well with their classes. Such measurement of results for administrative purposes has proved to be very helpful in standardizing the practices of large school systems where the superintendent cannot come into personal contact with all of the teachers. The results in such cases must however be interpreted with great caution if injustices are to be avoided; for a teacher may very often have a class of low ability or of especially difficult type, as when she attempts to teach English to a group of children from homes where the English language is not spoken.

Tests have also been used in general school surveys where experts from outside a school system have been called in by the board of education or by the citizens in order to make a study of the virtues and defects of the system.

Improvements Based on Measurements. Schools have been greatly stimulated by the results of these studies. Measurement has given, first, a better understanding of what ought to be expected at the different levels of education. No teacher, however isolated, needs to be in any doubt as to the success or unsuccess of his work, because it is now thoroughly known what may be expected of children of different ages. Secondly, the tests and experiments have served as a means of deciding between different methods of instruction. Some methods are good and produce excellent results rapidly; other methods of teaching are less satisfactory, and students make slower progress when these less satisfactory methods are employed. With the scales and tests it is possible to determine accurately the rates of progress. It is, therefore, becoming increasingly difficult for a poor method of teaching to survive in a school. It is also becoming increasingly difficult for individual teachers to escape the necessity of cultivating at all times acquaintance with the best methods that have been devised for the treatment of the various topics in the course of study.

CREDIT CORRESPONDING TO EACH NUMBER OF PARAGRAPHS MARKED IN EACH GRADE

Grade	Number of Paragraphs Read and Marked Correctly																				Grade
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
3	0	26	32	38	44	50	56	62	68	74	80	86	92	98	100	..	..	..	..	..	..	3
4	0	14	20	26	32	38	44	50	56	62	68	74	80	86	92	98	100	..	..	..	..	4
5	0	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92	98	100	..	..	..	5
6	0	2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92	98	100	..	..	6
7	..	0	2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92	98	100	..	7
8	..	..	0	2	8	14	20	26	32	38	44	50	56	62	68	74	80	86	92	98	100	8



GENERAL INTELLIGENCE TESTS

A type of test which has come into great prominence in recent years and has been very much discussed in connection with the work in the schools is the so-called general intelligence test. This has been applied in schools, and it has been employed also in industry in determining the efficiency of different sorts of workers. It has been used on a large scale by the United States armed forces since World War I, for the purposes of classifying recruits and officers.

This type of test originated many years ago in the experimental studies of the psychologist Ebbinghaus (1850–1909). Ebbinghaus devised a so-called completion test. He took a simple narrative and dropped out a word here and there. He then asked the person whose general intelligence he wanted to test to supply the omitted words. A comparison of different individuals showed that the persons of largest intelligence were those who could supply most rapidly and most correctly the missing words in the narrative. It is obvious that great service will be rendered to society if it is possible to devise some plan by which the general intelligence of a person can be rapidly measured, in the same way that his physical condition can be measured by his strength and endurance. Psychologists have, therefore, steadily pursued this matter in the effort to improve on the tests of Ebbinghaus and enlarge their application.

Cattell attempted to make use of the general intelligence test in the classification of college freshmen at Columbia university, during the late '90's, but his tests proved to be too crude for the purpose, and the results did not at that time seem very satisfactory. However, Cattell and his students pursued the matter until now numerous tests have been devised and are in use for measuring the general intelligence of all classes of students, as well as of persons who are to be selected for professional and business positions.

Binet and His Scale. In 1905 the Paris authorities asked the eminent psychologist Binet to devise some way of picking out the defective children in the elementary school. Binet devised, in response to this invitation, the now famous scale which bears his name.

The special character of Binet's scale lies in the fact that he brought together a number of questions and a number of tests of skill for each age. He thus set up a series of tests which ought to be passed by an ordinary child of three years of age and another set somewhat more difficult for children of four years of age, and so on up the scale. The way in which he determined the appropriateness of these tests for different ages was to try them out on a large number of pupils. He thus determined how far three-year-old children under ordinary circumstances can go in solving the various questions which he laid down in his series.

Various revisions of the Binet scales have been prepared, and a formula has been developed by means of which the relative intelligence of an individual can be expressed in a single numerical term. If the age of a person is compared with his achievements in the Binet series of tests, it can be determined whether the individual compares favorably with those of his own age or is above or below expectation. Thus, if a ten-year-old child passes the ten-year-old test and no higher, he has exactly fulfilled expectations. By dividing ten, the intellectual age of the child according to the expectations of the Binet scale, by his chronological age ten, we get the quotient one. This is known as the intelligence quotient and is commonly expressed by the letters I. Q. Another child of ten years of age might succeed in passing the test for twelve-year-old children; his I. Q. would then be 1.2. A third child of ten years of age might show a deficiency and be able to pass only the eight-year-old test. His I. Q. would be .8.

Stanford Revision of the Binet Scale. The following summary of the tests to be used with children of different ages constitutes the so-called Stanford revision of the Binet tests. The examples here given cover years three, four, five, and six. Similar lists have been prepared for the later years of the child's life.

THE STANFORD REVISION AND EXTENSION

"YEAR III. (6 tests, 2 months each.)
1. Points to parts of body. (3 of 4.)
   Nose; eyes; mouth; hair.
2. Names familiar objects. (3 of 5.)
   Key, penny, closed knife, watch, pencil.
3. Pictures, enumeration or better. (At least 3 objects enumerated in one picture.)
   (a) Dutch Home; (b) River Scene; (c) Post-Office.
4. Gives sex.
5. Gives last name.
6. Repeats 6 to 7 syllables. (1 of 3.)

Al. Repeats 3 digits. (1 success in 3 trials. Order correct.)"

"YEAR IV. (6 tests, 2 months each.)
1. Compare lines. (3 trials, no error.)
2. Discrimination of forms. (Kuhlmann.) (Not over 3 errors.)
3. Counts 4 pennies. (No error.)
4. Copies square. (Pencil. 1 of 3.)
5. Comprehension, 1st degree. (2 of 3.)
   (Stanford addition.) 'What must you do'; 'When you are sleepy?' 'Cold?' 'Hungry?'
6. Repeats 4 digits. (1 of 3. Order correct.)
   (Stanford addition.)

Al. Repeats 12 to 13 syllables. (1 of 3 absolutely correct or 2 with 1 error each.)"

"YEAR V (6 tests, 2 months each.)
1. Comparison of weights. (2 of 3.)
   3–15; 15–3; 3–15.
2. Colors. (No error.)
   Red; yellow; blue; green.
3. Æsthetic comparison. (No error.)
4. Definitions, use or better. (4 of 6.)
   Chair; horse; fork; doll; pencil; table.
5. Patience, or divided rectangle. (2 of 3 trials. 1 minute each.)
6. Three commissions. (No error. Order correct.)

Al. Age."

"YEAR VI. (6 tests, 2 months each.)
1. Right and left. (No error.)
   Right hand; left ear; right eye.
2. Mutilated pictures. (3 of 4 correct.)
3. Counts 13 pennies. (1 of 2 trials, without error.)
4. Comprehension, 2d degree. (2 of 3.) 'What's the thing for you to do':
   (a) 'If it is raining when you start to school?'
   (b) 'If you find that your house is on fire?'
   (c) 'If you are going some place and miss your car?'
5. Coins. (3 of 4.)
   Nickel; penny; quarter; dime
6. Repeats 16 to 18 syllables. (1 of 3 absolutely correct, or 2 with 1 error each.)

Al. Morning or afternoon."

Note.—Al. signifies alternative.

The following examples will serve to illustrate the way in which each of these lists of tests is elaborated in the instructions prepared for those who are to give the tests:

"III, 1. POINTING TO PARTS OF THE BODY

Procedure. After getting the child's attention, say: "Show me your nose.' 'Put your finger on your nose.' Same with the eyes, mouth, and hair.

"Tact is often necessary to overcome timidity. If two or three repetitions of the instruction fail to bring a response, point to the child's chin or ear and say: 'Is this your nose?' 'No?' 'Then where is your nose?' Sometimes, after one has tried two or three parts of the test without eliciting any response, the child may suddenly release his inhibitions and answer all the questions promptly. In case of persistent refusal to respond it is best not to harass the child for an answer, but to leave the test for a while and return to it later. This is a rule which applies generally throughout the scale. In the case of one exceptionally timid little girl, it was impossible to get any response by the usual procedure, but immediately when a doll was shown the child pointed

willingly to its nose, eyes, mouth, and hair. The device was successful because it withdrew the child's attention from herself and centered it upon something objective.

"Scoring. Three responses out of four must be correct. Instead of pointing, the child sometimes responds by winking the eyes, opening the mouth, etc., which is counted as satisfactory.

"Remarks. Binet's purpose in this test is to ascertain whether the subject is capable of comprehending simple language. The ability to comprehend and use language is indeed one of the most reliable indications of the grade of mental development. The appreciation of gestures comes first, then the comprehension of language heard, next the ability to repeat words and sentences mechanically, and finally the ability to use language as a means of communication. The present test, however, is not more strictly a test of language comprehension than the others of the 3-year group, and in any case it could not be said to mark the *beginning* of the power to comprehend spoken language. That is fairly well advanced by the age of 2 years. The test closely resembles III, 2 (naming familiar objects), and III, 3 (enumeration of objects in a picture), except that it brings in a personal element and gives some clue to the development of the sense of self. All the data agree in locating the test at year III.

"III, 2. NAMING FAMILIAR OBJECTS

Procedure. Use a key, a penny, a closed knife, a watch, and an ordinary lead pencil. The key should be the usual large-sized doorkey, not one of the Yale type. The penny should not be too new, for the freshly made, untarnished penny resembles very little the penny usually seen. Any ordinary pocketknife may be used, and it is to be shown unopened. The formula is, 'What is this?' or, 'Tell me what this is.'

"Scoring. There must be at least three correct responses out of five. A response is not correct unless the object is named. It is not sufficient for the child merely to show that he knows its use. A child, for example, may take the pencil and begin to mark with it, or go to the door and insert the key in the lock, but this is not sufficient. At the same time we must not be too arbitrary about requiring a particular name. 'Cent' or 'pennies' for 'penny' is satisfactory, but 'money' is not. The watch is sometimes called 'a clock' or 'a tick-tock,' and we shall perhaps not be too liberal if we score these responses plus. 'Pen' for 'pencil,' however, is unsatisfactory. Substitute names for 'key' and 'knife' are rarely given. Mispronunciations due to baby-talk are of course ignored.

"Remarks. The purpose of this test is to find out whether the child has made the association between familiar objects and their names. The mental processes necessary to enable the child to pass this test are very elementary, and yet, as far as they go, they are fundamental. Learning the names of objects frequently seen is a form of mental activity in which the normally endowed child of 2 to 4 years finds great satisfaction. Any marked retardation in making such associations is a grave indication of the lack of that spontaneity which is so necessary for the development of the higher grades of intelligence. It would be entirely beside the point, therefore, to question the validity of the test on the ground that a given child may not have been taught the names of the objects used. Practically all children 3 years old, however poor their environment, have made the acquaintance of at least three of the five objects, and if intelligence is normal they have learned their names as a result of spontaneous inquiry.

"Always use the list of objects here given, because it has been standardized. Any improvised selection would be sure to contain some objects either less or more familiar than those in the standardized list. Note also that three correct responses out of five are sufficient. If we required five correct answers out of six (like Kuhlmann), or three out of three (like Binet, Goddard, and Huey), the test would probably belong at the 4-year level. Binet states that this test is materially harder than that of naming objects in a picture, since in the latter the child selects from a number of objects in the picture those he knows best, while in the former test he must name the objects we have arbitrarily chosen. This difference does not hold, however, if we require only three correct responses out of five for passing the test of naming objects, instead of Binet's three out of three. All else being equal, it is of course easier to recognize and name a real object shown than it is to recognize and name it from a picture.

"III, 3. ENUMERATION OF OBJECTS IN PICTURES

Procedure. Use the three pictures designated as 'Dutch Home,' 'River Scene,' and 'Post-Office.' Say, 'Now I am going to show you a pretty picture.' Then, holding first one before the child, close enough to permit distinct vision, say: 'Tell me what you see in this picture.' If there is no response, as sometimes happens, due to embarrassment or timidity, repeat the request in this form: 'Look at the picture and tell me everything you can see in it.' If there is still no response, say: 'Show me the ....' (naming some object in the picture). Only one question of this type, however, is permissible. If the child answers correctly, say, 'That is fine; now tell me everything you see in the picture.' From this point the responses nearly always follow without further coaxing. Indeed, if rapport has been properly cultivated before the test begins, the first question will ordinarily be sufficient. If the child names one or two things in a picture and then stops, urge him on by saying, 'And what else?' Proceed with pictures (b) and (c) in the same manner.

"Scoring. The test is passed if the child enumerates as many as three objects in one picture spontaneously; that is, without intervening questions or urging. Anything better than enumeration (as description or interpretation) is also acceptable, but description is rarely encountered before 5 years and interpretation rarely before 9 or 10.

"Remarks. The purpose of the test in this year is to find out whether the sight of a familiar object in a picture provokes recognition and calls up the appropriate name. The average child of 3 or 4 years is in what Binet calls 'the identification stage'; that is, familiar objects in a picture will be identified but not described, their relations to one another will not be grasped.

"In giving the test, always present the pictures in the same order, first Dutch Home, then River Scene, then Post-Office. The order of presentation will no doubt seem to the uninitiated too trivial a matter to insist upon, but a little experience teaches one that an apparently insignificant change in the procedure may exert a considerable influence upon the response. Some pictures tend more strongly than others to provoke a particular type of response. Some lend themselves especially to enumeration, others to description, others to interpretation. The pictures used in the Stanford revision have been selected from a number which have been tried, because they are more uniform in this respect than most others in use. However, they are not without their difference, picture (b), for example, tending more than the others to provoke description.

"There seems to be no disagreement as to the proper location of this test."

TESTS IN WORLD WARS I AND II

General Intelligence Tests. Since the imp ovement of the Binet scale, especially by Professrr L. M. Terman of Leland Stanford Junior university significant programs for the measurement of intelligence have been conducted, principally by the schools and by the United States armed forces in World Wars I and II. World War I gave the intelligence-testing movement the greatest stimulus which it has ever had. The chief testing instrument used by the army during World War I was known as the Army Alpha Test reproduced below. During World War II, all branches of the armed forces used intelligence tests known as General Classification Tests. These were given to all enlisted personnel and to officers.

The chief purpose of these tests was to aid in eliminating all persons who were so incompetent that they could not understand and follow orders. Another purpose was to aid in the selection of those persons with the highest degree of intelligence for positions of command. The tests were also used to assist in making promotions from one rank to another rank. In brief, the tests were used in both wars to measure the degree of intelligence of the military personnel. Because of their success in the wars, their use in the schools of the nation received a tremendous impetus.

Occupational Tests. During World Wars I and II, the armed forces also needed a system of classification whereby they could place their personnel in the various occupations which were necessary for carrying on military operations. The locating of persons suited to the various occupations was effectively handled, in part, through a knowledge of the earlier occupations pursued by the persons. In many instances, however, it was necessary to place persons in occupations which were different from those pursued by them in civilian life, and tests were needed in order to avoid, so far as possible, misfit assignments.

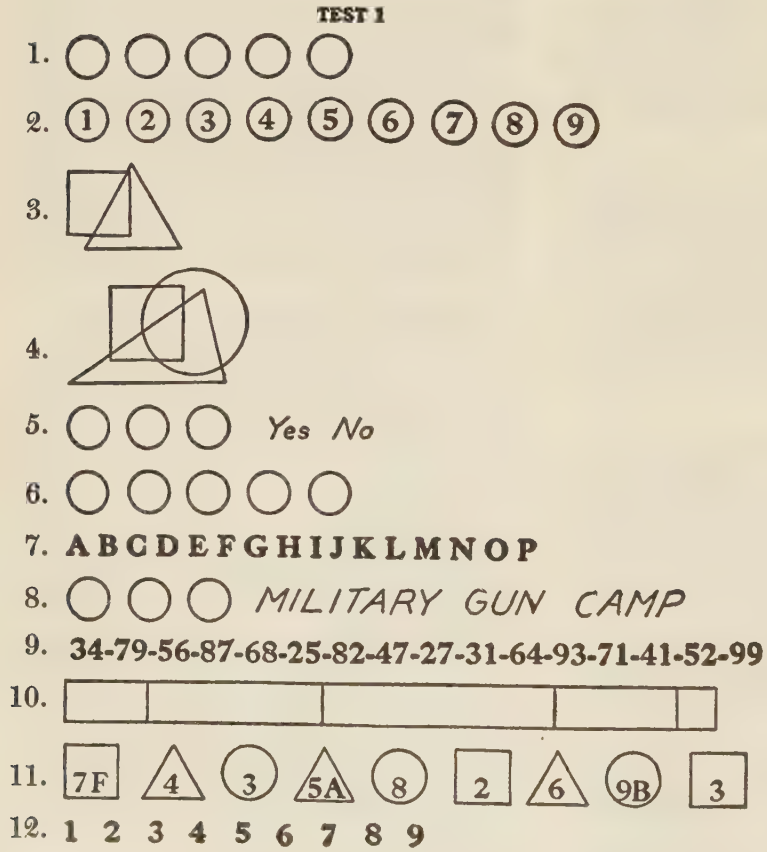
Fortunately the methods for making such tests had been developed in much detail by psychologists and educationists even before World War I. With this beginning, many occupational tests were developed during World War I, and following that war and during World War II many other occupational tests were developed.

In 1940 war had become much more complex than in 1917. Many branches of the armed forces were confronted with the problem of selecting highly qualified men for difficult and specialized tasks. Candidates were given a battery of tests designed to provide a profile of aptitudes and abilities. The value of these tests as predictors was clearly reflected in lower "washout" rates.

After World War II the Army introduced the Aptitude Area System. This consisted originally of nine special aptitude tests called the Army Classification Battery and was given to all inductees. It included: A Verbal Test, Arithmetic Reasoning Test, Pattern Analysis Test, Mechanical Aptitude Test, Army Clerical Speed Test, Army Radio Code Aptitude Test, Shop Mechanics Test, Automotive Information Test, and Electronics Information Test.

One of the results of the impetus given to testing in World Wars I and II was the spread of the use of tests in the schools. Between 75% and 90% of all public elementary and secondary schools in the United States make use of standardized tests. A tremendous boost to testing was given in 1958 as a result of Title VA of the National Defense Education Act. This made funds available to states to establish and maintain a program for testing aptitudes and abilities of students in public secondary schools. Federal assistance was extended to private secondary schools under Section 504(B). By 1964 approximately 35% of all testing going on in secondary schools was being financed by the Federal Government and all 50 states were participating in the program.

REPRODUCTION OF ARMY ALPHA, FORM 5.



This is an oral directions test. The directions given are as follows:

TEST I, FORM V

1. "Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go,' but not before, make a cross in the first circle and also a figure 1 in the third circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers in them. When I say 'go,' draw a line from Circle 1 to Circle 4 that will pass *above* Circle 2 and *below* Circle 3.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go,' make a cross in the space which is in the triangle, but not in the square, and also make a figure 1 in the space which is in the triangle and in the square.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go,' make a figure 1 in the space which is in the circle, but not in the triangle or square, and also make a figure 2 in the space which is in the triangle and circle, but not in the square.—Go!" (Allow not over 10 seconds.)

(N.B. Examiner.—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If a machine gun can shoot more bullets a minute than a rifle, then (when I say 'go') put a cross in the second circle; if not, draw a line *under* the word No.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go,' put in the second circle the right answer to the question: 'How many months has a year?' In the third circle do nothing, but in the fourth circle put any number that is a wrong answer to the question that you have just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go,' *cross out* the letter just before C and also draw a line *under* the second letter before H.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go,' make in the *first* circle the first letter of the *first* word; in the *second* circle the *first* letter of the *second* word; and in the *third* circle the last letter of the *third* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go,' *cross out* each number that is more than 20, but less than 30.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go,' put a 3 or a 2 in each of the two largest parts and any number between 4 and 7 in the part next in size to the smallest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go,' draw a line through every even number that is not in a square and also through every odd number that is in a square with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 7 is more than 5, then (when I say 'go') cross out the number 6 unless 6 is more than 8, in which case draw a line under the number 7.—Go!" (Allow not over 10 seconds.)

TEST 2

Get the answers to these examples as quickly as you can. Use the side of this page to figure on if you need to.

Samples
1. How many are 5 men and 10 men? Answer . . . . . (15
2. If you walk 4 miles an hour for 3 hours, how far do you walk? Answer . . . . (12

1. How many are 30 men and 7 men? Answer . . . (
2. If you save $7 a month for 4 months, how much will you save? Answer . . . . . (
3. If 24 men are divided into squads of 8, how many squads will there be? Answer . . . . . (
4. Mike had 12 cigars. He bought 3 more, and then smoked 6. How many cigars did he have left? Answer . . . . . (
5. A company advanced 5 miles and retreated 3 miles. How far was it then from its first position? Answer (
6. How many hours will it take a truck to go 66 miles at the rate of 6 miles an hour? Answer . . . . (
7. How many cigars can you buy for 50 cents at the rate of 2 for 5 cents? Answer . . . . . (
8. A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 8 miles. How many miles did they march the last day? Answer. (
9. If you buy two packages of tobacco at 7 cents each and a pipe for 65 cents, how much change should you get from a two-dollar bill? Answer . . . . (
10. If it takes 6 men 3 days to dig a 180-foot drain, how many men are needed to dig it in half a day? Answer . . . . . (
11. A dealer bought some mules for $800. He sold them for $1,000, making $40 on each mule. How many mules were there? Answer. . . . . (
12. A rectangular bin holds 400 cubic feet of lime. If the bin is 10 feet long and 5 feet wide, how deep is it? Answer . . . . . (
13. A recruit spent one-eighth of his spare change for post cards and four times as much for a box of letter paper, and then had 90 cents left. How much money did he have at first? Answer . . . . . (
14. If 3½ tons of coal cost $21, what will 5½ tons cost? Answer . . . . . (
15. A ship has provisions to last her crew of 500 men 6 months. How long would it last 1,200 men? Answer . . . . . (
16. If a man runs a hundred yards in 10 seconds, how many feet does he run in a fifth of a second? Answer . . . . . (
17. A U-boat makes 8 miles an hour under water and 15 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go two-fifths of the way under water? Answer . . . . . (
18. If 241 squads of men are to dig 4,097 yards of trench, how many yards must be dug by each squad? Answer . . . . . (
19. A certain division contains 3,000 artillery, 15,000 infantry and 1,000 cavalry. If each branch is expanded proportionately until there are in all 20,900 men, how many will be added to the artillery? Answer . . . . . (
20. A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 29 mess halls. Of this remainder each mess hall received 54 barrels. What was the total number of barrels supplied? Answer. (

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

Sample

Why do we use stoves? Because
- ☐ they look well
- ☒ they keep us warm
- ☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1. Cats are useful animals, because
   - ☐ they catch mice
   - ☐ they are gentle
   - ☐ they are afraid of dogs
2. Why are pencils more commonly carried than fountain pens? Because
   - ☐ they are brightly colored
   - ☐ they are cheaper
   - ☐ they are not so heavy
3. Why is leather used for shoes? Because
   - ☐ it is produced in all countries
   - ☐ it wears well
   - ☐ it is an animal product
4. Why judge a man by what he does rather than by what he says? Because
   - ☐ what a man does shows what he really is
   - ☐ it is wrong to tell a lie
   - ☐ a deaf man cannot hear what is said
5. If you were asked what you thought of a person whom you didn't know, what should you say?
   - ☐ I will go and get acquainted
   - ☐ I think he is all right
   - ☐ I don't know him and can't say
6. Streets are sprinkled in summer
   - ☐ to make the air cooler
   - ☐ to keep automobiles from skidding
   - ☐ to keep down dust
7. Why is wheat better for food than corn? Because
   - ☐ it is more nutritious
   - ☐ it is more expensive
   - ☐ it can be ground finer
8. If a man made a million dollars, he ought to
   - ☐ pay off the national debt
   - ☐ contribute to various worthy charities
   - ☐ give it all to some poor man
9. Why do many persons prefer automobiles to street cars? Because
   - ☐ an auto is made of higher grade materials
   - ☐ an automobile is more convenient
   - ☐ street cars are not as safe
10. The feathers on a bird's wings help him to fly because they
    - ☐ make a wide, light surface
    - ☐ keep the air off his body
    - ☐ keep the wings from cooling off too fast
11. All traffic going one way keeps to the same side of the street because
    - ☐ most people are right handed
    - ☐ the traffic policeman insists on it
    - ☐ it avoids confusion and collisions
12. Why do inventors patent their inventions? Because
    - ☐ it gives them control of their inventions
    - ☐ it creates a greater demand
    - ☐ it is the custom to get patents
13. Freezing water bursts pipes because
    - ☐ cold makes the pipes weaker
    - ☐ water expands when it freezes
    - ☐ the ice stops the flow of water
14. Why are high mountains covered with snow? Because
    - ☐ they are near the clouds
    - ☐ the sun seldom shines on them
    - ☐ the air is cold there
15. If the earth were nearer the sun
    - ☐ the stars would disappear
    - ☐ our months would be longer
    - ☐ the earth would be warmer

16. Why is it colder nearer the poles than near the equator? Because

- ☐ the poles are always farther from the sun
- ☐ the sunshine falls obliquely at the poles
- ☐ there is more ice at the poles

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under same. If they mean the opposite or nearly the opposite, draw a line under opposite. If you cannot be sure, guess. The two samples are already marked as they should be.

Samples	good—bad	same—opposite	
	little—small	same—opposite	
1	wet—dry	same—opposite	1
2	in—out	same—opposite	2
3	hill—valley	same—opposite	3
4	allow—permit	same—opposite	4
5	expand—contract	same—opposite	5
6	class—group	same—opposite	6
7	former—latter	same—opposite	7
8	confess—admit	same—opposite	8
9	shy—timid	same—opposite	9
10	delicate—tender	same—opposite	10
11	extinguish—quench	same—opposite	11
12	cheerful—melancholy	same—opposite	12
13	accept—reject	same—opposite	13
14	concave—convex	same—opposite	14
15	lax—strict	same—opposite	15
16	assert—maintain	same—opposite	16
17	champion—advocate	same—opposite	17
18	adapt—conform	same—opposite	18
19	debase—exalt	same—opposite	19
20	dissension—harmony	same—opposite	20
21	repress—restrain	same—opposite	21
22	bestow—confer	same—opposite	22
23	amenable—tractable	same—opposite	23
24	avert—prevent	same—opposite	24
25	reverence—veneration	same—opposite	25
26	fallacy—verity	same—opposite	26
27	specific—general	same—opposite	27
28	pompous—ostentatious	same—opposite	28
29	accumulate—dissipate	same—opposite	29
30	apathy—indifference	same—opposite	30
31	effeminate—virile	same—opposite	31
32	peculation—embezzlement	same—opposite	32
33	benign—genial	same—opposite	33
34	acme—climax	same—opposite	34
35	largess—donation	same—opposite	35
36	innuendo—insinuation	same—opposite	36
37	vesper—matin	same—opposite	37
38	aphorism—maxim	same—opposite	38
39	adjure —renounce	same—opposite	39
40	encomium—eulogy	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two examples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

Samples	a eats cow grass	true—false	
	horses feathers have all	true—false	
1	lions strong are	true—false	1
2	houses people in live	true—false	2
3	days there in are week eight a	true—false	3
4	leg flies one have only	true—false	4
5	months coldest are summer the	true—false	5
6	gotten sea water sugar is from	true—false	6
7	honey bees flowers gather the from	true—false	7
8	and eat good gold silver to are	true—false	8
9	president Columbus first the was America of	true—false	9
10	making is bread valuable wheat for	true—false	10
11	water and made are butter from cheese	true—false	11
12	sides every has four triangle	true—false	12
13	every times makes mistakes person at	true—false	13
14	many toes fingers as men as have	true—false	14
15	not eat gunpowder to good is	true—false	15
16	ninety canal ago built Panama years was the	true—false	16
17	live dangerous is near a volcano to it	true—false	17
18	clothing worthless are for and wool cotton	true—false	18
19	as sheets are napkins used never	true—false	19
20	people trusted intemperate be always can	true—false	20
21	employ debaters irony never	true—false	21
22	certain some death of mean kinds sickness	true—false	22
23	envy bad malice traits are and	true—false	23
24	repeated call human for courtesies associations	true—false	24

TEST 6

Samples	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

3	4	5	6	7	8	....	....
10	15	20	25	30	35	....	....
8	7	6	5	4	3	....	....
3	6	9	12	15	18	....	....
5	9	13	17	21	25	....	....
8	1	6	1	4	1	....	....
27	27	23	23	19	19	....	....
1	2	4	8	16	32	....	....
8	9	12	13	16	17	....	....
9	9	7	7	5	5	....	....
19	16	14	11	9	6	....	....
2	3	5	8	12	17	....	....
11	13	12	14	13	15	....	....
29	28	26	23	19	14	....	....
18	14	17	13	16	12	....	....
81	27	9	3	1	⅓	....	....
20	17	15	14	11	9	....	....
16	17	15	18	14	19	....	....
1	4	9	16	25	36	....	....
3	6	8	16	18	36	....	....

TEST 7

Samples	sky—blue : : grass —**table green warm big**	
	fish—swims : : man—**paper time walks girl**	
	day—night : : white—**red black clear pure**	

In each of the lines below, the first two words are related to each other in some way What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	gun—shoots : : knife—**run cuts hat bird**	1
2	ear—hear : : eye—**table hand see play**	2
3	dress—woman : : feathers—**bird neck feet bill**	3
4	handle—hammer : : knob—**key room shut door**	4
5	shoe—foot : : hat—**coat nose head collar**	5
6	water—drink : : bread—**cake coffee eat pie**	6
7	food—man : : gasoline—**gas oil automobile spark**	7
8	eat—fat : : starve—**thin food bread thirsty**	8
9	man—home : : bird—**fly insect worm nest**	9
10	go—come : : sell—**leave buy money papers**	10
11	peninsula—land : : bay—**boats pay ocean Massachusetts**	11
12	hour—minute : : minute—**man week second short**	12
13	abide—depart : : stay—**over home play leave**	13
14	January—February : : June—**July May month year**	14
15	bold—timid : : advance—**proceed retreat campaign soldier**	15
16	above—below : : top—**spin bottom surface side**	16
17	lion—animal : : rose—**smell leaf plant thorn**	17
18	tiger—carnivorous : : horse—**cow pony buggy herbivorous**	18
19	sailor—navy : : soldier—**gun cap hill army**	19
20	picture—see : : sound—**noise music hear bark**	20
21	success—joy : : failure—**sadness success fail work**	21
22	hope—despair : : happiness—**frolic fun joy sadness**	22
23	pretty—ugly : : attract—**fine repel nice draw**	23
24	pupil —teacher : : child—**parent doll youngster obey**	24
25	city—mayor : : army—**navy soldier general private**	25

26 establish—begin : : abolish—**slavery wrong abolition end** 26
27 December—January : : last—**least worst month first** 27
28 giant—dwarf : : large—**big monster queer small** . 28
29 engine—caboose : : beginning—**commence cabin end train** 29
30 dismal—cheerful : : dark—**sad stars night bright** . 30
31 quarrel—enemy : : agree—**friend disagree agreeable foe** 31
32 razor—sharp : : hoe—**bury dull cuts tree** . . . 32
33 winter—summer : : cold—**freeze warm wet January** 33
34 rudder—ship : : tail—**sail bird dog cat** 34
35 granary—wheat : : library—**desk books paper librarian** 35
36 tolerate—pain : : welcome—**pleasure unwelcome friends give** 36
37 sand—glass : : clay—**stone hay bricks dirt** 37
38 moon—earth : : earth—**ground Mars sun sky** . . . 38
39 tears—sorrow : : laughter—**joy smile girls grin** . . 39
40 cold—ice : : heat—**lightning warm steam coat** . 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes ears nose mouth**

The correct word is **ears**, because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

Samples { People **hear** with the **eyes ears nose mouth**
France is in **Europe Asia Africa Australia**

1 **America** was discovered by **Drake Hudson Columbus Balboa** 1
2 **Pinochle** is played with **rackets cards pins dice** . . 2
3 The most prominent industry of **Detroit** is **automobiles brewing flour packing** 3
4 The **Wyandotte** is a kind of **horse fowl cattle granite** 4
5 The **U. S. School for Army Officers** is at **Annapolis West Point New Haven Ithaca** 5
6 **Food products** are made by **Smith & Wesson Swift & Co. W. L. Douglas B. T. Babbitt** 6
7 **Bud Fisher** was famous as an **actor author baseball player comic artist** 7
8 The **Guernsey** is a kind of **horse goat sheep cow** . 8
9 **Myrna Loy** is known as a **suffragist singer movie actress writer** 9
10 **"Hasn't scratched yet"** is used in advertising a **duster flour brush cleanser** 10
11 **Salsify** is a kind of **snake fish lizard vegetable** . . 11
12 **Coral** is obtained from **mines elephants oysters reefs** 12
13 **Rosa Bonheur** is famous as a **poet painter composer sculptor** 13
14 The **tuna** is a kind of **fish bird reptile insect** . . 14
15 **Emeralds** are usually **red blue green yellow** . 15
16 **Maize** is a kind of **corn hay oats rice** 16
17 **Nabisco** is a **patent medicine disinfectant food product tooth paste** 17
18 **Velvet Joe** appears in advertisements of **tooth powder dry goods tobacco soap** 18
19 **Cypress** is a kind of **machine food tree fabric** . . 19
20 **Bombay** is a city in **China Egypt India Japan** . . 20
21 The **dictaphone** is a kind of **typewriter multigraph phonograph adding machine** 21
22 The **pancreas** is in the **abdomen head shoulder neck** 22
23 **Cheviot** is the name of a **fabric drink dance food** . 23
24 **Larceny** is a term used in **medicine theology law pedagogy** 24
25 The **Battle of Gettysburg** was fought in **1863 1813 1778 1812** 25
26 The **bassoon** is used in **music stenography bookbinding lithography** 26
27 **Turpentine** comes from **petroleum ore hides trees** 27
28 The number of a **Zulu's legs** is **two four six eight** 28
29 The **scimitar** is a kind of **musket cannon pistol sword** 29
30 **Nylon** is the name of a **metal vegetable textile bird** 30
31 The author of **"The Raven"** is **Stevenson Kipling Hawthorne Poe** 31
32 **Spare** is a term used in **bowling football tennis hockey** 32
33 A **six-sided figure** is called a **scholium parallelogram hexagon trapezium** 33
34 **Isaac Pitman** was most famous in **physics shorthand railroading electricity** 34
35 The **ampere** is used in measuring **wind power electricity water power rainfall** 35
36 The **Chrysler car** is made in **Buffalo Detroit Flint Toledo** 36
37 **Mauve** is the name of a **drink color fabric food** . 37
38 The **stanchion** is used in **fishing hunting farming motoring** 38
39 **Mica** is a **vegetable mineral gas liquid** 39
40 **Scrooge** appears in **Vanity Fair The Christmas Carol Romola Henry IV** 40

Interpreting Results of the Alpha Test. The results of the army tests have been compiled by various writers in an effort to bring out the mental characteristics of the army recruits from different sections of the country and from different nationalities. One author has compiled the results of these tests in such a way as to show very definitely that the immigrants who come to the United States from the southeastern European countries are not able to pass the test with as high a grade as the immigrants who come from the northern European states. In view of the fact that recent immigration has been predominantly from the countries in the southeastern part of Europe, these findings raise grave social questions.

Another general fact brought out by these tests is that the average recruit was able to answer the tests only about as well as school children between 13 and 14 years of age. On the basis of this fact, the statement is sometimes made that the average American citizen is intellectually between 13 and 14 years of age. Against this statement it has been argued that the tests include only those types of intellectual effort which belong to a school training. Beyond 13 years of age the ordinary man does not continue to cultivate the same type of thinking which he cultivated in the school. Consequently, the test does not uncover the mental development which has been going on, for example, in business or in practical mechanics. There is nothing in the test to show what a man who works in a foundry has been learning since he left school.

Controversy as to the meaning of the test has arisen at another point also. There are some who regard the test as a measure of native ability, while others regard it as a measure of acquired information. If the test measures native ability, then it is not to be expected that anyone who passes the test well at any given time will be of low mental ability at any other time in his life. Conversely, anyone who is not able to pass the test at a level that comports with his age cannot be expected to show intellectual ability of a higher order later. Those who believe that the test measures acquired information, on the other hand, interpret the results to mean that a man has had certain intellectual opportunities if he passes the test well, and that he has been deprived of these opportunities if he does not pass well.

It has been shown very clearly that the ability of recruits from different states parallels closely the efficiency of the school systems of these states. This fact would seem to indicate that the test measures school training quite as much as it does native intelligence. In general, this latter conclusion is probably more nearly the exact truth than the statement that the test measures only native ability.

Applications of Intelligence Tests. There can be no doubt that the experience of the army demonstrated the value of the various tests which were used. Some people were so much impressed by the success of the army tests that they believed a method had been found of classifying all human beings for all sorts of purposes, and the most extreme positions have been taken with regard to the use of these tests.

For example, it has been asserted by some that anyone who passes with a low grade should not be educated in a high school, and certainly not in college, on the theory that it is uneconomical for society to bestow its training on those who are en-

dowed with only moderate degrees of intelligence.

Furthermore, extremists have appeared in some school systems who would rearrange the classification of pupils, sometimes even to the extent of ignoring the judgment of teachers, putting into a given grade only those children who stand at the same level in a general intelligence test.

These extremists have been met by vigorous objectors who hold that it is quite impossible on the basis of a single test to determine a person's intelligence and his probable achievements in the intellectual world. The objectors have marshaled a large body of evidence to show that the tests are in need of elaboration if they are to be relied upon at all, and that it is necessary to administer more than one test before any reliance can be placed upon the classifications which they suggest.

As a matter of actual practice, these tests are now extensively used to supplement the judgments of teachers in classifying students in all grades of schools. This is undoubtedly the legitimate use to which they can be put. They cannot be used to the exclusion of the other evidences in regard to students' achievements, but they are proving in their refined forms to be very much more reliable than any other single type of evidence, and because of their extended use they certainly supply a basis for the comparison of educational institutions and of teachers.

Furthermore their extensive use has led to a careful scrutiny of all the other devices for measuring human ability, such as examinations and teachers' judgments. The net result has been a refinement of the methods of placing pupils in the school and of graduating them at the completion of their courses. The indirect advantages have therefore often equaled the direct.

Types of Intelligence Tests. Intelligence tests usually consist of a series of sub-tests which endeavor to measure the mental age of an individual as determined by his behavior in representative tasks. A device known as the Intelligence Quotient (IQ) is a means for summarizing the performance in this series of sub-tests. This is described in Psychology on Page 997.

A criticism of intelligence tests has been that the success one has with them depends on reading ability and a knowledge of a particular type of culture. To offset this criticism, a kind of intelligence test has been devised to overcome the limitation caused by the emphasis on verbalism. This is called the non-verbal test. The most widely used test of this type is the Army Beta Test. It is used to test those who are linguistically handicapped or are non-academic. Recently this test is being used in conjunction with or as a part of other verbal intelligence tests.

Types of Tests in Use. Numerous tests have been developed to determine the development of a child before the age of six years, and to predict his later status. The most effective of these endeavor to construct a scale by identifying what is considered to be normal behavior at the age in which the development is found. The resulting scales permit the identification of the child who is making more or less progress than others at a given age. However, the use of these tests as predictors is very dangerous. Also, expert interpretation of the scales is desirable in identifying what is considered to be normal behavior.

Performance tests are a type which provides essential information about the person being tested when he is handicapped on verbal tests. They are useful as a means of indicating how persons of borderline mental defects can be fitted into society. They are useful also as devices to supplement other forms of testing. Such tests are usually administered individually and great importance must be given to the expert who rates the performance of the person being tested.

A large number of tests have been constructed to measure special abilities in an individual. These have been useful in vocational guidance and vocational selection. Spatial and perceptual tests are of this type. They are of importance in determining suitability for work in the fields of engineering or architecture. Other tests have endeavored to group the elements of a performance to the task to be done and to set standards. Thus, such things as speed and reaction time, manual dexterity, aiming, steadiness, strength, and co-ordination have been tested in different types of activities related to a skill to determine the extent of abilities called for by a job. In addition, trade tests have been developed for use where knowledge of one job is important. The United States Employment Service has made wide use of this type of test. They are used as a screening device during short interviews. There are three groups usually tested: expert workers, beginners in the trade, and workers in closely related trades.

In the field of the arts, several tests have been designed to identify aptitude or ability in art. These tests attempt to determine judgment in art, measure the likelihood of success in drawing and painting, or test native capacities to see or hear. As yet most of these tests have limited value.

Choosing the Proper Test. Because of the large number of tests being distributed and the possible dangers of the misuse of tests or the use of poor tests, it is important that careful selection of the proper test be made. There are several sources of information which the client can use to find out about the value of a test for his situation. The publishers of tests usually give in their catalogs brief descriptions of the tests and their costs. From a reading of these descriptions, the client may reach a decision about the worth of the test for his situation. *The Mental Measurements Yearbook* edited by O. K. Buros provides reviews of a wide variety of tests. This yearbook is published periodically and gives several reviews for each test included by outstanding experts in the field of testing. There are several other sources which review tests. *The National Education Association* and the *Encyclopedia of Vocational Guidance* are among these.

Selection of a test on the basis of the particular purpose for which it is to be used is important. Not all published tests are good tests. It has been found that often even in similar situations the same test may not be used appropriately. Tests tend to become outdated and a test which is excellent for a given situation may be entirely inappropriate to be used again. Some tests are designed for children and others for adults. In selection they must be examined to find what group they most readily fit. Some tests give specific measures and others provide a general picture. Here again the needs of the situation determine which test to choose. One of the practical considerations is the cost of the test. Costs involve more than the initial price. Scoring and interpreting the results of the test must be included in the cost. These may make wide variations in the total cost of a testing program. The time required for a test is also a consideration. Some tests are too long. The time required has an effect on the co-operation of the subject. On the other hand, a test which is too short may not do as thorough a job as a longer test. Experts in test construction are constantly at work trying to design tests of appropriate length.

The ease with which a test can be administered and scored must be considered because the proper administration of a test often provides serious problems. Administering a test usually requires proper space, atmosphere, timing, and expert guidance as the test is given. It may be difficult to supply these. Where classroom teachers can give tests in schools, they tend to take greater interest in the results. However; this may become a burden when teachers have to score large numbers of papers. Many of the published tests provide for machine scoring of the papers. A central agency gives this service for a fee or, as in the case of many school systems, a scoring machine is available. Since tests are used very often to compare results against others, it is desirable that

results of proper equivalent tests shall be available. Often in testing programs, several tests of the same type are given so as to enable comparisons to be made. Also, the results of a test are compared with scores made by others on the same or like tests. Any test should be related to the interest of the person taking the test. He will then see the necessity for taking the test and will do as thorough a job as possible to get accurate results.

Usability becomes another important consideration in the selection of a test. Results often bring out strong prejudices in those who use them. Therefore, it is wise to have the test acceptable to those who will interpret the results. The usability of a test is related to the extent of information available about the test, the period of time of its usefulness, and the means for interpreting the results.

Interpreting the Scores of Tests. When a test is taken, a score is generally given as a report of the performance. The value thus placed on the results of the test is called the "raw score." Commonly this score is indicated by a numerical percentage grade or a letter indicating a rating of excellent, good, fair, poor, or unsatisfactory. It has been traditional practice to compare such grades with others and, although there may be little or no relationship between the scores thus given on tests, to interpret them alike. The standard practice over the years of scoring tests and comparing the results in this manner has raised many questions about the meaning of the scores. Many unfair judgments have been made about test results. Comparisons of scores have been made where such comparisons have not been warranted.

Raw scores have limited meaning unless they are related to some common standard. When a standard of reference is established, there is a proper measure to which the scores of tests can be referred for comparison. Then a more accurate picture is presented in the interpretation of a score and raw scores take on more meaning. In recent years, the makers of tests have attempted to make the meaning and accuracy of the raw scores greater by developing tests having standards which are usable for larger numbers of people.

In order to compare one score with a group of scores from the same test, a common procedure is to distribute all of the scores resulting from the test according to the frequency of each score. It is found usually that the scores distribute themselves so that "norms" or normal results can be seen showing the usual performance on the test. A score then can be compared with the "norm." A score above the norm indicates superior work and a score below the norm shows inferior quality. Another means for making comparison is to distribute the scores according to frequency and to express the score as a percentage of the group. This is called the percentile rank. Percentiles are counted upward. Therefore, a score at the 75 percentile means that there are 75 per cent of the scores below it. Scores at a given percentile rank may be compared easily with others. A third method for comparison is to find the average score on the test by adding all of the test scores and dividing this sum by the number of scores involved. The figure resulting is called the "mean" or average. Test experts endeavor to standardize scores by applying them to formulas which are designed to consider possible inaccuracies caused by the conditions of the testing procedure. As a result greater accuracy in determining the value of test scores has been achieved.

Testing Agencies. In the United States there are several agencies which have testing as a function. One of these is the Educational Testing Service. In 1947 three major educational groups involved in testing programs combined their testing functions to form the Educational Testing Service. These three were the American Council on Education, the Carnegie Foundation for the Advancement of Teaching, and the College Entrance Examination Board. On January 1, 1948 the new organization began its formal operations dedicated to the purposes of aiding in the discovery and development of human talents by providing tests and testing services for special needs of schools and colleges, governmental agencies, and the professions; to assist test users; to conduct educational and measurement research; and to explore undeveloped areas in testing.

Over the years the Educational Testing Service has expanded its programs and has become a major institution for the promotion of testing programs. Its services have been used widely by the government, schools and colleges, and industry. Four major areas of endeavor have characterized the work of this organization. It has developed a number of qualifying examinations to aid authorities in the placement of candidates in institutions of learning. A widely used examination of this type has been the College Entrance Examination which is designed to measure the scholastic ability of students applying for admission to college. Many colleges now include this examination as a regular part of the requirements for admission. It is given twice yearly in centers throughout the United States and other parts of the world. Each year approximately 500,000 candidates take this examination. Other qualifying examinations are the Graduate Record Examinations which aid colleges in evaluating achievement of students at various levels, or determine their fitness for graduate study; The National College Testing Programs for Freshmen and Sophomores in College; The National College Preparatory Testing Program; and the Secondary School Admissions Test which is designed to measure scholastic ability of students applying for admissions to secondary schools.

Another activity of the Educational Testing Service is to provide Scholarship services. It gives consultative services to non-collegiate sponsors of scholarship programs. Approximately 300,000 applicants for scholarships take scholarship tests offered by sponsors using these services. Also the Testing Service has a program entitled The Financial Statement Services. This is designed to provide colleges with a central financial transcript and computation service that collects and evaluates financial information relating to scholarship applicants.

A third activity of the Educational Testing Service which has broadened rapidly in its scope has been its aptitude testing program. The Selective Service College Qualifying Test was used to justify deferment of college students from military service. Other aptitude tests have been widely used in the selection of candidates for such professional schools, or professions as: Graduate School of Business Law School, Medical College, Actuary, Engineering, Foreign Science, Home Economics, Teaching and School Administration. In addition to tests of this sort, other aptitude tests have been developed to aid individual organizations or groups in determining special abilities or interests.

The fourth major area of concern of the Educational Testing Service has been research in the field of testing. Here the organization has centered its activities around the development of better tests, studies of the use of tests in areas heretofore untested, factors influencing test scores, norms and scales for tests, test theories, and personality measures.

Other organizations with major concerns in testing are the Psychological Corporation, Science Research Associates Incorporated, The California Test Bureau, and the World Book Company. The Psychological Corporation among its other activities prepared and conducts nationwide group testing programs for the evaluation of candidates for professional training. It also develops and sells a wide variety of aptitude, intelligence, personality, and achievement tests. Science Research Associates Incorporated is a private organization which provides a wide variety of testing services to schools. The National Merit Scholarship Qualifying Test

designed by this organization has been used extensively to help select candidates for college scholarships. The California Test Bureau and the World Book Company both are private organizations which publish many types of tests usable by schools and industry.

LABORATORY STUDIES

Another and somewhat more elaborate form of scientific study which has contributed to the better organization of schools and to improved methods of teaching may be described under the name "laboratory studies." There are certain types of investigation which teachers cannot readily carry on in the classroom, the results of which are yet very useful in directing educational work. An illustration of this type is to be found in the studies which have been made on the maturing of the child's physical organism. A little child is immature in his physical structures in the same degree as he is immature in his intellectual development. The physical changes through which he passes are in some respects easier to observe and record than are the intellectual changes. A good deal of energy has therefore been devoted to taking physical measurements of children.

Reaction Measurements. Direct laboratory measurements of children's special abilities are also made. One of the earliest of these, which has been influential in affecting school practice, is the measurement of so-called "reaction times." The amount of effort necessary to carry out a certain intellectual process is indicated by the length of time which it requires. Thus it requires more time to work out an elaborate problem in multiplication than to solve a simple problem in addition. The exact measurement of time required for various mental processes can be made by means of elaborate time measuring devices used in the laboratory. By the use of such apparatus, it is found that a child can recognize a word in the same length of time that is required for him to recognize a single letter. This being the case, it is evidently much more economical, in the early stages of reading, to train him to recognize word-wholes rather than to require him to recognize the letters which make up words. Guided by these laboratory experiments and by practical experience, teachers have found it advantageous to abandon the A-B-C method of teaching reading in favor of the word-whole method.

Methods of Reading. In addition to the A-B-C method mentioned above, the *Phonetic Method* and the *Word Recognition* methods of reading have figured prominently in teaching children. In the Phonetic Method the syllables of a word are ' sounded out" and the child learns to identify words by assembling the component syllable sounds.* The syllable sounds are grouped into "families" and children learn these families. Once the sounds are learned, a child finds it easy to construct the total sound of a word through its parts. In this method it is necessary to give ear training to be sure that the child hears properly. A criticism of this method is that time is wasted on the process of learning the "families" of sounds and breaking up of words into parts when the eye naturally sees the word as a whole. Critics believe that it would be better to train children to see the word as a whole and learn it that way.

The Word Recognition method is one which endeavors to train children to learn words as a whole. The child is taught simple words at first and then as he progresses the words become more difficult. Words used in the learning process are generally those which laboratory tests have proven children should know at different stages of intellectual and chronological age development. In the process of learning the words, their meaning is as important as recognition of the word. As words are learned, the child also learns to construct the words into meaningful sentences.

It is now generally agreed among experts in the teaching of reading that no one reading method is appropriate for all children. It has been found that the letter-by-letter spelling or sounding out of syllables is a slow and unnecessary process in most cases. The use of this method usually depends upon some special condition which would keep children from learning to read in the more natural way of word recognition. The A-B-C method depends on the previous learning of the alphabet. Today, educators believe that, because of the great variety of visual material available to most children, it is unnecessary to teach the alphabet before a child learns to read. It is agreed however that, although the Word Recognition method is the most natural way to read, the A-B-C method and the Phonetic method have places in the process of learning to read.

Reading and Eye Movements. The most productive laboratory studies that have been made of school subjects are the studies of the reading of pupils. The mental processes through which a child passes in looking at a series of words have been measured by photographing the movements of his eyes. If the eyes move rapidly across a page, the indication is that the child has been able to recognize the successive words fluently. If, on the other hand, the eyes move very slowly across a line of printed matter, it is evident that the child has not been able to recognize the successive words fluently.

Photographs of eye movements have brought out the fact that no one looks at each individual letter of a line of printed matter; the eye moves forward in steps of greater or less length. The reader takes in at each step a number of letters or words, and then moves forward to the next position, from which a new group of letters or words may be taken in. The length of the steps made by the reader is a fair measure of his range of recognition. It has been found that little children move their eyes in short steps along a line of printed matter. The trained adult, on the other hand, is able to take in whole phrases at a time, and his eye movements are rapid and long.

By means of similar photographs it has been possible to discover the various types of difficulty which arise in training children to read. It has also been possible to study minutely the effects of various methods of teaching, and in this way to devise ways to remedy defects in children who show incompetency in school work.

SCHOOL SURVEYS

During the same period in which scientific methods were used to improve the school program, steps were taken to measure the efficiency of an educational institution or school system. Communities began to conduct what are now known as school surveys. A number of earlier social surveys were organized to investigate such matters as the housing conditions in cities or the situation regarding employment. Following the examples of these social surveys, educators organized a number of general school surveys.

The first great school survey was that of New York City in 1912. The results of this survey were published in three large volumes and excited a tremendous amount of controversial discussion among school officers of the city. The question was pointedly raised whether the methods employed by the surveyors were adequate to the task of evaluating the work of a great school system. Since the New York City survey, there appeared in rapid succession reports of surveys of individual schools, city school systems, state school programs, and even surveys of school programs of national scope.

*Evidence of current interest in this approach to the teaching of reading is seen in the publication of textbooks on *Phonics* and the holding of "Phonics Workshops" for teachers.

An important development in school surveys was the financial support of them by a wide variety of agencies. In some instances the individual school or school system financed the survey using local resources. In other instances, public agencies from the outside or private groups gave financial assistance. Many of the states now provide professional help to schools for the purpose of conducting school surveys and it is considered desirable for such surveys to be conducted periodically.

Types of Surveys School surveys can be generally divided into Comprehensive or Special studies. Comprehensive surveys include studies of the school curriculum, school population trends, the educational status and growth of the pupils, the financial structure, the administrative organization, the faculty, and the nature of the facilities provided for the school program. A Special survey may include studies of any one or even a part of one of the above listed areas of the school program.

Survey Agencies. There are several kinds of agencies which conduct school surveys. Private companies have been established to give this service to schools. However, most school surveys have been made by university agencies or university professors. Certain state departments of education and the United States Office of Education have also made surveys.

BUREAUS OF RESEARCH

Finally, it is becoming common for school systems to provide themselves with agencies that can make continuous studies of their school operations. Many of the leading school systems of the country now have such bureaus of investigation.

All these indications of the mature application of the science of education make it certain that the preliminary stages of this movement have passed, and that the schools of the country will from this time on depend increasingly on scientific methods for the determination of their efficiency. A striking example of the use of scientific methods in administering a school system can be found in the city of Detroit, where the whole supervisory scheme is based on systematic tests, and where the organization of the classes in the schools is controlled by the measurements made by a department of research.

STUDIES OF THE CURRICULUM

A review of the development of the science of education would not be complete without indicating some of the newer lines of inquiry which in recent years have been pushed forward. The most productive of these relate to the curriculum of the schools. For a long time the courses administered in schools of all grades have simply followed traditions. Additions have, indeed, been made to the older curriculum, but these additions have come very slowly and they have not changed the essential character of the fundamental courses. There have been changes also in the fundamental courses, but these have been in the nature of slight revisions here and there, rather than radical reconstructions of the whole course.

In recent years, it has become apparent that a very large body of new instructional material must be put into the schools. The changes in social and industrial life, which have come with expanding civilization, require training of the young people of the country in lines which were never thought of when the school course was first laid down. The question immediately arises, under these conditions, as to what new subjects are most urgently demanded and how the time can be found for inserting them into the school program. Obviously, revision of the older courses must involve an elimination of any material which is not essential to a complete education. Additional material of value must be found. Studies of the curriculum have aimed, therefore, to discover what parts of existing courses may be dispensed with and what new material must be added in order to make the school serviceable to the modern community.

Also it is becoming apparent that changes must be made in the organization of the curriculum as well as its subject matter. Ways of allowing and encouraging independent study on the part of the student, means for having students get special help from the teacher, ways of using the many new teaching devices which have been developed, and ways for allowing students to develop intellectually at their optimum rate are all to be considered as the curriculum is studied.

As a result of the curriculum studies now being made, more resources are being placed at the disposal of the teacher. Also, school buildings and equipment are being made available for longer periods of time for students, and facilities have been redesigned to meet modern needs. Students are encouraged to enroll in more subjects during their period of schooling.

Instructional Materials Centers. In order to help teachers and students take advantage of the many educational resources now becoming available, schools are beginning to establish instructional materials centers. In these are kept lists of available educational and curriculum materials. Also, there may be kept in them textbooks, resource units, films, slides, science equipment, and other kinds of instructional facilities. Teachers use the materials and return them to the center. Also, students may be assigned to the center for the purpose of independent study.

In some instances one center serves an entire school system and various schools draw on the materials of the center. In other cases each school is provided with its own center.

JOB ANALYSIS

Another type of study which is common is described by the term "job analysis." The children who go out of the schools must be prepared, as far as the school can prepare them, for the activities of life. If a boy is to become a salesman or a printer, the training which is given him during the last few years of his schooling ought to be intelligently directed toward these activities. This will be possible only if the actual demands of these activities are fully understood. Various educational agencies, therefore, have attempted to analyze the demands made upon the printer and the salesman. Careful tabulations of the daily routine of these and other occupations are undertaken, and in the light of these tabulations an effort is made to determine exactly what knowledge of a literary and scientific sort will best prepare one to deal with these demands.

This method of job analysis has suggested that schools include in their training much material which has been overlooked or ignored. For example, it is perfectly clear that the salesman must know how to meet people in such a way as to get their attention. The school has not ordinarily attempted to deal with such social matters and has nowhere in its curriculum provided for training in social leadership. The modern school is beginning to realize that success in life may depend upon direct emphasis on personal and social qualities quite as much as on spelling, arithmetic, and literature.

THE SCIENCE OF EDUCATION AND EDUCATIONAL REORGANIZATION

Enough of the scientific movement in education has been described to justify the assertion that schools in the United States are in process of constructive reorganization under the guidance of scientific investigators. The defects and virtues of the American educational system are being demonstrated by exact methods, and significant improvements are being introduced at a rate never before equaled in the history of schools.

MODERN SCHOOL SYSTEMS OF FOREIGN COUNTRIES

EDUCATION IN GERMANY

The school system of Germany has had four periods of development. The first period extends from the Napoleonic wars (1800–15) to the close of World War I in 1918. During this time the *Volksschule*, the *Gymnasium*, and the university were the major developments. The *Volksschule* was an eight year school for the laboring classes. This school was for children 6 to 14 years of age and was free to all. It was followed by a three year continuation school. The *Gymnasium* was a nine year classical school for pupils 9 to 18 years of age, largely of the upper classes. Similar to the *Gymnasium* in organization were the *Realgymnasium* and the *Oberrealschule* which were developed during the latter part of the period in response to a demand for more emphasis on modern languages and science. The first three years preparatory to entering these upper class schools were done in a separate elementary school known as the *Vorschule*. During this period the universities of Germany became world famous, and many graduate students from the United States and other countries attended them.

Period of the Republic. This, the second period, extends from the close of World War I to the coming to power of Adolph Hitler in 1933. During this period the most important school changes were (1) the establishment of an elementary school (*Grundschule*) for all children between the ages of 6 and 10; (2) the reforming of instruction in the upper years (10-14) of the *Volksschule*; and (3) the reform in the training of teachers.

Period of Hitler. The third period is that under Hitler from 1933 to the defeat of Germany in World War II in 1945. Although the structure of the school system did not change much during this period, the curriculum and teaching methods were radically changed. Hitler's *Mein Kampf* was widely used as a text, and the school system became a blatant instrument of propaganda for the Nazi party. Academic freedom was dead during this sad period.

Period After Hitler. The fourth period began with the allied occupation of Germany after her military debacle. During their occupation the allied powers took steps to eliminate all Nazi materials and employees from the schools. All Nazi textbooks were ordered destroyed and more democratic ones procured.

Grundschule. As was stated above, this is a four year school for beginners, and all children attend it. It takes the place of the first four years of the old *Volksschule* and also of the preparatory work of the secondary schools. In it, pupils learn the three "R's" and some of the better German culture. This school, provided by the Weimer Constitution of 1919, was an attempt to lessen the gap between the classes. It has practically eliminated illiteracy.

Secondary Schools. These schools admit pupils after they have had the four years of preparation provided by the *Grundschule*. They are tuition schools, and less than 15 per cent of the German youth attend them. The great majority of pupils continue their education from four to six years in the old *Volksschule* or in some type of *Mittleschule*, in which, in turn, they prepare for the vocational schools. In these vocational schools the pupils complete the thirteenth year of education at about the age of nineteen.

For those select pupils who are preparing for the universities and the professions, there is ample provision through the *Gymnasium*, 466 in number, which is the traditional school with emphasis on the languages; the *Realgymnasium*, 686 in number, with emphasis on Latin and the modern languages; the *Oberrealschule*, 319 in number, dedicated largely to mathematics and science with some emphasis on modern languages; and the *Deutsche Oberschule*, 70 in number, with a curriculum devoted largely to German culture and the arts. In recent years, all schools give some emphasis to German culture. During the 19th century the *Gymnasium* was by far the most important of these schools. In recent decades, however, these traditional classical schools have been giving away more and more to the modern schools with emphasis on science and social studies. These secondary schools are nine year institutions, beginning with the fifth grade. Their work is thus more advanced than that of the secondary school in the United States. While there are some provisions for pupils to pass from the *Volksschule* to these other secondary schools, only a small per cent of the pupils in these higher schools are from the working classes.

It may be noted that in the *Gymnasium* the study of Latin begins in the first year and continues throughout the curriculum of the *Gymnasium*, so that in the aggregate a pupil spends 68 year-hours in the study of this language. The result of this intensive study of Latin is that the average graduate of the *Gymnasium* is able to read any Latin text with ease. As compared with American institutions, these higher schools in Germany secure much more efficient results of the type just described than are secured in American colleges or universities, even among most students who specialize in the classical languages. The advantages of early specialization and continued study of a given subject are thus secured in full measure.

It is the universal attitude of the teachers in the higher institutions in Germany that the training which they give is much superior to that which is given in the American high school. On the other hand, it is to be pointed out that the breadth of training which is given in the *Gymnasium* is relatively less than the breadth of training given in an American school. For example, the opportunities for the study of general history are very slight. So also are the opportunities for the study of natural science. The curriculum of the *Gymnasium* is heavily loaded on the literary side, and, while it is intensive, it is lacking in the possibilities of general training.

The American high school, by contrast, aims at the cultivation of many different kinds of interests on the part of students. The adoption of the elective system in American high schools is in striking comparison with the rigidity of curriculum exhibited in the *Gymnasium*.

Universities. There are 25 German universities. Enrollment of students in 1933 was 88,298 and, in 1935, was 68,148. About 16 per cent of these are women. Of the total enrollment, not more than 4 per cent were from the working classes. In 1934, only 4700 new students were admitted to the universities, of whom 700 were women. No Jews were admitted. Restriction on admissions is motivated by considerations of the difficulty in finding employment. University admission is based on examination on the part of graduates from the *Gymnasium* or other schools of the same level. Universities in Germany are research and professional institutions, not groups of colleges as in England.

The method of instruction is the lecture method. The degree granted by these institutions is that of doctor of philosophy. Commonly, such a degree may be taken by a student only after three years of residence, and very frequently a German student takes a much longer period to complete the work for the degree. It is the habit of the German student to migrate from institution to institution, spending a semester in each of a number of the leading universities, thus coming in contact with the prominent lecturers in the different institutions and fields.

The German student life is relatively free from restrictions. The university has complete jurisdiction over its students. A regular university court

adjusts all matters of student discipline, and the student is answerable not to the city police but to the university court, it being assumed that as a non-resident of the city he is under the jurisdiction of the university rather than of the municipality.

The universities are maintained by royal grants, by student fees, and by appropriation from the state. An instructor receives a certain fee for each student who registers in his courses.

The University Professor. The German university professor is socially of the highest rank. In many instances the rulers of Germany have decorated professors with civic honors. Their salaries are superior to those of any except the governmental officials of highest rank. There is a long period of apprenticeship before the professor can secure his appointment. He is first allowed to give lectures in the university in a capacity which is almost purely private. The title which attaches to his position at that stage is *Privatdocent*. If the young instructor is successful in his lectures at this level, he may be appointed to an assistant professorship, as it would be called in America. Ultimately, from this level he may be advanced to a full professorship.

The universities of Germany have no officer corresponding to the president of an American college. The academic professors meet from year to year and recommend three of their number from whom the Ministry of Education appoints a *rector*. The duties of this *rector*, however, are not at all those of the American college president; he is merely a temporary representative of the academic group without authority over them.

Landjahr. One of the first acts of the Nazi party was to create in 1934 an organization known as the *Landjahr*. The organization was an outgrowth of the Youth Movement founded in 1898, and under Hitler and his Nazi régime it became an effective instrument for molding in the Nazi pattern the attitude of German youth. The 1934 regulation creating the organization provided that all youth in the industrial cities who had completed eight years of elementary schooling must spend the next nine months in the rural districts. The youth were required to make contacts with the land, to learn to work, to see how people live in the country, to obtain physical training, and above all to become enthusiastic Nazis. Persons who spent this period in the organization were given preference when applying for admission to the universities. Most of them, however, found positions or were drafted into the armed services, and did not enter a university. Soon after the beginning of World War II in 1939, the organization was abandoned. It had, however, served a Nazi purpose.

Coeducation. The sexes in Germany attend kindergarten together, and, to a degree, the university. In other schools, as a rule, the sexes are separated. By far the majority of the students in the secondary schools and the universities are men, but the percentage of women students is slowly increasing.

The Training of Teachers. Germany was one of the first countries to require professional training for teachers. In amount of training, its secondary school teachers have for several decades led the world. Most secondary school teachers possess the Ph.D. degree or the equivalent. The elementary school teachers have had between two and three years of training, which is similar in amount to that of the typical teacher in the elementary schools of the United States. The secondary school teachers receive larger pay and have higher social standing than the elementary school teachers. As in the schools of the United States, the elementary school teachers have been struggling for professional and financial equality in comparison with the secondary school teachers. Their efforts have been rewarded but not to the extent that similar efforts in the United States have been rewarded.

Administration. The German system of schools is decentralized; that is, administered and supported largely by the provinces or local states. Local autonomy was almost complete till the coming of the Nazis into power in 1933. Although this status continued to some degree during the Nazi régime, extensive supervisory power was given to the Central government. In control of this supervisory power, Hitler was enabled to change the entire philosophy of German education, to modify the curriculum, and to control the training, the appointment, the promotion, and even the thinking of the teachers. He brought the universities under his supervision, and practically extinguished academic freedom, which has been the historic pride of great universities everywhere.

The Curriculum. In his *Mein Kampf*, Hitler gave specific suggestions for the new curriculum for the schools. In his totalitarian state, which was Germany during this régime, the schools were to be used to indoctrinate the youth concerning the Nazi policies. The following statement summarizes his views on how history was to be taught:

History in the German schools need not be greatly concerned about world attitudes and other nations. More attention must be given to German history. Tacitus was misinformed about the low cultural level of the early Germans. The Nordics have been most important in history. The Germans are pure Nordics. Propaganda and education go hand in hand. History is to be taught to discredit the Republic and to extol the Nazis. It is to be taught not impartially as a part of world history, but as German history.

Such views took firm hold of the German people, and the allied armies of occupation are not finding it easy to supplant the views with democratic ones. They are, however, making progress in these efforts, and it is believed that eventually a democratic school system will serve a German republic.

EDUCATION IN FRANCE

The French school system consists of two distinct branches. The *école primaire* is the common school, and in it attendance is compulsory for all pupils to the thirteenth or fourteenth year. The subjects taught are history, geography, grammar, arithmetic, literature, drawing, manual training, and physical education. Enrollment in this school at present is approximately 5,000,000, of which about 20 per cent attend private schools. The *école primaire* may be followed in the case of the brighter children by the *école supérieur*. At present, about 5 per cent of the children continue their studies in these superior schools. The number of, and the attendance at, these schools has grown rapidly during recent years.

Secularization of Schools. There is one striking characteristic in which the French public schools differ from those of Germany. The French schools do not teach religion. Formerly the Church was dominant in the public schools of France as it was throughout Europe. After many struggles a law was passed in 1881, secularizing the French schools and substituting training in civics and morals for the earlier courses in religion. In 1886 a law was passed providing that no clerical teachers shall give instructions in the common schools. In 1904, teaching by the clerical congregations was suppressed, and public schools were substituted for those which had been controlled by the Church. The laws thus successively enacted provide that no teacher shall deal with religious matters.

Lycées, Collèges, and Universities. The higher schools of France include the *lycées*, the *collèges* scattered throughout the country, and the universities, chief among which is the University of Paris.

The curriculum of the *lycée* is the traditional classical curriculum, and leads to the baccalaureate degree, which corresponds roughly to the American bachelor's degree. Lately a scientific course, corresponding to that of the *Realschule* of Germany, has been organized in some of the *lycées*. About

5 per cent of the population 11 to 18 years in age attend secondary schools. Approximately 150,000 attend the Catholic schools. The *Lycées for Girls* had an enrollment of 48,046 in 1935.

At the colleges, and more especially at the universities, instruction is made easily accessible to all comers. The method is that of the lecture. A great many students attend these lectures without attempting to secure any degree. The degree of doctor of philosophy conferred by the French universities is a higher degree than the degree of the same name conferred by the German universities. Indeed, before World War I, it was so difficult for a foreign student to qualify for this degree that very few such students were to be found in the French universities. Since that War, however, an effort has been made on the part of the French universities to interest foreign students in attendance at French institutions, and certain degrees have been provided with a view to accommodating foreign students to the French system of higher education. There are 17 of these universities in France, of which 5 are Catholic.

Control. The control of the French educational system is vested in a ministry of the central government. This minister of education prescribes in great detail the courses of study and the form of organization of all the institutions. Support of the lower schools is secured from taxation, while the support of the higher schools is derived very largely from student fees.

The Training of Teachers. In each so-called department or subdivision of the French state, there is a normal school for the training of boys and another for the training of girls who are to enter the teaching profession in the lower schools. Progress through one of these schools is dependent upon the success of the candidate in passing competitive examinations. Positions in the teaching profession are eagerly sought after, as they are permanent when once secured, and at the end of his professional career the teacher receives a pension for life.

The Training of Teachers for Higher Institutions. The normal school method of training teachers has been carried by France into its higher educational system. There is a special advanced school for those who are to teach in the *lycées* and in the *collèges*. Here the higher subjects of instruction are taught. This advanced normal school now has connection with the University of Paris.

Vocational Education. Attendance at vocational schools is nominally compulsory for part time. Since World War I, attendance has increased very rapidly.

Private Resources of the Universities. The law of 1896 gave the universities the rights of civil persons, that is, the right of accepting gifts and legacies, of holding private property, and of administering it without restrictions. Each university has a budget in which are included the receipts from fees for courses, from registration, and from library and laboratory fees paid by the students in accordance with the regulations. The income from this source may be spent on the following objects: expenses for laboratories, libraries, and collections; erection and maintenance of buildings; establishment of new courses; grants in the interest of students, as, for example, subsidies to student associations. The French universities have not, up to the present time, met with such generous donors as those of the American universities. A good beginning, however, has been made, and at the University of Paris the names of benefactors are inscribed on a marble tablet; while Lyon, Montpellier, Bordeaux, and others have also received important gifts.

ENGLISH EDUCATIONAL SYSTEM

Education in England is much less compactly organized than in France and Germany. England has followed the theory of individual freedom expressed by John Stuart Mill in 1859, which has resulted in a system of education that has three marked characteristics: (a) decentralization of responsibility and control, (b) the use of voluntary agencies in making provision for educational opportunities, and (c) marked freedom of the school administrators and teachers in matters relating to curricula, courses of study, and methods of teaching.

Ministry of Education. Historically, the United Kingdom consists of four distinct national units, England, Wales, Scotland, and Northern Ireland. Administratively, England and Wales comprise one unit and there are accordingly three distinct educational administrative systems in the United Kingdom. The Ministry of Education in London has no authority in Scotland, where the Scottish Educational Department is the appropriate department, and Northern Ireland has its own Ministry of Education.

The Ministry of Education in England, which displaced the old Board of Education, operates through its inspectors, whose headquarters are located in the areas wherein their work lies. The central authority is concerned chiefly with external features of the school rather than with internal matters, and, although their authority is final in some cases, there is a marked degree of local autonomy.

In the absence of a strongly centralized educational system, numerous voluntary agencies, including philanthropic societies, church organizations, and private enterprises of various kinds, supply educational facilities for the youth of England. This has given rise to "vested interests," whose contributions to the educational traditions of England must be reckoned with in any study of the educational system.

The administrators and teachers generally enjoy an unusual degree of freedom within their institutions. Teachers are not civil servants, that is, they are not servants of the state. They are employed and paid by the local authorities, and are subject to them rather than to the Ministry of Education. The latter serves only in an inspecting and advisory capacity. This practice is gradually producing greater homogeneity among the schools of England.

Types of Schools. School attendance is compulsory in England from the ages of 5 to 15 years. Two types of schools provide the necessary educational facilities for the children who come within these age limits. The first of these types is that provided by the local educational authorities. These schools are called *Provided Schools* or *Council Schools*, since they are provided by the local councils. In England and Wales, more than 6,850,000 children attend these publicly-maintained schools. The second type of school is provided by voluntary groups such as the Church of England or the Roman Catholic Church. Such schools are called *Voluntary Schools*. These schools may be aided financially by the government or they may be entirely independent. Of the approximately 9 million students in full-time attendance at schools, over 90 per cent attend publicly-provided or aided schools.

Both of these types of schools, or such of them as are recognized by the Ministry of Education, are maintained by the local educational authorities. Maintenance includes salaries for teachers, books, supplies, and equipment whether the school be Provided or Voluntary. Voluntary bodies must supply their own buildings and keep them in repair, but if they accept public grants they must submit to inspection by the Board of Education.

Teachers for the Provided schools are appointed by the local educational authorities. Those for the Voluntary schools are appointed by the voluntary bodies, subject to the approval of the local authorities. The latter may disapprove of a teacher only on educational grounds, however.

Religious instruction is given in all public elementary schools. In the provided schools this instruction must be non-sectarian. In the voluntary schools it conforms to the religious beliefs of the body providing the school.

Elementary Schools. Public elementary education in England has long been divided into three stages: the infant stage (from 5 to about 7 or 8 years of age), the junior stage (from 7 or 8 to about 11 years of age), and the senior stage (from about 11 to 14 years of age). Sometimes these three groups have separate schools, especially those in the junior and senior groups, but occasionally they are all grouped together in one school. The latter is likely to occur where the population is sparse.

Since 1926 the organization of public elementary education in England has been undergoing reorganization into primary (from 5 to about 11 years of age), and post-primary (11 to 14 years of age). The object of this reorganization is to make the post-primary schools meet the needs of the older children more adequately than those needs have been met in the past. This has given rise to new types of advanced public elementary schools. The reorganization is not yet complete throughout England.

Nursery school facilities are provided extensively by both public educational authorities and private or voluntary bodies. Such schools care for children between 2 and 5 years of age. Sometimes these provisions for nursery school education are attached to regular elementary schools; sometimes they consist of separate schools.

Secondary Schools. There are two general types of secondary schools—those which give a general education and the technical schools. In the main, the secondary schools provide general education and the most popular of this type of school is the *Secondary Modern School* which gives general education with a practical bias. A secondary school which has come into prominence is the Comprehensive School, which offers all types of secondary education desired by the students. About one-fourth of all secondary school students attend *Grammar Schools*, which are for students who hope to go to a university. Secondary Technical Schools offer education related to industry, commerce, and agriculture. The Public Schools are characteristic English schools. Most of these are Independent Schools. Some Public Schools, such as Eton, Harrow, Winchester, and Rugby, are famous in the history of English education.

Many secondary schools are not open to girls, the latter having secondary schools of their own. In the case of provided schools, local educational authorities decide how selection will be made to its secondary schools. More and more secondary schools are now being opened to girls.

Vocational Education. England provides a wide variety of opportunity for students wishing to specialize in particular vocational or technical school. Hence there are numerous technical, commercial, and art schools and colleges especially designed to meet this need. These schools enroll approximately one million students annually.

Adult Education. The movement for adult education began with university extension lectures at Cambridge in 1873. Since that time the movement has swept throughout England and is today furnishing thousands of classes for adults by means of universities and university colleges, voluntary organizations, local educational authorities, collegiate and other institutions, and charitable trusts.

The Examination System. The higher educational system of England is not as exclusive as the systems on the continent. England is unique in the fact that it has a system of examinations by which children who are especially competent and who have taken their lower training in the common, or board, schools may transfer, when ten years of age or older, to the secondary schools.

In this way England has succeeded in recruiting its upper classes from the lower levels of society much more liberally than have any of the other European nations. It is the pride of England that its civil service officers are drawn from all levels of society, and this fact is to be explained by the examination system just described. Matthew Arnold (1822–88), who was a school inspector, gave a name to this examination system which is commonly used everywhere in England. He called it the "educational ladder."

Municipal Secondary Schools and Universities. In recent years there has developed very rapidly in the great industrial cities of England a series of schools known as "municipal secondary schools" and "municipal universities." These institutions differ from the older secondary schools and universities in the fact that they lay much greater stress on the physical sciences and the practical engineering subjects. There has come up accordingly a sharp cleavage between the older classical type of training and the newer scientific type represented by these newer institutions.

Oxford (1110 or 1120?) and Cambridge (1229). At the head of the conservative type of higher education are the two great universities, Oxford and Cambridge. Both these universities were established in the medieval period, and are made up of separate colleges. These separate colleges can be traced back to religious orders. The whole organization can be understood by observing that the English university is an assemblage of living quarters or fraternity houses that have descended from the religious communities which originally established many of the colleges. As time went on, new colleges were established and endowed by wealthy patrons, some of them royal personages. The English university system thus provides for an intimate social life on the part of its students. The lectures which are conducted in these institutions are not regarded as the major contribution to the student's training. A tutorial system has gradually been evolved, which provides for each undergraduate the opportunity to associate intimately with a tutor who guides the student's readings and who engages him in discussions of what he has read. The student attends such lectures as interest him, but in the main his business is to read and to work independently in the field of his choice under the supervision and partial guidance of his tutor.

The result of this system is that a great many boys attend Oxford and Cambridge with no intention of studious effort. They go to the college merely for the purpose of spending a few years of their youth in pleasant intellectual surroundings. For these young men the college has a so-called "pass" course. On the other hand, those students who devote themselves to strenuous intellectual effort take what is known as the "honors" course. The examinations in these courses are very rigid, and the standards are so high that only a well trained specialist can complete the course.

The Rhodes Trust was founded in 1902 by Cecil Rhodes to provide scholarships to Oxford for 66 men annually. Thirty-two of these are selected from the United States. The Yearbook of Education, 1937, lists seventeen other large educational trusts in England and Scotland.

Examining Universities. There are also in England certain examining institutions. Thus the University of London is not altogether a teaching institution; it awards degrees to candidates who present themselves for examination after independent study in some particular field.

The Fisher Act. During World War I, English enthusiasm for a more liberal type of education ran very high, and there was enacted into the law by the British Parliament an educational code known as the Fisher act. This code provided that every child in Great Britain should be under the supervision of the Ministry of Education until the age of 18 years. The ministry was empowered to develop certain forms of industrial education for many of the pupils and to supervise the employment of all those children less than 18 years of age who were taken into the industries of Great Britain.

The plan laid down in the Fisher act has never been put into actual operation. The costs were found to be too great, and a commission which canvassed the matter reported that it would not be possible under economic conditions then prevailing to begin operating under the act. In 1929 Parliament took action increasing the age of compulsory education to 15 years, thus proceeding with the Fisher program.

Training of Teachers in England. England has numerous institutions for the training of teachers for the lower schools. These institutions are known as teacher training colleges. They are maintained in part by the localities in which they are situated, and in part by grants made by the central board of education for the maintenance of the individual students who are taking the courses.

New Education Bill. In 1944, Parliament enacted a new Education bill which reconstructed the whole system of public education in England and Wales. By this bill the school-leaving age was raised to 16 in 1947. The previous distinction between elementary education, which was compulsory for all, and secondary education, which was limited to pupils who could pass an entrance examination, was abolished. The school system was reorganized into three continuous parts—Primary, Secondary, and Further. In addition to these three parts, nursery schools were to be established by all local education authorities where there is sufficient demand. Attendance at these nursery schools, however, is not made compulsory.

The primary stage remains much as formerly, and includes children between the ages of 5 and 11. Secondary education is available to a much larger number of children and in a larger number of forms for children of various aptitudes.

The term "further education" includes university courses of all types, adult education, and compulsory part-time schooling for boys and girls under 18 who are no longer obtaining full-time instruction. The part-time instruction is given in new "Young People's Colleges," which are organized by local school authorities, and at which instruction is compulsory for at least 44 days in every year. In these colleges, the facilities for technical education are greatly increased.

Although England was already a leader in its provisions for pupil welfare, the new Education bill greatly extends such provisions. The provision for special education for the physically and mentally handicapped is enlarged. And provisions for religious instruction—denominational or undenominational—are made in all schools. In all primary and secondary schools the school day begins with worship. Schools containing pupils with various denominations follow an "Agreed Syllabus" in their religious instruction.

It is worthy of note that England enacted this legislation in 1944, during the dark days of World War II. By so doing she indicated to the whole world the importance of education. And she taxed herself more severely to meet the added cost entailed by the legislation.

RUSSIAN EDUCATIONAL SYSTEM

Education in Russia is a state monopoly. There are no church or private schools. Each of the sixteen republics which make up the U.S.S.R. has its own ministries of education, but these are subordinate to the central ministries which control education throughout the country.

The ministry of culture organized in 1953 is responsible for the organization of and teaching in all specialized secondary schools and the agricultural institutes.

A second central authority, the Ministry of Labor Reserves, controls all lower vocational education, including factory schools, but does not maintain them.

The local authorities are charged with the maintenance of pre-school institutions, primary and general secondary schools, and with adult education. The latest available statistics show that 60 per cent of educational expenditures are paid for by the local authorities, 19 per cent by the republics, and 23 per cent by the central government.

The educational system of Russia comprises the following types of schools: elementary schools, secondary schools, colleges, technical schools, workers' schools, and apprentice schools. Compulsory education extends from the age of 7 to 15, but is universally enforced only for ages 7 or 8 to 12. Kindergartens are provided for children of 3 to 7 but attendance is not compulsory, and only about 6 per cent of children attend.

Organization. Generally, the schools of Russia are organized on a 4-3-3- plan with completion of the program leading to the University or Institute. Children may enter Kindergarten from age three to seven years. Primary schools usually are four years in length although in some areas the schools have seven grades including both primary and secondary education.

The school system is uniform throughout the country in that all education is directed towards service to the state. All nationalities are permitted to use their mother tongue as a medium of instruction in their schools, but the Russian language is compulsory as a second language, beginning in the second grade, in all non-Russian schools. Public instruction everywhere is secular. Effort is made to establish separate schools for boys and girls.

A few pre-school institutions and those for adult education are maintained by trade unions, cooperatives, and collective farms, but they are under the strict control and supervision of public authorities. Primary schools are provided for all, and attendance is compulsory. Schools for the Liquidation of Illiteracy are provided for adults. Great numbers of advanced students assist in the work of these schools as a part of their service to the state.

On the secondary level, in addition to a wide system of secondary schools, are technical schools and "Workers' Faculties." The Workers' Faculties, called Rabfacs, were organized to give systematic preparation to experienced workers who were not ready for regular college work. On the higher levels, not only are there no tuition fees, but the students are supported, and, after graduation, employment is assured. Schools are open to all classes, and 75 per cent of students in the higher schools belong to the working classes.

In higher education there are two basic establishments—the University and the Institute. The university aims to train scientific workers with a view to research or to teaching in the secondary schools. Universities are divided into faculties, the most numerous of which are the faculties of physics, mathematics, philology, history, geography, biology, and chemistry. The course of study in the University usually lasts five years. Each of the republics has at least one university.

The Institutes teach special subjects such as medicine, pharmacy, mechanics, and mining. At the end of a course the student takes a State examination.

COMPARATIVE EDUCATION

The United Nations Educational, Scientific, and Cultural Organization (Unesco) is entrusted with the task of promoting the advancement of education throughout the world. In its efforts to fulfill this mission, Unesco has included in its program various provisions for the exchange of information about educational methods, activities, and achievements in different countries.

Comparative education, it points out, is a relatively new branch of the science of education which attempts to study educational conditions in different countries, so that increased understanding of those conditions and developments may stimulate

and contribute to the general improvement of education in all countries.

"Educational concepts and movements," it goes on to say in its recent publication *World Handbook of Educational Organization and Statistics*," though often characteristically national, have a way of traveling across frontiers. This process is as old as the history of education. Plato's ideas on education, originating in ancient Athens, are today a part of the universal heritage of mankind. So are also, in proportion to their recent origin, the educational theories of John Dewey growing out of the contemporary needs of American life. In the intervening 2400 years the amount of mutual borrowing has been so extensive that no treatise on the history of education has yet done full justice to it."

In some cases this educational exchange has taken the form of wholesale copying of methods of organization, of courses of study, of school programs, and even of text books. Unesco notes that students of comparative education rightly look with suspicion at wholesale borrowing and adoption by one country of the ideas and methods developed in another, because educational theories and practices develop as the result of the needs of the country where they originate, and there is danger that they may, to a greater or lesser degree, be unsuited to the country which adopts them.

In view of the prevalence of the practice, however, Unesco saw the needs for international statistics relating to the study of comparative education, but encountered difficulties in collecting up-to-date and reliable data for the intelligent appraisal of the educational conditions and achievements of different countries. While such statistics have become increasingly available through the efforts of national and international agencies, they are still unsatisfactory.

International Statistics. "The development of educational statistics," Unesco states, "has lagged far behind the statistics in other fields. The reasons for this are not hard to find. In the first place the regular collection and publication of statistics on a national scale has been a matter of slow and uneven growth in most countries. Subjects of more immediate need and tangible value, such as figures relating to territory and population, births and deaths, agricultural and industrial production, domestic and foreign trade, prices, wages and the cost of living are usually dealt with first. Statistics on education, public health, and other social services are either left out altogether, or prepared in a very rudimentary and summary form."

In the next place, Unesco proceeds to point out, education in many countries is still in the hands of local authorities or is a matter of private enterprise. Accordingly, except in those countries where there is a high degree of centralized control over education, the national government often finds itself unable to collect complete statistical information from all local or private schools. For this reason, even the most diligent efforts of the central administrations frequently fail to meet the most elementary requirements of completeness, recency, and comparability.

"Finally," Unesco concludes, "educational ideas and methods, though susceptible of international exchange, cannot always be reduced to quantitative expression. On the other hand, such quantitative data as numbers of schools, teachers, and pupils are not suitable for direct international exchange. International requirements for the exchange of currency or commodities, for example, create a direct demand for such statistics on the international level. They even impose a certain degree of uniformity or comparability on the nationally collected statistics. But the need for international exchange of educational ideas and methods is only partially and indirectly met by the collection of statistics. Hence there is not the same sense of urgency regarding their international collection or standardization.

"Thus far, the attempts of international organizations to obtain the desirable statistics on education for international collections have often run far ahead of the actual availability of such statistics."

Illiteracy in Certain Countries. Some notion of the extent of education in a country is gained by examining the per cent of illiteracy of the country. The elimination of illiteracy is dependent on the establishment of schools and the enforcement of compulsory attendance laws. Countries which have longest made those provisions have the smallest amount of illiteracy. During recent years, every nation has been making an intensive effort to eliminate or decrease illiteracy.

ILLITERACY IN VARIOUS COUNTRIES OF THE WORLD*

Date	Country	Age group	Per cent
1948	Algeria	Moslem 10 and over	94.0
		European	7.7
1950	Angola	10 and over	16.0
1947	Egypt	10 and over	74.5
1952	Mauritius	5 and over	48.7
1950	Port. Guiana	10 and over	99.7
1954	Reunion	14 and over	55.1
1946	Union of South Africa, Bantu	10 and over	70.9
1946	Barbados	10 and over	7.8
1950	Bermuda	7 and over	3.0
1946	British Honduras	10 and over	16.9
1950	Costa Rica	10 and over	21.2
1953	Cuba	10 and over	23.6
1950	Dominican Rep.	10 and over	56.8
1950	El Salvador	10 and over	57.8
1945	Guadeloupe	14 and over	30.4
1950	Guatemala	10 and over	70.3
1950	Haiti	10 and over	91.3
1954	Honduras	7 and over	66.3
1946	Leeward Islands	10 and over	17.1
1954	Martinique	14 and over	22.6
1950	Panama	10 and over	28.8
1950	Puerto Rico	10 and over	25.6
1946	Trinidad	10 and over	23.7
1946	Windward Islands	10 and over	30.4
1947	Argentina	14 and over	13.3
1950	Bolivia	5 and over	68.9
1950	Brazil	10 and over	51.4
1946	Br. Guiana	10 and over	21.8
1952	Chile	10 and over	19.4
1951	Colombia	10 and over	38.5
1950	Ecuador	10 and over	43.7
1954	French Guiana	14 and over	26.6
1950	Paraguay	10 and over	31.8
1950	Venezuela	7 and over	51.1
1946	Aden	10 and over	78.6
1947	Brunei	10 and over	73.9
1954	Burma	10 and over	42.7
1946	Ceylon	5 and over	42.0
1946	Cyprus	7 and over	35.7
1951	India	10 and over	82.1
1948	Israel	5 and over	6.9
1947	Malaya	15 and over	61.7
1951	North Borneo	10 and over	84.0
1948	Philippines	10 and over	37.8
1950	Ryukyu Islands	10 and over	25.2
1947	Sarawak	10 and over	83.4
1947	Singapore	15 and over	54.1
1947	Thailand	10 and over	46.3
1950	Turkey	10 and over	65.4
1947	Belgium	10 and over	3.1
1946	Bulgaria	15 and over	24.2
1946	France	10 and over	3.3
1951	Greece	10 and over	23.5
1949	Hungary	6 and over	5.9
1948	Malta and Gozo	10 and over	39.7
1950	Portugal	10 and over	41.7
1953	Yugoslavia	10 and over	25.0
1951	Cook Islands	10 and over	11.4
1951	Niue	10 and over	6.9
1951	Tokelau	10 and over	6.7
1951	West Samoa	10 and over	14.0

Source: Statistical Yearbook, 1957. UNESCO.

*Most European countries, Canada, the United States, Japan, and Australia and New Zealand have ceased to ask for information on illiteracy, as the percentages are negligible.

EDUCATION IN THE UNITED STATES

THE PUBLIC SCHOOL SYSTEM

Wide Diversity of Schools. The present public school system in the United States is the result of the extension of the concept of the common school of colonial times. It now includes the vast majority of elementary and secondary schools of the country and in some instances has extended even to the university level.

Education is considered to be a state function and all institutions included within the public school system of the United States are under the control of the various states. As a result there is a great diversity of practices and standards. To safeguard education and to achieve the objectives set for it, people have insisted on provisions in State Constitutions and statutes quite different from those for other governmental services. States have followed a practice of treating the educational organization as a separate domain governed by laws peculiar to it and designed to keep control of education by the people themselves. Some similarity of organization has resulted from the national tendency to imitation, which leads a given institution to follow the example of similar institutions about it. Too, the decisions of the courts have established a body of common school law which has tended in some measure to render uniform the practices of different communities. Furthermore, private organizations have developed standards which have helped to influence the uniformity. In the main, however, despite the elements of commonality which exist, variety rather than uniformity is characteristic of American schools.

Absence of Federal Control. As has been pointed out in earlier sections, there is no central Federal control of schools in the United States. The Constitution makes no provision for participation by our Federal government in school activities. The result is that each of the states has gone its way without interference or supervision from the central government. The only way in which Federal authority has entered into educational matters is through subsidies of various forms, given either to the states or to particular types of institutions within a state.

The United States Office of Education. In April 1953 a new department of the Federal government, the Department of Health, Education, and Public Welfare took over the old Office of Education, which was a special bureau in the Department of the Interior. This office prepared and still prepares elaborate statistical reports, which have been so frequently drawn upon in the course of the earlier discussions of this section that it is hardly necessary to do more than refer to its statistical activities. It has absolutely no authority over public schools. It does not have authority even to demand statistical reports. In spite of this handicap, however, it has succeeded in developing the most valuable educational reports published by any government in the world. The United States Office of Education has been given the responsibility for the administration and supervision of various Federal laws related to education. This function has become increasingly important in recent years as these laws provide considerable Federal funds for public schools. In addition, the Office of Education often takes leadership in the promotion of national interest in education or co-operates with private, state, and local groups in studies of educational needs.

THE STATE AND THE LOCAL DISTRICT

Within the states very large authority has been left to the local district. Originally the entire control of the school was in the hands of the local district. Even the definition of the boundary of the district was a matter of relatively little concern to the state as a whole, because in the early days communities were so distinct from one another that their boundaries were obvious and natural. It was only after the states came to be somewhat thickly populated that problems of school support and school efficiency which concerned the larger community began to arise and the states assumed the authority which belongs to them. We find, accordingly, that schools were at first controlled by local officers rather than by the sovereign state. The result is that the states seem of late to have taken away from the local districts rights which the latter had long exercised.

Authority of the State. The movement toward centralization of authority in state departments of education has in some cases created friction with communities which regard this modern policy as a usurpation of their rights. Constitutionally, there can be no doubt that the state has a right to prescribe to the local districts in any degree which it will. Legislatures have been given power by State Constitutions which makes them the most important policy-making agent for education in a state. Legislatures establish the framework for education; they determine the scope of the system; they determine how public education is to be supported; they make direct appropriations for education; they create educational institutions; and they determine whether or not certain educational programs are to be authorized, expanded, decreased, or eliminated.

The Legislature usually authorizes a State education department to administer its policies. It may, however, provide for a State board of education to advise it regarding policy and to administer the educational program. The central agency may define the extent of the local district and may determine in all detail what shall be done within this district. While this is the constitutional right of the state, the practical fact is that the local district conducts its schools in very large measure according to its own desires, and local officers often look upon state supervision as indefensible interference.

Certification of Teachers. A conspicuous illustration of increasing state control is to be seen in the matter of the certification of teachers. In the colonies and in the older states the community selected the teacher. The trustee or the committee of the district not only employed the teacher but determined whether the qualifications of a given candidate were satisfactory; in other words, the local officers licensed the teacher. When the states began to organize more compact school systems, it immediately became apparent that local districts are not competent to license teachers. The judgment of the trustee is frequently biased by purely personal considerations. The various states, therefore, gradually assumed more or less control in this matter.

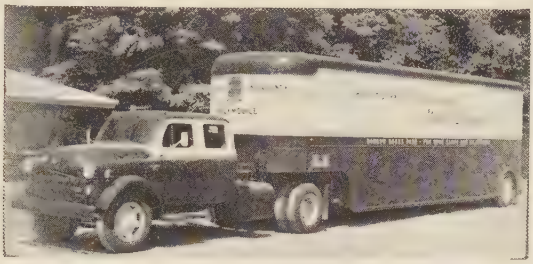
Since the assumption of control has been gradual and partial, there are a great many different practices in different parts of the country. There are still local districts which virtually select their own teachers without any large degree of state supervision. In many other cases a unit smaller than the state but larger than the local district has the power of certification. Especially common is certification by the county superintendent. The general tendency, however, is to prescribe by state law the qualifications necessary for a license to teach, and to enforce the requirement through the state department of education.

The results of the older and looser system are present, however, on every hand. A major reason for this has been the continued shortage of qualified teachers. The N.E.A. estimated that in 1960 the supply of beginning qualified teachers was less than one half of the demand. This, coupled with the fact that only about 73 per cent of graduating students, qualified to teach, enter teaching, provides a dismal picture of teacher supply. At the present time one

Harvard's modern Lamont Library reflects the spirit of an institution that readily combines current business research with traditional scholarship.

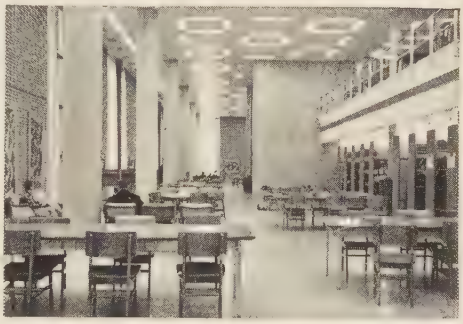
The Library of Congress, on Capitol Hill, is the world's largest library building. Its book shelves are 250 miles long. The library houses important documents.

LIBRARIES IN THE UNITED STATES

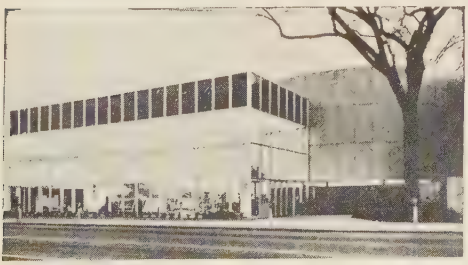


The "Library on Wheels" that seeks out its patrons is illustrated by this Bookmobile operating in Buffalo and Erie County, New York.

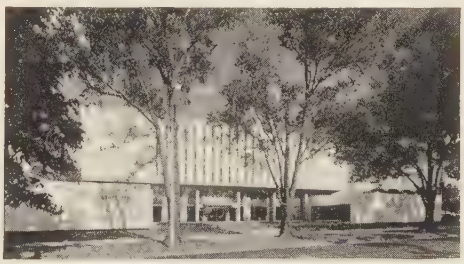
The new Public Library at Phoenix, Arizona is the key structure in a group of buildings dedicated to various cultural pursuits.



The new Pius XII Memorial Library at St. Louis University facilitates study and research through the latest improvements in lighting and equipment.

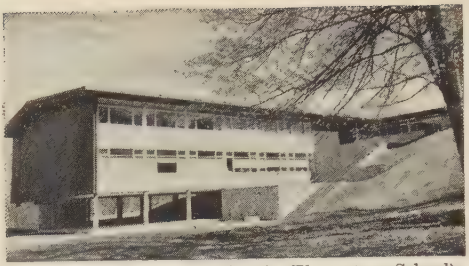


Extending public library service to surrounding areas has resulted in city-county mergers. The Charlotte-Mecklenburg County (N.C.) Library, above, illustrates this development.



Distinctive in its modern design and attractive in its setting, the Louisiana State Library at Baton Rouge invites visitors and patrons.

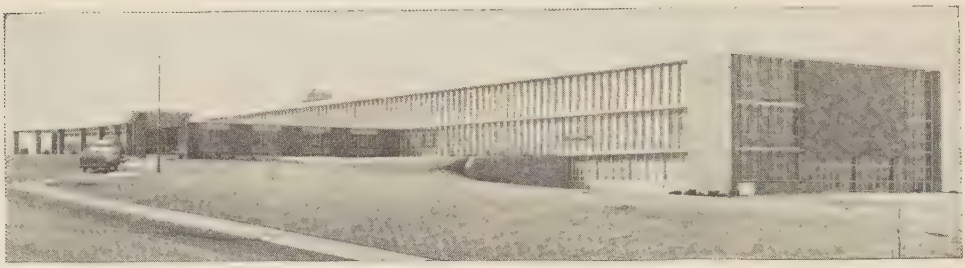
Welsh Valley Jr. H.S., Ardmore, Pa. (A Junior High)



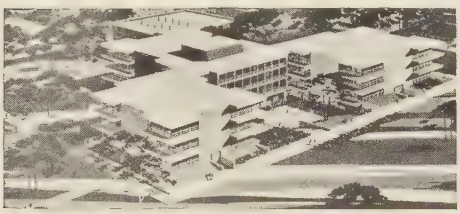
Hoyt School, Madison, Wis. (An Elementary School)

Children's Retreat & Training School, Grand Rapids, Mich. (A Special Services School)

MODERN SCHOOL BUILDINGS



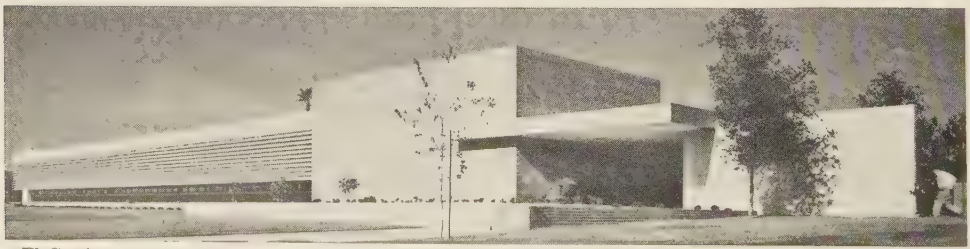
Shawnee-Mission East H.S., Prairie Village, Kansas (A Senior High)



Byrd Elementary, Chicago, Ill. (A large city Elementary)

North Shore H.S., Glen Head, L.I., N.Y. (A Jr-Sr. High)

Vincent G. Kling, Architect



El Camino (Calif.) College, Music & Commerce Complex (A Junior College)

Smith, Powell & Morgridge, Architects

TRENDS IN NUMBER OF SCHOOL DISTRICTS 1931-32 TO 1960-61

State	1931–32	1939–40	1949–50	1960–61	Per cent of change 1931–32 to 1960–61
Alabama	112	111	108	114	. . . . .
Alaska			27	29	0.0
Arizona	500	405	274	297	40.6
Arkansas	3,193	2,907	421	419	86.8
California	3,589	2,993	2,381	1,656	53.8
Colorado	2,041	1,868	1,533	340	83.3
Connecticut	161	169	172	177	. . . . .
Delaware	17	16	17	93	. . . . .
Dist. of Columbia	1	1	1	1	0.0
Florida	67	67	67	67	0.0
Georgia	272	1,203	186	198	27.2
Hawaii			1	1	0.0
Idaho	1,418	1,195	810	137	90.3
Illinois	12,070	11,996	4,880	1,607	86.6
Indiana	1,292	1,156	1,056	900	30.3
Iowa	4,870	4,869	4,652	1,575	67.6
Kansas	8,748	7,394	5,257	2,414	72.4
Kentucky	384	262	237	211	45.0
Louisiana	66	67	67	67	0.0
Maine	518	510	492	460	11.1
Maryland	24	24	24	24	0.0
Massachusetts	355	351	351	378	. . . . .
Michigan	6,965	6,466	4,918	1,977	71.6
Minnesota	7,773	7,685	7,116	2,410	68.9
Mississippi	5,560	4,954	3,673	150	97.3
Missouri	8,764	8,661	6,273	1,732	80.2
Montana	2,439	2,066	1,381	1,050	56.9
Nebraska	7,244	7,063	6,769	3,560	50.8
Nevada	266	255	196	17	93.6
New Hampshire	244	241	240	230	5.7
New Jersey	552	559	559	588	. . . . .
New Mexico	98	1,730	107	91	7.1
New York	9,467	6,433	3,929	1,292	86.3
North Carolina	200	171	172	173	13.5
North Dakota	2,228	2,274	2,250	1,070	51.9
Ohio	2,043	1,668	1,509	862	57.8
Oklahoma	4,933	4,174	2,176	1,274	74.1
Oregon	2,234	2,015	1,179	510	77.1
Pennsylvania	2,587	2,535	2,524	958	62.9
Rhode Island	39	39	39	41	. . . . .
South Carolina	1,792	1,738	1,559	109	93.9
South Dakota	3,433	3,429	3,401	3,012	12.2
Tennessee	194	162	148	154	20.6
Texas	7,932	5,664	3,324	1,531	80.6
Utah	40	40	40	40	0.0
Vermont	268	60	265	267	0.3
Virginia	125	124	127	130	. . . . .
Washington	1,792	1,411	591	415	76.8
West Virginia	450	55	55	55	87.8
Wisconsin	7,662	7,392	5,792	2,400	68.6
Wyoming	400	375	316	212	47.0
Total United States	127,422	116,999	83,642	37,475	70.5

N.E.A. Research Bulletin February 1962.

TRENDS ON ONE-TEACHER SCHOOLS 1917-18 TO 1958-59

		1917–18	1927–28	1937–38	1947–48	1958–59
One Teacher Schools to Total Number of Public Schools	Per Cent Number	70.8 196,037	60.9 156,066	50.0 121,310	44.0 74,844	19.5 23,695
Teachers of One-Teacher Schools to Total Number of Public School Teachers	Per Cent	31.0	19.0	13.8	8.7	1.8

Source: N.E.A. Research Monograph 1960 M. 1. June 1960.

teacher in fourteen is an "emergency" or unqualified teacher. Many states still have standards which allow people to teach with less than a college degree.

Compulsory Attendance. In other respects, as well as in the employment of teachers, the state has found it necessary to assume control over the local districts. For example, the state has enacted compulsory attendance laws. This has been necessary because some districts are negligent and allow their children to grow up without proper schooling. When these children become adults, it is not the local district alone which suffers, but the whole commonwealth. The state can be economically and socially efficient only if its citizens are trained. The state, therefore, takes the local district and the family in hand and compels the education of all children.

The table on page 1664 shows the diversity of practice in different parts of the country in the matter of compulsory attendance legislation. Special attention is called to the dates at which the different states acted in this matter. No clearer example could be given of diversity of organization in the public school systems of this country.

State Departments of Education. Every state now has for its educational activity a chief executive officer, usually designated state superintendent or commissioner of education. In little more than one half of the states this officer is elected by popular vote. In a large number of states he is appointed by a State board of education and in a few others he is appointed by the governor. The majority of states provide in the State Constitution the method of selection of the chief school officers. Consequently, only by revision of the state constitution, in these states, can a change be made in the method of selection. Despite this, 18 states made such a change between 1945 and 1954.

In several of the Western states, especially since women received the franchise, state superintendents have been women.

The state superintendent is frequently associated in the execution of the duties of his office, with a State board of education. Although all of the states have State education boards, the functions of these boards vary widely and so does the relationship of the state superintendent to them.

In every state the state superintendent has organized a department of subordinate officers to help him supervise the educational program. There are wide differences in the functioning of these officers. In some states the central department is very active and powerful, as, for example, in New York and New Jersey. In other states the central control is very slight, as in Iowa and Missouri.

State Participation in School Finance. The state always takes some share in the financial support of schools. Usually there is a state fund, derived from the sale of school lands or from certain forms of taxation, which is distributed to the local districts in proportion to the school population or as an incentive to the organization of some particular form of education, such as classes in agriculture or in physical culture. In some cases the state provides a very considerable proportion of the total expenses of the school system, as, for instance, in Delaware, Georgia, New Mexico, Alabama, North Carolina, and South Carolina. In the majority of states, however, the local districts provide most of the financial support.

Intermediate School Districts. Because most states operate their schools through many small school districts it has been found desirable to organize some sort of intermediate unit for school administration. The intermediate units, operating between the state and local level, include counties, parts of counties and supervisory unions. The main responsibility of the units has not been the operation of schools, but rather the rendering of consultative services, inspectorial functions, and some additional services which a small school district would be unable to provide alone. About 30 states now operate such units and about one half of these have intermediate boards of education.

The Local School District. School districts vary in size and kind throughout the United States. They are organized for the purpose of promoting education within a given area of a state. In some instances the districts are concerned only with the educational program of some special area of education such as vocational education; special services such as health supervision, attendance services, or pupil transportation; or some level of education such as the elementary school or the secondary school. In other cases the officers of the district are empowered to promote all aspects of education. The school district usually has a trustee or a board of education selected from among the citizens of the district to operate the schools. These officers, in turn, usually employ professional educators to help in the running of the schools.

Organization of the Board of Education. In the history of American schools, boards of education have differed greatly in their size and in their mode of conducting business. As cities grew up during the last decades of the 19th century, many school boards became unwieldy bodies. Membership had formerly been on the basis of representation of city wards or on some other basis which led, during the rapid growth of the city, to the expansion of the number of the board to a point where the large size of the assembly made it almost impossible to do business. There has been a marked tendency in recent years, therefore, to reduce the size of the board to seven in the larger cities and to five or three in the smaller cities.

Another major item in this connection is the internal organization of the board. In some cases, boards of education have divided themselves into standing committees, each committee being in charge of some aspect of school work. Thus, a committee on finance and a committee on school buildings have been very common in such cases. Practical experience has shown that such a division of the board very frequently results in the assignment to these standing committees of all the business of the board in respect to the matter over which a committee has charge. The board as a whole then loses something of its effectiveness. Students of school organization recommend that boards be not divided into standing committees, and that committees be created only when it is necessary to make a study of some particular problem

Powers of the Board of Education. Where there is a board of education, it is usually elected by vote. Sometimes it is appointed by some civil officer, such as the mayor or the judges. The board of education in many cities is historically descended from a committee of the common council. It is still very common for the board of education to be dependent on the city government in matters of finance. Thus, in New York City the board of education must submit its budget to the board of assessments and apportionments, which has charge of the finances of all branches of the city government. In other cases the board of education is constituted by state charter into an independent taxing body. This is true, for example, in the city of Denver, Colorado.

Among the important powers and responsibilities usually assigned to boards of education are the following: to provide facilities for the education of children; to determine who shall attend the schools and the discipline in the schools; to employ and discharge professional personnel to teach or administer in the schools; to develop rules and regulations for the running of the schools; to determine courses of study and instructional materials within the framework of state regulations; and to determine, within some limitations, the financing of the educational program.

The Superintendent of Schools. The relation of the board of education to the officers which it ap-

points has never been worked out with satisfactory clearness. The superintendent of schools is sometimes the executive officer of the board; that is, he carries out the resolutions of the board and is very definitely restricted in his activities by the votes of the board. In other cases the superintendent has powers assigned to him by law and is, in certain functions, independent of the board. For example, in the city of Saint Louis, Missouri, the superintendent of schools is empowered to nominate all teachers. The board of education can act in the appointment of teachers only on the nomination of the superintendent. In some other cities it is possible for the board of education to make appointments without even consulting the superintendent.

The relation of the board of education to the building principal and to the teacher who has charge of the individual classroom is ordinarily indirect. In most cases the superintendent is authorized by the board to direct the activities of these persons. On the other hand, there are cases where the board of education exercises direct supervision over the details of school organization. In general, this is regarded by students of school problems as a bad form of organization. It survives from the time when the lay officials of the school were in full charge of the employment of teachers and the equipment of the classroom.

In larger and more populous school districts, the superintendent often is assisted in his work by staff specialists. These may include persons given special responsibility for directing staff personnel and pupils activities, co-ordination of curriculums, or handling of any other of the many details of administration of the school program, which, in smaller districts, are assigned as a part of the superintendent's work.

The Business Manager. Boards of education have frequently found it advantageous, especially in the larger cities, to appoint an officer whose duty it is to carry on all of the business operations of the schools, such as purchasing supplies and keeping accounts. In many instances, this business manager has been made independent of the superintendent, on the theory that the superintendent is in charge of instruction, while the business manager is in charge of material equipment. Such a separation of business management from the instructional activities of the school is unfortunate, since the material equipment is always provided with a view to meeting educational needs. The best practice is that in which a special business officer is made responsible to the superintendent and through him to the board. In the smaller towns, it has been found advantageous to give the superintendent direct charge over the business organization of the schools.

Transportation of Pupils. A recent phenomenon of public education has been the consolidation of schools and school districts in rural areas. In a little more than twenty years, more than two-thirds of the one-room schools have been abandoned. In the same period of time the number of school districts has been reduced by more than one half. As consolidation has gone forward, the communities receive compensation for additional expenditures in the form of enlarged opportunities for rural children. It is perfectly clear that rural communities are increasingly demanding a share in the social facilities which were formerly restricted to the towns and cities. The development of consolidated school districts with schools having superior facilities has in some states followed the adoption of laws which provided at first only for transportation from rural districts to the centers where high schools existed.

With the advent of consolidation of small school districts the transportation of pupils has become increasingly important. Approximately thirty-five per cent of all children attending school are transported from their homes to the school. Both private and public carriers are used to transport children to school. Many school boards have provided district-owned school buses for school children. Elaborate organizations are now provided for training of bus drivers and maintenance crews, routing of buses, and directing the program for efficiency and for the maximum safety of the children.

The School Lunch Program. As increasingly larger numbers of children have been transported long distances from their homes to attend school, it has become desirable to provide lunchrooms for them. Schools have therefore organized cafeterias to supply an adequate place for children to eat and also give opportunity for the children to get a "warm" meal. Since 1935 the Federal government has encouraged school-lunch programs in public schools by giving cash grants and allotting surplus commodities for school-lunch purposes. At the present time, an average of about one-third of the pupils attending public school are served by school-lunch programs.

School Advisory Committees. Recently changes have taken place in school districts, the number of members of school boards has decreased, and the problems associated with meeting the needs of the schools have become more complex. Because of these things, school boards and their administrative officers have often felt the need for help as school problems are studied. Therefore, informal committees have been formed to advise boards of education about methods desirable to solve particular problems. Particularly useful have been advisory committees which have helped boards to decide the proper types of school buildings desirable for a school district. These committees often give good advice about the selection of sites, sizes of schools, how to encourage approval by school patrons, and means for financing the schools. Other school affairs about which advisory committees have helped boards of education, are salary schedules for teachers, curriculums, grading systems, and personnel policies.

THE ELEMENTARY SCHOOL

Enough has been said of state educational organizations to make it clear that the schools of the United States are characterized by local differences. With this general qualification in mind, the following statement may be made with regard to the typical form of school organization in this country. In the main, the system is a *unit system*, that is, there are no parallel lines in the lower grades, as there are in Europe, designed to keep apart different classes of the population. All pupils begin in the same elementary school and progress into the high school.

Curriculum of Elementary Schools. The elementary school is usually divided into what is called lower primary and upper primary divisions. The lower primary division commonly consists of three grades. These three grades introduce the pupil to the work of the school and teach "the three R's." They also give the children some opportunity to cultivate observation of nature and to learn something of the fundamental laws of health. Following the primary training, the elementary-school program becomes very different in different parts of the country. The course of study varies and includes subjects which have gradually been added in the course of the development of American schools.

The following table shows the development of the elementary school subjects from the time of the first schools to the present. It will be observed that, when new subjects are added, the old ones are nearly always retained. Of course, innumerable changes of a practical nature have been made in the content of the various subjects. Likewise, many improvements have been made in the content of the various subjects and in teaching methods. During recent years there has been a marked tendency for teachers "to teach the child as well as the subject." In part as a result of the Progressive education movement, pupil interests and abilities are being considered by teachers more than ever before. Also, more services, such as health, free textbooks, libraries, guidance, extracurricular activities, lunch

DEVELOPMENT OF THE ELEMENTARY SCHOOL SUBJECTS FROM 1642 TO THE PRESENT

Subjects in 1642	Subjects in 1775
Reading Writing Bible	Reading Writing Arithmetic
Subjects in 1875	**Subjects at Present**
Reading	Reading
Writing	Writing
Arithmetic	Arithmetic
Spelling	Spelling
Conduct	Character Education
Language and Grammar	Language and Grammar
Geography	Geography
History and Civics	History, Civics, and Current Events
Drawing	Art
Music	Music
Nature Study	Science
Physical Exercises	Health Education and Supervised Play
	Safety Education
	Industrial Arts
	Home Economics
	Agriculture
	Commercial subjects
	Consumer Education
	Foreign Language

programs, and transportation, are now being provided than ever before.

Forms and Duration of Elementary Schools. The elementary school in many rural districts is organized in the form commonly known as the one-room school. A single teacher is in charge of the whole curriculum, and promotes the individual children as in his or her judgment they are ready to go forward with their work. In the larger communities the elementary school is graded; that is, the children of different states of maturity and school attainments are assembled in separate rooms, and each room has a teacher in charge of the work in that particular grade. The more highly organized elementary schools usually have, as stated previously, eight separate grades. In the larger cities and in some of the better organized rural areas a single school building often houses duplicate grades. In some of the less thoroughly organized schools, two or three grades are assembled in a single room in charge of a single teacher. With the development of school transportation, many one-room schools or schools with small enrollments have been abandoned and large elementary schools have taken their place. The number of one-room elementary schools in the United States is approximately one-third of that in 1930 and now children in rural areas often ride many miles to attend elementary school.

The elementary school is conducted in different communities for different numbers of days during the year. In the more highly organized states, 200 days a year constitute the regular program. In some rural districts this number is often reduced to 120 days or even less. In the United States there has been a steady trend in the direction of longer school terms.

Control of Elementary Schools. The method of control of the elementary school differs according to the size of the community. In smaller communities school trustees are usually in charge of the school. They have the power to employ the teacher and to provide for the material equipment of the school. The local lay school authorities are elected by the community, either at a town meeting or at a regular election. In the larger communities and populous school districts a board of education usually operates under a special charter from the state and has full administrative authority over the schools. It usually appoints, in addition to the teachers, a principal of each school building and a superintendent. In most cases the teachers and principals are appointed upon the recommendation of the superintendents. In fact, the trend is distinctly toward accepting the recommendations of the superintendent in all professional matters.

In some instances the smaller districts are provided by the state with a supervisory officer. In many of the states the counties are organized having a county superintendent of schools who, like the state superintendent, is usually elected by popular vote.

THE JUNIOR HIGH SCHOOL

In recent years, a radical reform has taken place in the course of study and in the administration of the educational program for children of adolescent years. A new institution, commonly known as the junior high school, has been organized to include what normally would be the lower years of the adolescent period. Most frequently the junior high school includes the seventh and eighth grades of schooling. Often however the 9th grade is included. There were several reasons for this new organization. Formerly the elementary school did not include in its program the advanced studies, such as higher mathematics and foreign language, nor any of the subjects which lead directly into professional training.

The reason why these subjects were originally excluded is that, at the time the elementary program was first formulated, the average pupil usually went to school for only a very short period, and American parents were satisfied if their children enjoyed a relatively meager training in "the three R's" and other rudimentary subjects. Furthermore the example of the common school of Europe was at first strong in determining the practices of American elementary schools, and the common school of Europe, unlike the schools for the better classes, was very limited in its course of study. The American elementary school was originally organized, in respect to its subjects of instruction, with a very meager program, as though it were intended to serve only the common people, although as a matter of fact it has served to train all classes of pupils, including those who are to go forward to higher institutions.

The limitations under which the American elementary school operated in the past have, in recent years, been overcome in some measure through the sheer expansion of the educational system. Children have attended school so much more regularly and for so long a period that they have mastered the rudimentary or common branch subjects and, by the time they have entered the seventh grade, are ready to take more advanced work than they could have taken in earlier years. The demand has come to be very insistent, therefore, that the seventh and eighth grades include the beginnings of work which formerly belonged to the high school.

A second reason for the separate organization of the junior high school resulted from the gradual change in compulsory education laws in America. By these laws children were encouraged to stay in school longer, in most of the states, until the age of sixteen. The organization of a separate middle school above the elementary school grades provided opportunity to allow students to complete schooling close to the sixteen-year age and made a more natural termination point at the end of the ninth grade rather than the eighth.

A third reason was that the junior high school helped to orient the student into the high school program. It has been found that pupils in the seventh and eighth grades are mature enough to be dealt with in matters of discipline and social organization in a fashion wholly different from the way in which primary children and children in the fourth, fifth, and sixth grades ought to be handled. Junior high schools have been organized more

closely along the lines of the high school. The external organization of the grades has undergone a modification in the direction of greater liberalizing of discipline. Pupils have been allowed to move about the building more freely than the younger children, and have been brought into contact with what is known as the departmental organization of their studies; that is, they have a number of teachers who are specialists in the different fields. The departmental form of organization has removed pupils to some extent from the close supervision of a single teacher which is common in the lower grades. Also, it has provided opportunity for more and better instruction in a wider range of subjects more closely related to the upper high school grades.

Curriculum of the Junior High School. In recent years the organization of junior high schools has been advocated on the basis of the unique contributions they can make to the education of children. It has been stressed that children of early adolescent age have certain peculiar characteristics and needs which can be provided for more effectively if the children are grouped separately in a junior high school. The program of studies has emphasized exploration of subjects which in the upper high school grades would be studied more seriously. Guidance of children into fields of interest has become an important aspect of the program. The junior high school enables the pupil to explore many potential fields of interest before he reaches the upper high school grades. At the same time he obtains a background for the subjects he will study in these grades. One of the significant aspects of the junior high school program has been the development of the *core curriculum*. In the core the teacher has a class for a daily block of time longer than one period, problems are studied which involve more than one subject and there is pupil-teacher planning in the development of projects for the course.

Advantages of Junior High Schools. Some advantages of the junior high school can be listed. These are:

1. Children of early adolescent period can be grouped together in facilities especially designed for their education.
2. The curriculum can be broader, and richer learning experiences are provided than in the 8-4 system.
3. Teachers with better preparation teach as subject specialists in the junior high school.
4. Better opportunities are provided for pupils to explore their interests, abilities, and talents in curricular and extra class programs, and to be guided into desired fields for advanced study.
5. Articulation between the elementary school and high school improves with organization of the junior high school.
6. Better building facilities, equipment, and athletic fields can be provided for children of this age group at less cost.

PUBLIC HIGH SCHOOLS

Turning from the elementary school and the junior high school to the high school, which is the highest unit of the public school system, we find diversity of practice and of organization even more pronounced than it was in the lower school.

The high school is typically four years in length and includes grades 9 through 12. However, there are high schools which have from two to six grades. The high school conducts its course with a view to preparing pupils either to enter directly upon the duties of adult life or to enter a college or other high institution. In the past, cities and large villages have been the centers which most commonly maintained high schools. Usually, in order to gain an enrollment large enough to maintain a high school the district has had to be somewhat larger than that which supplies pupils to the elementary school. In recent years rural communities have become very enthusiastic about organizing high schools. There has been considerable consolidation of small districts which maintain only elementary schools so that a high school program could be offered. Also, many school districts with both elementary and high schools have felt themselves to be too small to maintain an adequate high school program and so have consolidated. There are now striking examples to be found of rural high schools which serve districts lying entirely outside of any large centers of population.

Curriculum of High Schools. The courses of study in the high school cover a great variety of subjects. This condition is traceable to the fact that, at this higher level of education, there are few subjects which are regarded as essential to the training of every pupil, and there are evident differences in the individual needs of the pupils. Similarities which appear among high schools in the matter of curriculum arise very largely out of the fact that the tradition of higher education, as borrowed from Europe, is that of a classical training. Foreign languages, especially the ancient, and higher mathematics have therefore long been accepted items in the curriculum of American high schools. Even where the high school is organized by a community which is not preparing its pupils to go into the learned professions, there has been a disposition to continue the classical tradition.

In addition to the classical tradition or in some instances in direct opposition to it, there has been a growing tendency in American communities to provide courses which shall acquaint students with modern civilization. Since the high schools of the country have not been centrally controlled, this desire to enlarge the course of study has expressed itself in the greatest variety of experiments. Courses in science and in literature and in history and civics have been rapidly incorporated into the curriculum.

Commercial and industrial interests of late have demanded better training for those who are to enter these callings and the high school in its effort to meet this new social demand has introduced technical courses. In response to the commercial demand, typewriting, stenography, and bookkeeping have been organized and, in response to the industrial demand, home economics, agriculture, and technical courses have been opened upon an astonishingly large scale. Increasing attention is being given to health, physical education, and aesthetics in the high school program.

The common practice in high school is for a student to graduate when he has completed sixteen units of credit in an approved course of study beginning at grade nine. In small high schools only one or two courses of study may be offered. In the larger high schools the college preparatory course, the commercial course, the vocational or industrial course, and the general course are offered.

Internal Organization of the High School. Ever since the beginning of the high school, there have been movements for revision of its internal organization. Recently Dr. James B. Conant, former president of Harvard University, examined the High School of the United States. He suggested that the high school should provide a general education for all future citizens, give opportunity for adequate training to those who were using the high school for terminal education, and a background for the college-bound youth. He suggested a series of standards in order to make these goals possible. These included having a school of adequate size, having adequate facilities, and having well-trained teachers. His study has led to examinations of these things in high schools throughout the United States.

Another study of the High School sponsored by the N.A.S.S.P. has encouraged sweeping changes in the internal organization of the High School. For some time it has been traditional for classes of the

High School to be organized into periods of 45 to 60 minutes in length with 6 or 7 of such periods constituting a school day. It is now suggested that there need be no uniformity about the length of periods, that some subjects of the high school should have longer periods of recitation than others. Furthermore, it is suggested that students be arranged into large groups of 75 to 150 for lectures in some subjects and that these be co-ordinated with small seminar groups of 15 to 20 students. Large blocks of time for independent study are being advocated in this type of grouping. The exponents of this plan for internal reorganization suggest that approximately 30 per cent of the student's weekly time be spent in large group instruction, 40 per cent in small group instruction, and 30 per cent in independent study. This plan has encouraged "team teaching" in which several teachers plan together the learning activities of the students and teach together, each teacher contributing his special skills.

Another recent innovation in the internal organization of the High School is the "school within a school." In this, a large school is divided into small units. Each unit may have a complete high school program or may have one phase of the total program. The unique features are that each unit has a complete faculty, student body, and administrative organization. The unit functions as a complete school, but shares facilities common with other units. Thus, it is believed that the advantages of the small school and the economies of the large school are welded together.

A third type of grouping of students is the "track" system. In this plan students are grouped homogeniously on the basis of their natural capacity to learn when they enter high school. Then they proceed throughout the high school program with the same group. A high school may have several of such "tracks" each with different content material in the same subjects. The purpose of the track system is to enable students to learn to their capacity. Thus, a group of students in one track may learn much more subject material than another during the same period of time in high school.

The significance of independent study has been emphasized by the development of machines for teaching. Educational psychologists are providing data which prove the value of various types of machines in the learning process. These enable the student to learn many different subject skills while studying independently and using a machine properly programmed for learning.

High School Districts. Some high schools are organized in special high school districts and are controlled by special high school boards. Approximately 7.5 per cent of all school districts maintaining high schools are organized in this way. In this type of school district high school pupils are drawn from several elementary schools. This special high school district may be organized to provide a comprehensive educational program or it may give only a technical or vocational education.

Break between Elementary and High Schools. Where the high school is part of the same system as the elementary schools, it is common for the pupils who complete the work of the eighth grade to pass without examination into the high school. At this point, however, in spite of the unit type of organization, there is a distinct educational break. The methods of instruction and the social atmosphere of the high school are much freer than were those of the elementary school.

The break encountered by students in passing from the lower to the high schools is due in part to the fact that the teachers in the two institutions are entirely different in preparation and outlook. Elementary school teachers have usually prepared for their professional careers in normal schools or teachers' colleges, while, especially in the better grade of high schools, the teachers are college or university graduates. Even though a single board of education controls both schools, and even though there is a single superintendent in charge of the whole system, the elementary school and the high school represent two different types of education. Efforts in recent years have been toward minimizing the effects of the break between the elementary and secondary schools. Organization of the junior high school to retain many characteristics of the elementary school, orientation program which enables the elementary school child to learn about and even participate in the secondary school program before he enters high school, and standardization of admission procedures are ways used to bridge the gap between the elementary and secondary schools.

Types of High Schools. Whenever a community is able to give an enlarged curriculum for its high school, the question arises as to how to provide for the types of courses to be included. The solution to this problem is very different in various places. In certain cities the older high schools were those which devoted themselves to the academic curriculum and prepared students for college. As the curriculum expanded, separate schools were erected for technical and vocational education. Thus there came into being the technical high school, the vocational high school, the trade school, the commercial high school, and other types of special high schools. In other places, high schools such as the Manhattan High School of Women's Garment Trades in New York City or the Textile High School of Wooster, Massachussetts offer specialized curriculums in one or two subjects.

In recent years, the comprehensive high school, which offers both academic and technical programs, has come into favor. The great majority of high schools endeavor to include a wide variety of subjects so that all students will find something of value to meet their interests and needs. In some high schools where enrollments are too small to support certain subjects students are permitted to take them by correspondence and, when the courses are completed to the satisfaction of the school authorities, credits for them may be applied towards high school graduation. In other high schools where the school board cannot financially support equipment for vocational classes, pupils may enroll for vocational subjects and work in nearby factories under the instruction of trade journeymen and the supervision of school authorities.

The High School Unit. The process of standardizing high schools, which began with the report of the Committee of Ten referred to in the historical section, has gone so far as to develop a definite uniformity in the credits administered by these schools. Formerly it was the practice of high schools to give a number of different kinds of courses. Some of these consisted of two class exercises a week throughout the year; others were made up of four or five class exercises. Much confusion arose because of the variable programs of different schools. The colleges and secondary schools of the country were led by the Committee of Ten to approve a plan whereby each course should be of standard length.

In recent years a number of agencies have powerfully re-enforced the movement toward standardization. The result is that a so-called high school unit is now defined as 120 hours of classroom work in the course of a year, and all secondary schools are expected to report their work in these terms. The Carnegie Foundation engaged in a study which defined a unit as representing a year's study in any subject in a secondary school. The Unit constitutes approximately a quarter of a full year's work and the assumption is that the school has grades nine through twelve, is in session from 36 to 40 weeks, and a period is from 40 to 60 minutes in length. The Unit was to consist of at least 126 minute hours. This Unit so defined has grown to be commonly

called "The Carnegie Unit." This study has been very helpful to state departments of education and accrediting agencies which have prepared approved lists of secondary schools and colleges.

Originally, the Carnegie study was made in connection with a plan for granting pensions to college teachers. The administration of pensions required that the foundation should determine when a given institution is an acceptable college. This in turn led back to the entrance requirements of the college, and so to a determination of the type of high school from which the college received its students. The Carnegie Foundation insisted, in its dealings with the colleges, that the entrance requirements should be definitely and clearly standardized.

This was the same demand which was made by accrediting associations and state departments of education. Now, in addition to the activities of these associations which select the higher grades of secondary schools for their approved lists, the state education departments and the state universities are active in preparing lists of lesser high schools which organize their courses in standard units even though they are not able to meet the complete standards of the major associations. The results secured by the preparation of these approved lists is a relatively high degree of uniformity, at least on the quantitative side of the administration of high school courses.

It has become almost universally standard for high schools to graduate students who have successfully completed an approved program of studies comprising 16 units of work beginning in the ninth grade of school. A few high school programs in special subject areas may require more than 16 units.

Methods of College Admissions. Prior to the organization of the standardizing associations, the common practice of American colleges was to administer entrance examinations to all students passing from the secondary school into college. The entrance examination system came to this country from England, where it is the chief means of regulating the work of all educational institutions. It is still the dominant method of college admission in the states east of the Allegheny mountains. The University of Michigan, established in 1837, devised the method of admission by certificate and thus broke away from the examination system of the older American institutions.

The theory on which the University of Michigan proceeded was that, as the highest institution of learning in the state, it had responsibilities which obligated it to provide through inspection and advice for the development, not only of its own courses, but also of the courses of the other institutions in the state. The University of Michigan, therefore, began to send members of its faculty to visit the high schools and encourage them in perfecting their methods of organization. When a student came from one of these inspected high schools he was received into the college as a satisfactory student, because the institution from which he came was known to conform to the requirements of the university. The certificate system has spread rapidly, especially in the Middle West and the West, and is today the accepted mode of college admission west of the Allegheny mountains.

In recent years the use of general intelligence tests has been advocated as a much better device than examination or certification to determine who shall pass from the high school into college. Elaborate studies have been made of the success with which the work of college students can be prognosticated on the basis of their school records, by entrance examinations in the particular subjects, or through general intelligence tests. It has been found that the school record and general intelligence tests are distinctly superior to examinations in particular subjects. General intelligence tests serve also to correct the estimate of the student based on his school record. The school record is determined in many instances by other considerations than native intelligence. Thus, an industrious student who is dull may sometimes make a better record than a bright student who is not attentive to his work. College officials have found it advantageous, therefore, in dealing with students, to collect the information supplementary to the school record, as a basis for the classification and administration of the school body.

Educational Guidance. With the growing complexity of the high school curriculum and with the influx into the high school of a student population that includes a great many different kinds of young people who are looking forward to all sorts of careers, it has become necessary to add to the administrative machinery of these schools agencies which shall be able to give students more advice than was formerly necessary in the choice of studies. As was pointed out in an earlier section, the high schools of 1870 had a very meager course of study, and students were very much of the same type. The very fact that they came to the schools showed that they had selected their careers and were prepared to fit into the very definite régime of the school.

The point has now been reached where nine of every ten children of the country who are of high school age are attending high school. Data from the U.S. Office of Education and the U.S. Census Bureau show that the proportion of youth of high school age staying in school has been steadily increasing and that the level of schooling among the total population has risen significantly in recent years. It is evident that there is no such definiteness in the expectations of students or of their teachers as was common at an earlier date. It is evident, too, that the youth who attend high schools now have wider dissimilarities in abilities, in intelligence, in interests, and needs. High school administrators are finding it necessary, therefore, to study the problems of course elections very carefully and to offer advice to students about the best ways of preparing themselves for those activities to which their capacities and desires lead them.

Most of the larger high schools of the country have recently added to their staff, for the purpose of giving such advice to students, special officers not formerly found in the schools. In some instances this officer may be an assistant principal in charge of student affairs; or there may be two assistants, one in charge of affairs of girls and one for boys. It is the business of this officer to supervise in an intimate way the social and personal activities of the students under his charge.

It is becoming more and more common for high schools to provide guidance counselors who give tests to youth to ascertain their interests and abilities, gather necessary information about the students to help them pursue their programs of study wisely, and advise them about courses of action in the progress of their programs. High schools now maintain extensive records for each student to aid the guidance counselor in his work.

One of the urgent problems of guidance is the choice of technical courses and the selection of suitable industrial opportunities for a given pupil. As a special phase of educational guidance, so-called vocational guidance has been provided in many schools. Vocational guidance in some cases has gone to the extent of providing courses in the industries of the city, so that pupils may become aware of the opportunities which are open to them in later life. Whether such special cases are given or not, it has been found desirable to give personal advice to students and to help them choose their courses and prepare themselves definitely for callings which are open to them. Another important work of guidance has been to learn as much as possible about each student to help place him in situations where learn-

ing is most effective for him, and to provide teachers with data so that they can help him learn efficiently. Guidance counselors, through testing programs, anecdotal records, case studies and devices help students to recognize their own abilities, needs, and personal goals.

Extracurricular Activities. The high school recognizes its obligation to the community in social as well as intellectual lines, and has accordingly provided, under the supervision of the school, intellectual, social, and athletic opportunities which were uncommon in the secondary schools of two decades ago. High school clubs have long been a part of the extracurricular activity of the school. However, in recent years many different types of clubs have been set up, with the view to drawing out the student's powers and encouraging him to take part in social activities which would not be aroused by the regular classroom exercises. In some high schools a regular period of the school day is set aside for club activity and thus clubs become closely aligned to classroom work. Intermural and interscholastic athletic programs are common in the high schools; the programs, assuming a personal character, aid the sports associated with the seasons of the year.

Various forms of student self-government have in some cases arisen out of these social activities. Not infrequently the high school has come to be a center of organization, not only for the young people of the community, but also for adults. Reference to this general matter will be made again in a later section dealing with the development of the community center movement.

Federal Encouragement of Technical Courses. In recent years the Federal government has encouraged the organization within high schools of special courses in agriculture and technical subjects. This encouragement has been given through certain supervisory agencies which have been provided from Washington, and through appropriations to the different states by the Federal government for the support of these special courses. The Federal government has no direct control over the secondary schools of the country, but it has set up elaborate machinery for approving plans made in various communities for the introduction of technical courses, and thus indirectly has exercised a great influence in the enlargement of the high school curriculum. Special reference will be made to this matter in a later section dealing with vocational education.

COLLEGES AND UNIVERSITIES

The lack of uniformity in American standards and practices, which has been a subject of frequent comment in earlier paragraphs, is nowhere more strikingly exhibited than in the organization of higher institutions of learning. Even the terms college and university are frequently interchanged, and in many cases the institutions which call themselves by these names are in reality devoting all of their energy to work of a grade which should be classified as belonging to the secondary school.

College. The college is typically a four-year institution, and is devoted to nonprofessional instruction or, as it is called, instruction in the liberal arts. Formerly the colleges, like the secondary schools, were dominated by the tradition of a classical education, but, as the various sciences have expanded and as modern languages have come to be recognized as equally important with classical languages, the range of college subjects has been enormously expanded. Furthermore, the adoption of the elective system has brought about a condition in American colleges, especially since 1880, which has encouraged the expansion of the curriculum into every possible field of human experience.

The differentiation of the college course has taken place most conspicuously in the junior and senior years. Many institutions have found it necessary, in order to meet the needs of their students, to introduce into these years professional courses leading into law, medicine, or other professions. Recently the practice has become more common to have a sharp division between the first two and the last two years of college, with a selection process for students wishing to enter the last two. The college generally consists of several departments. It is the usual practice for a student to specialize his study in one of these departments. The term "college" is now often identified with professional schools and there are such schools as Engineering College, Law College, Medical College, and so forth.

University. The term "university," when strictly used, designates an institution which differs from the college in that it is a composite institution including a number of professional schools or colleges. In almost every case, the universities of the country include a college of liberal arts and a graduate school as sub-divisions of their organization. Professional schools may be organized for any of the accepted professions. Thus we have schools for Medicine, Fine Arts, Law, Pharmacy, Dentistry, Engineering, Theology, Education, Music, Agriculture, and many others.

Degrees. With the multiplication of divisions in American universities, there has come a very great expansion of the list of degrees granted. A number of bachelor's degrees have been established for different types of courses. The most common of these, other than the Bachelor of Arts, is the Bachelor of Science. There are also degrees of Bachelor of Philosophy and Bachelor of Letters. Most of the professional schools, which offer degrees at the bachelor's level, have their own degree designation. There are, therefore, Bachelor of Education, Bachelor of Fine Arts, Bachelor of Engineering, and other such professional degrees.

The universities which give courses beyond the regular four years of the college confer numerous advanced degrees. The first of these, following the bachelor's degree, is the Master's degree. This is usually conferred on the basis of one year of graduate study, although some institutions have a set of scholarly achievements and use a minimum resident study as requirements for the degree. The study required for the Master's degree is very commonly spent in a single department or in a narrow range of closely related departments. The usual degree granted by a graduate school is the Master of Arts or a Master of Science degree. It is very uncommon for American institutions to grant the Master's degree on any basis other than the actual taking of courses in the institution itself.

Above the Master's degree is the Doctor's degree. The Doctor's degree of the graduate school is the Doctor of Philosophy. The character of this degree is determined very largely by the example of the German universities to which many American students went during the decades between 1880 and 1910. The Doctor of Philosophy degree is usually conferred after three years of resident study beyond the bachelor's degree. One of the essential requirements for this degree is the preparation of a thesis which shall demonstrate the ability of the candidate to produce an original piece of work in the field in which he is specializing. The Doctor's degree is also awarded for graduate study in many of the professional schools. Common professional school degrees are the Doctor of Education and Doctor of Medicine.

American universities confer a number of honorary degrees, chief among which is the degree of Doctor of Laws. This is conferred by an institution upon anyone who has contributed, especially in an administrative or civic way, to the betterment of the community. Other degrees on this same level are Doctor of Science and Doctor of Letters.

TOTAL AND FIRST-TIME DEGREE-CREDIT ENROLLMENT IN INSTITUTIONS OF HIGHER EDUCATION—1962

Region and State	Total enrollment		First-time enrollment	
	Fall 1962	Per cent change 1957 to 62	Fall 1962	Per cent change 1957 to 62
United States & outlying parts	4,206,672	37.0	1,038,620	42.3
Alabama	47,654	14.7	11,459	11.3
Alaska	3,878	40.0	1,104	69.0
Arizona	43,736	76.0	11,218	47.9
Arkansas	30,878	45.2	9,347	51.3
California	551,524	49.7	154,272	50.8
Colorado	52,640	32.3	12,129	36.5
Connecticut	59,092	45.5	14,754	70.6
Delaware	8,979	47.1	2,451	114.2
District of Col.	51,155	33.4	6,789	16.9
Florida	89,802	68.0	24,118	79.9
Georgia	56,228	23.1	14,016	29.3
Hawaii	12,999	69.5	3,848	129.1
Idaho	13,912	36.4	4,886	51.2
Illinois	230,115	38.4	56,620	56.7
Indiana	111,861	40.5	26,924	36.3
Iowa	64,928	30.2	17,154	31.7
Kansas	59,900	32.8	16,843	29.8
Kentucky	53,361	35.1	13,581	42.6
Louisiana	66,692	37.6	14,597	27.3
Maine	15,025	37.6	4,058	33.3
Maryland	65,110	47.3	13,191	46.0
Massachusetts	155,647	30.2	37,096	20.0
Michigan	182,827	32.9	39,502	34.9
Minnesota	89,301	31.9	24,480	66.8
Mississippi	41,163	47.1	13,971	61.2
Missouri	96,851	31.4	24,511	41.0
Montana	14,997	44.8	4,242	44.5
Nebraska	36,379	34.2	9,888	32.8
Nevada	4,761	102.4	1,305	74.2
New Hamp.	13,176	23.0	3,488	42.1
New Jersey	101,419	49.4	21,876	54.7
New Mexico	20,839	44.3	4,753	47.1
New York	395,174	25.9	70,380	39.2
North Carolina	84,387	43.8	23,437	40.7
North Dakota	16,026	43.6	5,017	43.1
Ohio	202,374	36.8	49,623	47.0
Oklahoma	63,697	24.4	16,930	21.7
Oregon	51,948	43.8	14,301	48.9
Pennsylvania	214,244	27.6	46,266	22.9
Rhode Island	22,699	45.6	5,998	58.4
S. Carolina	35,142	25.9	9,701	36.3
S. Dakota	16,409	19.0	5,050	23.8
Tennessee	72,844	34.8	21,626	51.3
Texas	216,641	30.0	55,401	32.5
Utah	38,940	39.5	10,291	39.5
Vermont	11,123	41.8	3,476	37.7
Virginia	65,944	35.0	18,067	60.2
Washington	77,491	51.8	21,721	66.2
W. Virginia	33,700	30.1	8,854	26.5
Wisconsin	87,403	40.5	21,033	41.4
Wyoming	7,707	39.4	2,114	21.0
U.S. Service Schools	14,214	43.4	2,797	40.6
Outlying Parts				
Canal Zone	483	72.5	302	106.8
Guam	1,247	139.3	468	63.6
Puerto Rico	30,006	48.2	7,296	34.7

Source: *Office of Education, U. S. Department of Health, Education, and Welfare.*

Types of Higher Institutions. Three classes of universities and colleges may be distinguished from the point of view of their support and government. These are: privately-endowed institutions; state institutions; and municipal institutions. The most common form of American college is that which is dependent for its support upon private endowments. Two-thirds of the colleges of this country derived their initial support from religious bodies. Endowments come from many different sources to colleges. The funds given are usually committed to a board of trustees. Frequently the trustees are representatives of the religious bodies which organized the institution. In many instances, on the other hand, they constitute a self-perpetuating body. In all cases the board of trustees appoints an administrative head of the institution. There are more than twice as many private universities and colleges in the United States as there are public, although the public universities and colleges enroll many more students.

More than three million students are now enrolled in institutions of higher learning of the United States. Conservative estimates have been made which predict that by 1970 there will be more than four million students in these types of institutions.

State Universities. Beginning with the state of Virginia and extending rapidly through the area which was at one time the Northwest Territory was a movement giving rise to institutions which have grown to be great state universities. The funds for their buildings and current expenses are supplied by the legislatures of their states. These institutions are universities in organization and are usually equipped with a full quota of professional work, especially in agriculture and engineering from subsidies granted by the Federal government. Many of the larger state universities are organized to operate in several locations in the state, thus serving all areas of the state. In this regard, one state university, that of New York, has no central campus but operates through a system of institutions both public and private throughout the state. All of the 49 states of the United States now have state universities.

Municipal Universities and Colleges. The third type of organization which has become increasingly common is the municipal college or university. The first municipal university in this country was organized in Charleston, South Carolina in 1837. Others were at Louisville, Kentucky in 1846, City College in New York City in 1849; and one in Cincinnati, Ohio in 1873. From these early institutions many large cities of the United States modeled municipal universities to serve their citizens. Some cities, unwilling to support universities, have established municipal colleges, many of which have two-year programs.

The College Year. The college year, or university year, has ordinarily consisted of 36 to 40 weeks,

SCHOOL ENROLLMENTS BY TYPE OF SCHOOL—1930 TO 1960

Year	Total Fall Enrollment	Type of School			
		Kindergarten	Elementary School	High School	College or Professional
1960	49,915,104		24,457,321	11,847,783	3,610,000
1958	2,279,493	2,135,917	27,991,073	8,868,586	3,283,917
1956	39,103,059	1,838,202	26,493,882	7,774,975	2,996,000
1950	31,319,271	1,175,312	21,031,929	6,453,009	2,659,021
1940	29,751,203	660,909	20,466,112	7,129,979	1,494,203
1930	9,652,377	786,463	22,953,377	4,811,800	1,100,737
Increase 1930–1960	20,262,727	1,369,454*	1,503,944	7,035,983	2,509,263
Per cent	68.3	174.1	6.5	146.2	227.9

Source: *U.S. Bureau of the Census.*
* Increase from 1930–1958

the sessions beginning in the middle of September and ending with graduation exercises late in June. President Harper, at the time of organization of the University of Chicago, pointed out vigorously the lack of economy in an arrangement which left the college buildings and equipment unused from the end of June until the middle of September. His original proposal was for four quarters of twelve weeks each, with a week of vacation after each quarter.

It has not been feasible to carry out this program. Generally colleges have operated on what s known as the semester plan. The college has two semesters during the academic year. The first semester begins in September shortly after Labor Day and ends during January or February of the following year. The second semester follows this and ends in May or June. Many colleges and universities operate a summer session during the period between June and September. The summer session varies in length at different institutions. A few universities are now operating on what is called a trisemester plan. Here the attempt is made to eliminate waste in the use of buildings and to provide a program to accelerate the studies of students.

During the summer months teachers of high and elementary schools attend these summer sessions in such large numbers that the universities become, during this period, training places for the teachers in the lower schools. So vigorous has this movement become that boards of education are cognizant of it, and they offer inducements for their teachers to continue study by giving them additional compensation for it or by basing promotion within the school system on such study.

THE JUNIOR COLLEGE

The junior college is an institution offering training on the level of the first two college years, that is, the two years immediately following the close of the typical high school period. Although the beginnings of the movement reach back into the 19th century, the actual development of junior college units unassociated with universities covers a period of little more than three decades.

While the junior college first took hold in California and the Middle West, the South has proved a fertile field for the development of this type of institution. The movement has perhaps made the least progress in the New England and Middle Atlantic states. In these two groups the independent type is in the ascendent, in the South the church, and in the Middle and Western states the public.

The junior college is fast becoming a community college. Trends indicate that in time it will become a terminal college rather than merely the first two years of the four-year college. The Educational Directory of the United States Office of Education lists a total of 644 junior colleges of all types existing in the United States in 1963.

The History of the Movement. The beginnings of the junior college movement reach far back into the 19th century. As early as 1851, the year before he assumed the presidency of the University of Michigan, Henry Phillips Tappan recommended a differentiation between what he designated the "collegial" and the "executive" parts of education, terms which may be taken to have meant with him what we regard as, respectively, preparatory and professional education. He saw the organization for which he was contending exemplified in the relationship between the *Gymnasien* and the universities of Germany.

Perhaps the most influential of those who have fostered the junior college movement was William Rainey Harper, first president of the University of Chicago. President Harper was largely influential in the establishment, during the early years of the present century, of the first public junior colleges, -those maintained in connection with the high schools at Goshen, Indiana, and Joliet, Illinois (a township high school), the latter having maintained an uninterrupted existence to the present day. He encouraged also the establishment of junior colleges on private foundations, and contended that by becoming junior colleges many of the smaller colleges could find a logical place and function in the school system.

Among others who gave significant encouragement to the junior college, previously to and during the earliest stages of its actual development, are Edmund J. James, Alexis Lange, and David Starr Jordan.

The Place of the Junior College. The claims made for the junior college by its friends are many, among them the following: (1) that it will be able to give satisfactorily the first two years of college or university work; (2) that it will do much to popularize education on this level; (3) that it will hasten the provision of general and occupational training on this level for those who cannot or should not aspire to higher levels of training; (4) that it will accelerate the impending and desirable reorganization of higher education; and (5) that it will help in obviating the large amount of overlapping of high school and college courses which is known to exist at the present time.

That junior colleges are doing satisfactorily the first two years of college work is attested by the fact that most colleges and universities are admitting graduates of properly accredited junior units to third year standing. Comparison of the teaching staffs of junior colleges with those of other higher institutions shows the former to be somewhat less well prepared for the work, when consideration is given to periods of graduate study. At the same time, even in the present early stage of development, teachers in junior colleges are, on the average, much better prepared than are typical high school teachers, and they compensate to some extent for their present lack of graduate training by having had more experience than college and university teachers and by manifesting in class some superiority in teaching procedure. Salaries of teachers in public junior colleges are not so low as to lead to a misgiving that these institutions will not be able soon to compete with other higher institutions in order to secure a satisfactory teaching personnel.

There is evidence to indicate that, because of lowered costs and proximity to the prospective student, the public junior c llege is in a position to provide education on this level for a much larger proportion of the total population of the country than now receive it.

Reorganization. The tendencies of reorganization in secondary and higher education during a century have been in the direction of making a place for the junior college. The age of freshmen at Harvard experienced an advance of more than two years in the five decades from 1830 to 1880, and in other older Eastern colleges between the same dates large proportions of students entered at 12 to 17 years of age. During the same period and subsequently (by 1900), the extent of subjects required for admission increased from what was the equivalent of seven to nine units of work to fifteen or sixteen units. This is another way of saying that at least two more years of liberal education were being required for admission to college at the close of the last century than near its opening. While these changes were taking place, collegiate subjects were shifting downward, so that courses formerly open to upperclassmen only, like chemistry, physics, and history of English literature, were available for lowerclassmen, and had even been included in enriched rather than in diluted form in the upper high school years.

The operation of similar forces is seen in the gradually decreasing proportion of students enrolled in the upper years of separate colleges of liberal arts.

The tendency of students of such institutions when transferring to other schools is to enroll predominantly in professional curricula. In consequence, there is a decreasing proportion of men in the upper years of colleges of liberal arts, while in universities the number of men in the upper years increases out of proportion to the lower classes.

There can no longer be doubt that high school and freshmen and sophomore college courses have much in common. This means two things: first, that, being much alike, the line that divides secondary from college work as at present administered is artificial, for, if the work in the lower unit is "secondary" in character, that in the first two years of the upper unit is also largely secondary; second, that this identity involves much actual repetition for the individual student. The repetition results from giving similar work in two institutions, the upper of which knows little of what is going forward in the lower one.

Other types of claims which appear acceptable on behalf of the junior college are: (1) that, owing to smaller enrollments, there will appear in it less of the "depersonalization" of instruction which now tends to characterize the larger colleges and universities; (2) that in the new unit there will be better opportunities for laboratory training in leadership than in institutions in which leaders are largely selected from upperclassmen.

The Junior College and the Public School. From what has been said in description of the public junior college, it may be judged that, for the most part, it is an upward extension of the secondary school, with some measure of separation from the unit below. In communities with four-year high schools this means a 6–4–2 organization of public education. The junior-senior high school organization beginning with the seventh grade is, however, gaining such headway that in most cities, unless there is to be a regrouping of grades, we shall have a 6–3–3–2 organization, including in effect three secondary school units, two of them three years in length and the third two years in length.

It does not require much consideration of this plan or long experience with it to make one aware of its unwieldiness. In consequence, there has appeared an advocacy of a redistribution of the eight years of the new secondary school into two units of equal length,—a lower one to include the grades from the seventh through the tenth, and an upper to include the last two high school and the first two college years. Such a plan may be seen to be in harmony with the considerations supporting junior college reorganization already discussed. Small school systems will not, of course, even with generous provisions for state aid, be able to justify the support of the full eight-year period of secondary education. In this respect, however, the situation will in no wise differ from that now obtaining, in which communities maintain differing amounts of training beyond the elementary school, according to their resources and the number of children of secondary school age.

Junior Divisions in Universities. Another form of reorganization, which has something in common with the three main types of junior college referred to, is the horizontal separation of the first two from the last two years in certain universities, the lower unit being designated as the "junior college," "junior division," or "lower division," and the upper by corresponding names. By 1922 six universities had introduced this line of cleavage. By 1934 this number had increased to 136.

Recently, with the emphasis being made on the development of community colleges, universities have accelerated the organization of "junior divisions." Many state universities now offer the work of the first two years of college in "centers" located in the various areas of the state.

Public Junior Colleges. These are institutions which have developed in association with the public school system and which, with few exceptions, are maintained in connection with public high schools, usually with some attempt at separation. They are for the most part under the direction and control of local school authorities, and constitute an upward extension of the public school system, a natural step in evolution in communities which, in something like a satisfactory manner, have taken care of education on the lower levels.

The accompanying table shows that the publicly-controlled junior colleges are increasing in number, while privately-controlled ones are decreasing. As enrollments have gone up, one answer to the need for increasing facilities has been the junior college. Many experts believe that the needs of the citizenry can be met by this type of college rather than the regular four-year college. Following World War II junior colleges, particularly the public ones, have been showing a remarkable increase in enrollments.

Church Junior Colleges. Of the privately controlled junior colleges, approximately two-thirds are church operated. More than one-half of these are in the South. Practically all of the larger denominations are represented by at least one junior college, with the Baptists, Methodists, and Roman Catholics having the largest representation both in number of schools and in enrollments. Like other types of denominational schools, the church junior colleges give large emphasis to the creeds of the churches which sponsors them.

Independent Junior Colleges. The privately controlled independent junior college is often incorporated or it may be owned and operated by one or more persons, unincorporated. There are only 98 schools of this type, of which 38 are coeducational. Sixteen are for men, and 44 are for women. This is the least important of the three types both in the number of schools and in the total enrollment.

The table below gives the enrollment by subjects in 32 public junior colleges in California. Social sciences, English, and commerce and law lead the list. Ancient languages rank below aviation; home economics below art; mathematics below music. These enrollments indicate an important change in interests from a generation ago.

COURSES IN 32 CALIFORNIA PUBLIC JUNIOR COLLEGES

Subjects	Per cent of students enrolled	Subjects	Per cent of students enrolled
Social sciences	18.7	Art	3.8
English	18.0	Orientation	3.0
Commerce and law	11.1	Philosophy	2.7
Modern languages	9.5	Home economics	1.0
Physical sciences	9.1	Aviation	.5
Biological sciences	6.4	Civic health	.5
Music	6.2	Ancient languages	.3
Mathematics	5.0	Agriculture	.2
Engineering, etc.	3.9		

UNIVERSITY EXTENSION

The university extension movement began in England more than a century ago. Its motive was described by one of its early advocates in the question: "Though it may be impossible to bring the masses requiring education to the university, may it not be possible to carry the university to them?" After the movement had made much progress in England, it was brought to this country in 1887 through a discussion at a library conference in Albany, N. Y. Very shortly, centers were established in several cities, and in 1890 a society known as the American Society for the Extension of University Teaching was established and maintained by subscriptions in Philadelphia. In 1891 a number of important steps were taken: the state of

JUNIOR COLLEGES—NUMBER AND ENROLLMENT: 1920–1960

Year	All Junior Colleges		Publicly Controlled		Privately Controlled	
	Number	Enrollment	Number	Enrollment	Number	Enrollment
1920	52	8,102	10	2,940	42	5,162
1922	80	12,124	17	4,771	63	7,353
1924	132	20,559	39	9,240	93	11,319
1926	153	27,095	47	13,859	106	13,236
1928	248	44,855	114	28,437	134	16,418
1930	277	55,616	129	36,501	148	19,115
1932	342	85,063	159	58,887	183	26,176
1934	322	78,480	152	55,869	170	22,611
1936	415	102,453	187	70,557	228	31,896
1938	453	121,510	209	82,041	244	39,469
1940	456	149,854	217	107,553	239	42,301
1942	461	141,272	231	100,783	230	40,489
1944	413	84,616	210	56,439	203	28,177
1946	460	156,456	235	109,640	225	46,816
1948	472	240,173	242	178,196	230	61,977
1950	483	242,740	256	187,695	227	55,045
1952	506	231,175	291	184,054	215	47,121
1954	518	325,804	293	272,036	225	53,768
1958	490	349,385	283	297,680	207	51,705
1960	509	403,524	310	348,538	199	54,986

Source: *Office of Education, U.S. Department of Health, Education, and Welfare.*

New York appropriated $10,000; the newly established University of Chicago took over a local society and began extension work on a large scale; and in December a national congress on university extension was held in Philadelphia.

Scope of the Movement. Following these early steps, the movement has spread over the whole country. The state universities especially have taken it up and are now engaged in a great variety of enterprises which are intended to carry opportunities of intellectual improvement to the people of their states. The work of the state universities is in many cases generously supported by appropriations made by the legislature. Local centers also contribute through payment of fees to the maintenance of classes or lecture courses, and many endowed colleges and universities co-operate with the state universities by sending out lecturers or conducting correspondence courses.

Variety of Extension Service. A brief summary of the types of service rendered may be attempted. First, there are bureaus of information. These prepare bibliographies and outlines for schools, clubs, and civic associations which are pursuing systematic studies, supply information on public health, child welfare, municipal problems, and like matters. Second, aid is given in organizing various forms of community activities, such as pageants, community exhibits, farm demonstrations, and other general occasions. Third, bulletins are published on legislation, on civic and state problems, and on recent scientific advances. Fourth, educational and entertainment films are supplied to clubs, churches, and schools. Fifth, packages of books are made up and lent to persons or organized groups who do not have access in their own towns to public libraries. Sixth, debates in schools or in clubs are organized and directed. In many cases selected reading material is supplied with the plans.

Seventh, classes are conducted in all kinds of subjects. Teachers' classes are conducted in educational subjects; farmers' classes in the mechanics of farm machinery; mothers' classes in the care of infants; general classes in literature, history, and science. These classes are conducted either wholly or in part by lecturers who come from the university, and often are made the basis of regular credit toward the degrees of the university. Eighth, correspondence courses are conducted. These also are often made the basis of credit toward graduation.

It may be remarked that the correspondence study phase of extension education has in recent years been developed by several large private institutions which devote their entire energy to this line of activity. These private correspondence schools usually specialize in commercial and mechanical courses with a view to giving practical education to students who have terminated their schooling early.

PROFESSIONAL SCHOOLS

The colleges and universities of the country lead into the professional schools. There was a time when training in law and medicine depended upon a general plan of apprenticeship training, whereby the candidate for admission to the profession associated himself with some experienced member of that profession and studied with him in private. Young men "read law," as the phrase put it, in the office of some law firm, or the prospective doctor acted as an assistant to some practitioner. Later the professional men organized institutions where a number of candidates came together and paid fees for training. Professional schools thus grew up on a quasi private basis and in many instances were very profitable because the instruction was given by men who secured their main salaries from the regular professions and took the student fees as additions to their incomes.

As the demands for professional training became more rigid, and especially after legal enactments began to prescribe more in detail the requirements for admission into the professions of law and medicine, the private professional schools found that they had to reconstruct their organization. It was no longer possible to give adequate instruction under conditions which were attractive to the instructors who devoted most of their time to other professional duties. Gradually professional schools began to be assimilated by universities, until finally the private professional training school has very largely disappeared.

Standardization in Medicine. The standardization of professional education is being pushed forward rapidly at the present time. The most vigorous movement of this type is exhibited in the schools devoted to the training of physicians. Under the guidance of the American Medical Council, a survey of the medical schools of the country was made in 1910 and it was found that most of the private institutions were very meager in their equipment and inadequate in their instruction. The Medical Council set up a system of grading medical schools, and, while it had no authority to enforce its grading and classification, the significance of its pronouncements was so great that most of the private medical schools were forced to close their doors. In this way a professional group acting without authority enforced a

high standard upon institutions for professional training.

In the professions other than medicine the movement has taken the same general direction, but somewhat more slowly and without any concentrated effort on the part of any single powerful board.

Economy in Professional Training. One of the important problems with which these standardizing bodies for the professional schools have had to deal is that of the relation of professional education to the general training given in the college of liberal arts. In this country the training of a candidate is so far behind that of European candidates in point of time that the professional man in the United States usually enters upon his productive activities two years later than the European candidate. The reasons for this delay in American professional education have already been given in the preceding discussions of the organization of elementary and of secondary schools. Elementary education in this country has never been so related to higher education as to introduce those who are going on into higher schools to the advanced subjects as early as do the European institutions.

The professional schools of the United States, however, have not in general gone back in their consideration to the high or the elementary schools, but have attempted to adjust their own relations with the college in such a way as to enable young men to get into the professional courses at a somewhat earlier date. There has been from time to time very vigorous discussion of the possibility of reducing the college course to two or three years. In many cases professional schools have been advised to accept students directly from the high school. At the present time there is no definite solution of this difficulty, and the probabilities are that a solution will not be reached until the professional schools and the higher institutions of learning canvass the whole problem of the organization of American education, from its elementary stages through the professional schools.

Technical Schools. Technical education of a higher grade has developed very rapidly in the United States in recent years. There are a number of engineering schools which are of university grade. These have been especially fostered by the land-grant colleges, and in some instances have come to be such important parts of the educational system that their courses have eclipsed in large measure the liberal arts training which formerly was characteristic of all higher institutions.

Many technical schools have developed co-operative programs with liberal arts colleges. In doing this, they have co-ordinated their curriculums so that a student may attend a four-year liberal arts college for three years, then transfer to a co-operating technical school for one year and obtain a professional degree.

Inequality of Educational Opportunity. The difference in the amount of money spent per pupil for education clearly indicates that the education supplied varies from state to state.

What is true of states is equally true of districts within the state. Neighboring districts having equal school registrations often differ in wealth in the most extreme degree. Rural children, in general, have much more meager educational opportunities than urban children. Often, inequalities occur in education because the school authorities are not willing to spend proper amounts of money for education. Some communities make greater effort than others for the support of their schools.

Bonded Indebtedness. In addition to the revenues for current expenses which are derived from taxes, the public schools of the United States have developed a method of securing funds for making payments on buildings and permanent improvements through the sale of bonds which must in the long run be paid for out of public funds. The amount of bonded indebtedness incurred for schools is very difficult to ascertain, but it is altogether certain that in many communities obligations have been assumed which constitute a very heavy burden for the future to carry. It is especially true in connection with the erection of rural high schools that communities have been led through a spirit of competition with neighboring communities to invest large sums in the equipment of relatively very elaborate buildings when the prospect of a student population for these high schools is comparatively slight.

SCHOOL FINANCE

The funds for the maintenance of the educational system described in the foregoing pages are derived from public taxes, Federal grants of land, student fees, and donations. In general, it may be said that the revenues for the support of elementary schools and high schools are all derived from taxes and grants of land. Revenues for higher education come from a variety of sources.

The table presented on page 1635 shows expenditures for education in the United States from 1900 to 1960. The greatest sources of income for public education are state and local governments. However, the Federal government is being urged to take an increasing interest in education, and programs in special areas of education are receiving federal support.

There are wide differences in the amount of money spent for education in the different states, as shown by the following table.

Current Expenditures in Dollars Per Pupil for Public Elementary and Secondary Day Schools: 1929-30 through 1962-63

State	1929–30	1939–40	1951–52	1961–62	1962–63
Alabama	37	36	150	246	255
Alaska	..	..	..	558	620
Arizona	109	96	263	409	445
Arkansas	34	31	123	239	279
California	133	142	261	457	515
Colorado	111	92	253	405	437
Connecticut	103	109	291	458	522
Delaware	95	109	318	465	502
Dist. of Col.	132	132	301	450	455
Florida	51	58	206	321	347
Georgia	32	42	166	255	298
Hawaii	..	..	..	334	382
Idaho	87	78	212	300	314
Illinois	103	115	258	488	526
Indiana	92	86	253	380	405
Iowa	96	86	261	386	414
Kansas	93	83	246	390	422
Kentucky	46	47	151	247	275
Louisiana	48	57	237	389	379
Maine	70	64	181	305	338
Maryland	80	84	243	420	469
Massachusetts	110	115	267	435	465
Michigan	115	92	267	425	447
Minnesota	101	100	227	434	481
Mississippi	36	31	96	214	230
Missouri	70	80	212	351	405
Montana	110	109	302	431	459
Nebraska	93	74	246	348	355
Nevada	136	131	263	433	441
New Hampshire	93	91	255	368	399
New Jersey	125	136	312	512	556
New Mexico	77	76	261	364	421
New York	138	157	352	585	645
North Carolina	43	41	176	241	297
North Dakota	100	69	266	375	395
Ohio	96	96	232	419	422
Oklahoma	65	63	226	320	342
Oregon	103	97	316	457	502
Pennsylvania	88	92	264	423	464
Rhode Island	96	105	259	421	467
South Carolina	40	40	154	230	237
South Dakota	95	86	251	370	390
Tennessee	43	44	148	234	262
Texas	55	66	223	331	379
Utah	75	78	196	344	354
Vermont	84	85	220	350	362
Virginia	44	48	169	275	335
Washington	100	105	284	430	488
West Virginia	72	64	183	272	297
Wisconsin	94	91	285	427	467
Wyoming	129	109	312	459	510
Total U.S.	87	88	244	393	432

Rapidly Increasing Costs. The increase in school expenditures in recent years has been a source of great anxiety to those who are in charge of public revenues. In all areas of school expenditures, costs have risen since World War II, and the number of pupils to be educated has increased. The question has been seriously raised in many quarters whether the public schools of this country can be carried forward on the scale which has been set by earlier practices of American communities. One of the chief problems which have led to this discussion in recent years is the problem of financing high schools. High school education is more costly than elementary education. A few years ago the attendance in high schools was relatively small, and, though the per capita expenditures were high, the aggregate expenditure for these schools was within easy possibility of support by the public. Since the high schools have increased in population so rapidly in recent years, they have made a very heavy demand on public resources. The estimates of future increases in high school enrollments make the problem very troublesome.

American communities do not usually understand why the cost of education in this country is so much higher than it is in other countries. No other nation has brought into its high schools anything like the proportion of the youth of the country represented in the high schools of the United States. Those who are disposed to advocate a curtailment of expenditures for public education in this country should recognize clearly the fact that they are asking the country to give up an experiment in popular education which is one of the unique characteristics of this democracy.

On the other hand, communities will have to recognize the fact that it is quite impossible to maintain public schools of the kind which exist in the United States without making very heavy demands on public funds. It is estimated that from one third to one half of the public revenues of the municipalities are expended in the maintenance of public schools.

State Appropriations for Education. In every state appropriations are made for education. Usually there are separate allotments made for the public elementary and secondary schools and for higher institutions of learning. The state usually distributes monies to the public elementary and secondary schools on the basis of the number of pupils in average attendance. Appropriations to universities take the form of direct grants or are given to the students of the institutions in the form of scholarships.

Individual Responsibility and Costs. These figures raise an interesting and important question regarding the individual's responsibility for the cost of his education. The student undoubtedly gains great personal advantage from his schooling. He is prepared to earn a higher wage than he would receive if he were uneducated. It is a perfectly legitimate question, therefore, to ask how far he should pay for this improvement in his earning capacity by paying tuition for his education. Especially in the higher institutions does this question become an immediate one in view of the fact that the resources of the higher schools are limited and the population of these institutions is rapidly increasing.

While it may be argued that the lower schools are necessary for the maintenance of the state and may legitimately be paid for by public moneys, it becomes very much more controversial to defend public support for higher education.

FEDERAL PARTICIPATION IN PUBLIC EDUCATION

In foregoing discussions it has been stated that the Federal government does not have any direct control over the school systems of the various states. It exerts some indirect control, however, through the standards which it establishes for school participation in the various educational funds which it appropriates.

The Federal government has shown its interest in education in three ways: first, through making land and money grants for education; second, through free distribution of surplus commodities; and, third, through establishing various educational agencies such as the United States Office of Education. Its land and money grants from the beginning to the present time would total several billion dollars, and during recent years its annual appropriations have amounted to several hundred million dollars. There has been a definite trend toward larger grants of money from the Federal government and a greater percentage of the total costs of education being borne by the Federal government.

The major appropriations at present being made by the Federal government for education are for the following purposes: education of active participants in World War II, vocational education in public secondary schools, higher education in land grant colleges, vocational rehabilitation, public schools in the District of Columbia, schools for Indians, education for military service, local school systems affected by Federal government programs, agricultural extension service, agricultural experiment stations, the school lunch program, and the United States Office of Education.

As a matter of historical development, the Federal government first became involved in education because of its relation to scientific and educational problems. The various departments of the Federal government find it necessary to employ experts as it participates in the scientific work of the nation. Many believe that the resources of the Federal government are necessary in some cases if scientific work is to go forward on a scale to insure adequate general information for the conduct of modern enterprises.

It becomes a matter of vital importance to the nation that experts be trained for the various lines of public service. Furthermore, when they undertake their work they must be supplied with suitable scientific equipment. The government has been forced, therefore, into the most intimate and vital contact with educational institutions of the country.

Land Grants. For reasons entirely foreign to those which were cited in the last paragraph, however, the Federal government was drawn into the support of public education. A publication of the office of education written by Professor F. H. Swift states the case as follows:

"On May 20, 1923, will occur the one hundred and thirty-eighth anniversary of the passage of one of the most famous and most significant ordinances ever enacted by the Congress of the United States. Out of this Ordinance of 1785 arose a national policy which has resulted in providing the states with vast grants for public education. This policy was not, however, positively assured until two years later, when Manasseh Cutler, one of the directors of the Ohio Company, held up the Congress of 1787 with the threat to buy land from some individual state unless his demands for school, university, and church lands should be granted.

"Congress, badly in need of money and fearful lest Cutler should carry out his threat, passed, on July 23, 1787, an ordinance authorizing the board of treasury to contract for the sale of lands to the Ohio Company on the terms demanded by Cutler, which included the following grants of land: Two townships for an institution of higher learning, and, within each township, one section of land for the ministry and one for schools. Thus began a national policy which resulted in granting to the states, Federal lands and moneys for public schools. Every one of the 30 public land states, i. e., states carved out of Federal domain, received extensive grants of Federal lands for endowing schools, which have been largely devoted to establishing permanent state endowments for public schools.

Extent of Grants. "Some Federal lands granted to the states have been given specifically for public schools; others, such as swamp lands, salt lands, and internal improvement

lands, although not given specifically for schools, were devoted to schools by many states. Every public land state admitted prior to California, in 1850, received from the national government for the support of public schools the section numbered 16 in each congressional township. California and every subsequently admitted state, except Utah, Arizona, New Mexico, and Oklahoma, received sections 16 and 36. The first three of these states received sections 2 and 32 as well as 16 and 36. Oklahoma offers a special case also.

"In addition to township school sections aggregating approximately 73 millions of acres (73,155,075) (*a*), Congress, under separate acts, has granted to public land states approximately 11,000,000 acres of public domain for purposes of internal improvement; salt lands aggregating over 606,000 acres, and swamp lands aggregating more than 64,000,000 acres. It should be noted that lands granted as swamp lands, as in the case of Minnesota, sometimes proved to contain rich mineral deposits which made them among the most valuable lands granted to a state. From these various grants there have been given in all to the 30 public land states approximately 147,000 square miles of school lands, 101,000 square miles of swamp lands, 17,000 square miles of internal improvement lands, and 900 square miles of salt lands.

Colonial School Lands. "The policy of reserving for schools one or more sections of land in newly surveyed townships had become fairly well established in colonial days. As early as 1659, the general court of Massachusetts granted the towns of Charlestown and Cambridge 1000 acres of land each on condition that they be forever appropriated to maintain a grammar school. In 1672, Connecticut granted 600 acres each to the four county towns of Fairfield, New London, New Haven, and Hartford for the support of a grammar school. In 1687, the Connecticut colony granted more than one-half of what is now Litchfield county to the towns of Hartford and Windsor to save this land from the cupidity of the royal governor Andros. Hartford and Windsor refused to restore this land to the colony when the troublesome times ceased. A controversy arose which resulted in a compromise. In 1726, the territory was divided in half. The eastern half was given to Hartford and Windsor. The colony took the western half, which it laid out in seven townships. Five of these townships were divided into 53 parts each. One of these 53 parts

"(*a*) Exclusive of approximately 21,000,000 acres of school lands reserved in Alaska; approximately 94,000,000 acres, if Alaskan reservations be included."

FEDERAL FUNDS FOR EDUCATION-1963

GRANTS	$1,971,305,000
Elementary Secondary Education	626,940,000
Adult Education	141,513,000
Surplus Property Transfer	94,625,000
LOANS	
Elementary-Secondary Private School	1,500,000
Higher Education	491,300,000
Research and Development	1,089,124,000
Related School Services	387,761,000
Training of Federal Personnel	82,973,000
Library Services	24,708,000
International Education	63,000,000
Co-operative Agriculture Extension	63,264,000
Promotion of Apprenticeship	4,344,000
Education in Federal Institutions	2,290,000
Apprenticeship training Canal Zone	42,000

EXPENDITURES FOR EDUCATION, 1962-63

Level of Instruction and Type of School

	Public & Private	Public	Private
TOTAL	$31,980,000,000	$24,760,000,000	$7,220,000,000
Elementary and Secondary Schools	22,840,000,000	19,540,000,000	3,300,000,000
Federal Schools for Indians	120,000,000	120,000,000	.....
Higher Education	9,020,000,000	5,100,000,000	3,920,000,000

INSTITUTIONS OF HIGHER EDUCATION WITH $40,000,000 OR MORE IN ENDOWMENT 1950 AND 1961

Harvard University	Cambridge, Massachusetts	$201,775,433	$393,335,917
University of Texas	Austin, Tex	82,637,332	367,530,798
Yale University	New Haven, Connecticut	127,392,152	211,669,123
Columbia University	New York, New York	100,707,278	142,282,405
University of Chicago	Chicago, Illinois	77,863,256	139,272,367
Massachusetts Inst. of Technology	Cambridge, Mass.	51,603,652	110,000,000
University of California	Berkeley, California	54,916,786	107,106,438
Cornell University	Ithaca, New York	44,949,027	98,193,576
Stanford University	Stanford University, Calif.	36,910,578	97,924,224
Northwestern University	Evanston, Illinois	60,900,559	94,500,000
Rice Institute	Houston, Texas	31,598,354	92,860,000
University of Rochester	Rochester, New York	60,473,402	83,291,908
Johns Hopkins University	Baltimore, Maryland	36,125,751	79,811,000
Princeton University	Princeton, New Jersey	49,818,878	75,492,000
Dartmouth College	Hanover, New Hampshire	27,156,681	71,618,123
University of Pennsylvania	Philadelphia, Pennsylvania	31,453,798	69,000,000
University of Minnesota	Minneapolis, Minnesota	38,544,466	63,183,616
Duke University	Durham, North Carolina	58,280,050	58,117,092
New York University	New York City, New York	*	55,306,077
Washington University	St. Louis, Missouri	31,012,675	52,690,000
Western Reserve University	Cleveland, Ohio	*	49,741,742
Vanderbilt University	Nashville, Tennessee	31,555,082	49,122,000
California Institute of Technology	Pasadena, California	24,093,641	47,000,000
University of Pittsburgh	Pittsburgh, Pennsylvania	*	43,809,004
Carnegie Institute of Technology	Pittsburgh, Pennsylvania	29,448,854	42,000,000
University of Washington	Seattle, Washington	*	40,917,553

* less than $20,000,000 in 1950

in each town was reserved for the support of a town school, and two for the support of the ministry. In 1733, the assembly of the colony of Connecticut enacted that seven towns belonging to the colony be sold and the proceeds divided among the towns already settled, in proportion to their list of polls and ratable estate, the proceeds to be set apart by each town as a permanent school fund.

"From the proceeds of this policy of Connecticut two classes of permanent funds arose: (1) The fund belonging to the colony which was distributed among the towns of the colony; (2) funds belonging to new towns, arising from reservations of school lands within the towns.

"The colonial policy of reserving lands in each town was adopted soon after the formation of the Union by several states. Georgia, in 1783, provided for the reservation of 1000 acres of land in each county for the support of free schools. New York, in 1786, and Massachusetts, in 1788, provided for the reservation, in state-owned lands, of lots for schools and for the ministry."

Land-Grant Colleges. The interest of the Federal government in science, together with its method of appropriating land as a device for aiding the states in promoting education, led during the Civil War to the adoption of the so-called Morrill act of July 2, 1862. This act gave to each state 30,000 acres of public land for each senator and representative to which it was entitled in Congress, the states not having enough public lands within their borders receiving land scrip for the deficit. The money derived from the sale of these lands was to constitute an endowment fund, the interest of which was to be used for the support of "at least, one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." The legislative assent of a state to the provisions of the act was made necessary before the state could participate in the benefits of the act.

On March 2, 1887, Congress appropriated $15,000 annually to each state, to be used by the state in conducting researches and in verifying experiments in the agricultural experiment stations under the direction of the land-grant colleges. The appropriations were made from money arising from the sale of public lands.

The second Morrill act, of August 30, 1890, appropriated annually, out of money derived from the sale of public lands, $15,000 to each state and territory for the further endowment and maintenance of the land-grant colleges, this to be increased annually by $1000 for ten years, after which time the amount for each state and territory was to be $25,000 annually. This money was to be applied only to instruction, and none of it could be used for buildings.

Subsequent acts have increased from time to time the appropriations to the institutions established under the acts mentioned in the foregoing paragraphs.

Many of the land-grant colleges were started in states which did not have state universities and in due time were expanded into state universities. Every state now has at least one land-grant college. Each of the Southern states has two such colleges, one for whites and the other for Negroes.

On the curriculum of higher education the land-grant colleges have exerted a large influence by popularizing the advantages of vocational education, especially in agriculture and engineering. Through their teaching, their research, and their extension work and other services they have promoted the rapid development of agriculture and engineering. Over the years they have had generous financial support from the Federal government and from the states.

Other Federal Subsidies for Education. For many years the Federal government has made annual appropriations for various educational enterprises. The annual appropriations made by the Federal government to education are as follows:

United States Office of Education for Land-Grant Colleges, Vocational Education below college level. Smith-Hughes Act, George Barden Act, assistance to federally-affected areas for operation of schools and schoolhouse construction; *Public Health Service* for further research in health and for education of health personnel; surplus property distribution; vocational rehabilitation; Gallaudet College; American Printing House for the Blind; Howard University; *Department of Agriculture* for research in agriculture and agriculture stations, school lunch program; *Department of Commerce* for state marine academies, Federal marine schools for training and upgrading of marine personnel; *Department of Defense* for academic training of military personnel, education of children of military and civilian personnel overseas and military personnel while off duty; *Department of Interior* for education programs for Indians, Virgin Islands, and Pribilof Islands and children of Federal park employees; *Department of Justice* for vocational and general education in Federal penal institutions; *Department of State* for educational exchange programs; *Department of the Treasury* for the coast guard academy and tuition of coast guard personnel; *Atomic Energy Commission* for research and development of scientists, construction and operation of schools in centers operated by the Commission; *Canal Zone* for operation of schools; *District of Columbia* for public education; *International Cooperation Administration* for educational activities in undeveloped countries; *Veterans Administration* for administration of public laws 16,894, 346, and 550; *National Science Foundation* for research in mathematics, engineering, physical, biological, and medical sciences, and, in 1958, for the civilian space commission.

The 85th Congress passed the National Defense Education Act which calls for a total appropriation of $877 million to strengthen the American system of education. By this act, due to run four years, the states will appropriate a matching sum of $405 million. The allotments are to be spent on loans and fellowships to students in higher education; financial assistance for strengthening science, mathematics, and modern language instruction; guidance, counseling and testing; research and experimentation in effective use of television, radio, motion pictures and other audio-visual media for education and vocational education. Almost $71 million was borrowed by 15,115 college students under the National Defense Student Loan program in the 1960–61 academic year. The average loan was $470. The college puts up $1.00 for every $9.00 received from the federal government.

In the spring of 1962, Congress passed the Manpower Development Training Act to encourage vocational training and enable those untrained to get needed skill in vocations. As can be seen in the table *Federal Funds for Education*, considerable funds have been appropriated for this use.

Federal Land Grants. By its system of land grants to schools, the Federal government has given public education a mighty stimulus. This stimulus was much needed, especially in the early days when the financial resources of the people were limited and when a general interest in education had not yet risen among the people. The income from these land grants today provides less than one per cent of the support of public schools and colleges, but in the early days the income provided a much larger percentage.

Taking the place of Federal Land Grants have been grants of money by the Federal government for education. For the most part these have taken the form of grants to schools to aid in the development of new programs in special areas of education and scholarships for research within these programs.

The Federal Government uses different bases for determining apportionments. Following the Louisiana Purchase, assistance was given in proportion to land areas. The 16th section of each township from the public domain was given to help with the establishment and operation of a system of education. About ¾ of the states have received this type of Federal assistance.

A provision of the Morrill Act of 1862 authorized grants of 30,000 acres of the public lands to the states for each Senator and each Representative in Congress. The resulting grants were generally for the most populous states.

In some programs of assistance the Federal Government requires that State and local communities match any Federal funds allocated to them. The allotment procedure for vocational education which specifies that state and local funds must be provided in specific proportions is an example of the use of this base.

"G.I. Bill of Rights." According to the Serviceman's Adjustment Act of 1944 and as amended in 1945, any veteran of World War II who had at least 90 days of active service is entitled to at least 12 months of education at government expense, provided it is started not later than 4 years after separation from active service or 4 years after the end of the war, whichever date is the later. After that 12 months, he is entitled to an additional period equal to the time spent in active service after September 15, 1940, and before the end of the war. The total period was not to exceed 48 months, nor extend beyond 9 years after the end of the war.

The student could select his course and his school, provided it was on the list of the Veterans' Administration. For his fees and textbooks the government paid up to $500 per school year. It also paid a certain amount each month for his subsistence.

This act expired in July 1951 for all who were not already in continuous training. Another Federal act known as the "Korean G.I. Bill" was enacted. For the veteran with at least 90 days of service, the new act provided one and one half days of education for each day in service after June 27, 1950. The veteran must pursue an approved course of study not later than 3 years from the date of discharge from active duty and no training is allowable beyond eight years from that date.

As in the original G.I. Bill, the student could select his course and his school. The government gave monthly payments designated as "training allowance" instead of "subsistence." This included the costs of schooling and some aid toward living expenses. The size of the training allowance was based upon the dependency status of the veteran and the rate of the veteran's training time.

VOCATIONAL EDUCATION

The term "vocational education" has been used in recent times to cover those school courses which prepare for commercial and industrial pursuits. This is a very limited meaning of the words, because preparation for the professions is also in a very proper sense vocational education. If the broader meaning be attached to the term, all education is vocational. Harvard college, the first American institution of higher education, was a vocational school organized to train the clergy. Every college or technical school has in like manner been a school for the training of young men and women to enter upon the duties of adult life.

Considered in a narrower sense, vocational education, or preparation for commercial and industrial positions, is of comparatively recent origin in the United States. Formerly boys and girls were trained for such positions by being apprenticed to individual employers from whom they learned by imitation and without systematic instruction. The apprenticeship system began to break down, however, as soon as modern economic conditions became complex and especially when machine industry replaced the older and simpler handcrafts.

The first type of special training for practical business pursuits in this country was commercial education. The manufacturing processes by which raw materials are worked over were developed on an extensive scale in Europe rather than in this country.

Estimated "Life-Time" Income
For Men by Amount of Education

$143,000	Completion of less than 8 years of school
184,000	Completion of 8 years of school
247,000	Completion of 4 years of High School
385,000	Completion of 4 years of College
455,000	Completion of 5 years of College

Source: *N.E.A. Research Bulletin Vol. 42 No. 1, Feb. 1964.*

Commercial Schools. As early as 1843, a man named Bartlett established in Philadelphia a school for the training of bookkeepers. Bartlett was followed by others, and soon every large city was supplied with a private business school or college which taught the elements of accounting and gave training in penmanship. These schools flourished because they supplied an urgent practical demand of the business world. Their courses were of short duration and highly intensive. The students were eager and there was a ready market for their services.

As business methods evolved, the courses of study in the private business schools also developed. When the typewriter came into common use, the schools transformed themselves in many cases into schools of typewriting and stenography.

In the early 1890's, the interest in commercial education had become so widespread that the attention of the public and of educators was drawn to it, and commercial courses for the public began to be advocated. In 1894 a group of commercial teachers met in Asbury Park and launched the movement. Since that date, high schools have rapidly developed courses in typewriting, stenography, and business methods, until now commercial education is one of the leading lines of instruction.

Manual Training. The first types of technical training to be adopted in this country were drawing and manual training. The exhibits of skilled workmanship brought from Europe to the Centennial exposition in Philadelphia in 1876 attracted the attention of Americans and convinced them that this country was far behind in the training of artisans. There was at that time no provision in the public schools for training pupils in manual skill. The European systems of woodworking were therefore borrowed and put into the school programs. This was especially true for the Swedish *Sloyd* system which emphasized the making of useful articles. Special schools were organized for the purpose of giving manual training courses. The first of these was the manual training school connected with Washington university at Saint Louis.

Manual training was advocated by its early promoters as a useful form of general training appropriate for all pupils, whether they were going into industry or the professions. Skill of hand, these promoters said, is just as important as reading and the sciences for a full development of personality.

The manual training movement has resulted in the introduction of handwork of some type into all schools. As a device for satisfying the demands of the business world for the training of workers, however, it has been superseded by a later and more distinctly technical type of education. Most schools now use the term "industrial arts" instead of manual training. An effort is made, also, to use the knowledge and skills of manual training as general education. Because of this, many new activities have been added to the manual training classes.

Technical Industrial Schools. In 1906 the state of Massachusetts appointed a commission on industrial and technical education. This commission pointed out that boys and girls were urgently needed in the machine industries, and that they were utterly unprepared by the ordinary schools for their places in factories. Indeed, it was clearly the belief of this commission that the ordinary forms of education are in many cases detrimental to industry. With the report of the Massachusetts commission there began a controversy which has been waged continuously from that time. On the one side have been arrayed the industrial leaders of the country, who have advocated two systems of schools, one for industrial workers, and one for the children of the upper classes of society who are to enter the professions. On the other side are the educators and other citizens, who hold that American public education must be a unit system unlike the dual system of Europe. This latter group advocates a reconstruction and liberalizing of common education, but insists that all the children of the United States shall be educated in the same school.

The National Society for the Promotion of Industrial Education, organized shortly after the Massachusetts commission had made its report, was the chief agency in inducing Congress to pass in 1917 the law creating the Federal board for vocational education. This board at first devoted its energy to the promotion of a dual system of education, but has since receded somewhat from that position and is at present co-operating with the high schools of the country in the establishment of industrial courses.

Agricultural Education. Parallel with the growth of technical education in industry, the schools have developed courses in agriculture. The department of agriculture has been influential in promoting such courses, and since 1914 has used a large Federal fund provided under the Smith-Lever act for this purpose.

Home Economics. Special training for girls in the arts of home making, cooking, and dressmaking has developed rapidly in recent years in the upper grades of elementary schools and in the high school.

Part-time and Co-operative Courses. Schools and industrial concerns have arranged to employ students on part-time programs so that there may be opportunities for these students to study and at the same time come into contact with practical processes. This type of work-study instruction has been widely adopted, both in colleges and in secondary schools since it was introduced by Herman Schneider in 1906 in the College of Engineering of the University of Cincinnati.

Smith-Lever Subventions. The Smith-Lever act, which became Federal law in 1914, is commonly known as the agricultural extension act. It provides Federal subventions to aid the states in promoting extension work in agriculture and home economics. The act made an appropriation for extension purposes but required each state or local community, or both, that might desire to participate in the funds, to match the Federal appropriation. This was the beginning of the use of the matching principle by the Federal government and, with few exceptions, such as in the case of grants made to the schools for defense training during World War II, the principle has been subsequently followed.

The extension work is carried on chiefly among adults but partly among youth of school age. Under the provisions of this act and its later amendments, approximately 90 per cent of the counties of the United States now employ agricultural agents and approximately 50 per cent of the counties employ demonstration agents of home economics. Approximately 15 per cent of the counties employ club-work agents who work exclusively with boys and girls in 4-H Club work and similar activities.

In each state the extension activities are supervised by the extension division of the land-grant college of the state. Each of these divisions publishes annually many bulletins and these have wide circulation, especially among the farming districts of the state. In addition to the day-to-day work of the county agents and of the club leaders, many institutes and other meetings are held every year.

All in all, these extension activities have constituted the largest experiment in adult education which the world has ever seen. They have not only improved agriculture but they have also improved the homes and the general environment of the rural areas.

Smith-Hughes Subventions. The approval of the Smith-Hughes law in 1917 marked the beginning of a new policy of the Federal government toward the financing of education; in brief, it started the policy of providing subventions for education lower than the college level. This act, which is often called the Federal Vocational Education act, provided for subventions to the secondary schools for instruction in agriculture, home economics, and industrial education. It also provided funds for the preparation of teachers of those subjects According to the provisions of the act, the subvention was to amount to $1,860,000 in 1917–18, and was to increase annually until a maximum of $7,367,000 was reached in 1925–26. The appropriations have been increased several times since 1925–26, and they now amount to more than $30,000,000 annually. The money is apportioned to the several states on the basis of total population, and in order to be eligible to receive it, the state or local community, or both, shall spend an equal amount for this work; each state and local community must also meet certain other standards prescribed by the act.

These vocational departments of agriculture, home economics, and industrial education are now found in thousands of schools, especially secondary schools, and thousands of new teachers are required annually by the departments. Salaries paid these teachers are somewhat higher than the average salary for teachers of the nation. They must serve 11 months, however, whereas the typical teacher serves only 8 or 9 months; and they must do much more community work than the typical teacher.

General supervision of the Smith-Hughes program is given by the United States office of education. More intensive supervision of the program is provided in each of the states by the division of vocational education of the state department of education. Such a division is required by the Smith-Hughes act. Any school desiring to organize a Smith-Hughes department, or a George-Deen department, should contact its state department of education.

George-Deen Subventions. The George-Deen legislation, enacted in 1937, provides an annual Federal subsidy for training workers for retail selling and other distributive occupation. Departments for the training of these distributive occupations are already found in hundreds of high schools, especially the large schools. The preparation given for such occupations is commonly called "distributive education."

As is the case with the Smith-Hughes subvention, the George-Deen funds are distributed to the states on the basis of total population, and in order to be eligible to receive them, the state or local community, or both, shall spend an equal amount for the program. Certain other standards must also be met.

George-Barden Act (Vocational Education Act of 1946). This Federal law passed in 1946 provided that funds allocated to the George-Deen subvention be replaced and additional funds were granted for vocational education. Under the act vocational education was developed further and funds were allowed to be used in connection with vocational guidance as well as vocational education.

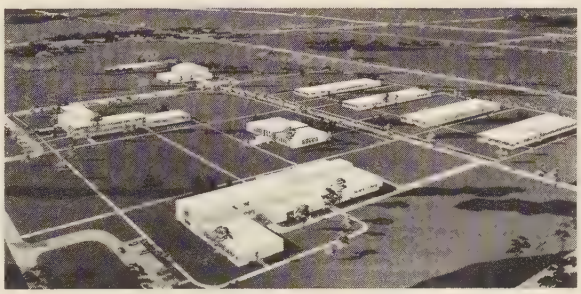
Corporation Schools. Many industrial concerns have found it necessary to supplement the training given in the public schools by special courses for their own employees. Thus, department stores have found that they must train their salesmen, first, by giving them general information with regard to the duties of salespeople and, second, by giving them special instruction in regard to the particular commodities handled in that special establishment.

Another type of corporation school has been organized by industrial concerns. For example, there are schools for the training of printers. Young boys are taken into these schools and brought up in the trade. Instruction in such schools is much more systematic than was the training formerly given to an apprentice in the trade, and it is also more elaborate in that the boy who is attending the school is given some instruction, not only in the particular activi-

The Institute for advanced study at Princeton, New Jersey. The Institute is a part of the famous Princeton University Graduate School which is located on adjoining property.

The W. Harrison Hightower Textile Engineering Building on the campus of the Georgia Institute of Technology in Atlanta, Georgia, which was founded in 1885. It is coeducational.

TECHNICAL INSTITUTIONS



Above One of 28 colleges in New York State operating under the community college law, Erie County Technical Institute in Williamsville, N. Y. offers 11 programs of study in the daytime division, while the evening division has about 25 diploma programs and several hundred individual courses which may be taken.

Left With a 5-year program in the fields of mechanical, industrial, and electrical engineering, the General Motors Institute offers young men an opportunity to prepare for positions in the various units of General Motors Corporation.

The Norman W. Church Laboratory at the California Institute of Technology is dedicated to research in chemical biology.

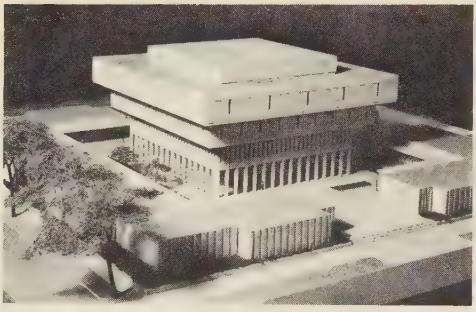
A campus scene of Rice Institute as seen from Lovett Hall. Rice is located in Houston, Texas, and was founded in 1912.

The West Virginia University Medical Center at Morgantown.

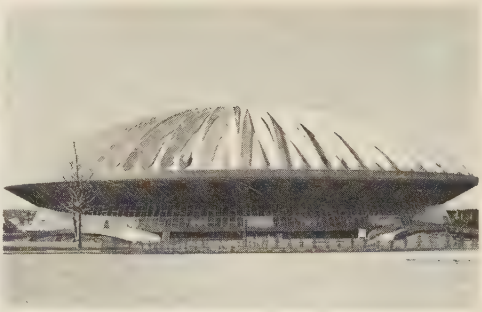
Faculty Center at the University of Washington, Seattle.

Bethlehem Steel Co.

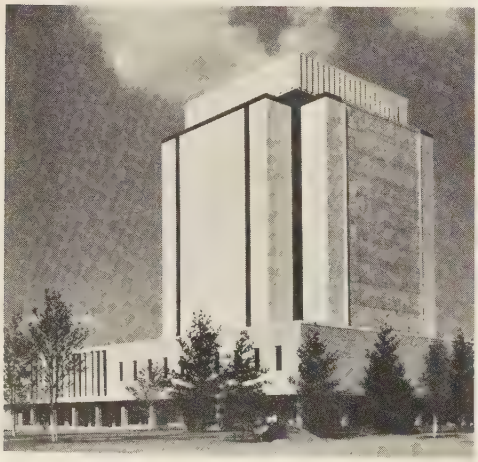
HALLS OF LEARNING



Shapero Hall of Pharmacy, Wayne State University, Detroit, Michigan.



16,000-seat Assembly Hall, University of Illinois, Urbana.



Memorial Library, University of Notre Dame, Indiana.

Freeman Memorial Library, Science Center, Lake Forest College, Lake Forest, Illinois.

ties of the trade itself, but in the use of language and in the simpler elements of the sciences which contribute to the trade.

Continuation Schools. The general term "continuation school" has been used to refer to numerous types of organized education, sometimes conducted by the public school system itself, and very frequently conducted by institutions like the Young Men's Christian Association and the Young Women's Christian Association. A continuation school is a school in which students who have completed the ordinary course are carried further and are given training especially suited to the industrial and commercial activities which they are to take up in adult life.

In some states the laws require employers to release their minor workers for attendance on continuation schools during regular working hours in the week. Continuation classes are therefore to be distinguished from the evening courses often organized in public schools for the training of adults who are engaged in industry. Continuation classes are one phase of the general movement, which has been going on in recent years in this country, for the education of industrial workers.

Vocational Guidance. The recorded history of vocational guidance in connection with education and philanthropy begins about the year 1908, and is associated with the names of Frank Parsons in Boston and E. W. Weaver in New York. Parsons' initial efforts were sponsored by philanthropy, and placed major emphasis on two units of the guidance program,—occupational choice and the selection of training programs. The High School Teachers' Association, under the leadership of Mr. Weaver, sponsored the New York movement. The dissemination of occupational information and placement received equal emphasis with occupational choice and selection of training programs. Case study was employed in both cities. Neither effort received financial support from, or administrative recognition by, the public educational system.

From this informal beginning, vocational guidance has developed into a regular part of the program of many school systems. There are three distinct types of school activity which can properly be classed under the head of vocational guidance. First, numerous courses are now provided in high schools and colleges in which information regarding vocational opportunities is given. Second, pupils are offered, especially at the junior high school level, courses known as exploratory courses in which they are given an opportunity through short periods of contact with various lines of activity to discover whether they are interested in mechanical, artistic, literary, or commercial vocations and whether they have aptitude in any of these lines. Third, many schools have official advisers who make careful studies of pupils, testing their intelligence and abilities and consulting with them regarding their tastes and economic needs. Such advisers sometimes come in contact with pupils when they apply for work certificates. At other times they advise pupils throughout their whole school careers. The program of vocational guidance merges into the general program of educational guidance or, as it is sometimes called, the program of personnel guidance.

In its broadest sense, guidance is concerned with every phase of the life of the individual. Many educators, therefore, hold the view that it is the same as education. Other educators, on the contrary, believe that it is concerned only with crises in the life of the individual. The more important of these crises and types of guidance are the following:

1. School guidance
2. Vocational guidance
3. Leisure-time guidance
4. Health guidance
5. Character guidance
6. Home-membership guidance
7. Civic guidance

The Personnel Problem. Between 1908 and 1918 many educational systems and a large number of industrial plants instituted and operated a considerable variety of personnel units, or "special features," more or less independent of one another, but each intended to assist in the solution of some phase, or some phases, of the personnel problem. During the same period three or four national organizations came into being with the solution of personnel problems as their major objective. National vocational guidance conferences met in 1910 and 1912, and a permanent organization was perfected in 1913.

Organization on a national basis was a war-time accomplishment, and at the close of the war the association paid the penalty of overdevelopment on a nonprofessional basis and disbanded. The American Association of Public Employment Offices was launched in 1913 under the auspices of practical students of employment problems. Each of these organizations has been reorganized, and two have changed their names, but none has made any outstanding contribution to the solution of personnel problems. In addition to the above organizations a considerable number of national associations, with major objectives in other or allied fields, have been interested in and have made minor or local or national contribution within the personnel field. The Young Men's Christian Association, The Young Women's Christian Association, the Knights of Columbus, chambers of commerce, the American Association for Labor Legislation, and the Federated American Engineering Societies are illustrations.

World War and Personnel Programs. The war brought into prominence all the operating units of personnel programs and broadened the vision of both employer and educator relative to the interrelation of such units and the desirability of unification. The study of individual differences, which had long commanded the attention of educators, was applied to army personnel service under the direction of nationally known experts. Rating scales were developed, and the beginnings of job analysis, job classification, and job specification were borrowed from industry and were adapted to war emergencies. Rehabilitation programs tended to renew guidance activities in connection with vocational education; and training programs for counselors and personnel directors were offered by a number of colleges and universities. The United States Employment Service, the Training and Dilution Service, the War Labor Policies Board, the War Industries Board, and the Women in Industry Service are examples of war-time governmental services which were instituted to deal with personnel problems.

Overvaluation of war-time experimentation and results has tended to discredit the entire personnel movement, and the re-establishment of public confidence now confronts professional students of personnel problems. The standardization of personnel terminology and a fundamental philosophy of personnel service in its relation to all of the varied experiences which an individual meets in the process of occupational preparation and adjustment demand scientific determination. In the meantime, vocational guidance is still quite generally applied to educational and philanthropic efforts, while employment management, industrial relations, and personnel service are correspondingly common terms in industry. The Second International Conference, Barcelona, 1921, unanimously adopted the terms "vocational guidance" and "vocational selection." Vocational guidance was defined as the choice of an occupation for an individual; vocational selection, as the choice of an individual for a given occupation.

No agency has, as yet, instituted a unit program covering the entire personnel field. It is, however, generally conceded that when such a program is formulated it should co-ordinate all personnel functions and should include the study and interpretation of individual differences, methods of personality culture, and a number of other units. The problem is one of general estimation of all personal traits and of general education. The term "vocational guidance" seems too narrow to cover the whole series of broad considerations that thus appear to be important. The term "personnel guidance" has accordingly been suggested.

Personnel Guidance. The increasing complexity of the industrial activities and of the educational opportunities of the country have tended to confuse the individual in making a choice of his life work. Industrial concerns have found, also, that the securing and placement of workers is a complex and difficult task. This is the justification for emphasizing in schools and in industry personnel guidance.

Evening Schools. In the large cities evening classes are very commonly conducted by the public school system. These are attended either by those who seek a continuation of the regular school training or by adults who have had only a limited opportunity of education. In many cases the evening classes are especially organized for immigrants, to whom instruction is given in the use of the English language and in the facts about American institutions. In some cases these classes are organized into systematic curricula, especially by the Y. M. C. A. and similar organizations, and a student may pursue a systematic course leading to high school graduation or to very definite diplomas of a similar type.

Americanization Classes. The Americanization movement is the name given to a group of educational efforts which were greatly stimulated by World War I, and are aimed at the training of immigrants in a knowledge of American institutions. It became a matter of very keen social consciousness during the war that a great many communities made up of foreign-born persons are not acquainted with the institutions of government and social life in the United States. It was found in some of these communities, which have in a measure segregated themselves, that the cultivation of foreign languages has prevented even the children from becoming acquainted with American ways.

In the army, it became apparent that a great many foreigners did not use the English language with sufficient freedom to carry on intercourse with their American neighbors or to make use of the American newspaper. All of these discoveries with regard to the ineffectiveness of ordinary methods of instruction led the public schools and the Federal government, through its department of the interior, to undertake vigorous efforts for the training of all foreigners in the knowledge of American institutions and in the use of the English language. Many industrial concerns allowed their workers a certain amount of time each day to attend classes. These industrial concerns in many instances also provided space in which classes could be held. Sometimes the public school system supplied teachers; again volunteer workers gave instruction. Subsequent curtailment of immigration reduced somewhat the urgent necessity for this type of training, but in all parts of the country the Americanization movement stimulated attention to the need of training for citizenship.

Adult Education. This term was used in England for a long time before it became common in the United States. It referred originally to courses in which men and women who had had only limited educational opportunity were offered instruction in such subjects as religion, literature, and the lines of scientific knowledge which would be helpful to them in their practical lives.

In the United States the movement to provide similar opportunities for persons beyond the age when they could attend public schools began in a variety of different forms.

States have given impetus to the movement by providing funds to be used in public schools and colleges for adult education. In 1957 it was estimated by the *Bureau of the Census* that more than 8 million persons 14 years of age or over were enrolled in Adult Education classes.

In recent years the effort has been made to co-ordinate the various agencies which contribute to adult education. The American Association for Adult Education which was organized in 1926 is an organization which includes representatives of school systems and of philanthropic, social, and religious organizations, librarians, industrial leaders, and representatives of labor colleges and of such independent institutions as Cooper Union of New York, the Mechanics Institute of Rochester, N. Y., and Lewis Institute of Chicago.

Some of the early manifestations of the American movement for adult education are as follows:

Lyceums. An organized plan of instruction of adults was inaugurated under the name lyceum in Millbury, Mass., in 1826. This was a voluntary association of farmers and mechanics formed for "self-culture, community instruction, and mutual discussion of common public interests." By 1839 more than 3000 town lyceums were in existence. They usually met weekly and the members presented essays, gave lectures, or engaged in debates and discussions. Later the practice grew up of inviting paid lecturers to address the lyceums. A national organization was formed in 1831 and held conventions until 1839. The local lyceums continued to flourish until the time of the Civil War.

Chautauquas. The chautauqua institution grew out of an annually conducted camp meeting held by the Methodist Episcopal Church at Fair Point (later named Chautauqua), N. Y. In 1874 its character was changed, largely through the efforts of Bishop Vincent and Lewis Miller, from that of camp meeting to an assembly for studying Sunday school methods. Other subjects of instruction were offered until the whole field of education was covered. Popular entertainment and, later, drama were added. The institution was imitated by many other municipalities, and in 1904 a circuit plan was inaugurated by which the same speakers and entertainers appeared successively at different chautauquas. In the third decade of the 20th century, however, the popularity of the chautauqua circuits declined, in part at least, because of the advent of radio with its easily available program of entertainment and instruction.

Recent Extensions. One of the most widespread forms of adult education is that carried on by commercial correspondence schools. The work is almost wholly vocational and technical. Enrollment is estimated to exceed 2,000,000. See *Correspondence Schools*. Many of the larger universities, following the example of the University of Chicago, provide work by correspondence. Public evening schools and so-called continuation schools, supported by taxes, are numerous in urban centers. In addition there are thousands of business schools operated for a profit. The Y. M. C. A. and kindred organizations are active in supplying education, both vocational and general.

Education for workers is of two types—that offered by employers for immediate practical use in industry, and that provided by agencies for the workers. The Workers' Education bureau of America, organized in 1921, was made the agency for the educational program sponsored by the Ameri-

can Federation of Labor, publishing textbooks and study outlines. The Brookwood Labor college at Katonah, N. Y., has a two-year course and conducts special summer institutes. Alumni schools have been organized by several colleges and universities and in some cases colleges have opened in the summer courses for persons who are not eligible for regular admission during the year.

The American Library Association, acting through the public libraries, has taken the initiative in bringing informing books to its readers through reading courses and the establishment of county libraries for rural districts. Public museums are usually centers of instruction on scientific topics, and many of the state and national parks provide education in nature lore. No small factor in the growth of adult education is the increasingly popular use of reference works in the home.

Illiteracy. The most frequently used measure of the extent of education of a people is the per cent of illiteracy. In the United States, illiteracy is so small that the Census Bureau no longer asks questions regarding it on its census forms. Illiterates, generally, are those people who have migrated to the United States and do not use the English language or the few people who do not take advantage of the school system. The Census Bureau reported that in 1960, 8.3 per cent of civilians in the age group of 25 years old and over had less than 5 years of schooling, approximately 41 per cent had 4 or more years of high school, and 7.7 per cent had at least 4 years of college. The median number of years of school for these citizens was 10.6 years. The following table shows the average number of years of schooling of persons 25 years of age or over in the United States.

AVERAGE NUMBER OF YEARS OF SCHOOLING OF PERSONS 25 YEARS AND OVER IN U.S.

Year	Male	Female
1940	8.6	8.7
1947	8.9	9.3
1950	9.0	9.6
1952	9.7	10.4
1957	10.3	10.9
1960	10.3	10.9
Increase from 1940–60	1.7	2.2

Source: *U.S. Bureau of the Census*

SCHOOL BUILDINGS

When American educational organization was relatively simple, the school buildings reflected the simplicity of the course of study and of the organization of the classes. In the early days of education the colleges and universities had the most elaborate structures. The design of buildings followed that of European universities or the prevailing style of buildings in America. More recently the function of the building has determined the type of architecture and, as can be seen by pictures, a variety of styles exist.

In the elementary and secondary schools, buildings range from one or two rooms to very large and elaborate structures. Generally the attempt has been made to eliminate the one-room buildings with their simple desks and meager equipment. This type of building is gradually being replaced by a much more elaborate structure with fuller equipment. Some of the typical enlargements are as follows:

Playgrounds have been enlarged and equipped with apparatus; the heating and ventilating apparatus and the sanitary equipment of the school have been improved; desks have been provided which fit the pupils and furnish better conditions for schoolwork; greater attention has been paid to classroom lighting; rooms have been provided for special activities of the school such as laboratory and shop music, art, the lunch program, and the assembly program.

In many of the enlarged buildings the schools have been given responsibilities in addition to the education of elementary or secondary school children. They have become community educational centers. As such they are used for adult education programs and as public gathering places for educational meetings.

A number of problems have arisen as people decided to enlarge their school buildings. The costs of the larger buildings are greater. School authorities and citizens have had to make major decisions about educational programs, design, and size of facilities. In cities where land values are high, it is sometimes necessary to erect a school building of several stories in order to provide outdoor space for school playgrounds. The larger buildings must of necessity be equipped with fire protection devices. Corridors, stairways, and other means of communication between rooms are necessary. The evolution of the modern school building has thus been in the direction of increasingly commodious housing for complex educational activities. As a result, many new ideas have developed in the design of school buildings. Some of the recent innovations in school design have been: the campus type of school where several buildings, each housing special facilities, are located on a large compound; odd-shaped classrooms which deviate from a rectangular shape; the curtain wall which provides a maximum of daylight in classrooms; and buildings shaped to eliminate corridors.

Examples of modern school buildings are to be found opposite page 1665 of this volume. From the illustrations, it can be seen that school buildings are reflecting the architectural innovations of the times. These typical new buildings representing various sections of the United States are designed to provide desirable standards of living and a comfortable, pleasant environment as the students learn.

Standard Buildings. In recent years, standards have been set for school buildings. A number of devices have been developed for scoring buildings, so that communities may have a basis for judging the efficiency of any particular building.

In general the standards have been concerned with several major divisions of the building; its site, the structure of the building, the classroom, the special rooms, and the service systems. Score cards have been designed to evaluate a school building and give numerical scores to the divisions. The building is rated on the basis of its score. The various points on the cards are scored with numbers which indicate the relative importance of each item in making up an estimate of the building as a whole.

Community Centers. There is a widespread movement in this country in the direction of the use of school buildings for purposes other than the instruction of children. Some years ago attention was drawn to the fact that there is a great waste in public resources when school buildings are left empty during the late afternoon and evening after the children have gone home. Proper use of the buildings, it was pointed out, will make it possible for a community to carry on various lines of useful social activities at hours when the school building would otherwise be unused. It is especially true in rural districts, where there are scant accommodations for social gatherings, that the school building furnishes a natural center for community gatherings of all types. Particularly where a rural community has erected a consolidated school building it can also use this larger building for various community purposes.

As a result of the agitation for the wider use of school plants, many school buildings have been equipped with auditoriums and other accommo-

dations for social purposes. These auditoriums serve the regular school for assemblies and the community for all kinds of gatherings. For example, in the city of Rochester, New York, the school buildings have been extensively used for political meetings, social meetings, lectures, stereopticon and moving picture exhibitions, and other similar purposes. In the schools of the city of New York a regular system of free public lectures has been carried on for years, through which people in various parts of the city have been given access to types of information which can be contributed only by specialists in various fields of science and literature.

In the consolidated schools of Colorado, extensive programs of community betterment have been centered. These large consolidated schools are in some cases used for community church services; they have equipment for motion picture exhibitions; and they are used in many cases for meetings leading to the improvement of roads and to other civic undertakings. In one of the rural districts of Wisconsin a school became the center for a dairying business which was carried on co-operatively by all of the patrons of the school. In North Dakota, the consolidated schools have been used for dramatic exhibitions, and the people have found that various forms of public entertainment can be provided economically through these institutions. School buildings have been used also as demonstration centers for the extension courses given by state universities and by the Federal department of agriculture. Physical education has been stimulated through these community meetings, and in many cases the community has been led through these social gatherings to increase the school equipment.

EDUCATIONAL FOUNDATIONS

Gifts for the endowment of educational institutions have been common in America since the earliest colonial times. Recently several large donors have preferred to give, not to particular institutions, but to a general foundation empowered to distribute the funds to various institutions as may seem wise.

Peabody Education Fund. The first of the educational foundations was established in 1867 when George Peabody, of Massachusetts, gave to a board of trustees composed of fifteen men the sum of $3,000,000 to be used in the development of education in the more destitute portions of the Southern and the Southwestern states.

John F. Slater Fund. In 1882 John Slater set up a foundation which was to help in uplifting the "lately emancipated population of the Southern states."

The Carnegie Foundation. In 1905 Andrew Carnegie gave to a board of trustees $10,000,000 to be utilized for the purpose of pensioning college professors. The original plan adopted by this foundation, known as the Carnegie Foundation for the Advancement of Teaching, contemplated the retirement of college professors after 25 years of active service. It was assumed that after such a period of service it would be better for institutions to recruit their faculties by appointing younger men. At the same time the retired men would be able to carry on productive literary work which would increase the materials of instruction and promote the intellectual life of the nation.

Closely related to the Carnegie Foundation were certain scientific organizations set up by the same donor. The Carnegie Institute was established in 1902 for the purpose of promoting scientific research and publishing the results. It was assumed that many scientific and literary workers could greatly increase their output if they were supplied with research assistance. Carnegie also established a technical school in Pittsburgh, and ultimately created what is known as the Carnegie Corporation, holding large funds to be dispensed for any educational or charitable purpose.

The Carnegie Foundation has been a highly influential body in determining educational practice in this country. It was obliged to abandon its original plan for the pensioning of college professors. In lieu of this program, it has adopted a system of insurance which is much less expensive than the pension scheme originally projected.

In the course of its operations, the Carnegie Foundation has made numerous studies which have been used in defining the character of higher institutions. Reports have been prepared on schools of medicine, schools of law, and schools of engineering. Their regular reports have contained much information in regard to the organization of colleges and universities.

Other reports related to the studies made of higher education have been those dealing with the quality of teaching in the high school, the role of physical instruction in schools, and the development of a definition of a unit of instruction. The latter, commonly called the *Carnegie Unit*, has been used widely as a standard.

Another major project of the Carnegie Foundation was the establishment of and aid to libraries. Many libraries throughout America bear the name Carnegie because of the contributions made by the foundation to their support.

Rockefeller Boards. A great educational foundation was endowed by John D. Rockefeller in 1902, under the name of the General Education Board. This organization is closely related to the Rockefeller Institution of Medical Research and the Rockefeller Foundation, the latter being a general corporation supplied with large funds. It was created in 1913 by a special act of the legislature of the State of New York as a corporate body "to promote the well-being of mankind throughout the world."

The General Education Board has used its funds in large measure for the encouragement of colleges and universities. This encouragement has been rendered through direct donation to the endowments and through gifts to maintain higher salary schedules, the latter being a special type of appropriation which was undertaken in order to meet emergencies which arose in most institutions of higher learning after World War I.

The General Education Board has organized a special division of state school surveys, and is engaged at the present time in co-operating with a number of states in carrying on this type of investigation.

The Russell Sage Foundation. The Russell Sage Foundation, established in 1907 by Mrs. Russell Sage after the death of her husband, has co-operated with numerous social agencies for the improvement of the administration of charities and other social enterprises. For a period during its history, the Russell Sage Foundation conducted a division of educational investigations. This division issued numerous reports, notably certain reports comparing the activities of different states in educational matters and showing the rank of these states in educational achievements. It also published elaborate studies and scales for measuring various types of school work such as scales for the measurement of handwriting, for spelling, and for reading. The last mentioned is reproduced on page 1647 in this volume.

The Cleveland Foundation. The Cleveland Foundation is a community organization established in 1914 by Mr. F. H. Goff in the city of Cleveland. At the time of the establishment of this foundation Mr. Goff was president of the Cleveland Trust Company. His experience with many of the large estates in Cleveland showed him that there are

many persons of wealth who do not know how to dispose advantageously of such funds as they are willing to give to worthy enterprises. He induced a number of these persons to turn over their estates to a corporation made up of a board of trustees, appointed in part through public officials and in part by representative bodies of citizens. This board of trustees was constituted into a community trust, and was authorized by its charter to utilize such funds as came into its possession for any worthy social undertaking, especially in the city of Cleveland.

Acting under this charter, the Cleveland Foundation carried on an extensive survey of the public school system of the city. Reference has been made in an earlier paragraph to this survey, which is one of the most complete scientific studies of a school system that have been made in the United States. Following the school survey, came a survey of the recreational opportunities of the city, and then a survey of the administration of criminal law through the courts.

The activity of the Cleveland Foundation has been extensively imitated. The New York City Community Trust is organized on the same general plan as the Cleveland Foundation. In other parts of the country, also, bankers have seen in the example of the Cleveland Foundation the possibilities of such a proper and permanent organization of the estates of the country as will benefit the communities in which they have been accumulated. It seems probable that this type of foundation will be set up in a great many communities.

The Commonwealth Fund. The Commonwealth Fund is a relatively new foundation established in 1917 by the Harkness estate and chartered in New York. This foundation devotes itself to various philanthropic and educational enterprises. It has organized a special committee to deal with juvenile delinquency, is carrying on demonstration clinics in a number of cities, and is co-operating with juvenile courts. It has also organized a special committee to deal with the problems of educational research. This committee receives and acts upon various proposals made by students of education in different parts of the country, and subsidizes investigations which seem to be promising for the promotion of educational organization and research.

The Ford Foundation. The Ford Foundation was established in 1936 by Henry Ford and his son Edsel Ford for the administration of funds "for scientific, educational, and charitable purposes, all for the public welfare." The avowed purpose of its educational program is "to strengthen, expand, and improve educational facilities and to promote greater equality of educational opportunity." In 1951 the foundation began a program of assistance in five fields: the establishment of peace; strengthening of democracy; strengthening of the economy; education for a democratic society; and individual behavior and human relations. Both American and foreign institutions were involved. Economic, educational, and social assistance has been given to south and southeast Asia and the Near East. In December 1955 the Ford Foundation announced the allocation of $500,000,000 to 4157 privately-supported colleges, universities, and hospitals in the United States—the largest philanthropic donation ever made. The income for the Foundation is approximately $100,000,000 yearly.

The W. K. Kellogg Foundation. Established in 1930, this foundation had as its original purpose: "the promotion of the welfare, comfort, health, care, education, feeding, clothing, sheltering and safe guarding of children and youth." Later the purpose of the foundation was broadened to "receive and administer funds for educational or charitable purposes." The major activities of the foundation have been in education, medicine and public health, agriculture, dentistry, and nursing. One aspect of these activities which has received special attention has been administration. The Cooperative Program in Educational Administration financed by a grant from this foundation has done much to stimulate interest in the administration of public schools. Eight centers were established for the program and approximately 140 institutions participated in a series of studies designated to analyze the problems of the school system and evaluate the school administrator's educational needs.

EDUCATIONAL SOCIETIES

Professional workers, engaged in the cultivation of literary and scientific subjects, are organized into numerous national societies. The American Historical Association, for example, includes those who are professionally connected with departments of history in colleges and universities and also many of those who give instruction in secondary schools. This association meets once a year in sessions at which papers are presented by its members, reporting the lines of research in which they are engaged. It also publishes a journal, the *Historical Review*, which includes original articles and reviews of all the publications in the field of history. The association appoints from time to time committees which make reports on various professional topics connected with the development of history as a subject of instruction. Especially significant have been the reports of committees outlining programs for history courses in secondary schools.

The statements which have been made about the American Historical Association can be repeated for a long list of learned societies both in the fields of the humanities and in the domains of the natural sciences.

American Association for the Advancement of Science. The associations which bring together representatives of the natural sciences are affiliated in one general organization known as the American Association for the Advancement of Science. This larger and more comprehensive organization is patterned after the older British association and is made up of a number of sections, such as the sections for chemistry, physics, mathematics, anthropology, and so on. The American association meets once a year for a winter session, at which time there are general sessions and sessions of each of the sections. In addition, there are occasional summer meetings which bring together certain divisions of the association.

National Education Association. Besides the special professional societies, there is an organization which includes teachers in all grades of schools. This is known as the National Education Association. This association, under various names, has been in existence since 1857. It is organized under a Federal charter, and has recently reconstructed its internal government so that the national meeting is now a representative body made up of delegates from the various state and local associations of teachers. The general association is subdivided for professional purposes into certain groups, such as the American Association of School Administrators, the classroom teachers, the department of higher education, and so on. These various divisions and departments organize programs at which papers are read, dealing with the special interest represented by the department. The general association, or representative assembly, deals with legislative matters and appoints committees and listens to their reports.

State Teachers' Associations. Affiliated with the national education organization are state associations. These in turn are made up in some states of sectional associations. Annual meetings are held by these associations, at which speakers present

professional topics and committees report on various interests of the teaching body.

The National Catholic Educational Association. This is an organization of individuals and institutions interested in Catholic education. The origin of the association was in St. Louis, Missouri in 1904 where it grew out of a joint meeting of several other Catholic educational groups. Now there are seven departments of the association; Major Seminary, Minor Seminary, College and University, Secondary School, Elementary School, Special Education, and School Superintendent. At the present time the total membership is over 10,000. The association holds national and regional meetings. Important in its program is the publication of its *Newsletter*, *Catholic Education News Digest*, *Catholic High School Quarterly*, and other bulletins.

National Research Council. During World War I the National research council came into existence as a group of scientists contributing to the activities of the departments of war and navy and to the scientific inquiries which were necessary to provide the material resources of the country for the war. So significant were the contributions of the research council to the national war policies, that it was continued and has received generous endowments for its work. It now administers a series of fellowships and funds for the development of scientific research. It has its seat in Washington, and is directed by a staff of central officers, who not only administer the various divisions of the council but promote in general ways the development of science throughout the country.

The American Council and Other Bodies. Numerous other educational organizations have their seats in Washington. Notable among these are the American Academy of Science which is made up of 100 selected scientists; the American Geographical Society, which publishes a journal of geography but is otherwise only a loosely organized society; and, finally, the American Council on Education, which is one of the newest national educational organizations. The American Council is made up of representatives from various educational associations. It has a director and meets in annual session for the transaction of business. Among the constituent organizations which send delegates to the meetings of the American Council are the Association of American Universities, the Association of Land-Grant Colleges, the Association of State Universities, and other similar organizations.

Standardizing Associations. Mention has been made in an earlier paragraph of certain standardizing associations, such as the North Central Association of Colleges and Secondary Schools. These standardizing associations, while having no authority, prepare approved lists which designate selected colleges and secondary schools in various sections of the country as of high grade. The desire of institutions to appear on such lists is so keen that the associations have acquired very wide influence, even though they have no official public standing.

Mention may be made in this connection of certain professional organizations such as the American Medical Association. This is an organization, including all the physicians in the country, which publishes both a technical journal and a journal of a popular type intended to promote the interests of public sanitation and health. It has, through its central council, standardized medical schools. Similar professional associations exist among the lawyers, dentists, and other professional groups.

Parent-Teacher Associations. Numerous associations have been organized with a view to making the community better informed on school problems. Sometimes these organizations are initiated by school officers who find it desirable to get into closer communication with their patrons; sometimes they originate in the spontaneous desire of parents to improve the conditions which surround their children in the schools. They represent in a sense a revival of the town meeting, which was the original civic organization in control of the school district. While the town meeting has been replaced by representative assemblies for the enactment of ordinances and statutes, these newer forms of organization are felt by the community to be too remote from so vital an interest as the protection and schooling of children. While people are willing to leave property and public interests such as roadmaking and policing to their representatives, they want to be fully informed about the teachers who have charge of their children and about the organization of the school. The following statements are quoted from or based on bulletins published by the Office of Education, which describe the rise and development of these organizations:

Mothers' meetings inaugurated in 1855, in connection with the kindergarten movement in the United States, seem to have been the precursors of the parent-teacher associations. A mothers' conference was called by a kindergarten training teacher in Chicago in 1894. Three years later a national congress of mothers was called in Washington D. C., by Alice McLellan Birney and others, in which the interests of all little children in the home and the community were discussed. A permanent organization of mothers was formed, and plans for the study of problems relating to child welfare were developed. In 1900, a formal charter was granted this organization in the District of Columbia.

National Organizations. Mothers and teachers discovered that they could accomplish more if united into a co-operative organization than was possible when each worked separately. Parent-teacher associations came into existence in response to the expressed need. Other organizations with various names but similar purposes came into existence also and united in this national organization. Among them were the parents' leagues, home and school associations, mothers' leagues, mothers' unions, preschool groups, reading circles, etc. In 1908, the National Congress of Mothers changed its name to include parent-teacher associations, and in 1915 a new charter was secured.

The movement has developed until the parent-teacher association has become the dominant national activity of parents and teachers. Membership grew from about 200,000 in 1920 to more than 1,500,000 in 1931. In 1958, the membership was 11,018,156. Summer courses for training leaders were given in colleges for the first time in 1922 at Columbia university.

The conditions under which the national organization operates may be briefly summarized as follows:

(1) The *annual convention* has all power over the conduct of the organization and is a delegate-voting body representing the state branches.

(2) The *board of managers* (composed of officers, state presidents, and the committee chairmen whom they elect) is authorized by the convention to carry on its work between the annual meetings, and must report annually to the convention.

(3) The *executive committee* is the servant of the board of managers and performs for it such duties as the board may assign to it, reporting to the board and the convention and having no independent authority.

(4) The *state branch* is the representative of the congress in the state and is pledged to carry out the objects and policies of the national organization.

(5) The *district organization* is the representative of the state branch in the district and is therefore pledged to carry out the state and national objects and policies in its territory.

(6) The *county council* represents the state branch in the county and carries the congress work to the individual members in every locality.

(7) The *local association* unites the members for carrying out the plans of the congress and for the promotion of the welfare of the children in the community.

(8) The *individual member* belongs directly to both the state and the national congress and is responsible for the attainment of its objects.

ACTIVITIES OF ORGANIZATIONS

A study of the reports of activities in parent-teacher associations in many states reveals a diversity of activities, but one general aim,—to surround children with conditions favorable to their growth. Among other things, this involves the education of parents in caring for the physical and mental health of preschool children. As one means of pursuing this object, the national organization, or congress,

sponsors a so-called summer round-up of children, the purpose of which is to send to school in the first grade a class of children 100 per cent free from remediable defects. The method employed is to induce parents to secure in May a physical examination of their children who will begin school the following September, a second examination in September being held to determine the extent of corrections made.

Other objects, sponsored by special committees of the national congress, include safeguarding the health of school age children and the guidance of high school children by means of a study of social hygiene. For the latter purpose there is a committee on mental hygiene, headed by a competent psychologist.

The following list sets forth some of the concrete results of parent-teacher activities as reported by county superintendents:

1. Terms of schools lengthened.
2. School attendance improved.
3. System of uniform textbooks established.
4. Improvement in schoolhouses in sanitation and apparatus.
5. New school buildings erected.
6. Schools standardized.
7. Playground equipment purchased.
8. Instruments purchased for the schools.
9. Library books and pictures purchased for the schools.
10. School grounds beautified.
11. Warm noon lunch served.
12. Milk provided for underweight children.
13. Dental clinics established.
14. Physical examination of school children and remediable defects corrected.
15. Cases of tardiness lessened.
16. Junior banks organized.
17. Picture shows supervised.
18. Reading rooms sponsored.
19. Health crusades sponsored.
20. Scholarships created.
21. Standard of home life raised through child study.
22. Friction in community eliminated.
23. A friendly relationship between parents and teachers established, thus making discipline easier for teachers and creating a stimulus for better work among students.
24. The moral standard of the community improved.
25. Parents visit school, becoming acquainted with modern methods of education and curriculum.
26. Phases of child amusement and recreation in community improved.
27. Night schools established.
28. Work accomplished in the removal of illiteracy.
29. Community halls built.
30. More students finish eighth grades and high schools.
31. Kindergartens established.
32. Equipment for school lunches purchased.
33. As a whole, the parent-teacher association acts as a socializing and educating project in any community.

Preschool Groups. Two important activities which are the outgrowth of parent-teacher associations are the preschool study groups and reading groups. These consist of parents of little children under school age. Programs for these groups include the subjects of child care and training, proper diet for the young child, proper clothing, advice to expectant mothers.

The activities of the Co-operative Education Association of Virginia are, as indicated by the name, largely concerned with raising money in order to improve the school plant. They finance school lunches, improve the social and recreational life of the community, and co-operate with the school board in its efforts. Many libraries have been installed as a result of the efforts of these organizations.

SPECIAL TYPES OF AMERICAN SCHOOLS

Special Schools for Men and for Women. Higher schools exclusively for boys were organized in the early colonies and most of the older institutions, such as Harvard, Yale, and Princeton, are institutions exclusively for the training of boys.

The practice of excluding girls from schools led to the establishment of a group of secondary schools and colleges designed to give higher education to women. In 1820 Mrs. Emma Willard secured $4000 for the establishment of a female seminary in Troy, New York. Since then a number of great endowments have been devoted to the education of women at Vassar, Wellesley, Smith, and other centers.

Coeducation. The common schools generally are open to girls as well as to boys, but in some cases private secondary schools have opened their doors to boys only. Likewise, many private colleges enrolled only boys or only girls. As the Western states organized higher institutions supported by public taxation, and as the concept of the "common school" extended into secondary education, it became politically impossible to exclude women from the privileges of public institutions. Likewise, after World War II, as pressures for college education among young men and women increased, many higher institutions which formerly enrolled only one sex found it necessary to become coeducational. Many of the traditionally all-male or all-female colleges and universities have made arrangements to enroll both sexes. Thus Harvard University has Radcliffe College, and Vassar College has enrolled male students. At the present time many other institutions at the secondary school and college level are taking similar steps.

Correspondence Schools. The enthusiasm of President Harper of the University of Chicago, and others interested in wider education of all classes of people, led to the organization of correspondence courses under the supervision of universities and of special schools organized to administer such courses.

Education by correspondence had a wide appeal and many correspondence-study schools arose. Many have been very successful. One of the great limitations in their work is that many students start courses but do not have the persistence to carry them on.

The recent development of extensive programs of Adult Education carried on by institutions of higher education and public and private schools has almost entirely eliminated the need for correspondence schools except in the areas of certain technical skills. And the programs of adult education are being encouraged to spread their activities into these areas.

Experimental Schools. Many schools have been organized in different parts of the United States for the purpose of demonstrating the feasibility of some educational reform. These experimental schools often have been organized in connection with teacher-training institutions. One of the famous schools of this sort was the Dewey school, organized by John Dewey in Chicago for the purpose of correcting the formal practices of schools.

The University of Missouri developed an experimental school which attempted to have a course of study without the use of textbooks. Mrs. Johnson's school at Fairhope, Alabama was organized on the general principle that children should be allowed great freedom. Other schools have been established around such ideas as 1) a curriculum based on the study of great books; 2) a curriculum when a student concentrates on only one or two subjects at a time until they are mastered; and 3) curricula which enable a student to study independently and at his own pace for learning.

EDUCATION OF DEFECTIVES

There are certain types of physical and mental deficiencies which debar a student from participation in the ordinary activities of school life. Thus, a child who is blind is of necessity excluded by that defect from many of the ordinary school opportunities. The larger cities and most of the states have accordingly provided special institutions for the training of the blind. It is even more necessary to provide for children who are deaf.

Schools for the Blind. Various systems of training have been provided for the blind. It has been necessary to prepare a special type of book which can be read by touch. The earlier forms of letters used in books for the blind were reproduc-

tions of the ordinary alphabet, but it was soon found that this form of letters is not especially adapted to recognition through touch, and a point system, known as Braille, was substituted. In 1958 an audio machine was developed for reading by the blind, which holds much promise.

Schools for the Deaf. In the training of the deaf there are two systems: one attempts to make the deaf person as nearly like a normal individual as possible by teaching him to understand what other people are saying through a careful observation of lip movements; the other system resorts to communication through hand movements, where various positions of the hand and fingers reproduce either the alphabet or word-wholes. Deafness is very frequently accompanied by inability to speak, and many of the schools for the deaf attempt to train their pupils, not only to recognize language when it is used by normal individuals, but also to participate in conversation through articulation which is acquired without the advantage of the sense of hearing. A deaf person has to learn to control his vocal cords by watching his own mouth and the vocal organs of others and then imitating the positions which produce sounds that he never hears.

Deficiencies in General Intelligence. Another group of defects which appear in abnormal individuals are very much more difficult to deal with. These are imbecility and feeble-mindedness. The most extreme cases in this group are of the custodial type and cannot be dealt with in the schools at all. For pupils who have some intelligence, but not a normal degree, special classes or special schools have been organized in many centers, and industrial training has been given as a substitute for ordinary school training, in the hope that the abnormal individuals may be made independent of charity. Formerly it was assumed that children of inferior intelligence should be associated with normal children in order that they might get the advantage of such association. It was also argued that normal children benefit by contact with slower children. It has become entirely evident, however, on the basis of accumulating experience, that the mixing of children of different degrees of intelligence is not an advantage, and methods have been developed of segregating children of inferior ability so that they may receive the special instruction necessary for their training.

The Emotionally Disturbed Child. Recently, great concern has been shown to the child who is emotionally disturbed. Special schools and classes are being organized for children with this defect. Increasing numbers of children have injuries to their personalities because of family situations or unfavorable social conditions. When a child is so afflicted often he cannot profit from instructions in the regular school or class. Teachers with special training and understanding of the problems of the emotionally disturbed person conduct educational programs which lead to the rehabilitation of children and enable them to take their places in society. Some states now have laws recognizing this condition in children and require that special classes or schools be organized when there are enough children classified as emotionally disturbed to form a class.

RELIGIOUS EDUCATION

The secular character of American schools has led to an elimination of religious instruction from the public schools. It is contended by many citizens that this is a misfortune, not merely because religion is thus in a measure eliminated from the common body of knowledge dispensed through the schools, but also because there is withdrawn from the schools the opportunity for the teaching of moral maxims and principles which would be advantageous in the training of the children. There has been a constant effort on the part of certain groups to reintroduce into the system of public instruction the teaching of the Bible and other forms of moral and religious subject matter. The result is that much legislation has been proposed and enacted, and numerous court decisions have been rendered on the general matter of the use of the Bible in the public schools. In some cases this legislation restricts the use of the Bible to a reading from the text without comment of any kind whatsoever. In other cases the decisions of the courts, based on legislation, have eliminated the Bible altogether from the school, making it illegal to read from the Bible even for opening exercises.

Various experiments are being tried to provide instruction in religion without attempting to modify the secular character of the schools. Experiments of this type have arranged some form of religious teaching outside of the regular school hours. In some cases children have been excused from the school for a period in the day and have gone to some neighboring church where religious instruction of suitable type has been given.

Other plans have arranged for instruction in Sunday schools to be supervised and credited by the public schools. The so-called Colorado plan is of this type. High schools approve the work of Sunday classes and treat such work as regular courses to be counted toward high school graduation.

Religious instruction has in recent years been greatly improved in Sunday schools as well as in classes of the type mentioned above. Many Protestant churches now provide normal classes for the training of teachers and a number of commissions have been active in reorganizing and enriching the courses of study used in Sunday schools.

Parochial Schools. Throughout its history, the Roman Catholic Church has been a patron of education. During the medieval period the clergy of this Church were the only teachers of the people. This special regard for education was retained by the Lutheran and various other Protestant bodies. At the present time, not satisfied with the instruction given in secular schools, these churches conduct numerous parochial schools and colleges. In these institutions, instruction in the conventional subjects is supplemented by instruction in religion and in Church history. In the case of the Roman Catholic Church, members of the religious orders are usually in charge of these schools. Since 1900 enrollments in elementary and secondary non-public schools have steadily increased both in numbers and percentage of the total students of full-time day schools. They now account for approximately 13 per cent of all full-time elementary and secondary school enrollments. The schools of the Roman Catholic Church enroll almost 90 per cent of these non-public school students. Protestant and other denominational schools account for about 6 per cent.

Of great concern to the Roman Catholic Church is its inability to support its extensive system of schools. Among plans suggested by leaders in the Church to do this are: that Federal, State, and Local tax funds be given for Church schools; that tax rebates be given to parents who send their children to parochial schools; and that the Church school system be reorganized.

Among the protestant churches the Lutheran Church has the largest number of students attending parochial schools. Other protestant churches having well-organized parochial schools are the Protestant Episcopal, Seventh-Day Adventist, Friends, Presbyterian, Methodist, Baptist, and Congregational churches.

The greatest concentration of parochial school enrollments is in ten states: New York, Pennsylvania, Illinois, Ohio, Michigan, New Jersey, California, Massachusetts, Wisconsin, and Missouri. In eight states the enrollments of non-public schools exceed 20 per cent of the total enrollment of all schools.

Control over the parochial schools is exercised by the various states in different ways. It was clearly determined in 1816 by the *Dartmouth Case* that private educational institutions had the right to exist. The *Oregon Case* in 1925 established that it was a violation of the 14th amendment to the U.S. Constitution for a state to require parents to send to public schools their children who were subject to the compulsory education laws.

Generally, the state laws regulating the parochial school are the same as those which apply to all individuals or organizations conducting businesses, charitable undertakings, or educational institutions. Legislation regarding the parochial schools is usually concerned with 1) incorporation, 2) state approval, 3) compulsory education, 4) public support, 5) tax exemptions, and 6) occupational licensing.

TEXTBOOKS

From the beginning, American common schools have been reading schools. In this respect they differ from the common schools of Europe, where instruction is given largely in oral form by the teacher. American schools have therefore needed from the outset a supply of reading books. As the curriculum was extended, reading material in each subject was put into the hands of the pupils, and they were required to prepare their lessons from this reading material.

The publication of textbooks, throughout American school history, has been left very largely to private initiative, and as a result there have grown up in connection with the schools of the country numerous large publishing houses which specialize in the preparation and publication of textbooks. The number of textbook publishers has increased in past years and the stiff competition has resulted in great improvement in appearance and content of textbooks. A large percentage of the salesmen for these companies are former teachers or school administrators and their work is done on a high plane of professional service to schools and teachers. Professional Bookmans Association of America (P.B.A.) was formed in 1947 and now has chapters from coast to coast. This organization emphasizes the professional aspect of selling and distributing textbooks, supplementary books, and reference books. There is also the American Textbook Publishers Institute (A.T.P.I.), an organization of publishers representing a high percentage of all publishers, which has the aim of improving all procedures which go into the making of modern textbooks.

State Regulation. Legislation has been passed providing for the official adoption by some authorized public body of a list of books which may be used in different grades of school. State textbook commissions are defended because they secure uniformity throughout the state, and this is regarded by some as an advantage, in that it permits children to move from center to center without being compelled to supply themselves with an entirely new equipment of school textbooks. On the other hand, state adoption is criticized because, at the time of adoptions, competition between various publishing houses frequently runs very high.

RADIO AND TELEVISION IN EDUCATION

In the early 1920's experimentation began with the use of radio in the classrooms. A notable experiment was made in Cleveland, Ohio schools, where radio lessons became a part of the curriculum. Statewide "School-Of-the-Air" programs have been developed and schools equipped with radios have had available to them a wide variety of educational subjects. In these programs a yearly schedule of educational topics is developed and schools are supplied with work books and teachers' manuals to supplement the broadcast. The movement for radio reception in the schools has been so widespread that now most of the schools of the United States are equipped with radio receiving sets and the Federal government has been encouraged to allow time on the air for educational programs. Schools use different means to take advantage of the many radio programs designed for educational use. A school may be equipped with a central radio receiving set and the desired program monitored to the classroom. In other schools each room is equipped with a receiving set. Another procedure used is to record a program on a tape recorder, edit it, and then present it to the students whenever the program fits the lesson.

A more recent teaching device is television. Experiments are now under way to determine its most effective use as an educational medium. Experimentation is taking place in two major areas: (1) the operation of equipment and the mechanics of using television as a teaching device; and (2) the development of proper programs for school use. A study in 1958 found that 50 institutions of higher education were experimenting with the use of closed circuit television in the classroom. Numerous secondary schools throughout the nation are beginning to use closed circuit television as a means to improve the quality of education. The *Ford Foundation* has given a large grant of money for the purpose of experimentation in the area of programming for educational television. One phase of the National Defense Education Act, passed by Congress in 1958, is concerned with research and experimentation in the use of the radio and television for educational purposes.

The first commercial television station owned by an educational institution was Iowa State College's commercial outlet, WOI-TV. Kansas State College of Manhattan, Kansas, was the first educational institution to apply for and be granted a non-commercial channel for television.

According to the United States Office of Education, there are presently 257 non-commercial educational television stations reserved. Of these over 60 are actually in operation. A total of 12 states have 65 state-wide networks of television devoted solely to education, either in operation or proposed. To show the interest developing in educational circles, 46 of the states have 199 colleges and universities which offer courses in Television. In addition, 268 colleges in 46 states and the District of Columbia offer college credit for network television courses. Television in the schools is not limited to colleges only. In 30 of the states, school districts report the regular use of television in the school programs.

A type of television of particular use to the schools is "Closed Circuit" television. This is a system which transmits a video signal from a sending camera to television receivers directly connected by a cable. In the use of this type of television, the installation can include a single room where one camera focuses on a speaker or demonstration and receiving sets are located in various areas of the room. By the use of this procedure, large rooms with large groups of students can have the closeness of small group procedures. Another use of "Closed Circuit" television provides for complex installations connecting numerous school buildings.

One experiment in educational television was the Mid-west Program on Airborne Television Instruction. At an altitude of 23,000 feet over Indiana UHF Channels number 72 and 76 were used to telecast to a six-state area of Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin. The potential audience was 5 million students in 13,000 schools. The program hoped to prove that television could be a means for economy in education while enriching the teaching of children.

A recent invention enables television pictures to be recorded on tape, called "Video Tape." This tape is usable for delayed re-broadcasting. Like radio tape recording, it can be edited and used by schools when the recording fits into the curriculum. At the present time, this invention is considered too costly to be practical for extensive school use.

EARLY CHILDHOOD EDUCATION

EARLY Childhood Education normally consists of a period previous to formal schooling (preschool), kindergarten, and the primary grades (one through three) with a program adapted to the developmental needs of children 3 to 9 years of age.

During the first three or four years of life, a tremendous amount of learning takes place. These early years should be supplemented with an enriched program by providing the opportunity for each child to develop to his full potential.

Greater strides in research during the decade of 1960 will probably result in curriculum changes which will attain a better balance in basic education and surpass the progress of the past era.

DEVELOPMENT OF THE PRESCHOOL MOVEMENT

The preschool movement can be traced back as far as the 4th century B.C. when Plato stressed the importance of early childhood, and the necessity for family co-operation. A study of ancient history reveals that some of the early philosophers, preachers, and educational reformers considered the significance of parent-child relationships, and made plans for improved education for infants and young children. However, it is in the 17th century that early childhood education as we know it received its impetus.

As noted in the History of Education (pp. 1629–1634) several educational leaders have made valuable early contributions to the preschool movement. The pioneer work of Comenius, Rousseau, Basedow, Pestalozzi, and Froebel in this field is particularly noteworthy. More recently, important additions were made by Montessori, Dewey, and others. Early in the 20th century, organized planning for preschool training led to the introduction of institutions designed specifically for this purpose. In England (1908), for example, the consultation Committee of the Board of Education recommended good nursery schools to take care of children too young to attend regular schools.

The first preschools in America were adaptations of the English idea, differing however in aims, motives, and organization. The American preschool was promoted in the interest of psychological and educational research and was concerned with what could be learned from children rather than taught them. Social forces that prevailed in the country after 1890 further influenced their development. The number of schools increased rapidly following the close of World War I.

Nursery schools served chiefly the children of the middle classes prior to 1933 when the *Federal Emergency Relief Administration* aided in establishing federally-supported *Emergency Nursery Schools* principally for underprivileged children of the depression years. Their purpose was to provide employment for unemployed teachers and to promote physical, mental, social, and emotional well being for young children. The *Works Progress Administration* took over the supervision of the Emergency Schools in 1935. During World War II many of these schools revised their programs to meet the needs of children in defense areas.

The *National Association for Nursery Education* founded in 1931 has assumed leadership and guidance in the field. Other private and government organizations have promoted the popularity and public acceptance of nursery education by emphasizing the importance of the early formative years. The 20th-century school was planned not to give custodial care nor to impart specific moral or intellectual information, but to enrich experiences and to supplement rather than to supplant the activities of the home.

THE NURSERY SCHOOL PROGRAM

A Nursery School offers a valuable supervised educational program for children beginning at the approximate age of three years by making possible experiences which promote social, physical, mental, and emotional development. It aims to meet the developmental needs of the age levels before Kindergarten and to provide children with a variety of educational experiences. The term nursery school is often misused and should be differentiated from that of "day school" or "child care center."

Lack of legislation concerning facilities for nursery school age children in many states is responsible for the variety of institutions labeled "Nursery Schools." The diversity of organization and sponsorship makes it almost impossible to obtain accurate information and statistics concerning this area of preschool education. Existing programs range from mere baby sitting to well-run nursery schools which meet high educational standards. The type of organization, the methods of sponsorship, or the age of the children in attendance in no way determine the quality of the school. However, there is among preschool specialists some general agreement as to the essentials and objectives of a good nursery school. These are listed in a pamphlet by the National Association for Nursery School Education, written in 1942, entitled "Some Ways of Distinguishing a Good Nursery School."

The Nursery School program includes play periods and routine activities usually designated as free play time, juice time, story time, music time, rest time, and bathroom time. The schedule must be balanced and arranged to alternate listening with talking, active with quiet play and regulation with freedom. No element of the daily schedule should be rigid and as much leeway as the group needs and the school can manage should be given.

The programs of the three and four year olds differ in the allotment of time and kinds of experiences appropriate to the interests and needs of the age level. Because of the development of interest and greater physical ability, four year olds are capable of participating in more active group experiences, and performing some of the routine activities independently.

The free play period provides time to move about freely and a free choice of play materials to challenge the child's adaptability. Two free play periods are commonly found in the daily nursery school schedule, one of 45–60 minutes, and another of 30–40 minutes.

Periods devoted to music, group discussions, and stories are small group experiences. They should never exceed 20 minutes. The program should be flexible and often these activities can be incorporated in the free play period.

The number of days as well as the length of the nursery school day varies in different schools. Some meet for as little as one half day a week, others have a full day program including a morning and an afternoon session. At present there is no evidence or agreement that the preschool child benefits most from a program with a stated number of hours per day per week.

Nursery school groups should be small in order to give children individual attention and promote satisfactory group living. The younger the child is the smaller the group should be. For example, 20 4-year olds and 18 or fewer 3- or 2-year olds in one group is recommended.

The teacher-child ratio recommended by most authorities is one teacher for every ten 5-year olds, one teacher for every eight 4- and 3-year olds, and one teacher for every six 2-year olds. For health and safety reasons, it is desirable to have two adults supervising a group of nursery school children at all times.

A preschool group works best when children of like ages are grouped together. When the children are within a comparatively short age range, there are many opportunities for social adjustments, opportunities are present to give and take; to learn

how to get along with peers; to lead and to follow; to consider the rights of others; to stand up for one's own rights; and to defend one's self. In some states an age of three years is suggested as the minimum entrance age.

The underlying principle of preschool education in the United States today is that the first six years of the child's life are the most important ones in the physical, mental, social, and emotional adjustment and many ills of adult life could be avoided through proper training in early childhood.

Preschool children need a wide variety of play material, sturdily built and washable. The following list is provided as a frame of reference for parents: Unit blocks made of hardwood, grouped with wooden or rubber animals, figures, small trucks, trains, airplanes, and boats. The housekeeping corner should contain a child size table, chairs, stove, refrigerators, beds, carriages, bedding, dishes and cooking utensils, ironing board, iron, broom, mop, dustpan, shelves or chest for storing, and a good supply of dressup clothes including purses, hats, belts, dresses, and suitcases. Art supplies should include easels, easel and finger paint, large brushes, a variety of size and kinds of paper, large crayons, blunt scissors, a clay and a storage crock. Water play utensils are such things as a galvanized tub, measuring cups, plastic and aluminum containers. Simple musical instruments such as drums, triangles, bells and percussion instruments; a good variety of apparatus for climbing, sliding and building; table and educational toys including wooden puzzles, beads, pegs and books; carpentry bench with sturdy hammers, saws, nails and soft wood; a sand box, piano and record player, round out the equipment. Basic furniture of appropriate size includes tables, chairs, storage shelves, lockers and low screens to provide partitions for some centers of interest.

TYPES OF NURSERY SCHOOLS

Nursery schools are of several types. A *Cooperative Nursery School* is one organized and administered by parents. Parents who form the group equip the school, administer policy, are responsible for financial support, employ teachers, and serve as assistants to the teaching staff.

The Private Nursery School typically is a proprietary school owned by the Director. Since it is a business venture, it must operate at a profit. Private Schools differ greatly in terms of fees charged, program and facilities, qualifications of teachers, and the socio-economic status of the families served. These private schools comprise about one-half of the existing Nursery Schools in the United States.

Religious Institutions have established educational centers for young children. The greatest numbers of these centers provide the regular nursery school educational program with the addition of the religious aspect.

The Laboratory Nursery School attempts to provide a rich creative experience for young children and in most instances is a center for Child Research and Parent Education. They have made a significant contribution to knowledge about the child and family living.

Nursery Schools for Exceptional Children are a recent contribution of education. They are for children who are handicapped in vision, hearing, movement, or have mental retardation. Such schools provide the special education needed for these children at an early age. Counseling help for parents is also one of their services.

Community Nursery Schools are organized, sponsored, and operated under some community auspice.

Settlement Nursery Schools place special focus on intercultural and interracial experiences whereby the special interests of various ethnic and racial groups contribute to the program to make understanding and acceptance of differences a primary goal.

Day Nurseries or *Child Care Centers* offer supervised group experiences to young children who cannot have adequate supervision in their own homes. They usually operate on an all-day, every-day basis.

Nursery Schools in the Public School System. The Nursery school is slowly finding a place in public education although relatively few are so organized and placed. California is the only state in which nursery schools are free and financed by State Education Department funds. In all other states, it is illegal to use public funds to operate a nursery school. The program in California is accomplished by means of the adult education program of the state.

Laws Governing Nursery Schools and Child Care Centers. Twenty-seven states have laws to protect children in Nursery Schools and Child Care Centers. However, the laws are often vague and unspecific, and enforcement is weak. Only twelve states regulate licensing of both nursery schools and child care centers and three states license nursery schools but not child care centers. Seven states have laws pertaining to professional qualifications for teachers of Nursery Schools but these do not apply to the staffs of Child Care Centers.

Only ten states specify penalties for violations of their laws regarding nursery school regulations. They have penalties which range from fines of $50 to $500 and six month to one year imprisonment.

THE KINDERGARTEN PROGRAM

The first kindergarten in the United States was established for German-speaking children in Watertown, Wisconsin in 1856 by Mrs. Carl S. Schurz. In 1860 Elizabeth Palmer Peabody opened the first kindergarten for English-speaking children in Boston, Massachusetts.

A study of kindergarten programs in various sections of the United States would seem to indicate that there has been little attempt to standardize them. The program may vary from school to school, and probably, even within a school system. However, with their diversities they all have some common elements. Children's learning in the kindergarten is foundational and basic to later learnings in the elementary school. Their learning is not acquired or recognized by the children as separate subjects. It is not achieved through drill, through subject teaching as may be appropriate later, or by the use of workbooks or textbooks. What and how much is learned differs with each child, depending upon his past experience, home environment, emotional stability, drive and native intelligence.

For purposes of identification to teachers and parents, the learnings in the kindergarten, basic to the later acquisition of more advanced knowledge and skills, may be grouped into Language Arts, Science, Health, Safety and Physical Education, Mathematics, Art and Music, Citizenship Education or Social Studies These are the same areas followed for the entire elementary school program.

The Language Arts Program is given 15% to 25% of the time of the average school week and includes: Story Time, Poetry, Exploring Books, Dramatizations, Corrective Speech Work, and Listening to the Teacher.

Citizenship Education occupies about 15% of the school week. Children are encouraged to become dependable members of the group. They share in the making and carrying out of plans and assume responsibility for care of equipment and materials. They learn of the interdependence of people and begin to understand celebrations of national holidays. Health, Safety, and Physical Education occupies 15% to 25% of the time. It includes dances and rhythm activities which use large muscles. Habits of safety in home, school, and community are stressed.

Mathematics is given approximately 10% of time. Here, making comparisons and counting as related to meaningful activities is done.

Science uses 10% of the time. The weather, stars,

seeds, pets and other animals are tools for discussions and learning activities.

Enrichment of Life Activities such as singing and other music experiences, art activities of painting, modeling, and construction are used for about 10% of the time.

Routines such as care of clothing, housekeeping, and classroom duties fill from 5% to 10% of the time.

Most kindergartens operate on a two and one-half or three hour session, one in the morning and one in the afternoon. Other programs are two-hour or all day sessions. The full day program is not widely used and, under present conditions, with the influx of small children in the elementary school, many schools cannot accommodate such a program.

Revision of Kindergarten Program. There are some educators and parents who do not see the need for evaluation and revision of the present kindergarten curriculum. Others, however, would suggest many changes. Some believe that commercially-designed readiness material should be included in the form of workbooks or that formal instruction in reading or other subjects should begin. Few children know how to read when they enter school. Not all children are ready to read at the kindergarten level, and some are still not ready for reading at the first grade level.

The issue still remains a controversial subject.

THE PRIMARY PROGRAM

The primary school is generally interpreted as the place for providing the educational program for children of ages 6 through 9 years. The organization of the program may vary in different schools. In some, children are placed in grades 1, 2, and 3 according to maturity and accomplishment. In other schools the children are enrolled in an "ungraded school" program. Here the children stay in one group for a three-year period and learn at their own rate during their stay.

The changing nature of the home and family life, occupational needs, and economic pressures make it difficult for parents to provide for the increased educational needs of their children. The school has been the agency to fill the gap and has gradually taken the responsibility for teaching additional subject matter. A core of desired experiences has resulted which are generally accepted as activities of the primary school program. The following is an account of some of the current practices.

LANGUAGE ARTS WHICH INCLUDE READING, WRITING, SPEECH AND SPELLING

Reading. Learning to read and reading to learn prevails throughout the school program and appears to permeate the entire curriculum. Formal reading instruction in the first grade is preceded by a preparatory period, generally known as reading readiness. In this the child becomes acquainted with the procedures of learning to read from left to right and front to back. He also learns to distinguish likenesses and differences in objects, pictures, and forms.

Initial instruction in reading is usually informal and built around first hand experiences of the children. Reading readiness tests are often administered to determine the child's readiness in terms of vision, experience, and social maturity. Modern reading programs provide a variety of reading levels and reading materials of each grade level. A balance of oral and silent reading is used. Remedial reading programs either by the classroom teacher or reading specialist are used in some schools.

Alphabet. The *Initial Teaching Alphabet* made up of 44 characters by England's Sir James Pitman, with each symbol representing only one sound instead of the ABC alphabet of 26 letters, offers an interesting introduction to reading and writing. Pitman's symbols are often easier to grasp than the A B C's. Many teachers report that the two alphabets give no special trouble and there are no difficulties in switching.

Writing. Instruction in writing is begun some time during the first year of school. For the first two years the teacher and children use manuscript writing (letters more or less resembling those he reads). The reason for this is that the child learns and becomes familiar with the printed letters on his reading material. The transition from manuscript to cursive style is usually made in the third year of school.

Regular, brief supervised practice in writing is an essential part of the program. A less direct method is the attention given to penmanship in all written work in the various subject areas.

Speech and Spelling. During the early years of life children develop speech patterns. The school gives opportunity for conversations which under guidance enable them to acquire a wide vocabulary of meaningful words, to speak correctly, and to give facility in the use of language. The teacher sets a good example of speech.

Ability to spell correctly is not needed by the child until he has learned to write. Spelling instruction is centered around the words most frequently used in children's writings. Some children have learned to spell about 140–150 words by the end of the second grade. Approximately 20 new words are introduced each week in the third year of school. At the end of this year the child usually has a writing vocabulary of about 750 words. Spelling should not be just a "subject" in the curriculum. It should be given attention in all written work throughout the school day.

Mathematics. In the first year of school attention is given to the development of a number concept. Teachers stress the learning of mathematics by doing measuring, manipulating, constructing rather than activities that depend upon listening and writing. Mathematics is made meaningful to children by using concrete experiences of number concepts as they appear in the normal classroom procedures.

Generally, during the second school year, single column addition to sums not exceeding 18, two-column addition, and subtraction without carrying or borrowing are introduced. In the third year addition and subtraction are extended to three columns of figures. Basic multiplication and division are taught and children begin to use simple fractions.

Citizenship Education, including History, Geography, Civics and Social Studies. Citizenship education is given through a series of guided learning experiences for children in which materials of history and geography are blended with events of the day. In the first and second years of school, direct first-hand experiences are the background of the curriculum. Field trips are taken around the school or the neighborhood, and gradually understanding of the environment is expanded to include a wider community. In the third year children begin to study their local community in a setting of the past as well as the present. Also they visit a few more remote communities. At this level social studies texts are introduced. Reading is supplemented with the use of globes, maps, and other teaching aids.

SCIENCE AND HEALTH

Science. Science information is firmly rooted through watching, touching, examining, and experimenting. Children become aware of changes and characteristics of things rather than the reason for these. Care of pets, collecting and examining nature objects, observing weather and seasonal changes are some of the common learning experiences. In the second year of school, the scientific method of problem solving is introduced with simple experiments. Children probe into such areas as use

of magnetism and electricity, lifting and moving things. In the third year, experimentation continues and children show greater interest in physical manifestations of the world around them.

Health. This program focuses attention on growth of good habits, attitudes and knowledge in the areas of food and eating habits, sleep and rest, care of teeth, eyes, ears, and cleanliness and mental health. Stress is also placed on safe practices at home, at school, and in the community. Health education is considered a basic requirement in the primary school curriculum, and is required by law in all states of the United States.

THE ARTS, INCLUDING ART, MUSIC, AND DRAMATIZATION

In the first two years of school, children learn to sing many new songs and to play rhythm instruments. They are given opportunity to listen and respond to music. Awareness of rhythm, tempo, and pitch change are introduced with the reading of simple music in the third year of school.

A great variety of painting, modeling, and drawing experiences enables the child to develop concepts of form and design. The use of the materials is guided so that he becomes familiar with the use of color along with these concepts.

Dramatization on the nursery school and kindergarten levels is best on an informal and spontaneous basis. The use of puppets can be an effective way to use dramatization by observation.

Hand puppets can be used by children in dramatizing their feelings and experiences. Health and safety information is frequently presented in this manner.

The flannelgraph also offers unlimited opportunities to dramatize experiences of children. Pictures used to tell a story are created by children using this device.

Field Trips. The field trip is an ideal way for young children to learn. Appropriate trips would include going to the zoo, a farm, a neighborhood store, exploring the school building, principal's office, or custodians' quarters. Trips to help vitalize a unit of study would include the airport, art gallery, railroad station, post office, dairy, and places of historic value.

LITERATURE

Literature can never be a substitute for real living, but it is mentally stimulating and emotionally satisfying to children in the nursery school, kindergarten, and primary grades. Books, stories, and verse are mediums through which the child increases his knowledge of objects, events, and the world in general. They help him to interpret the relationships in the world about him. Books should have literary value, and be well illustrated, for they have aesthetic value and should promote further interest in reading. The nursery school and kindergarten children learn to respect and to enjoy their contents.

Over the past thirty years, modern writers and artists have tried to create juvenile books which would provide a source of information, but which would also satisfy basic emotional needs of children. With the flood of children's books on the market, it is increasingly difficult to select appropriate books for them. Although many of the books in the less expensive series have merit, children are not being exposed enough to the excellent collections available. When children are young, parents and teachers are responsible for this exposure. Adults should consult lists from the libraries and other reliable sources.

Books for the 2-year old should be practically indestructible, and a size that is easy to handle and to carry about. They should be simple picture books, with a few pictures on a page, preferably of objects that are familiar to the child. The 2-year old enjoys turning pages, and seeing the same pictures over and over. First he will only identify the objects; later he will talk about the pictures, and ask adults to tell him about them. In this way he develops his vocabulary as well as his imagination.

The 3-year old enjoys picture books with short and simple captions. His favorite book characters are children his own age doing the things he does daily. He also likes books about pets.

The 4-year old is a busy and active person, and stories of all moving objects interest him, such as trains, boats, etc. His imagination is better developed and he can pretend to be participating in the activity of the story. Humorous and exaggerated stories intrigue him and he enjoys repeating nonsense syllables. Books that are appropriate for the 3- and 4-year old can be used later as supplementary reading to the regular class textbooks.

The vocabulary is expanding rapidly for the 5-year old, so that books of facts are just as interesting as those of action. His imagination is vivid and everything in his environment can be alive. Therefore, he enjoys stories that personify animals and inanimate objects. Mother Goose rhymes, information about nature, information about mechanical things, and stories about the community and community helpers are subject matter areas that appeal to the 5-year old. Although the 5-year old does not usually read, he is beginning to take an interest in the printed word.

The 6-year old is usually in first grade, and is beginning to read simple stories for himself. He is interested in other children and, because of broader experiences, he is ready to hear stories about children of other lands, about situations beyond his immediate community. He can think in logical sequence and enjoys adventure in stories. Humor and nonsense appeal to him.

Award books provide an excellent source of literature for nursery school, kindergarten and primary children, parents, and teachers, because children as well as adults cast their votes for these awards. Frederic G. Melcher, former editor of *Publishers' Weekly*, established two awards for distinction in the field of children's books. The *Newbery Medal* is given annually for the book published in the United States, which is voted the most distinguished literature for children. The *Caldecott Medal* is given for the best picture book of the year. In order to encourage year round publication of good children's books, the *New York Herald Tribune* gives a Juvenile Book Award in the spring of each year. This award is given for the best children's book in three age groups. A year-by-year listing of Medal winners for the period 1955 to 1963, inclusive, is as follows: *Caldecott Medal.*—"Cinderella"—Brosn; "Frog Went A-Courtin' "—Rojanovsky; "A Tree Is Nice"—Simont; "Time of Wonder"—McCloskey; "Chanticleer and the Fox"—Cooney; "Nine Days to Christmas"—Ets; "Baboushka and the Three Kings"—Sidjakor; "Once a Mouse"—Brown; "The Snowy Day"—Keats. *Newbery Medal:* "The Wheel on the School"—De Jong; "Carry on Mr. Bowditch"—Latham; "Miracle on Maple Hill"—Sorenson; "Rifles for Watie"—Keith; "The Witch of Blackbird Pond"—Speare; "Onion John"—Krumgold; "Island of the Blue Dolphin"—O'Dell; "The Bronze Bow"—Speare; "A Wrinkle in Time"—L'Engle. Examples of New York *Herald Tribune* awards made during the above period are the following: Younger Children (ages 4-8)—"Madeline and the Bad Hat"—Bemelmans; "Crictor"—Ungerer; "Sis Lives on Kilimanjaro"—Lingren & Riwkin-Brick. Middle Age Children (ages 8-12)—"Gone-Away Lake"—Enright & Krush; "Chucaro: Wild Pony of the Pampas"—Kilnay & de Misky; "It Was the Long-Nosed Princess"—Halowell & Fava. Older Children—"Because of Madeline"—Stols; "Sons of the Steppe"—Baumann & Rothfuchs; "An Edge of the Forest"—Smith & Moynihan. See *Books for Children's Library*, page 135.

TEST QUESTIONS

List the changes in the purposes of Education from Primitive Peoples to Modern Society 1615
Characterize the schools organized in Europe in the 12th century. What was the first of these institutions? 1615–1616
Describe the origin of the common schools and indicate the part taken by the Church in their development 1616, 1621–1622
Compare the early common and higher schools of Massachusetts as to purpose and curriculum 1616

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What two classes of students were taught in the priestly schools of Egypt? 1617
Name three important teachers of ancient Greece 1617
Who was the great mathematician who worked at the University of Alexandria and what was his contribution to education? . . 1617–1618
Whose writings have long formed the basis of Chinese education? 1618
Indicate the present status of Chinese school systems 1618
The educational system of what nation has served as a model for the schools of modern India? 1618
Show how the Greeks came to be the teachers of Rome 1618
Illustrate the work of Alcuin in the Palace School of Charlemagne 1618–1619
State evidences of Arab influence upon the intellectual life of Europe 1619
Describe the organization and the purpose of the Jesuit schools 1619
Trace the origin of the term "secondary school" and describe its development in Europe 1619
Who were the leaders of the "neo humanism" movement in Germany? 1619
Point out the reasons for the introduction of many new subjects into the secondary school curriculum 1619–1620
Describe the "public school" of England and tell the nature of its curriculum 1620
Outline the general character of the European university 1620
What is meant by "Academic Freedom?" 1620–1621
What are the terms used for two types of students in the English University? 1621
What was the one great advantage of the so-called Lancastrian movement? 1621
Outline the provisions of the "General School Regulation" issued in Prussia by Frederick the Great 1622
Why was the age of 14 adopted as the upper limit for compulsory school attendance in Prussia? 1622
Enumerate the three grades of schools which existed in the American Colonies 1622
Describe briefly the development of normal schools in the United States until 1860 . . 1625
For what purpose were the first American colleges established? How did the University of Pennsylvania differ from others in origin and curriculum? 1626
Indicate the importance of denominational colleges in the history of American higher education 1626
Review the changes made in choice of professions by college graduates 1626
Summarize the work of reformers in the history of education 1628
Indicate the relation of the kindergarten to the teachings of Froebel 1628
Point out some of the effects of Socrates' method of teaching 1628
Into what four branches did Plato divide higher education? 1628
Outline the ways in which Aristotle influenced medieval and modern education in Europe 1628–1629
Cite some methods of literary training advocated by Quintilian 1629
What were the effects of the teaching of Alcuin? of Anselm? of Peter Abelard? . . 1629
Describe the method of teaching employed by Saint Thomas Aquinas 1629
Upon what subjects did Erasmus write? . . 1629
What type of schools did Martin Luther advocate? 1629
Discuss the objective of the order established by Loyola 1630
To what educator can the modern organization of the German Gynmasium be attributed? . 1630
Describe the contributions of two English educators of the 16th century 1630
How is the influence of Comenius on modern education best stated? 1630
What is the position of John Locke in respect to classical education? 1630
Outline the plan of education for the individual as given by Rosseau 1630–1631
Describe some of the methods Basedow employed in his school 1631
Estimate the rank of Pestalozzi among educational reformers 1631–1632
Outline the chief psychological teachings of Herbart 1632
Summarize Froebel's leading educational principles 1632–1633
State the character of the contributions of Horace Mann and Henry Barnard to American education 1633
Outline the contents of Herbert Spencer's four famous essays on education 1633
What were the contributions of W. T. Harris to American education? 1633–1634
Describe the special educational contributions of Alfred Binet and Granville Stanley Hall . 1634
Summarize Charles W. Eliot's notable reforms at Harvard University 1634
On what was emphasis placed in the educational philosophy of John Dewey? 1634
What were the contributions to American education by Charles Hubbard Judd? . . 1634

RECENT EXPANSION IN AMERICAN EDUCATION

Give evidences of increased schooling of Americans in recent years 1635
List some reasons for development in periodical publication and circulation in the United States 1636
Prove from postal statistics, that writing ability has been greatly extended since 1840 1636
Explain the reasons for the school building shortage and the teachers shortage and the rising demand for school facilities 1637
Indicate some industrial changes which have occasioned the rapid growth of high schools . 1640
Discuss education and democracy in America . 1642

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Outline the general method and the results of the child study movement 1643
Describe briefly the place of the cultural Epochs Theory in American education . . 1643
Describe the tests conducted by J. M. Rice . 1643
Explain the meaning of the phrase "normal distribution" in a group 1644
Point out the meaning of "retardation" and "acceleration." 1644
Describe some methods used to group pupils in schools 1644

What two educators led in studies of retardation and elimination of pupils? 1645
How is the ability of a child measured by Courtis arithmetic tests? 1646
Describe the possible uses and values of Achievement Battery Tests 1646
Point out some improvements arising from the use of educational tests 1648
What is the "Intelligence Quotient" or I.Q. and how is it determined? 1648
For what purposes were the United States army tests devised? 1649–1650
Discuss the interpretation of the so-called Army Alpha Test 1653
What is the major purpose of the Army Beta Test? 1654
List some agencies which are promoting the use of tests and describe one of the major tests each has developed 1655
Discuss the pros and cons of the ABC method, the Phonetic and Word recognition methods action and eye movements? 1656
What important findings with respect to reading have followed laboratory studies of reaction and eye movements 1656
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Discuss extra curricular activities 1672
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Biography

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LINCOLN AND TAD

BIOGRAPHY

INTRODUCTORY

THE word biography is derived from the Greek words *bios*, meaning "life," and *grapho*, meaning "write." The term means a written account of one person's life. When the person whose life is described is also the author of the description, the work is designated by the word autobiography, which is formed by a prefix derived from the Greek *autos*, "oneself."

Biography differs from history in having its interest restricted to one person. History is concerned with movements, institutions, and social or national events in which the part of any one man is often extremely small. A biographical narrative, on the other hand, has its center of interest in the individual and in his pathway through the midst of larger events. It takes cognizance of his personal qualities, of his intimate words and thoughts, of his disappointments as well as of his achievements. Thus, from the point of view of history, the Civil War and the emancipation of the slaves are of more interest than the personal fortunes of any one man, even of Lincoln. In a biography of Lincoln, however, these great events are merely the setting, or background, of a narrative of his life.

It is the part of the more extended biographies to record all that is known regarding a person, and even the most trivial details are of value provided that they shed light upon his essential qualities. Biographical narratives of smaller compass, however, which are adapted more especially to meet the needs of the general reader, must, in order to be helpful, seize upon the central features of the larger narratives and must indicate the role which the subject of the narrative has played, or is now playing, in the drama of the world's activities.

Value. Although biography differs from history, nevertheless it is one of the most valuable aids to that study. To read history only is to see but one aspect of the drama of human life; the more intimate and, in many respects, the more interesting aspect can be seen only by acquaintance with the individual actors. It is through biography that an intimate knowledge of their lives may be obtained, and this knowledge in turn infuses a new and more personal interest into history.

To no less a degree, biography is essential to a complete understanding of literature and of art. Although great masterpieces have a universal appeal, nevertheless they are cast in a mold determined by the circumstances and experiences of the writer or artist. The pictures of women painted by Rembrandt, for example, would have been much different had he loved a different woman. The poetry of Whittier cannot be fully appreciated without a knowledge of his lifelong devotion to the abolitionist cause. Prescott's masterly *History of Peru* is invested with a certain tragic interest when we realize that it was written after the author had become blind.

It is hard to exaggerate the part played in people's lives by the example of the great. Alexander is said to have been inspired throughout his career by the recollection of the Homeric Achilles; every ambitious young scientist hopes some day to be a second Newton or Einstein; and before each schoolboy in every country are held up, for his emulation, those eminent men who are felt to be typical of the best qualities of the nation. Often a hint obtained from a biography opens a young reader's mind to previously undreamed possibilities and leads into wide usefulness a life that might otherwise have been common and uninspired.

Early Biographies. Biography is, in a sense, one of the most ancient forms of literature. In its earlier forms, it was often written to minister to the pride of the great. The Homeric poems and other early epics are chiefly accounts of heroes. Kings and warriors frequently hired poets or chroniclers to record the deeds of their lives. A Greek writer was paid by the Roman statesman and orator Cicero to write down the acts of the latter's administration, and Cicero requested him not to be sparing in the use of high colors.

Another class of biography that leaves much to be desired in the matter of veracity is that undertaken for the purpose of teaching moral lessons. Lives of famous or notorious characters are described in order to excite emulation or to arouse repulsion. The famous *Parallel Lives* of Plutarch are in part open to this criticism. The *Lives of the Emperors* by Suetonius represents the Roman rulers in a character much blacker, in all probability, than that in which they would appear to a disinterested inquirer. The numerous lives of the saints also were plainly written as much for the edification of the reader as for his enlightenment.

Modern Biography. With a few exceptions, such as Xenophon's *Memoirs* of Socrates, there was, until modern times, no work of genuinely biographical interest. Beginning with the 17th century, however, a vast literature has arisen consisting of books each of which aims to give a faithful account of the experiences and activities of one person from the cradle to the grave. Such works naturally differ greatly in value according to the abilities of the biographer. Among those of outstanding merit is Boswell's *Life of Johnson*, which, perhaps in all literature, has never been excelled in courage, picturesqueness, and mastery of portraiture.

In addition to individual biographies, a number of monumental dictionaries of biography have been written in recent times. The earliest of these was a Swedish work of 23 volumes completed in 1857 and embracing the lives of notable people of Sweden. The *Dictionary of National Biography* in 67 volumes contains biographies of more than 30,000 outstanding figures in Great Britain. The chief work of this type in America is the 21-volume *Dictionary of American Biography*.

Scope. This Department of Biography contains more than 3600 sketches of noteworthy men and women who have lived in the course of 4000 years of recorded history. The earliest lives narrated are those of the Babylonian Hammurabi and Cheops, king of Egypt, and the biographies of people still living are brought up to the date of printing.

The list of biographies will be found to contain the greatest figures in history, literature, art, science, invention, religion, commerce, discovery, and the other chief fields of human activity. A very large number also are treated who cannot be ranked among the greatest but who are remembered for some specific reason. These include Epicurus, the founder of Epicureanism; Vasco da Gama, who, in modern times, first sailed around the southern extremity of Africa; and Sholes, the inventor of the typewriter.

Among people still living or who have recently died, the leaders in every field of activity have been included. Thus biographical data will be found of those who have been elected to the American Hall of Fame and to the American Academy of Arts and Letters; many of the winners of Nobel prizes in all parts of the world; most of the rulers and chief statesmen, scientists, scholars, writers, artists, engineers, administrators, philanthropists, and religious leaders in all the principal countries.

Biblical characters have been purposely omitted, with the exception of Moses and Saint Paul. Moses was retained in order to complete the ranks of the great lawgivers, such as Lycurgus, Solon, Justinian, and Alfred. It appeared desirable, also, that a biography of Saint Paul should be included, who, as the chief founder of ecclesiastical Christianity, is ranked in the history of religion with Confucius, Mohammed, and other great leaders in that field.

Method of Treatment. The biographies in this department recount the salient facts in the life of each person, including their nativity, education, chief positions held, accomplishments, and, for those not living, the date of their death. These sketches, however, are not limited to a merely statistical record of information. While written with a rare degree of conciseness, they approach more nearly the fullness of an encyclopedia article than the skeletonic brevity of a biographical dictionary.

Wherever possible, the significance of each person's work has been briefly indicated. The relation of statesmen to the events of their time has been made clear; the nature and value of a scientist's contribution to knowledge have been estimated in accordance with the best authorities in the field; a concise outline has been given of philosophies or religions originated by leaders in these fields; and artists' works have been appraised as far as the world has arrived at a settled opinion regarding their value. In making all such statements, the utmost care has been taken to avoid partisanship of all kinds. Neither fulsome praise nor malice has any place in a work of this character.

In the case of authors, a representative list of their writings is set forth. The chief masterpieces of painters, sculptors, and architects are listed, as well as the location of many of their works The style and other qualities of composers are briefly characterized according to the judgment of eminent critics of music. In a word, this department has gone far toward being a complete guide to the vast field of human achievement.

Reference Groups. Throughout this department, the biographies are arranged alphabetically with a view to the readiest reference. At the end of the section, a second grouping of the names will be found, which is based on the field of achievement to which the different personages belong.

The first advantage of this grouping is that the reader is thereby enabled to see at a glance who are the coworkers, associates, or opponents of any one man in whom he may be interested. Moreover, since, within each group, the names are arranged chronologically, the development in any one field may be readily followed by consulting in order the biographies of the different people in this group.

It is, of course, impossible that each group should contain all the biographies that a specialist might look for in studying the development of his own field. Nevertheless, the *representative character* of the selection is such that, for biographies of people in fields outside the specialist's own department, these groups will be found no less valuable for the specialist than for the general reader.

Another unique feature of the department is the tabulation of all Nobel Prize winners. Opposite each name are entered significant data regarding the prize-winner's life and a brief characterization of his or her accomplishment.

Up-to-dateness. Many of the large encyclopedias do not contain information regarding significant events of the immediate past. Yet it is precisely the men and women who have recently come into prominence regarding whom people interested in present events need to be informed. Many life histories in this department have been secured only by special efforts made to obtain the facts from the persons themselves. In other words, many facts in the biographies of these people were not, at the date of printing, available in any other biographical reference work.

Illustrations. No small part of a reader's impression of a notable personage is a knowledge of his appearance. For this reason, photography may be a valuable aid to biography and, in this department, it has been laid under contribution to an unusual degree. Throughout this volume will be found a number of portraits of men and women whose lives are described in the text.

In addition to the portraits, there are numerous other illustrations which add to the effectiveness of biography. These include such pictures as the homes of noted Americans and reproductions of masterpieces in painting, sculpture, or architecture.

Cross References. In order to preserve the necessary conciseness and at the same time to enable the reader to learn as much as possible about the achievements of each person described, cross references have been inserted directing attention to other passages of this volume in which will be found a more complete account of some aspect of the person's work. Thus under Einstein there is a cross reference to the *Theory of Relativity*, which is appropriately treated more fully under Physics than in the Department of Biography. Similarly, under inventors, cross references are frequently given to articles in the section entitled Inventions; under authors, cross references direct the reader to articles on books or characters treated separately in the section on Literary Plots, Characters, and Allusions or in other parts of the Department of Literature; under artists, musicians, or educators, appropriate references are appended referring to instructive articles in the departments devoted to fine arts, education, or other subjects.

The enormous amount of material in this work would permit of an extraordinarily large number of cross references of this sort. To insert all those possible, however, would be distracting to many readers. Consequently, only those have been appended which appear to be the most imperative. They will serve as examples, showing how the careful user may obtain the maximum value from this department.

Spelling of Names. Personal names that come from certain foreign languages are often spelled in many different ways in English. This is especially true of Russian and Chinese names. To them might be applied the words of H. G. Wells, who, in speaking of Egyptian names, said that few self-respecting scholars in this field would tolerate the spelling of their colleagues. The form of such names used in this department is based in each case on the preference of one or more outstanding scholars.

The spelling of geographical names, as stated in the introduction to Geography, follows, in general, the decisions of the United States Geographic Board.

Test Questions. One of the distinguishing marks of an educated person is the range of notable people, in past ages or in the present, with whom he is acquainted. For extending and testing one's acquaintance with the great a stimulating means will be found in reading the test questions at the end of this department and consulting the text wherever the questions call for information not already familiar to the reader.

Bibliography. In order to meet the needs of those who desire to read more extensively regarding the lives of eminent personages, a bibliographical list has been added at the end of the department. This list contains the names of the finest biographical works in the English language as well as the names of the chief biographical reference works.

BIOGRAPHY

REFERENCE NOTE: The letter **c.** appearing before a date is an abbreviation for the word *circa*, meaning "about."

Abbey, Edwin Austin (1852-1911), artist, was born in Philadelphia, Pa., and began his art studies at the Academy of Fine Arts in his native city. He attained foremost rank among modern painters of historical and subject pictures. His works are remarkable for correctness of detail. He acquired great fame as an illustrator of Shakespeare, whose plays also supplied him with the subjects for some of his most successful pictures. After 1881, he resided in Great Britain. His principal works include "Richard III and Lady Anne," "King Lear's Daughters," "Hamlet," "Crusaders Sighting Jerusalem," "Fiammetta's Song," the decorative panels illustrating the "Quest of the Holy Grail," in the Boston Public Library, "Coronation of King Edward VII," and "Columbus in the New World." He was a member of the American Academy of Arts and Letters. See *Painting.*

Abbott, Lyman (1835-1922), American clergyman, author, and editor, was born in Roxbury, Mass.; was graduated at the University of New York in 1853; studied and practiced law; was ordained Congregational minister in 1860; resigned his pastorate in 1869 to devote himself to literature. He edited the "Literary Record" in *Harper's Magazine*; was associate editor of *The Christian Union* with Henry Ward Beecher, whom he succeeded as pastor of Plymouth Church, Brooklyn, in 1888; resigned in 1899; became editor of *The Outlook* in 1893. He was a leading exponent of the social gospel.

Abel (*ā'bĕl*), **Niels Henrik (1802-1829),** Norwegian mathematician, was born at Findo, Norway. He completed a course at the University of Christiania and spent two years in further study in Paris and Berlin. In 1828, he was made instructor at the University and the Military School in Christiania. He made important contributions to mathematical science, particularly by his work on the theory of functions, of which he was the originator. He died near Arendal. See *Mathematics, Modern.*

Abelard (*ăb'-ĕ-lärd*), **Peter (1079-1142),** scholastic philosopher and theologian, was born at Pallet, near Nantes, France. His immensely po ular lectures at the Paris cathedral school led to the founding of the University of Paris. Doctrines advanced by Abelard in a controversy with Saint Bernard reveal him as a rationalist, holding that nothing is to be believed but what has been first understood, while the more orthodox writers held that we must believe in order to understand.

When Abelard was 38 years of age, he fell in love with his pupil Héloïse, whose uncle later caused a separation of the lovers and the emasculation of Abelard. The story of this romantic attachment, preserved by extant letters, is unique among all historic love affairs.

Abelson, Philip H. (1913-), physical chemist, was born at Tacoma, Wash. He studied at Washington State College and at the University of California, where he worked in the Lawrence Radiation Laboratory. After receiving his doctorate, he became physicist for the Carnegie Institute for research in Terrestrial Magnetism at Washington and also served at the U.S. Naval Research Laboratory. In his research, he has placed much emphasis on biophysics and biochemistry. He was appointed director of the geophysical laboratory for the Carnegie Institute and, in 1962, he became editor of *Science* magazine. His views concerning Exobiology, or the possibility of life on other planets, have commanded widespread interest. See *Exobiology.*

Abercrombie, Sir (Leslie) Patrick (1879-1957), British architect and city planner, spent many years in the study of civic design. In addition to teaching this subject, first at the University of Liverpool and later at the University of London, he was consultant on projects for Dublin, Doncaster, Hull, Plymouth, and the County of London. His contribution to the master plan for rebuilding London has been described as "a program for orderly decentralization."

Abruzzi (*ä-brōōt'sē*), **Luigi Amadeo, Duke of the (1873-1933),** Italian prince, scientist, explorer, naval officer, and litterateur, was born at Madrid, Spain; traveled around the world as a youth; ascended Mount Saint Elias, Alaska, 1897; and led an Arctic Expedition in 1899, which penetrated nearest to the North Pole up to that time. In 1906, he ascended the topmost height in the Ruwenzori range, East Africa, and, in 1909, ascended some of the highest peaks of the Himalayas. His writings include *On the Polar Star in the Arctic Sea, The Ascent of Mt. St. Elias,* and *Ruwenzori.* In World War I, he was commander of the Italian fleet until 1917. After the war, he undertook a colonization scheme in Italian Somaliland. He declined an offer of the throne of Albania in 1922. See *Polar Exploration.*

Acheson, Dean (1893-), American diplomat, was born at Middletown, Conn. He studied at Groton, Yale University, and Harvard Law School, and was an ensign in the U. S. Navy in World War I. After graduation from law school he served briefly as secretary to Supreme Court Justice Louis D. Brandeis. In 1941 he was appointed assistant secretary of state. He engaged in other forms of public service, notably as chairman of the United States section of the permanent American-Canadian defense board. He was secretary of state from 1949 to 1953.

Acheson, Edward Goodrich (1856-1931), American inventor, was born at Washington, Pa. and was educated at Bellefonte Academy. While employed in Edison's laboratories in New York he discovered a process for making carborundum, an extremely hard abrasive, use of which soon became standard. In 1896, he obtained a patent for a method of making a pure graphite known as "dag", used extensively as a lubricant. Acheson began manufacturing carborundum in 1895 at Niagara Falls, N. Y., but later lost control of the enterprise. See *Carborundum, Graphite, Silicon.*

Acton (*ăk'tŭn*), **Sir John Emerich Edward Dalberg, First Baron (1834-1902),** English historian, was born at Naples, Italy. In 1895, he was made professor of modern history at Cambridge University, and as a liberal Catholic exerted profound influence. He planned the *Cambridge Modern History,* written by eminent historical scholars after his death. He wrote *The War of 1870, Wolsey and the Divorce of Henry VIII,* and *Schools of History in Germany.*

Adamic, Louis (1899-1951), American author, was born at Balto, Yugoslavia. He attended school in Yugoslavia until 1913, when he was brought to the United States. He was naturalized in 1918. After serving in World War I, he worked at various occupations which brought him into contact with other recent immigrants, a class to which he interpreted American ideals and whose interests and worth he interpreted to the public generally. His writings include *Dynamite, The Native's Return, Cradle of Life. My America,* and *From Many Lands.*

Adams, Arthur Stanton (1896-), American educator and engineer, was born at Winchester, Mass. He was educated at the United States Naval Academy and at several technical colleges, where he specialized in metallurgy. For several years professor of mechanics and metallurgy at the Colorado School of Mines, he became assistant dean of engineering at Cornell University and then, during World War II, special assistant in the Bureau of Naval Personnel at Washington. He had been president of the University of New Hampshire for two years when, in 1950, he was elected president of the American Council on Education, succeeding Dr. George Zook. While engaged in teaching he collaborated in the writing of two books—*Fundamentals of Thermodynamics* (with George Dewey Hilding) and *The Development of Physical Thought* (with Leonard B. Loeb).

Adams, Charles Francis (1807-1886), statesman and economist, son of John Quincy Adams. He was nominated by the Free-Soil party for the office of vice president in 1848; was elected member of Congress. 1858 and 1860, by the Republicans; was minister to England, 1861–68; and was appointed one of the arbitrators of the Alabama Claims, 1871–72. His position in England during the Civil War was a most difficult one, but the duties were performed with tact and discretion. He was Democratic candidate for governor of Massachusetts in 1876.

Adams, Franklin Pierce (1881-1960), American journalist, was born at Chicago, Ill. Having studied at the University of Michigan, he entered newspaper work with the Chicago *Journal* in 1903. He subsequently was on the staff of several New York newspapers, including the *Herald-Tribune* from 1931 to 1937 and the New York *Post* from 1938. His work consisted of a daily column "The Conning Tower," composed of mixed prose and verse in humorous vein. More recently he was a member of the panel on the "Information, Please" radio program. He was editor of *Anthology of Light Verse* (1942) and of *The F. P. A. Book of Quotations* (1952).

Adams, Henry (1838-1918), American historian, son of Charles Francis Adams, was born in Boston; was graduated at Harvard, 1858; and became private secretary to his father, who was American minister at London, 1861–68. He was assistant professor of history at Harvard, 1870–77, and editor of the *North American Review,* 1870–76. He then located in Washington, where he made a detailed study of the administrations of Jefferson and Madison, which he embodied in a work of original research entitled

History of the United States from 1801 to 1807. His *Mont Saint Michel and Chartres*, as masterly study of medieval times, and *The Education of Henry Adams*, demonstrating the inadequacy of the contemporary generation for meeting the problems of the 20th century, won him a wide and lasting reputation. He was elected to the American Academy of Arts and Letters in 1905.

Adams, Herbert (1858-1945), American sculptor, was born at West Concord, Vt. He was educated at the Institute of Technology, Worcester, in the Normal Art School of Boston, and in Paris. He then became instructor in art at Pratt Institute, Brooklyn. While modern and original in style, his fresh and refined realism resembles that of early Renaissance sculptors. He became distinguished for his beautiful busts of women, numerous statues, and for bronze doors at Saint Bartholomew's Church, New York, and at the Congressional Library, Washington. He became a member of the American Academy of Arts and Letters in 1912.

Adams, James Truslow (1878-1949), American capitalist and historian, was born in Brooklyn, N. Y. Graduating from the Brooklyn Polytechnic Institute and Yale University, he engaged in a brokerage and investment business until 1912, when he retired from active participation to devote himself to public service and literature. He was a captain in the military intelligence service during World War I and was detailed for special duty at the peace conference in 1919. He had already begun a series of studies in American colonial history, and his *Founding of New England* won a Pulitzer prize in 1922. *The Adams Family*, *The Epic of America*, and *The March of Democracy* attained a wide popularity for their freshness, vigor, and broad grasp of historical facts. He wrote also *Building the British Empire*. He was elected to the American Academy of Arts and Letters in 1930.

Adams, John (1735-1826), second president of the United States, was born at Quincy, (formerly Braintree), Mass. He was graduated at Harvard in 1755 and was admitted to the bar in 1758. He was one of the delegates to the Continental Congress at Philadelphia, 1774; was one of the signers of the Declaration of Independence; and throughout supported the Revolution, in which, as chairman of the board of war, he took an active part. He was commissioner to the court of France, 1778, and was sent on an embassy to England, 1779. He was elected vice president of the United States in 1789; succeeded Washington as president in 1797; but, in 1801, failed to gain re-election and retired from public affairs. He died, July 4, 1826, on the 50th anniversary of the birth of the nation which he devoted his best energies to establish. Elected to American Hall of Fame, 1900. See *American History: Presidency of John Adams*.

Adams, John Couch (1819-1892), English astronomer, was born at Laneast, Cornwall. He was graduated at Saint John's College, Cambridge, in 1843. After graduation he was made mathematical tutor at Cambridge; was appointed professor of astronomy in 1858; and, in 1860, succeeded Challis as director of the Cambridge Observatory. With Leverrier of France, Adams shares the honor of discovering the planet Neptune. Working independently, each without the knowledge that the other had attacked the problem, they each computed, in 1843–46, from observed irregularities in the motions of Uranus, the mass, orbit, and location of a supposed new planet. This new member of the solar system, later named Neptune, was first recognized by Galle of Berlin from Leverrier's calculations, though it had actually been seen but not recognized a few weeks earlier by Challis from Adam's calculations.

Adams, John Quincy (1767-1848), sixth president of the United States and son of the second president, was born in Quincy, (formerly Braintree), Mass. In his boyhood, he accompanied his father on an embassy to Europe, and he passed a considerable part of his youth in Paris, at The Hague, and, lastly, in London. When his father was elected president, the younger Adams was sent on an embassy to Berlin and traveled through Silesia. On his return to America, he was engaged as professor of rhetoric at Harvard University, where he had graduated in 1787, and was later chosen United States senator for Massachusetts. By President Madison he was sent as plenipotentiary to Russia and afterward to England. On this embassy, he took part in the negotiation of peace with England and assisted with his counsel the deputies sent from America to Ghent.

When Monroe was elected president, he recalled Adams from Europe and made him secretary of state. On the retirement of Monroe from office, Adams gained the presidency after a hard contest against Jackson in 1825. On the expiration of his term of office, he retired to Quincy, near Boston, but, in 1830, was chosen as representative of his Congressional district. He now joined the party of the Abolitionists, and frequently raised the whole House of Representatives against himself by his incessant petitions on the slavery question. On one occasion, in 1842, in order to assert strongly in the abstract the right to petition, he went so far as to present a petition for the dissolution of the Union. Elected to the American Hall of Fame in 1905.

Adams, Maude (1872-1953), American actress, was born at Salt Lake City; her family name was Kiskadden, but she adopted her mother's maiden name, Adams. She appeared on the stage in child's parts; joined E. H. Sothern's company, New York, at 16; played an ingénue role in the *Midnight Bell;* afterward joined Charles Frohman's stock company. She later was leading lady with John Drew for five years; achieved notable distinction and popularity as Lady Babbie in *The Little Minister*; as Juliet in *Romeo and Juliet*; also in *Peter Pan, Joan of Arc, Chantecler*, and many other plays. She retired from the stage in 1918, and in 1937 became professor of drama at Stephens College for Women, Columbia, Mo. She also worked on perfecting a system of stage lighting using the facilities of the General Electric laboratories.

Adams, Raymond W. (1898-), educator, was born at Elgin, Ill. and was educated at Beloit College and at the University of North Carolina, where he became a member of the English faculty. Besides serving as professor of English he has been president of the National Council of Teachers of English and has conducted the Research in Progress department for the Modern Language Association of America. He was founder and first president of the Thoreau Society.

Adams, Samuel (1722-1803), one of the American Revolutionary leaders, was born in Boston, Mass. He displayed on all occasions an unflinching zeal for popular rights and was placed in the legislature by the patriotic party in 1766. Adams was a member of the First Continental Congress, and signed the Declaration of Independence in 1776; took an active part in framing the constitution of Massachusetts; and was for several years president of the senate of that state. He held the office of lieutenant governor, 1789–94, and of governor, 1794–97.

Adams, Samuel Hopkins (1871-1958), American writer, was born at Dunkirk, New York. After he was graduated from Hamilton College in 1891, he became a newspaper reporter and magazine writer. Of his many novels, several have been filmed, among them *It Happened One Night* (1934), *Gorgeous Hussy* (1934), and *The Harvey Girls* (1942). He also wrote *The Pony Express* (1950), *The Santa Fe Trail* (1952), and *The Erie Canal* (1953). His *Grandfather Tales* was published in 1955.

Adams, William T. See *"Optic, Oliver."*

Addams, Jane (1860-1935), social reformer and head resident of Hull House, Chicago, was born at Cedarville, Ill.; was graduated at Rockford College, 1881; spent two years in Europe, 1883–85; studied in Philadelphia, 1888; and, in 1889, with Miss Ellen Gates Starr, opened the social settlement of Hull House. By her practical methods, executive gifts, and humanitarian spirit, she became one of the foremost leaders of social settlement work in America. In 1919, she was elected president of the International Congress of Women at Washington and attended the peace conventions at Zurich in 1919 and at Vienna in 1921. She received one-half the Nobel prize for peace, 1931. Her publications include *The Spirit of Youth and the City Streets* and *A New Conscience and an Ancient Evil*.

Addison, Joseph (1672-1719), English essayist, was born at Milston, England; was graduated at Oxford; and held for some years a fellowship at the University. Here some of his early writings brought him into notice and secured him a pension of $1500 a year. He traveled on the continent, observing, studying, and writing. In the winter of 1701, amid the stoppages and discomforts of a journey across Mont Cenis, he composed his *Letter from Italy*, which contains many fine touches of description and is by far the best of his poems. His poem *The Campaign*, written in celebration of the battle of Blenheim, 1704, won him, as a reward, the office of excise commissioner. He held other public offices, which kept him from writing much for the next six years. In 1710, he began writing a series of essays, upon which his fame chiefly rests. These he contributed to the *Tatler*, next to the *Spectator*, and afterward to the *Guardian*, which he published in conjunction with his friend, Richard Steele. Of these periodicals, the *Spectator* ran only a few months, but, mainly on account of Addison's essays, it still lives in the history of English literature. See *English Literature: Eighteenth Century*.

Ade (*ād*), **George (1866-1944)**, American humorist and playwright, was born at Kentland, Ind.; was graduated at Purdue University, 1887; was engaged in newspaper work in Lafayette, Ind., 1887–90; and was with the Chicago *Record*, for which he wrote his widely popular *Fables in Slang*, 1890–1900. His characters are chiefly drawn from rural life, outlined faithfully and sympathetically. He was the author of *Artie, The Girl Proposition, Breaking into Society*, and *In Pastures New*. His plays, which display

cleverness and much satirical humor, include *The Sultan of Sulu, The College Widow, Father and the Boys, Marse Covington,* and *Nettie.*

Adenauer, Konrad (1876-), German statesman and lawyer, has served since 1949 as chancellor of the newly-formed West German Republic, with headquarters at Bonn. He was born at Cologne, practiced law there, was once lord mayor of the city, and founded the University of Cologne. He was arrested by the Nazi regime, and was not active in politics till after the surrender.

To the difficult task of rebuilding a shattered West Germany, he brought great patience and steadiness of purpose. He supported E.D.C. (European Defense Community) and sought to reach agreement with France concerning the Saar issue and other thorny problems. In the face of strong opposition, he won re-election in 1953, and again, by a larger majority, in 1957. He is given credit for the return of the Saar to West Germany, for the incorporation of West German troops in NATO, and for unexampled prosperity in West Germany.

Adler, Alfred (1870-1937), Austrian psychologist, was born at Vienna. He studied with Freud, with whom he came to differ, holding that Freud overestimated sex as a factor in conduct and underestimating the drive for power and the sense of inferiority. Adler coined the term "inferiority complex," which concept became widely current as a result of his lectures and books, including *The Practice of Individual Psychology, Pattern of Life,* and *What Life Should Mean to You.*

Adler, Felix (1851-1933), educator and lecturer, was born in Alzey, Germany; came to America in 1857; was graduated at Columbia University, 1870; studied at Berlin and Heidelberg; and was professor of Hebrew and Oriental literature at Cornell University, 1874-76. In 1876, he established the New York Society for Ethical Culture. He became professor of political and social ethics, Columbia University, in 1902. His publications include *Life and Destiny, An Ethical Philosophy of Life,* and *The Reconstruction of the Spiritual Ideal.*

Adoula, Cyrille (1921-), political leader, was born at Leopoldville in the Congo and was educated in a missionary school there. He was associated with Lumumba in the *Mouvement National Congolais* and was a member of Kasavubu's delegation in the General Assembly. On being chosen premier he was recognized by the UN as head of the government of national unity.

Adrian IV (*ā'drĭ-ăn*) **(c. 1100-1159),** named Nicholas Breakspeare, was the only English pope. He left England a poor man, went to Paris, became an ardent student, and was soon known for his learning and zeal. He was chosen abbot, then cardinal, and lastly pope in 1154. He was vigorous in maintaining his authority at Rome and throughout Europe. He died in Italy.

Æschines (*ĕs'kĭ-nēz*) **(389 B. C.-314 B. C.),** Athenian orator, who vied with Demosthenes in eloquence. As head of the peace party, at Athens, Æschines was the chief opponent of Demosthenes, who advocated strenuous opposition to Philip of Macedon, then pursuing his designs for the subjugation of the Greek states. Events justified the sagacious fears of Demosthenes. When, however, it was proposed by Ctesiphon to reward Demosthenes with a golden crown Æschines indicted Ctesiphon for bringing forward an illegal proposal. Demosthenes replied in perhaps the greatest of his speeches,—*On the Crown,*—and Æschines, defeated, had to leave Athens. He went into exile at Rhodes where, tradition says, he established a school of eloquence. Died at Samos.

Æschylus (*ĕs'kĭ-lŭs*) **(525 B. C.-456 B. C.),** Greek tragedian, was born at Eleusis in Attica. His father, Euphorion, brought Æschylus as a youth under religious influences which distinctly affected the tone of his dramatic works.

In 499 B. C., Æschylus made his first appearance as competitor for the prize offered annually at Athens to the poet producing the best tragedy, but it was not until 484 B. C. that he achieved his first victory. In the course of 40 years, he competed nearly 20 times, each time with a trilogy of three related tragedies followed by a so-called satyr play, having a comic character. He won the first prize on 13 occasions.

Æschylus took part in three famous battles against the Persians—Marathon, Salamis, and Platæa. He undertook three journeys to Syracuse—in 476, 471, and 456 B. C.—visiting the court of Hiero, the tyrant of the city. His absence from Athens has been attributed to political expediency, for Æschylus belonged to the conservative, aristocratic party, which was then on the decline in the growing democracy of Athens.

Before the days of Æschylus, Greek tragedy consisted of dramas acted by a chorus, a chorus leader, and one actor. There was little plot and no scenery or other accessories. Æschylus added a second actor; invented costumes, including mask, mantle, and the so-called tragic boot; had the plays produced on a regular stage; and used the services of the scene painter. He also gave to Greek tragedy its characteristic literary form. Such innovations entitled him to be called "the father of tragedy."

Æschylus was serious, bold, and often sublime in his style and originality of phrase. He stoutly upheld reverence for the gods, the sanctity of oaths, the duties of hospitality, and the inviolability of marriage. His plays have simple plots, for he does not represent the complex subtleties of human character; he rather depicts his heroes as victims of destiny, their struggles against which involve them in situations of great tragic intensity.

Only 7 of his 70 tragedies are extant. These are *The Seven against Thebes, The Suppliants, The Persians, Prometheus Bound, The Choëphori, The Eumenides,* and *Agamemnon.* See *Tragedy, Greek.*

Æsop (*ē'sŏp*) **(c. 620 B. C.-c. 560 B. C.),** celebrated fabulist, is said to have been born at Phrygia. He was as deformed in body as he was accomplished in mind. Originally a slave at Athens and at Samos, he gained freedom by his wit, traveled through Asia Minor and Egypt, and later attached himself to the court of Crœsus, king of Lydia. Sent by that monarch upon an embassy to Delphi, he so offended the inhabitants by the keenness of his sarcasms that they are said to have hurled him from a rock into the sea.

Agassiz, Louis Johann Rudolph (1807-1873), naturalist, was born in Switzerland, the son of a Swiss Protestant clergyman. He studied medicine and was graduated at Munich, but devoted himself principally to ichthyology, and was employed to classify and arrange the collection brought from Brazil by Martius and Spix. In 1846, he came to America, where he was well received, and, in 1848, accepted the chair of zoology and geology at Harvard College. In 1865, he visited Brazil and, on his return, placed in the museum of Cambridge the large collection he had made. He wrote *Glaciers, Outlines of Comparative Physiology, An Essay on Classification,* and numerous other valuable works. He was to the last a disbeliever in the Darwinian theory of evolution. He was one of the most gifted teachers of his time, and the list of his pupils includes many distinguished names in American biological science. Elected to American Hall of Fame, 1915.

Agesilaus (*ă-jĕs'ĭ-lā'ŭs*) **(c. 444 B. C.-c. 360 B. C.),** king of Sparta about 401-360 B. C. and one of the most notable soldiers of antiquity. Called on by the Greeks of Asia Minor to assist them against Artaxerxes, he commenced a splendid campaign in Asia; but the Corinthian War recalled him to Greece. At Coronea, he defeated the forces allied against his native city, and peace was concluded in favor of Sparta. Afterward, in the Theban War, he successfully defended his city against Epaminondas. Died when on an expedition to Egypt.

Agricola (*ă-grĭk'ō-lă*), **Cnæus Julius (37 A. D.-93),** a Roman of the imperial times, distinguished not less by his great abilities as a statesman and a soldier than by the beauty of his private character; born at Forum Julii (now Frejus, in Provence, France). Having served with distinction in Britain, Asia, and Aquitania, and gone through the round of civil offices, he was elected consul in 77 A. D., and, in the following year, proceeded as governor to Britain—the scene of his military and civil administration during the next seven years. He was the first Roman general who effectually subdued the island and the only one who displayed as much genius and success in training the inhabitants to the amenities of civilization as in breaking their rude force in war.

Agrippa (*ă-grĭp'ă*), **Marcus Vipsanius (63 B. C.-12 B. C.),** Roman statesman and soldier. He was the chief instrument of Octavius in establishing the Roman Empire. In 40, he took Perusia from Lucius Antonius and Sipontum from Mark Antony. In 36, he defeated Sextus Pompey at Mylæ and Naulochus and, in 31, contributed decisively to the great victory at Actium over Mark Antony. Agrippa was prætor in 41; consul in 37, 28, and 27, when he built the Pantheon; ædile in 33; and tribune in 18-12. Rome owed to him the restoration or construction of several aqueducts and the erection of the Pantheon, besides other public works of ornament and utility.

Agronsky, Martin (1915-), American newspaper correspondent and radio news analyst, was born in Philadelphia. After he was graduated from Rutgers University in 1936, he became a foreign correspondent. With the outbreak of World War II, he began covering the battle fronts. His broadcasts from all quarters of the globe became familiar to American listeners. He was with the British army in Libya, and when the Japanese attacked Singapore Agronsky was there. He joined the American Broadcasting Company in 1943 as Washington correspondent. In 1953 he was made president of the Radio and Television Correspondents Association, which is the regulatory body of the Senate and House radio galleries of Congress.

Aguinaldo (*ä'gê-näl'dō*), **Emilio (1869-1964),** Filipino general, was born near Cavite, Luzon, and was educated at Saint Thomas University Manila. During the rebellion of

the Filipinos against Spain, he was the chief of the insurgents, over whom he assumed dictatorial powers. In the Spanish-American War, he turned his arms against the Americans, but, in 1901, he was captured by General Frederick Funston. Aguinaldo then pledged allegiance to the United States and lent his influence to strengthening the American administration. When the Japanese invaded the Islands he became a member of the puppet government set up under their protection. See *Philippine Insurrection.*

Aiken, Conrad Potter (1889-), American poet, novelist, short-story writer, and critic, was born at Savannah, Georgia. He was graduated from Harvard in 1911, and the first of his many books of poems appeared in 1914. His *Selected Poems*, published in 1929, won the Pulitzer prize. His *Collected Poems* appeared in 1955. Meanwhile, in 1950, *The Short Stories of Conrad Aiken* was published. His novels include *Blue Voyage* (1927), *Great Circle* (1933), *King Coffin* (1935), and *The Conversation* (1940). A leader of the younger poets following World War I, Aiken lived for some time in England. He was elected to the American Academy of Arts and Letters in December 1956.

Airy (*ăr'ĭ*), **George Biddell (1801-1892)**, English mathematician, astronomer, physicist, and engineer, was born at Alnwick, England; was graduated at Trinity College, Cambridge, in 1823; and, soon after, published his *Mathematical Tracts on the Lunar and Planetary Theories*, the *Figures of the Earth*, and the *Undulatory Theory of Optics*. In 1825, he discovered astigmatism; in 1826, was appointed Lucasian professor of mathematics; and, in 1828, became Plumian professor of astronomy at Cambridge and director of the observatory. In 1863, he succeeded Pond as astronomer-royal at the Greenwich Observatory, a post which he held for 46 years, equipping the observatory with an entirely new outfit of instruments, which were mostly of his own design and were for a long time the most accurate in use. Here he introduced the systematic observation of the magnetic elements and investigated the lunar theory, the magnetism of iron ships, the density of the earth, the length of the seconds pendulum, and a great variety of other subjects.

Aitken, Robert Ingersoll (1878-1949), American sculptor, was born in San Francisco; received high school education and studied under Douglas Tilden at Mark Hopkins Institute of Art in his native city, where he afterward became professor of sculpture. Later he devoted several years to study in Paris and upon his return established a studio in New York. In originality, virility, and technique he ranks high among American sculptors. His more important works include the Dewey, Bret Harte, and McKinley monuments, San Francisco; the Liberty memorial, Kansas City; the monument to Robert Burns, St. Louis; the west pediment of the United States Supreme Court and figures at the Pennsylvania Avenue entrance to the Archives Building, Washington, D. C.

Akbar (*ăk'bär*) **(1542-1605)**, Mogul emperor, was born at Amarkote in Sind. When he ascended the throne, only a small part of what had formerly belonged to the Mogul Empire acknowledged his authority, and he devoted himself with great success to the recovery of the revolted provinces. He encouraged commerce and had the land carefully measured so that the taxes should be fair. His people were of different races and religions, but he was just and tolerant to all. He founded schools and encouraged learning. Such measures gained for him the title of "guardian of mankind," and caused him to be held up as a model to Indian princes of later times.

Akeley, Carl Ethan (1864-1926), American animal sculptor and naturalist, was born in Orleans County, N. Y. He was employed in the Milwaukee Museum from 1887 to 1895, and then went to the Field Museum, Chicago. There he developed a method of mounting habitat groups which has been widely adopted, a method which relies in part on animal sculpture. He created a large number of small animal figures or groups of figures in bronze, which depict vividly dramatic moments in the lives of the animals. Among them are the elephant group of "Wounded Comrade" and the "Lion and Cape Buffalo." From five expeditions for museums he brought back impressive specimens of elephants and gorillas. He wrote *In Brightest Africa.*

Akenside (*ā'kĕn-sīd*), **Mark (1721-1770)**, English poet and physician, was born at Newcastle on Tyne. He studied theology and then medicine at the University of Edinburgh. Later, he completed his medical education at Leiden. He owes his rank among poets chiefly to his *Pleasures of the Imagination*, published in 1744, which at once became famous. In 1745, he settled in London, and, in 1761, he became physician to the queen.

Alarcón y Mendoza (*ä'lär-kōn' ē mĕn-dō'sä*), **Don Juan Ruiz de (1590-1639)**, Spanish dramatic poet, was born in Mexico toward the end of the 16th century and, in 1600, went to Spain. In 1628, he published a volume containing eight comedies and, in 1634, another containing twelve. One of them, called *La Verdad Sospechosa*, "The Truth Suspected," furnished Corneille with the groundwork and greater part of the substance of his *men eur.* His *Tejedor de Segovia*, "Weaver of Segovia," and *Las Paredes Oyen*, "Walls Have Ears," have been very popular in Spain.

Alaric I (*ăl'ä-rĭk*) **(?-410)**, king of the Visigoths, was born about the middle of the 4th century. He is first mentioned in history in 394, when Theodosius the Great gave him the command of his Gothic auxiliaries. The dissensions between Arcadius and Honorius, the sons of Theodosius, inspired Alaric with the intention of attacking the Roman Empire. In 396, he ravaged Greece, from which he was driven by the Roman general Stilicho, but made a masterly retreat to Illyria, of which Arcadius, frightened at his successes, appointed him governor.

In 400, Alaric invaded Italy, but was defeated by Stilicho at Pollentia, in 403, and induced to transfer his services from Arcadius to Honorius on condition of receiving 4000 pounds of gold. Honorius having failed to fulfill this condition, Alaric made a second invasion of Italy, during which he besieged Rome thrice. The first time, in 408, the city was saved by paying a heavy ransom; the second, in 409, it capitulated, and Honorius was deposed, but was shortly afterward restored. His sanction of a treacherous attack on the forces of Alaric brought about the third siege, and the city was taken in 410 and sacked for six days. Alaric, however, did everything in his power to restrain the violence of his followers. He quitted Rome with the intention of reducing Sicily and Africa, but died at Cosenza. See *Rome: German Invasions; Visigoths.*

Albert (1819-1861), prince of Saxe Coburg Gotha and husband of Queen Victoria of England, was born near Coburg, Germany. He married Queen Victoria in 1840; soon after, he was made field marshal in the British army and, in 1857, received the title of prince consort. As the prudent adviser of the queen, he acquired great influence in public affairs and became popular throughout England.

Albert I (1875-1934), Belgian king. He was carefully educated, traveled widely, and became well versed in politics and economics. In 1898, during a visit to the United States, he made a study of American railroads. Later he investigated conditions in the Belgian Congo and urged many improvements and reforms. In 1900, he married the Duchess Elizabeth of Bavaria. Upon the death of his uncle Leopold II in 1909, he was made king. By reason of his democratic tastes, he became one of the most popular of sovereigns. His heroic leadership in resisting the German invasion of 1914 made him the idol of the Belgian people. With his equally devoted queen, he shared throughout the ensuing struggle the perils and hardships of his soldiers, re-entering Brussels on November 22, 1918, after the expulsion of the invaders. The continued confidence reposed in the king was evidenced in 1926, when dictatorial powers were conferred upon him to be used in stabilizing the Belgian currency. He fell off a cliff at Marche des Dames and was killed.

Albert, Eugen Francis Charles d' (1864-1932), pianist and composer, son of a French musician, was born in Glasgow, Scotland. He studied first in London under Sullivan, Prout, and Pauer, winning the Mendelssohn scholarship in 1881. Later, he studied under Richter in Vienna and also under Liszt at Weimar, where he was soon made court pianist. He appeared in concert with great success in Berlin, 1883, and afterward traveled in Russia, Italy, France, Germany, England, and the United States, giving concerts. By his masterful technique and intellectual grasp, he won foremost rank among the world's pianists and was especially distinguished for his interpretations of Bach and Beethoven. His compositions include the operas, *The Ruby*, *Ghismonda*, *The Departure*, *Im Tiefland*, and *Liebesketten;* also string-quartets, concertos, a symphony, and many songs and smaller works.

Albert, Joseph (1825-1886), German photographer, born at Munich. He established a photographic studio in Augsburg in 1850 but, in 1858, returned to Munich where he became interested in the application of photography to printing. About 1867, he discovered and introduced an improvement of great importance in photomechanical printing. Albert found that gelatin, by exposure to the action of light, could be hardened and rendered sufficiently durable for photomechanical printing. In place of the old metallic plates he substituted transparent gelatin plates. Prints made by this process were called "albertypes." After this process was perfected, it was possible to obtain more than a thousand albertype copies from one plate.

Alberti (*ăl-bâr'tē*), **Leon Battista (1404-1472)**, Italian architect and writer on art and poetry, was born at Florence. He was much employed by Pope Nicholas V. He completed the Pitti palace at Florence and designed the church of Saint Francis at Rimini. His chief book, *De Re Ædificatoria*, is highly valued. He died at Rome.

Albertus Magnus (*ăl-bĕr'tŭs măg'nŭs*) **(c. 1193-1280)**, the *Doctor Universalis* of the schoolmen, was born at Lau-

ingen, in Swabia. He studied at Padua, and, entering the newly founded Dominican order, taught in the schools of Hildesheim, Ratisbon, and Cologne. In 1245-54, he lectured at Paris; in 1254, he became provincial of the Dominicans in Germany; and, in 1260, was named bishop of Ratisbon. But, in 1262, he retired to his convent at Cologne to devote himself to literary pursuits. Of his works the most notable are the *Summa Theologiæ* and the *Summa de Creaturis*. Albertus excelled all his contemporaries in the wideness of his learning; in medieval legend, he appears as a magician. He died at Cologne.

Albright, William F. (**1891-**), American orientalist and archaeologist, was born at Coquimbo, Chile. The son of American missionary parents, he was educated in the United States. For twelve years he was head of the American School of Oriental Research at Jerusalem and was leader of several archaeological expeditions in that area. In his present position as professor of Semitic Languages and chairman of the Oriental Seminary at Johns Hopkins University, he has been particularly active in interpreting the meaning of recently discovered manuscripts and other religious relics from the Palestine region. In addition to numerous magazine articles on "The Dead Sea Scrolls" and related subjects, he has written several books, the best known of which are *The Archaeology of Palestine* and *From the Stone Age to Christianity*.

Alcæus (*ăl-sē'ŭs*), of Mytilene, one of the greatest lyric poets of Greece, flourished about the end of the 7th or the beginning of the 6th century B. C. He was the inventor of the form of verse which after him is called the Alcaic, and which Horace, the happiest of his imitators, adapted to the Latin language.

Alcibiades (*ăl'sĭ-bī'ă-dēz*) (**450 B .C.-404 B. C.**), Athenian general, was born at Athens. He was educated in the house of Pericles, his uncle. His handsome person, his distinguished parentage, and the high position of Pericles procured him a multitude of friends and admirers. Socrates was one of the former, and gained considerable influence over him. He was the ablest and most unscrupulous leader of the Athenians in the Peloponnesian War. He suppressed a revolt of the allied states by the capture of Melos and massacre of its male inhabitants. He promoted and was chief leader in an expedition against Syracuse. Being summoned back to stand trial for an alleged act of sacrilege, he deserted to Sparta and gave advice which eventually led to the capture of Athens by Sparta. The Athenian democracy again winning power, Alcibiades was recalled, having left Sparta after an affair with the queen became known. He commanded the fleet but was banished after some ships had been defeated in a battle undertaken contrary to his orders. He took refuge in Phrygia, where he was assassinated by Spartan order. See *Periclean Age*.

Alcott, Louisa May (**1832-1888**), American juvenile writer, daughter of Amos Bronson Alcott, was born in Germantown, Pa. Her first volume was *Flower Fables*, published in 1855. During the Civil War, she was a volunteer nurse in the South and, in 1863, wrote *Hospital Sketches. Little Women*, published in 1868, was one of the most popular books for girls ever written. It was followed at short intervals by *An Old-Fashioned Girl, Eight Cousins, Silver Pitchers, Under the Lilacs, Little Men, Rose in Bloom, Jo's Boys*, and other stories. She died at Boston, Mass.

Alcuin (*ăl'kwĭn*), or **Flaccus Albinus** (**c. 735-804**), a scholar of the 8th century and the confidant and adviser of Charlemagne, was born at York. He reorganized the palace school and established others throughout the kingdom, himself serving as abbot of that in Tours, which became the most famous in Europe. His handwriting is said to have become the model for that in western Europe. Besides numerous theological writings, he left a number of elementary works on philosophy, mathematics, rhetoric, and philology; also poems and numerous letters.

Alden, John (**1599-1687**), one of the Pilgrims to Plymouth, Mass., was born in England. He was one of the 41 signers of the compact for the government of the colony drawn up in the cabin of the *Mayflower* before the landing at Plymouth. Alden married Priscilla Mullens, to whom, according to popular legend, he first proposed in behalf of Miles Standish, but she indicated her preference for Alden over the soldier. A poem by Longfellow, entitled *The Courtship of Miles Standish*, has this incident for its theme. Alden was a magistrate for more than 50 years, and greatly assisted in the government of the infant colony. He died at Duxbury, Mass. See *Priscilla*.

Aldington, Richard (**1892-1962**), English novelist and poet, was born in Hampshire. He began writing poetry at 15 and was literary editor of the left-wing publication *Egoist* before 1916 becoming the recognized leader of the imagist school of poetry. While serving as infantryman in World War I, he suffered shell shock, from which he did not entirely recover until 1927. His poetry includes *Images of Desire, Exile*, and *A Fool i' the Forest*. Among his novels, over which hang a spirit of disillusionment, exquisitely expressed, are *Death of a Hero, Women Must Work*, and *Life for Life's Sake*. Biographical works written by him are *D. H. Lawrence, Portrait of a Genius . . . but* (1950), *Lawrence of Arabia* (1955), and *Portrait of a Rebel* (1957).

Aldrich, Thomas Bailey (**1836-1907**), poet and editor, was born in Portsmouth, N. H. While engaged in the office of a New York merchant, he began to write verses, the success of which soon induced him to enter on a literary career. His first volume, consisting of miscellaneous poems and called *The Bells*, was published in 1855. Later, he published several other volumes of poems, *The Story of a Bad Boy, Marjorie Daw*, and other stories. Aldrich was an industrious contributor to the best periodicals. From 1881 to 1890, he served as editor of the *Atlantic Monthly*. He was a member of the American Academy of Arts and Letters. Died at Boston, Mass.

Alembert (*ă'lăN'bâr'*), **Jean le Rond d'** (**1717-1783**), French mathematician and philosopher, the natural son of Madame de Tencin and the poet Destouches, was born in Paris. He was the friend of Voltaire and of Diderot, and acquired high esteem by his scientific works, which fill many volumes.

Alexander, Eben Roy (**1899-**), journalist, was born at St. Louis, Mo. and was educated at St. Louis University. He served as gunnery sergeant in 1918-19 and later took a leading part in the U.S. Army Infantry Reserve and in the Air Corps of the Missouri National Guard. Following editorial work on *The St. Louis Star* and *The St. Louis Post-Dispatch*, he joined the staff of *Time* magazine as contributing editor. Since 1960 he has been editor of *Time*.

Alexander the Great (**356 B. C.-323 B. C.**), Macedonian king, military commander, and conqueror, was born at Pella, the capital of Macedonia. His education was committed first to Leonidas, then to Lysimachus, and, about 342 B. C., to Aristotle. Alexander was 16 years old when his father, Philip, marched against Byzantium and, during his absence, left the government in his son's hands. In 338 B. C., Alexander displayed conspicuous courage at the battle of Chæronea, whereby Macedonian supremacy was established in the Hellenic world. Philip was about to conduct an expedition of all the Greeks against the despotism of Iran, when he was assassinated, leaving Alexander as his heir.

Conquests. Alexander ascended the throne in 336 B. C. and immediately punished his father's murderers. In 335 B. C., he destroyed Thebes and brought the Grecian states under his command. He crossed the Hellespont in 334 B. C. and, as a result of the battle of Granicus, liberated all the Greek cities of Asia Minor from the Iranian yoke. Proceeding on his way of conquest, he cut, at Gordium, the so-called Gordian knot, of which an oracle had said that he who untied it would be the lord of all Asia. In 333 B. C., in the neighborhood of Issus, he defeated Darius, king of the Iranians.

Alexander now turned toward Syria and Phœnicia, in order to cut off Darius' escape by sea. The next year witnessed Alexander's capture of Tyre, his victorious march through Palestine, and his conquest of Egypt. In Egypt, he restored the old customs and religious institutions of the country and, in 332 B. C., founded Alexandria.

Meanwhile, Darius had collected another army, and, in the spring of 331 B. C., Alexander advanced against him in Assyria. In October 331 B. C., Alexander conquered the forces of the Iranians, notwithstanding the great numerical superiority of his adversaries. In the following two years, Media, Parthia, and Bactria fell before him. As the conqueror of Asia, he now proceeded to Babylon, Susa, and Persepolis, where he was received by the inhabitants as their sovereign.

In 329 B. C., Alexander penetrated to the farthest known limits of northern Asia and overthrew the Scythians on the banks of the Jaxartes. Two years later, he proceeded to the conquest of India, then known only by name. He crossed the Indus and marched as lord through that part of India which is now called the Punjab. He wished to advance to the Ganges and conquer the whole of India, but, when he reached the Hyphasis River, the murmuring of his troops induced him to retreat. Meanwhile his friend Nearchus, who was made admiral of the fleet, had successfully accomplished the hazardous voyage from the Indus up the Persian Gulf to the Euphrates River. This campaign marked the extreme limit of his conquests.

Results. Both by arms and by policy, Alexander, for the first time, brought the East and the West into close contact with each other. Aiming at the fusion of Greek and Oriental by intermarriage and by exchange of customs, he set an example himself by marrying an Iranian princess and by encouraging the payment of divine honors to himself as to an Oriental despot. On the other hand, he lost no opportunity to spread the Greek language and the Greek civilization. His empire, it is true, was broken up, but Greek cities and colonies were founded everywhere, and

the Greek tongue became the universal speech of government and of literature. His impress on Greece itself was no less important. His conquests marked definitely the passing of the Hellenic city-states and heralded the period of rule by empires. Through him, also, a road was opened to India, and Europeans became acquainted with the knowledge and economic products of the remote East.

CHARACTER. More perhaps than any other commander, Alexander combined the chivalry of the heroic age and the more careful strategics of later times. His career not only excited romantic enthusiasm in his contemporaries, but later became the subject of legends propagated in most of the languages of medieval Europe. His genius and policy are variously estimated by historians, but there is no disagreement as to the magnitude of his designs. He is said to have planned the subjugation of Italy and of Carthage when his ambitious projects were cut short by his death in Babylon. See *Greece: History.*

Alexander I (1777-1825), emperor of Russia, 1801-25, was born at Leningrad. Possessing a humane and benevolent disposition, he was imbued by Laharpe with the enlightened principles of the age. Professor Kreft instructed him in experimental physics, and Pallas, in botany. In 1793, he married Elizabeth, daughter of Karl Ludwig, crown prince of Baden, and, on the assassination of his father, Paul, in 1801, succeeded him upon the throne, Alexander encouraged education and science and carried out many reforms. In 1805, he joined the coalition against Napoleon, and was present at the battle of Austerlitz. In 1808, he conquered Finland and, in 1806-12, waged a successful war against Turkey.

Alexander II (1818-1881), emperor of Russia, 1855-81. He was carefully educated; in 1851 he married the daughter of the grand duke of Hesse. The principal achievement of his reign, in large measure his own work, was the emancipation of the serfs—23 million souls—in 1861. This was followed by legal and municipal reforms, and the establishment of provincial assemblies. In foreign policy he was friendly to Germany and Austria. Russia made great territorial gains in the Caucasus and Central Asia, and by the war with Turkey in 1877-78 increased her strength in the south. No czar since Peter the Great had built up Russia more. He was assassinated at Leningrad. See *Russia: History.*

Alexander of Tunis, Field Marshal Harold Rupert Leofric George Alexander, Viscount (1891-), British general, was born in County Tyrone, Northern Ireland. He was educated at Harrow and Sandhurst and served in World War I. In World War II he commanded a division in France, and organized the final evacuation at Dunkirk, being among the last to leave the beaches. After commands at home and in Burma, he was sent to the Middle East as commander in chief. Later, as General Eisenhower's deputy commander, he completed the Allied victory in Tunisia. He commanded the invasion of Sicily and Italy in 1943. Promoted to field marshal in June 1944, and named supreme commander in the Mediterranean theater, he received the surrender of the German armies in May 1945. From 1946 to 1952 he was governor general of Canada.

Alexander, John White (1856-1915), American painter, was born in Allegheny City, now Pittsburgh, Pa. A telegraph boy in Pittsburgh, his marked talent for drawing attracted the attention of an employer, who assisted him to study art. At eighteen, he was an artist's apprentice on *Harper's Weekly,* where he worked with Abbey, Pennell, and Pyle. In 1877 he went to Europe for study in Germany, Italy, and Paris. Returning to New York in 1881, he achieved marked success with portraits of Oliver Wendell Holmes, John Burroughs, and others. Among his best known paintings are: "Isabella and the Pot of Basil," in the Boston Museum; "The Engagement Ring," in the Metropolitan Museum, New York; "Pandora," in the Philadelphia Academy; and his portrait of President Loubet in the Elysee palace, Paris. A mural, "The Evolution of the Book," is in the Library of Congress. He excels in portraits of women. He was a member of the American Academy of Arts and Letters.

Alexander Nevsky (*nyĕf'skê*), **(1219-1263),** Russian hero and saint, was born at Vladimir. He received the surname of Nevsky on account of the victory over the Swedes which he achieved in 1240 on the Neva, in the province where Leningrad now stands. In 1242, on the ice of Lake Peipus, he defeated the Livonian knights of the sword. At the death of his father, in 1247, he became grand duke of Vladimir. To the end of his life he remained a vassal of the Tartars, or Mongols.

Alexander Severus (c. 202-235), Roman emperor, 222-235 A. D., was the cousin, adopted son, and successor of Heliogabalus. Although a pagan, he reverenced the doctrines of Christianity and often quoted the "golden rule." His expedition against Artaxerxes, king of Iran, was terminated by a speedy overthrow of the enemy. But during a campaign against the Germans on the Rhine, to defend the frontiers of the empire from their incursions, an insurrection broke out among his troops, headed by Maximin, in which Alexander Severus was slain.

Alexanderson, Ernst Frederik Werner (1878-), American electrical engineer and inventor, was born at Upsala, Sweden, and educated mainly in Europe. He emigrated to America, where he became a friend and protege of the great Charles Steinmetz and co-worker with him in the laboratories of the General Electric Company at Schenectady, New York. Although Alexanderson's more than 300 patents include extensive contributions to the application of electricity in railway transportation, ship propulsion, and telephone communication, he is best known for his pioneer work in connection with radio and television. When the Radio Corporation of America was organized in 1919, he was appointed its chief engineer, a position which he held until 1924. Since that time he has been engaged chiefly in consulting work. One of his radio patents made possible selective tuning. Another, the magnetic amplifier, was the basis for transatlantic telephony. Then came the transmission of pictures by radio and later (in 1927) a process which made possible the first home reception of television, using neon lamps and a perforated scanning disk. His latest invention is a color television receiver.

Alexius I Comnenus (*à-lĕk'sĭ-ŭs kŏm-nē'nŭs*) **(1048-1118),** Byzantine emperor, was born at Istanbul. He was the nephew of the emperor Isaac Comnenus. In 1801, he was elevated to the throne by his soldiers. At the beginning of his reign, he was encompassed by many foes. The Scythians and Turks were pouring down from the north and northeast and the Normans were menacing his western provinces. His appeals for aid were the occasion for the First Crusade, 1096, whose leaders turned over to him their conquests in Asia Minor, thus greatly enlarging his empire.

Alfieri (*ăl-fyā'rē*), **Vittorio, Count (1749-1803),** Italian dramatic poet, was born in Piedmont. At Turin, in 1772, he left military service and devoted himself to literary pursuits. He became one of the foremost writers of Italian 18th-century literature. Among his most important tragedies are: *Virginia; Agamemnone; Oreste; Timoleone;* and *Saul,* his masterpiece. His literary ideal was to unite "artistic truth with moral truth, beauty with morality." He is honored in Italy, not only as a great dramatist, but as the reviver of a national spirit. He left 21 tragedies and six comedies, besides various odes and sonnets. See *Italian Literature; The Regeneration.*

Alfonso X (1226-1284), surnamed "the astronomer," "the philosopher," or "the wise," king of Leon and Castile, succeeded his father, Ferdinand III, in 1252. Alfonso was one of the most learned princes of his time, and acquired lasting fame through the completion of the code of laws commenced by his father and called *Leyes de las Partidas.* He improved the Ptolemaic planetary tables, is credited with a history of the Church and of the Crusades, and is said to have ordered a translation of the Bible into Spanish. Died at Seville.

Alfonso XIII (1886-1941), last king of Spain, was born after the death of his father, Alfonso XII. His childhood was spent at Madrid and at the palace of Miramar in San Sebastian. During the king's minority his mother reigned as queen regent. On May 17, 1902, Alfonso XIII assumed his full powers. In 1906, he married Princess Ena of Battenberg. The king proved a courageous and liberal monarch. He maintained an anticlerical policy and used his pardoning power with marked independence. With his tacit support the country was ruled by a military dictator from 1923 to 1931, when a revolt forced him to flee from the country. A republic was declared, and Alfonso took up his residence in Paris. He later went to Rome, where he died.

Alfred the Great (849-901), king of the West Saxons, was born at Wantage, Berkshire, England. With his father, Ethelwulf, the young Alfred spent much time in Rome. Later, through his stepmother, Judith, he became imbued with the culture, knowledge, and traditions of the great Frankish courts. In his 20th year, he married, and assisted his brother Ethelred in repelling the Danes.

VICTORIES. In 871, Alfred succeeded to the crown. Four years later, he defeated the Danes at sea, and, in 876, he made peace with them at Wareham. They broke the peace by capturing Exeter. The city was retaken by Alfred in 877; but, soon afterward, the invaders, under Guthrum, completely overran the whole kingdom of the West Saxons. Alfred was for a time obliged to seek refuge in a cowherd's hut. He kept up communication with his friends, however, and, as soon as the people began to arm themselves against the Danes, he built a stronghold at Athelney. From this base, he attacked and defeated the invaders, who at length capitulated. By the peace of Wedmore in 878, Alfred accepted hostages and exacted a solemn oath from the Danes that they would quit the territory of Wessex and receive baptism.

Alfred's power now steadily increased by land and also by sea. He is credited with the construction of England's first fleet. The weakness of the other kingdoms in England, which had been likewise attacked by the Danes, left Alfred as the strongest ruler in the island. By 886, he was recognized, without formal installation, as the sovereign of all England. His position was maintained, however, only at the cost of further struggles. These engaged much of his energies from 893, when a large body of Danes under Hastings landed in Kent, until the complete dispersal of the aggressors in 897.

CONSTRUCTIVE ACHIEVEMENTS. Alfred made a compilation of laws, in which, for the first time, no discrimination was made against the Welsh people. The laws were characterized by an intensely religious tone.

One of the most noteworthy features of Alfred's character was his zeal for learning. He caused a collection of the old Saxon poems to be made. Asser, Erigena, and other scholars were invited to his court. He established and directed a school for young nobles and founded abbeys for those of lower rank. He labored also himself as a scholar and a teacher. About 888, he began the adaptation and translation into Saxon of four important Latin works —The *Compilation* of Orosius, the *History* of Bede, the *Consolation* of Boethius, and the *Pastoral* of Pope Gregory. With these translations, English prose literature begins. English history also may be said to have originated when, in his reign, the *English Chronicle* received its final form. See *England: History, Danish Incursions.*

Algardi (*ăl-gär'dē*), **Alessandro** (**1602-1654**), Italian sculptor, was born at Bologna, Italy. His chief work is a colossal relievo, one of the largest in the world, in Saint Peter's, entitled the "Retreat of Attila from Rome."

Alger, Horatio (**1834-1899**), was the author of more than one hundred books for boys. Born in Revere, Mass., he was the son of a Unitarian minister and was himself educated for the ministry, but in 1866 gave up that calling to write. His first story, *Ragged Dick*, was published in 1867. A resident of New York City for many years, he was a devoted visitor to and patron of the Newsboys' Lodging House, where he gained much of the inspiration and color for his stories. Alger's heroes always succeed in gaining honor and riches by their courage and virtue in struggling heroically against heavy odds. Enormously popular, the books, with their elevated moral tone, exercised a strong influence on countless young Americans.

Allen, Ethan (**c. 1737-1789**), American soldier, was born at Litchfield, Conn. He distinguished himself early in the Revolutionary War by the surprise and capture of Fort Ticonderoga in 1775. While participating in Montgomery's expedition to Canada the same year, he was taken prisoner and was not exchanged until 1778. Allen was afterward a member of the Vermont legislature. He was author of *Reason the Only Oracle of Man* and other works.

Allen, Florence Ellinwood (**1884-**), American jurist, was born in Salt Lake City, Utah. After being graduated at Western Reserve University, she also at intervals studied law at Chicago and New York universities, meanwhile acting also as musical editor for the New York *Musical Courier* and the Cleveland *Plain Dealer*. She lectured on music for the New York Board of Education, 1910-13, and began the practice of law in 1914 at Cleveland, Ohio. After serving as judge of the local court of common pleas for one year, she was elected in 1922 to the Ohio Supreme Court, where she sat until 1934. In that year President Roosevelt named her to the United States Circuit Court of Appeals, the first woman to reach such a position in the judiciary.

Allen, James Edward, Jr. (**1911-**), American educator, was born at Elkins, W. Va., where his father was president of Davis and Elkins College. Allen worked his way through that institution, and after he was graduated in 1932 held a variety of jobs during the depression years. In 1939 he was offered a research position at Princeton University, with an opportunity to do postgraduate work. Two years later he was granted a fellowship at Harvard, where he earned his Ph.D. degree. He became president of the Graduate Students' Association, secretary to the faculty, and director of placement. He then went to Syracuse University as assistant professor of administration, and in 1947 joined the staff of the New York State Commissioner of Education. In 1955, he was chosen commissioner, becoming at the age of 44 the youngest man ever to hold that important post. His sphere of authority covers 5240 public and private schools, 126 colleges and universities, and 261 museums and art galleries.

Allen, James Lane (**1849-1925**), American novelist, was born near Lexington, Ky. He was educated at Transylvania University; taught in Kentucky University; and later was professor of Latin and higher English, Bethany College, W. Va. Beginning in 1886, he devoted his entire attention to literature, using Kentucky scenery and its vanishing pioneer, ante bellum, and social types as a background for his fiction. In his novels he portrays various struggles and problems of the human soul in a refined prose style somewhat in the manner of Hawthorne.

His works include *Flute and Violin, The Blue Grass Region and Other Sketches of Kentucky, A Summer in Arcady, The Sword of Youth, A Cathedral Singer*, and *The Landmark*.

Allen, Zachariah (**1795-1882**), American inventor and manufacturer was born in Providence, R. I. After being graduated from Brown University, he studied law and practiced from 1817 to 1822, when he became engaged in manufacturing enterprises. His ingenuity applied in this early stage of the machine age bore fruit in the use of belts instead of cogs for transmission of power and the automatic cut-off valve for steam engines. In 1821 he built the first hot-air furnace for the heating of dwellings. He was the first to calculate the motive power of Niagara Falls.

Allenby, Sir Edmund (**1861-1936**), English general, was educated at Haileybury. Entering the Inniskilling dragoons, he served in the Bechuanaland expedition, 1884-85; in the Zulu War, 1888; in the South African War, 1899-1902, and, on the outbreak of World War I, was placed in command of cavalry. In 1917, he was made commander of the Egyptian expeditionary force. Under his direction, British armies invaded Palestine and captured Jerusalem from the Turks, Dec. 9, 1917. At the battle of Samaria, Sept. 18-22, 1918, Allenby, by skillful use of his cavalry, utterly crushed a Turkish army of 100,000 under command of the German field marshal Liman von Sanders, capturing more than 75,000 prisoners and 350 guns. This notable victory virtually destroyed the military power of Turkey and hastened the collapse of the Teutonic nations and their allies in World War I. He served as British high commissioner for Egypt, 1919-25. He was buried in Westminster Abbey. See *World War*.

Allibone (*ăl'i-bōn*), **Samuel Austin** (**1816-1889**), American author was born at Philadelphia. He was the compiler of *A Critical Dictionary of English Literature and British and American Authors* and other valuable works of reference. He was also a contributor to periodical literature and, from 1879 to 1888, was librarian of the Lenox Library, New York. Died at Lucerne, Switzerland.

Allward, Walter Seymour (**1875-1955**), Canadian sculptor was born at Toronto. He was educated in the public schools, became an architect's apprentice in 1889, and developed talent for architectural figure-work. His first sculpture was the figure of "Peace" for the Northwest rebellion monument in Toronto. He executed busts of noted Canadians for the Provincial Art Gallery, Toronto, and increased his reputation as an artist by statues in various Canadian cities, including an allegorical memorial to Alexander Bell, inventor of the telephone, in Brantford. His greatest work was the Vimy Ridge memorial in France, on which he was engaged for 14 years. Among his other works are the Boer war commemoration monument in Toronto, memorials of World War I, erected in various cities throughout Canada, and monuments to King Edward VII and William Lyon Mackenzie.

Al-Mansur (*ăl'măn-sōōr'*) (**712-775**), second caliph of the house of the Abbasides. Upon his accession to the caliphate in 754, he carried on successful wars against the peoples of Asia Minor, placed the finances of his kingdom on a sound basis, regulated the post, and patronized learning. His greatest achievement was the founding of the city of Baghdad, to which he transferred his seat of government. He died on a pilgrimage to Mecca.

Alma-Tadéma (*ăl'-mà-tăd'ê-mà*), **Sir Laurence** (**1836-1912**), British painter of classical subjects, was born in Dronrijp, Friesland. He studied at the Royal Academy of Antwerp, and was afterward pupil and assistant of Baron Henry Leys. In 1873, he settled in England, where he achieved great distinction for his exquisitely executed pictures portraying the life of the ancient Greeks and Romans and other historical subjects. Among his numerous works are "Phidias and the Elgin Marbles," "The Roses of Heliogabalus," "Hadrian in Britain," "The Way to the Temple," "The Shrine of Venus," "Caracalla," "Egyptians 3000 Years Ago," "Reading from Homer," "Pyrrhic Dance," "The Vintage," and "The Conversion of Paula."

Almqvist (*ălm'kvist*), **Karl Jonas Ludvig** (**1793-1866**), Swedish author, was born at Stockholm. He had an erratic career; was once convicted of forgery and charged with murder; he fled from Sweden to the United States and, for a time, was private secretary to Abraham Lincoln. His novels are romantic in type and display notable power of language, while his dramas are marked by masterly dialogue and great tragic force. Among the best of his writings are *The Book of the Thorn-Rose, Araminta May, The Palace*, and *It's All Right*. He went to Bremen in 1865, where he assumed the name of Professor Westermann.

Alsop, Stewart J. O. (**1914-**), American newspaperman, was born in New York City. He was educated at Groton and Yale (1936), and started as an editor

with the book publishing firm of Doubleday Doran in New York. In 1942 he enlisted in the Kings Royal Rifle Corps of the British army, and rose to the rank of captain before transferring to the American army in 1944. Soon after the Normandy invasion he was parachuted into France to help the Maquis. After the war he formed a partnership with his brother Joseph to write a column called "Matter of Fact" which has been widely syndicated by the New York *Herald Tribune*. He is a contributor to many magazines.

Alströmer (*ôl'strē-mĕr*), **Jonas** (**1685-1761**), Swedish industrial reformer, was born at Alingsas, Vestergotland. Taken as a clerk to England by a Swedish merchant, who later failed, Alströmer amassed a fortune as ship broker. Returning to his birthplace in 1724, he introduced into Sweden many new and successful enterprises, including a wool factory, sugar refinery, and the importation of sheep. He was honored by a patent of nobility and a statue on the Stockholm exchange.

Altman, Benjamin (**1840-1913**), American merchant, art collector, and philanthropist, was born in New York City. Beginning in his father's dry-goods store and later trading in a small way for himself, he developed an immense retail mercantile business. Early in life he became interested in European paintings and in Oriental art, making collections of Chinese porcelains and of Oriental rugs. Of Rembrandt's paintings he possessed probably the largest private collection ever assembled. His collections embraced also many choice works of Velasquez, Van Dyck, Cuyp, Ruysdael, Vermeer, and other masters. He bequeathed this magnificent collection, the value of which was estimated at 15 million dollars, to the Metropolitan Museum of Art, New York. Shortly before his death, he established the Altman Foundation for the benefit of the employees of the department store of which he was the head.

Alva (or **Alba**), **Fernando Alvarez de Toledo, Duke of** (**1508-1582**), Spanish military governor. Assigned in 1567 by Philip II of Spain to repress Protestantism in the Netherlands, he set up a "Council of Blood," which pronounced sentence on the basis of charges assembled through a network of espionage. Alva boasted 18,000 persons had been executed at the Council's behest. Imposition of a heavy tax united Catholic with Protestant in a revolt, which was in large part crushed with bloody reprisals. Recalled in 1573, he was put in charge of a campaign against Portugal in 1581, which country was quickly subjugated. See *Netherlands: Spanish Rule*.

Alvarado, Pedro de (**c. 1486-1541**), Spanish conquistador, was born in Badajoz. He took part in the expedition and victories of Cortez, was intrusted with the command of the city of Mexico and distinguished himself in the rearguard action after the celebrated *Noche Triste* in 1520. He was afterward made governor of Guatemala and Honduras, a post which was maintained by continual expeditions of exploration and conquest.

Alzog (*äl'tsôĸ*), **Johann Baptist** (**1808-1878**), Roman Catholic historian, was born at Ohlau, Silesia. He was professor of church history in the Universary of Freiburg, and wrote a *Manual of Church History*, which was translated into many languages. He was also the author of *Outline of Patrology*, and in 1869 was a member of the commission on dogma which prepared the work for the Vatican council. Died at Freiburg, Baden.

Ambrose, Saint (**c. 374-397**), Church father, was born at Treves. Consecrated bishop of Milan in 374, Ambrose was the leading figure in having Arianism declared heresy. He assisted in its extirpation and resisted attempted revivals of paganism. When Maximus usurped power and took Rome, Ambrose refused to flee with the supplanted emperor. He melted the most sacred vessels of the Church to obtain money to save the populace from starvation. Courageous toward the powerful and solicitous for the weak, Ambrose denied Christian communion to the Emperor Theodosius until he had done penance for a massacre. His preaching and theology exerted great influence on his younger contemporary, Augustine.

Amerigo Vespucci (*ä'mâ-rē'gō vĕs-pōōt'chē*). See *Vespucci, Amerigo*.

Amherst, Jeffery, Lord (**1717-1797**), British general, was born at Riverhead, England. As major general, he was sent to capture the fortress of Louisburg in Canada from the French. His success there in 1758 and his capture of Ticonderoga and Crown Point led up to the taking of Montreal and the definite ascendancy of the British in Canada. He was raised to the peerage, 1776, and was appointed field marshal, 1796.

Ammann, Othmar H. (**1879-**), engineer, was born at Schaffhausen, Switzerland, and was educated at the cantonal college of Zurich and the Swiss Federal Institute of Technology. Having come to the U.S. in 1904 to investigate American practice in bridge building, he remained to become one of the country's most widely known bridge builders and to occupy such high posts as chief engineer for the Port of New York Authority and the Triborough Bridge and Tunnel Authority. Among famous bridges with which he has been connected are the George Washington, the Golden Gate, the Mackinac, and more recently the long-span Verrazano-Narrows Bridge, completed in 1965.

Amory, Cleveland (**1917-**), journalist, was born at Nahant, Mass. Following graduation from Harvard he was a member of the staff of Arizona newspapers in Tucson and Prescott. Later he joined the staff of the *Saturday Evening Post*. As a free-lance writer since 1945, he has written numerous magazine articles and several well-known books, including *The Proper Bostonians* (1947), *The Last Resorts* (1952), and *Who Killed Society?* (1958).

Ampère (*äN'pâr'*), **André Marie** (**1775-1836**), French mathematician and naturalist, was born at Lyons. In 1805, he was called to Paris, where he distinguished himself as a teacher in the Polytechnic School, and began his career as an author by his essay on the *Mathematical Theory of Chances*. In 1814, he was elected a member of the Academy of Sciences; in 1824, he was appointed professor of experimental physics in the Collège de France. He invented the astatic needle, which made the astatic galvanometer possible. The ampere, a unit of electrical current, is named for him.

Amundsen (*ä'mŭn-sĕn*), **Roald** (**1872-1928**), Norwegian explorer, was born in Borge, Norway. In June 1903, he sailed in the *Gjöa* and, after two years of exploration, located the north magnetic pole and the northwest passage. Sailing in June 1910, in Nansen's famous ship, the *Fram*, he led the Norwegian antarctic expedition which resulted in the discovery of the south pole, December 14, 1911. After an unsuccessful attempt to fly to the north pole by airplane in 1925, he succeeded, 1926, in passing over the pole in the dirigible *Norge*, traveling from Spitzbergen to Alaska. With Nobile, one of his associates in this trip, Amundsen was later involved in a bitter controversy. When Nobile in 1928 was lost in an attempt to repeat the feat, Amundsen flew by airplane to his rescue, but perished in the Arctic Ocean.

Anacreon (*ä-năk'rē-ŏn*) (**c. 563 B.C.-c. 478 B.C.**), Greek lyric poet, was born at Teos in Ionia. He was patronized by Polycrates, the tyrant of Samos, and by Hipparchus, the tyrant of Athens. His poems, chiefly devoted to the praises of love, pleasure, and wine, are characterized by marked simplicity and sweetness of style. The authentic fragments of his verse have been paraphrased in English by Thomas Moore. He died at Abdera.

Anaxagoras (*ăn'ăk-săg'ô-rās*) (**c. 500 B. C.-c. 428 B. C.**), Greek philosopher, was born at Clazomenæ. He studied under Anaximenes, and, after traveling through all the known parts of the world in search of knowledge, established himself at Athens, where he opened the first school of philosophy. He taught that mind rules the universe. Pericles, Socrates, and Euripides are said to have been among his pupils. He was condemned to die for alleged impiety. The sentence was changed to exile, however, at the pleading of Pericles, and he retired to Lampsacus, where he continued to teach philosophy until his death.

Anaximander (*ăn-ăk'sĭ-măn'dĕr*) (**611 B.C.-c. 547 B.C.**) Greek mathematician, astronomer, and philosopher, was born at Miletus. He was a pupil and friend of Thales, whom he succeeded as head of the Ionian school. He taught the obliquity of the ecliptic, which he is reputed to have discovered. He introduced the gnomon for determining solstices, and the sundial. He is also given credit for the invention of geographical maps. By some ancient writers he is said to have determined approximately the size and the distance of the planets and to have constructed astronomical globes. He imagined the universe as a number of concentric cylinders with the earth at the center. As a philosopher, he speculated upon the origin of the material universe, which he found to be an infinite, indeterminate substance, from which all material objects arise.

Andersen, Hans Christian (**1805-1875**), novelist, children's poet, and writer of fairy tales, was born at Odense, in Denmark. He early displayed a talent for poetry and was known in his native place as "the comedy-writer." He was placed in an advanced school at the public expense and began his academic education in 1828. He completed his *Agnes and the Merman* in Switzerland; one of his best works, *The Improvisatore*, a series of scenes depicted in a glowing style and full of poetic interest, was the fruit of a visit to Italy. In 1840, he commenced a somewhat protracted tour through Italy and the East, an account of which he gave in *A Poet's Bazaar*, 1842. In 1844, he visited the court of Denmark by special invitation, and, in the following year, he received an annuity which placed him in comfortable circumstances. In 1900, the Danish government stood sponsor as patron to a fine edition of his *Tales* in six languages. See *Danish Literature*.

Anderson, Carl David (1905-), American physicist, was born in New York City. He was associated with the California Institute of Technology as student; then, as fellow, 1927-33; and later as assistant professor of physics. Studying there under Robert A. Millikan, he investigated problems related to atoms and cosmic rays. His most notable discovery, for which he received the Nobel prize in physics for 1936, was evidence of the existence of the positive electron, or positron, one of the fundamental particles of matter. The existence of this particle had previously been foreshadowed by mathematical theory. Anderson's subsequent discovery served as a striking confirmation of the basic presuppositions of atomic physics.

Anderson, Marian (c. 1905-), American Negro singer, was born in Philadelphia, Pa. As a child she sang in the Union Baptist church choir in Philadelphia, where the unusual quality of her voice attracted attention. Money raised by a church concert enabled her to take lessons from an Italian instructor and she subsequently studied in New York, Chicago, and abroad. She began her singing career in 1924. In concert tours throughout the United States and Europe, she quickly won acclaim for her rendering of classic, operatic, and popular songs, and particularly of Negro spirituals. In 1941, she made her debut with the Metropolitan Opera Company, the first Negro to sing with that company. Her autobiography, *My Lord, What a Morning*, was published in 1957. It is interesting, both as a restrained account of her struggles and as a commentary on her favorite songs.

Anderson, Maxwell (1888-1959), American playwright, was born at Atlantic, Pennsylvania. He was graduated from the University of North Dakota (1911), and, after a number of years spent in newspaper work began to write plays. His first great success was *What Price Glory*, written in collaboration with Laurence Stallings. He also wrote many other successful plays of outstanding merit, including *Saturday's Children* (1927); *Elizabeth the Queen* (1930); *Both Your Houses* (1933); *Winterset* (1935); *High Tor* (1937); and *Joan of Lorraine* (1946). He has won both the Pulitzer and the Critics' prize. Later plays written by him are *Barefoot in Athens* (1951) and *The Bad Seed* (1954), a dramatization of William March's novel.

Anderson, Robert (1805-1871), American soldier, was born near Louisville, Ky. He was graduated at West Point in 1825, and was colonel of the Illinois volunteers in the Black Hawk War of 1832. He became instructor of artillery practice at West Point in 1835 and fought in the Seminole War in 1837-38. He served in the Mexican War, being severely wounded at Molino del Rey. In November 1860, he took command of Charleston harbor, where he was confined to Fort Sumter by the Confederates, and, on April 14, 1861, after a bombardment of 36 hours, he was compelled to evacuate the fort. This was the opening action of the Civil War. In 1865, he was brevetted major general. He wrote *Reminiscences of the Black Hawk War*.

Anderson, Sherwood (1876-1941), American author, was born at Camden, Ohio, and was educated in the public schools. His works, which belong to the more radical wing of modern American literature, reveal a high degree of originality and force. They include *The Triumph of the Egg*, *Dark Laughter*, *Perhaps Women*, and *Puzzled America*. In 1927 he purchased and became editor of two weekly newspapers in Marion, Va. Characteristic editorials and news stories from these papers were collected and published under the title of *Hello Towns*.

André (*ăn'drâ* or *ăn'drĭ*), **John (1751-1780)**, British soldier, was born in London, England; served in the war with America, and rose to the rank of major. He conducted the negotiations with Benedict Arnold for the betrayal of West Point, but, being discovered in disguise, was arrested and put to death as a spy. His remains lie in Westminster Abbey.

Andrêiev (*ăn-drā'yĕf*), **Leonid Nikolaevitch (1871-1919)**, Russian writer, was born at Orel. He studied law in Leningrad and Moscow and, while struggling to establish practice, became a police court reporter for a Moscow newspaper. About 1900, he began writing stories, sketches, and dramas with notable success. The sales of his first volume of stories, appearing in 1901, soon exceeded a quarter of a million copies. He achieved great popularity throughout Russia, and his work is perhaps better known outside his own country than that of any recent Russian writer, translations having been made into all European languages. He was a mystic possessed of unusually searching powers of analysis, who regarded life with horror and pity. He attempted suicide three times. Among his best-known stories are *The Red Laugh*, *The Burglar*, *The Seven Who Were Hanged*, *Judas Iscariot and the Others*, *Silence*, and *S. O. S.* The last is an appeal against the Bolshevik regime in Russia, from which he fled to Finland. See *Russian Literature*.

Andrews, Charles McLean (1863-1943), American historian, was born at Weathersfield, Conn. A graduate of Johns Hopkins University, he taught there from 1907 to 1910 and then became professor of history at Yale University. An authority on early stages of American history, he wrote *Colonial Period of American History*, the first volume of which was awarded a Pulitzer prize in 1935. In 1937 he was elected to the American Academy of Arts and Letters.

Andrews, Roy Chapman (1884-1960), American naturalist and explorer, was born at Beloit, Wis. He was graduated at Beloit College in 1906 and later received a master's degree at Columbia University. In 1908, he made explorations in Alaska. He was attached as naturalist to the U. S. S. *Albatross* on a voyage to the Dutch East Indies, Borneo, and Celebes in 1909-10.

For the American Museum of Natural History, New York, of which he was director, he conducted important scientific expeditions to Asia. These included an expedition in 1916-17 to Tibet, southwestern China, and Burma; an expedition in 1919 to north China and outer Mongolia; and expeditions in 1921-29 to central Asia and Mongolia. Among the most striking results of these highly fruitful expeditions was the finding of fossil dinosaur eggs and of skeletal remains of the baluchitherium, the largest known land mammal.

His writings include *Whale Hunting with Gun and Camera*, *The California Gray Whale*, *Camps and Trails in China*, and *This Business of Exploring*.

Andros (*ăn'drŏs*), **Sir Edmund (1637-1714)**, was born at London, England. He was governor of the colony of New York for eight years, beginning in 1674. In 1686, James II made him governor of the New England colonies with instructions to consolidate them into one dominion with unified defense against the French. The colonists resisted Andros's attempted suppression of their assemblies and the recall of their charters, and, after James was deposed in 1688, Andros was seized and sent to England as a prisoner. Later released, he served as governor of Virginia from 1692 to 1697, in which period he founded William and Mary College.

Resistance to his rule in New England is illustrated by a ruse which saved the Connecticut charter. Going to Hartford for it, Andros was kept talking until night, when it was produced in candle light. The lights were blown out, and, when they were relit, the charter had disappeared. After Andros's departure for England, the charter was taken by the colonists from the hollow of an oak tree where it had been hidden. The tree was later known as the "charter oak."

Angelico (*ăn-jĕl'ê-kō*), **Fra (1387-1455)**, is the commonly used name of the friar-painter, Guido di Pietri, whose monastic name was Giovanni. He was born at Vecchio in Tuscany. In 1407, he entered the Dominican monastery at Fiesole; in 1436, was transferred to Florence; and, in 1445, was summoned by the pope to Rome, where he resided during most of his remaining years. His most important frescoes are those in the Florentine convent of San Marco (now a museum), at Orvieto, and in the Nicholas chapel of the Vatican. Others were painted at Cortona and Fiesole. Of his easel pictures, the Louvre possesses "The Coronation of the Virgin."

Angell, (*ān'jĕl*), **James Burrill (1829-1916)**, American educator and diplomat, was born at Scituate, R. I., and was graduated at Brown University, 1849. He became professor of modern languages and literature, Brown, 1853; editor of the Providence *Journal*, 1860; president of the University of Vermont, 1866; and president of the University of Michigan, 1871. He was United States minister to China, 1880-81; a member of the Anglo-American international commission on Canadian fisheries, 1887; and minister to Turkey, 1897-98. During his long and able administration, the University of Michigan was brought to high rank among American institutions of learning. His writings include *Progress in International Law*, *The Higher Education*, and *Selected Addresses*.

Angell, James Rowland (1869-1949), American educator, was born at Burlington, Vt., son of James Burrill Angell. He was graduated at the University of Michigan and at Harvard; studied also at Berlin, Halle, Leipzig, and Paris. Beginning as assistant professor of psychology, University of Chicago, 1894, he became professor and head of the department, 1905. In 1911, he was made dean of the faculties, and, during 1918-19, was acting president of the University of Chicago. From 1921 to 1937 he was president of Yale University. In 1937, he joined the National Broadcasting Company as educational counselor.

Angle, Paul McClelland (1900-), American historian and authority on Lincoln, was born at Mansfield, Ohio. He has spent most of his active life in Illinois. As executive secretary of the Abraham Lincoln Association of Springfield, then historian of the Illinois State Historical Library, and, more recently, director of the Chicago Historical Society, he has spent many years exploring original sources of information concerning Lin-

coln's day-to-day activities and personal contacts. The results of this wide-ranging investigation have been made available to the general public through vividly written accounts which re-create the time and place settings for incidents in Lincoln's life. One of his books, *Here I Have Lived*, gives a history of Lincoln's Springfield in the years between 1821 and 1865. Another, written in collaboration with Carl Sandburg, is entitled *Mary Lincoln, Wife and Widow*. Best known among his works are *A Shelf of Lincoln Books* and *The Lincoln Reader*, a skillfully edited collection of writings from many authors, which has been called "a new form of biography."

Anglin (*ăng'glĭn*), **Margaret Mary** (**1876-1958**), Canadian actress, daughter of T. W. Anglin, former speaker of the Canadian House of Commons, was born at Ottawa, Canada; was educated at Loretto Abbey, Toronto, and the Convent of the Sacred Heart, Montreal; was graduated from the Empire School of Dramatic Acting, New York, and made her professional debut in *Shenandoah*, New York, 1894. She was leading lady with James O'Neil in *Virginius*, *Hamlet*, *Monte Cristo*, 1896-97; leading woman with E. H. Sothern, 1897-98; with Richard Mansfield, 1898-99; and with Henry Miller in *The Great Divide*, 1906-07. She toured Australia in 1908-09; in 1911, married Howard Hull of New York; during 1913-16, appeared in a Shakespearean repertoire. She took leading parts in various Greek dramas, producing the *Elektra* of Sophocles at Metropolitan Opera House, New York, in 1927, and, in 1935-36, starred in *Fresh Fields*. In 1927 she was awarded the Laetare medal.

Anna Comnena (*kŏm-nē'nà*), (**1083-1148**), Byzantine princess and historian, daughter of the emperor Alexius I (Comnenus). She received the best education that Byzantium could give. During the last illness of her father, she entered into a scheme, which her mother, the empress Irene, also favored, to induce him to disinherit his eldest surviving son, John, and to bestow the diadem on her husband, Nicephorus Briennius. Failing in this, she framed a conspiracy against her brother in 1118. Her brother spared her life, but punished her by confiscation of her property, which he later restored. She withdrew from the court and devoted herself to the composition of the *Alexiad*, a valuable historical work covering the period of her father's reign.

Anne of Austria (**1601-1666**), daughter of Philip III of Spain, was born at Madrid and, in 1615, became the wife of Louis XIII of France. The marriage was so far from being a happy one that the royal pair lived for 23 years in a state of virtual separation, a result due chiefly to the influence of Cardinal Richelieu, whose fixed determination to humble the house of Austria led him to spare no means for alienating the affections of Louis from his queen. On the death of the king in 1643, Anne became queen regent and evinced her discernment by choosing as her minister Cardinal Mazarin, by whose able management the young king, Louis XIV, came, on attaining his majority, into possession of a throne firmly established on the ruins of contending parties.

Anne, Queen of England (**1665-1714**), was the second daughter of King James II by his first wife, Anne Hyde, and was born in London, England. In 1683, she married Prince George, brother to the king of Denmark, by whom she had a large family of children, all of whom died young. Anne ascended the throne on March 8, 1702. She established a fund, known as "Queen Anne's bounty," for the augmentation of the livings of the poor clergy. During her reign, which was made illustrious by the military triumphs of the Duke of Marlborough, Sir George Rooke and Sir Cloudesley Shovel conquered the fortress of Gibraltar, a possession which Spain sought in vain to recover. During her reign also, the legislative union of Scotland with England was effected. The glorious galaxy of writers, in almost every branch of learning, who flourished in her time has caused it to be considered the Augustan age of English literature.

Annunzio (*ăn-nōōn'dzê-ō*), **Gabriele d'** (**1863-1938**), Italian poet, novelist, and dramatist, was born at Pescara. In his 15th year, while a student at Prato, he published his first volume of verse, *Primo vere*, followed in the ensuing 10 years by other volumes, which established his fame as a rising poet. His first novel, *Il piacere*, translated into English as "The Child of Pleasure," showed the influence of Maupassant and Bourget. Other famous novels from his pen include *L' innocente*, *Giovanni Episcopo*, *Il Trionfo della Morte*, and *Fuoco*. In the drama too, d'Annunzio attained a place in the front rank of Italian writers. His plays include *The Dream of a Spring Morning*, *The Dead City*, *Francesca da Rimini*, *Greater than Love*, *The Ship*, *Pisanella* or *The Perfumed Death*, and *The Honeysuckle*. While a "decadent," and regarded by Borgese as a product of a materialistic age, d'Annunzio was a most powerful writer and the greatest literary artist in modern Italian letters. When picturing the former glories of Italy, he rose to the level of a great classic writer.

Upon the outbreak of war with Austria in 1915, he entered the Italian army and became notable as an aviator. In 1919, he placed himself at the head of a volunteer army and seized Fiume in order to prevent its becoming a part of Yugoslavia. He established the city as an independent state and, for 15 months, refused in the face of all Europe to submit to agreements made regarding the city by the Treaty of Rapallo. Driven from the city by an Italian army in 1921, he went into retirement.

Anselm, Saint (**1033-1109**), archbishop of Canterbury, a scholastic philosopher, was born at Aosto, Piedmont. He led at first a dissipated life. He was later attracted by the reputation of Lanfranc and went in 1060 to study under him at the monastery of Bec, in Normandy. Three years later, he became prior and, in 1078, abbot of this monastery, the most famous school of the 11th century. Lanfranc, who in the meantime had gone to England and became archbishop of Canterbury, died in 1089, and, in 1093, Anselm was appointed his successor.

Anselm was in almost continual controversy with the English monarchs William II and Henry I on the question of primacy between secular and clerical prerogatives. His insistence on the primacy of the Church was unbending and led to his banishment in 1097-1100. His theological treatises were based on the theory that to understand one must believe.

Anthony of Padua, Saint (**1195-1231**), was born at Lisbon. He was at first an Augustinian monk but, in 1220, he entered the Franciscan order and became one of its most illustrious members. He preached in the south of France and in upper Italy. Numerous miracles were attributed to him, and he won great popularity by his effective preaching against the vices of luxury, avarice, and tyranny. According to legend, he preached to the fishes when men refused to hear him; hence he is the patron of the lower animals and is often represented as accompanied by a pig. He died at Vercelli and was canonized by Gregory IX in 1232.

Anthony the Great, Saint (**251-356**), the founder of Christian monasticism, was born at Coma near Heraclea in upper Egypt. In 285, having sold all his property and given the proceeds to the poor, he withdrew into the desert. While there, he was frequently tempted by the devil, who appeared in such forms as a beautiful woman or a wild animal. A number of disciples, attracted by his reputation for sanctity, gathered about him and formed the first community of monks. He afterward went to Alexandria to encourage the Christians to endure the persecutions of 311 and again, about 350, in order to preach against the Arians. He returned to the desert, where he died.

Anthony, Susan Brownell (**1820-1906**), American reformer, was born at Adams, Mass.; was educated at Bartenville, N. Y., and, 1837-38, at Friends' boarding school, West Philadelphia. She taught school from the age of 15 to 30; aided in organizing the first state Woman's Temperance Society in 1852; was active in the antislavery cause; and was organizer and secretary of the Women's National Loyal League during the Civil War. After the war, she devoted herself to the woman's suffrage movement; founded, in 1868, *The Revolution*, which she managed for several years; in 1869, organized, with Mrs. Stanton, the national woman's suffrage association. She was widely known as a lecturer and wrote a large part of the 4-volume work entitled *History of Woman Suffrage*. Elected to the American Hall of Fame in 1950.

Antiochus (*ăn-tī'ô-kŭs*) **III,** surnamed **the Great** (**c. 238 B. C.-187 B. C.**), succeeded his father, Seleucus Callinicus, as king of Syria in 223 B. C. and was the most distinguished of the Seleucidæ. He failed to recover Parthia and Bactria, but waged war with success against Ptolemy Philopator, and, though defeated at Raphia near Gaza, 217, he afterward obtained possession of all Palestine and Coele-Syria, dowering therewith his daughter Cleopatra on her betrothal to the young king, Ptolemy of Egypt. He afterward became involved in war with the Romans, who had conquered Macedonia; but he declined to invade Italy at the instigation of Hannibul, who had taken refuge at his court. He crossed into Greece, but was defeated in 191 at Thermopylæ and, in 190, by Scipio at Magnesia. Peace was granted him only on condition of his yielding all his dominions east of Mount Taurus and paying a heavy tribute. To raise the money, he proceeded to rob a rich temple in Elymais, but the people rose against him and killed him. See *Seleucidæ*.

Antoinette, Marie. See *Marie Antoinette*.

Antoninus (*ăn'tô-nī'nŭs*), **Marcus Aurelius.** See *Marcus Aurelius*.

Antoninus Pius, Titus Aurelius Fulvus (**86-161**), Roman emperor, was born of a family which came originally from Gaul. He inherited great wealth. In 120 he was made consul; afterward he was sent by Hadrian as proconsul into Asia. In 138 he was adopted by the emperor Hadrian, and he came to the throne in the same year. The reign of Antoninus was proverbially peaceful and happy.

He made legal reforms tending to greater simplicity and humanity, promoted art and science, advanced the construction of public works, and enlarged the provision for orphans.

Antony, Mark (**83 B. C.-30 B. C.**), Roman general, was born at Rome. He fought bravely as a soldier in Syria and Egypt, and in Gaul under Cæsar, whose firm friend he became. He took part in Cæsar's great victory of Pharsalia and was made consul with him in 44 B. C. After Cæsar was killed, Antony with Augustus and Lepidus formed a government called the Second Triumvirate, which defeated the republican army of Brutus and Cassius at Philippi. Some time after, Antony visited Alexandria, where he met the fascinating Cleopatra, queen of Egypt. His love for her caused him to neglect his duties of state. His rule became despotic, and he was eventually attacked by Augustus, who defeated him in the naval battle of Actium. During the battle, he was deserted by the Egyptian fleet. Soon afterward he took his own life. See *Rome: History, Rise of Octavius.*

Apelles (*ȧ-pĕl'ēz*), Greek painter, flourished in the latter part of the 4th century B. C. He was probably a native of Colophon, in Asia Minor. He united the fine coloring of the Ionian with the accurate drawing of the Sicyonic school. During the time of Philip, Apelles visited Macedon, where he became the intimate friend of Alexander the Great. It was probably at the Macedonian court that the best days of Apelles were spent. The most celebrated of his paintings were "Anadyomene," or "Venus Rising from the Sea," and similar subjects; but he cultivated the heroic as well as the graceful style. His ideal portrait of Alexander wielding a thunderbolt was highly esteemed and was long preserved in the temple of Diana at Ephesus. The date of his death is not known.

Apollodorus (*ȧ-pŏl'ō-dō'rŭs*), a Greek architect of the 2d century, was born at Damascus. He was employed at Rome by the emperor Trajan, for whom he built the forum and the column which bear that monarch's name. His greatest work was a huge bridge over the Danube at its confluence with the Alt. He was banished and put to death by Hadrian on charges generally believed to be baseless.

Apollonius (*ăp'ŏ-lō'nĭ-ŭs*) of Perga, in Asia Minor, called "the great geometer," lived in the second half of the 3d century B. C. He was educated at Alexandria, and wrote a treaties on *Conic Sections* in eight books. He is justly considered one of the founders of the mathematical sciences. To him are due the terms ellipse, hyperbole, and parabola.

Apollonius (**c. 295 B. C.-c. 215 B. C.**), called the Rhodian (Apollonius Rhodius), was born in Alexandria. He presided over an academy at Rhodes and was an eminent rhetorician. He wrote poems, one of which, the *Argonautica*, is an epic poem containing an account of the mythical expedition in search of the golden fleece.

Apollonius (**c. 3 B. C. -c. 100 A. D.**) of Tyana, was born in Tyana, Cappadocia. He was a zealous Neo-Pythagorean teacher, regarding whom many miraculous stories are told. He traveled widely and became acquainted with much of the religious knowledge of the Brahmans. Both in ancient and in modern times, biographical accounts of Apollonius have been written with a view to showing the superiority of his life to that of Jesus.

Appleseed, Johnny. See *Chapman, John.*

Apuleius (*ăp'ū-lē'yŭs*), **Lucius** (**c.125 A. D.-?**), Greek satirical writer, was born at Madaura, Africa, and was educated at Carthage. He went later to Athens, where he entered keenly upon the study of philosophy, displaying a special predilection for the Platonic school. He visited Italy and Asia, and was initiated into numerous religious mysteries. The knowledge of the priestly fraternities which he thus acquired served as material for his *Golden Ass*, one of the earliest romances in European literature. It narrates the adventures of a man who was temporarily transformed into an ass. The date of his death is unknown.

Aquinas (*ȧ-kwī'nȧs*), **Saint Thomas** (**1225-1274**), theologian and saint of the Roman Catholic Church, was born near Aquino, in the kingdom of Naples. He received his earliest instruction at the monastery of Monte Cassino and, about 1240, went to the University of Naples. He was without worldly ambition and longed for the seclusion and quiet of the monastic life. He made profession as a Dominican in 1243; studied at Paris; and, in 1245, became a pupil of Albert the Great at Cologne.

In 1253, Aquinas began his studies at the University of Paris and, four years later, received there his degree as doctor of theology. Thoroughly imbued with the scholastic, dialectic, and Aristotelian philosophy, he gained prominence as a teacher in Paris. In 1261, Urban called him to Rome to assist in the difficult task of reconciling the Greek and Latin churches. In 1269, he was again in Paris; three years later, he went to Naples, where he taught until shortly before his death.

The *Summa Theologica* "Compendium of Theology," is Saint Thomas's greatest work. It remains to this day the most comprehensive and complete of all expositions of the Catholic system. His commentaries on Scripture and his devotional treatises also have a high reputation. He united theology with ethics and clearly set forth the philosophy of Christian morals. All his works were written in Latin.

Saint Thomas sought, in his writings, to effect a harmony of reason and revelation by means of an orderly, consistent, and comprehensive system of theology. To this purpose, he invoked all the power and subtleties of Aristotle's logic. By nature and training, Saint Thomas was the very embodiment of the scholastic method of intricate analysis, yet his style was so clear that his writings are intelligible and interesting to the modern reader.

Aquinas died when on his way to attend the General Council that Gregory X had convoked at Lyons, France. He was canonized in 1323, and, two centuries later, Pius V named him the fifth doctor of the Church.

Arago (*ăr'ȧ-gō*), **Dominique** (**1786-1853**), French physicist, was born at Estagel, France. Becoming secretary of the Paris Observatory, he was commissioned in 1806 with Biot to measure an arc of a meridian. He became a professor in the Ecole Polytechnique at the age of 23, where he propounded the theory that light travels in waves. With A. J. Fresnel, he worked out the fundamental laws of the polarization of light.

Arbaces (*ăr-bā'sēz*) was one of the generals of Sardanapalus and the founder in 876 B. C. of the Median empire. In conspiracy with a Chaldean priest who commanded the troops from Babylon, he revolted, gained the assistance of several prominent officers, and defeated Sardanapalus, who then committed suicide. The dynasty of Arbaces lasted until 559 B. C., when Cyrus overthrew it.

Arc, Joan of. See *Joan of Arc.*

Archimedes (*ăr'kĭ-mē'dēz*) (**c. 287 B.C.-212 B.C.**), Greek scientist and inventor, was born in Syracuse, Sicily. He is said to have visited Egypt in early life, and to have invented there several hydraulic machines, including the Archimedean screw, which he applied to drainage and irrigation. He discovered (Proposition I) the relationship between weight and displacement of bodies immersed in a fluid. His purely mathematical works show that he far excelled all who preceded him. The most celebrated are on the ratio of the sphere and cylinder, on the ratio of the circumference to a diameter, on spiral lines, and on the parabola. In his old age, he defended Syracuse against the Romans under Marcellus with great mechanical skill, and was killed at its capture. See *Archimedes' Principle.*

Arden, Elizabeth (**1891- **), cosmetics manufacturer, was born in Ontario, but has spent much time in the United States. She is founder and owner of Elizabeth Arden, Inc., an American firm with numerous foreign branches.

Ariosto (*ȧ'rē-ôs'tō*), **Ludovico**(**1474-1533**), Italian poet, was born at Reggio. His education was intended to fit him for law, but this study proved uncongenial, and he spent much of his time in the composition of verse. In 1503, he was introduced to the court of the cardinal Ippolito d'Este, who employed him in many negotiations. Here he produced his famous poem, *Orlando Furioso*, which was published at Ferrara in 1516. See *Italian Literature: The Renaissance.*

Ariovistus (*ȧ-rĭ-ō-vĭs'tŭs*), a chief of Marcomanni, a German tribe, who crossed the Rhine to aid the Sequani against the Ædui in the 1st century B. C. He occupied a considerable territory in Gaul, but was finally defeated by Cæsar at Vesontium (Besançon) in 58 B. C. Ariovistus himself escaped over the Rhine into his own country.

Aristarchus (*ăr'ĭs-tär'kŭs*) of Samos, Greek astronomer, lived in the 3d century B. C., residing in Alexandria. He is the first astronomer known to have held the view that the earth revolves around the sun. His opinion was known to Copernicus, whose influence in the 15th century A. D. led to investigations establishing the truth of the heliocentric theory. Aristarchus held also that the earth revolves on its axis, thus causing day and night, and that the axis is inclined to the plane of the earth's orbit. His only extant work is *On the Sizes and Distances of the Sun and Moon.*

Aristides (*ăr'ĭs-tī'dēz*), (**?-468 B. C.**), surnamed "the just," was the son of Lysimachus. He was one of the ten leaders of the Athenians against the Iranians at the battle of Marathon, 490 B. C. He later supported a military policy as opposed to the naval policy of Themistocles. A popular vote decided against Aristides, who retired into exile. Recalled in 480 B. C., he had a share in the victories at Salamis and Platæa. He was instrumental in organizing the Delian confederacy and was charged with assessing the contributions to be made by each state.

Aristippus (*ăr'ĭs-tĭp'ŭs*) (**c. 425 B. C.-?**), the founder of the Cyrenaic, or hedonistic, school of philosophy among the Greeks, was born at Cyrene, in Africa. He was a pupil of Socrates. His system, based on the doctrine that pleas-

ure is the highest good, was further developed by his daughter Arete and by her son Aristippus the Younger. The date of his death is unknown.

Aristophanes (*ăr'ĭs-tŏf'ă-nēz*), **(c.445 B.C.-c.385 B.C.),** Greek comedian, was born at Athens. He began writing when very young, and his first plays were brought out under another name because he was not old enough to contend for the prize. He wrote, in all, 54 comedies, but only 11 have come down to us. *The Knights* and *The Clouds* are among his most admired pieces; others are *The Wasps, The Birds,* and *The Frogs.* Aristophanes was conservative and aristocratic in sympathy, and he mercilessly ridiculed the newer movements in politics and thought. One of his finest plays, *The Clouds,* is a satire against Socrates. His plays contain passages of the most beautiful and finished poetry interspersed in dramas sparkling with wit, much of it in a lusty and ribald strain. See *Greek Literature: Comedy.*

Aristotle (384 B. C.-322 B. C.), founder of the celebrated Peripatetic school of philosophy at Athens, was born at Stagira, Macedonia, the son of Nicomachus, a court physician of Macedon. Having lost both parents while he was quite young, Aristotle was brought up under the care of Proxenus, a friend of the family. When he had completed his 17th year, Aristotle repaired to Athens, where, for three years, he pursued his studies by books and teachers as best he could. On the return of Plato from Syracuse, Aristotle placed himself under his instruction and became the most distinguished member of the Academy, as Plato's school was called.

Career. The death of Plato in 347 B. C. was the occasion of Aristotle's departure from Athens, He went to Atarneus in Asia Minor, where, at the small but interesting court of Hermeias, he spent three years, enjoying the society of intellectual friends and devoting himself with unremitting assiduity to the study of nature. Aristotle subsequently married Pythias, the sister of Hermeias. To their son, Nicomachus, he dedicated his chief work on ethics, called the *Nicomachean Ethics.*

While residing at Mytilene in Lesbos, whither he went about 344 B. C., Aristotle received from Philip, king of Macedon, the flattering invitation to superintend the education of the latter's son, who later was called Alexander the Great. In 342 B. C., Aristotle took up his residence at the Macedonian court in Pella. It was for the use of his pupil that he wrote his *Rhetoric* in 338 B. C. From the death of Philip until the time of Alexander's Asiatic expedition, Aristotle continued to live with the youthful king as his friend and counselor.

Returning to Athens in 334 B. C., Aristotle opened a school called the Lyceum. From his habit of walking up and down in the garden during his lectures arose the other name of his school, Peripatetic, derived from *peripateo,* "walk about." It was his custom to give a morning lecture on the more abstruse subjects to select pupils, and then, in the evening, one of a more popular nature to a general audience. It is probable that, at this time too, he composed his principal works. Aristotle's connection with Macedon made him unpopular in Athens. He was charged with impiety and sedition, and, wishing to avoid the fate of Socrates, he made his escape to Chalcis in 323 B. C.

Comparison With Plato. Although a student under Plato for many years, Aristotle, in his writings, frequently criticized his master's views, sometimes unfairly. Plato was an artist and poet as well as a thinker, while Aristotle had a greater interest in reducing facts or methods to a system. Most of Aristotle's systematized results are to be found in Plato's works, but in a form dictated by artistic considerations. Plato was an expert mathematician, while Aristotle was a biologist. Aristotle's studies consequently rely much more heavily on observations, not only in the field of natural science, but also in politics and economics.

Writings. The most important of Aristotle's writings are the *Organon, Rhetoric, Poetics, Ethics, Politics, History of Animals, Physics, Metaphysics, Psychology,* and *Meteorology.* It may be said with justice that there was not one subject discussed in his day which Aristotle did not touch and clarify. He laid the foundations, also, of many new biological and social sciences. In his *Organon,* or "Logic," one finds the basis and nearly the whole substance of syllogistic logic, which became, with the schoolmen, the method of Catholic theology. See *Greek Education.*

Arius (*ā-rĭ'ŭs; ā'rĭ-ŭs*) **(c. 256 A. D.-336),** founder of Arianism, was born in Libya; was trained in Antioch; and became a presbyter in Alexandria. Here, about 318, he maintained, against his bishop, that the Son was not co-equal or co-eternal with the Father, but was only the first and highest of all finite beings, created out of nothing by an act of God's free will. He secured the adherence of clergy and laity in Egypt, Syria, and Asia Minor, but was deposed and excommunicated in 321 by a synod of bishops at Alexandria. Eusebius, bishop of Nicomedia, absolved him and, in 323, convened another synod in Bithynia, which pronounced in his favor. He defended his views before the council of Nicæa, 325, but they were condemned. He died at Istanbul.

Arkwright, Sir Richard (1732-1792), inventor of the spinning frame, was born at Preston, England, of poor parents, the youngest of thirteen children. In boyhood he was apprenticed to a barber, and his educational advantages were very limited. Settling at Bolton Willows near Manchester in 1750, he followed his trade for ten years; then, having invented a process of dyeing human hair, he became a hair merchant.

Little is known regarding the steps by which Arkwright was led to make the important invention that brought him fame and fortune. The first hint was received, however, according to his own account, from seeing a red-hot iron bar drawn through two sets of rollers, the second moving more rapidly than the first. As he lived in a district where cotton fabrics were extensively manufactured and was endowed with keen inventive genius, this process suggested to him that cotton, when cleaned and carded, might be dealt with in the same manner. In 1769, Arkwright obtained a patent for his spinning frame, by means of which a large number of threads might be spun at the same time, instead of the single thread produced on the ordinary spinning wheel.

The rise of the modern cotton manufacturing industry dates from the introduction of this labor-saving machine. At the time of its invention, however, Arkwright was too poor to buy clothing suitable for his appearance in public. Moreover, he was greatly hampered by the bitter opposition of jealous employers and hostile workmen. But, by reason of his earnestness, energy, and perseverance, which surmounted all obstacles, Arkwright won the support of able partners and built a mill at Nottingham in 1769. In 1771, he erected a much larger mill at Cromford.

Later, Arkwright established other factories and invented additional cotton-working machines, which produced for him and his associates fortunes then considered prodigious. The results of his discoveries were multiplied a hundredfold by the introduction of the steam engine. His patents were nullified by the courts in 1785, but wealth from his well managed factories continued to flow upon the inventor, who eventually amassed property valued at about $2,500,000. In 1786, he was knighted. Arkwright revolutionized the textile industry, not only by designing machines which immensely increased production, but also by organizing the system which made the modern factory possible.

Arliss, George (1868-1946), actor, was born in London, Eng. He made his first appearance on the stage in 1887 at London and his first tour of America in 1901, attaining instant success as the villain Zakkuri in *The Darling of the Gods.* His more notable later triumphs were made in the title roles of the *Devil* and *Disraeli* and in the *Green Goddess.* He repeated most of his earlier successes when he appeared in motion pictures, and added further to his laurels by his role in *Richelieu, Old English,* and *A Man of Affairs.* He wrote *Up the Years from Bloomsbury, My Ten Years in the Studios,* and *George Arliss, by Himself.*

Arminius (*ăr-mĭn'ĭ-ŭs*) **(c. 18 B. C.-21 A. D.),** a German chieftain, prince of the Cherusci. He became a Roman citizen and served as a soldier in the Roman army. Coming home, in 9 A. D., he found the whole country stirred up by the cruelties of Varus, the Roman governor. Arminius then became the head of a conspiracy and induced the Roman general to scatter his troops in small detachments. News of the conspiracy caused Varus to march into the interior; the scattered Roman troops were murdered, and the main body was surrounded and killed almost to a man, Varus taking his own life.

In 15 A. D., Germanicus marched against the Cherusci, but accomplished nothing. The next year, he marched again with 80,000 men and a fleet. Arminius artfully led him into narrow passes; then, falling upon him, cut off his cavalry, almost destroyed four legions, and forced him to retreat. The next year, the undaunted Germanicus came with 100,000 men and 1000 ships. On a plain, called "no-man's meadow," a great battle was fought. The Germans were beaten at first, but, the next morning, they compelled the Romans to retreat. From this time no Roman army ever marched beyond the Rhine, and Arminius is, therefore, justly called the "German liberator." He was assassinated. See *Germany: History.*

Arminius, Jacob (1560-1609), Dutch theologian, was born at Oudewater, a small town in the Netherlands. He studied at the University of Leiden, attended the school of theology in Geneva, and later studied at Basel. He was ordained at Amsterdam in 1588, and soon became distinguished as a preacher. In 1589, he consented to answer a book which attacked Calvin's doctrine of predestination and, while preparing to do so, embraced the doctrine of free will which he was trying to refute. His later writings developed this doctrine, which became known as Arminianism. From 1603 to 1609, he was professor in the University of Leiden. He was a gifted scholar, a preacher of great popular power, and an author of ability.

Armour, Philip Danforth (1832-1901), merchant and capitalist, was born at Stockbridge, N. Y. His fortune was made largely in the immense commission business he conducted in Chicago and elsewhere, and in railways. For many years, he was the head of the firm of Armour and Company, pork packers and dealers in dressed meats and provisions. At his death, his wealth was estimated at about forty millions. The chief objects of his benevolence were the Armour Institute of Technology in Chicago, opened in 1893, and the Armour Mission. He died at Chicago.

Armstrong, Sir William George (1810-1900), English inventor and manufacturer, was born at Newcastle, England. In 1840, he produced an improved hydraulic engine and, in 1845, the hydraulic crane. Shortly afterward, he began the erection of the Elswick engine works at Newcastle. This large establishment at first produced chiefly hydraulic cranes, engines, and bridges, but later became noted for the production of ordnance, and especially of the Armstrong gun. Armstrong offered to his government all his inventions. He was knighted in 1859 and was created Baron Armstrong in 1887. He wrote *Electric Movement.*

Arne (*ärn*), **Thomas Augustine (1710-1778),** English composer, was born in London. His father, an upholsterer, intended him for the bar, but young Arne became skillful as a violinist, forming his style chiefly after Corelli. His zeal in the study of music induced his sister, Mrs. Cibber, to cultivate her excellent voice. He wrote for her a part in his first opera, *Rosamond,* which was performed with great success in 1733. Next followed his comic operetta, *Tom Thumb,* and afterward his *Comus.* The national air, "Rule Britannia," originally given in the masque of *Alfred,* is his composition, as are also two operas, *Eliza* and *Artaxerxes.* He died in London.

Arnold, Benedict (1741-1801), American soldier and traitor, was born in Connecticut. He joined Ethan Allen's expedition against Ticonderoga, and later succeeded Montgomery after the latter's death in an unsuccessful assault on Quebec, 1775. Refused promotion by Congress, he consented to remain in the army only at Washington's request. While in command of Philadelphia, 1778-79, his actions were severely criticized, and he was court-martialed and reprimanded.

In 1780, Arnold secured command of West Point and entered into treasonable negotiations with Sir Henry Clinton for its betrayal. The capture of Major André exposed the plot, and Arnold escaped to a British war vessel. He became a brigadier general in the British army and commanded several minor attacks during the last months of the war. He was pensioned by the English government, but was despised and neglected by the English people. He was a soldier of remarkable daring and ability, but unscrupulous.

Arnold, Henry Harley (1886-1950), American general, was born at Gladwyne, Pa. After being graduated from West Point in 1907, he attended the Wright brothers' aviation school at Dayton, Ohio, in 1911. He served with the army air force at Panama and on the west coast and commanded various airfields. In 1934 he led an army flight to Alaska. He became major-general and chief of the army air corps in 1938. In 1942 he was placed in full charge of the army air forces. In 1943, as chief of air staff, he directed the American part of the great air offensive against the Axis. In 1944 he was advanced to the rank of general of the army. He retired in 1945.

Arnold, Matthew (1822-1888), English poet and critic, oldest son of Thomas Arnold, the noted head master of Rugby, was born in Middlesex, England. He was educated at Winchester, Rugby, and Oxford. In 1845, he was elected fellow of Oriel College and, in 1851, he was appointed lay inspector of schools. For ten years, 1857-67, he held the chair of poetry at Oxford. Among Arnold's productions may be noted his Newdigate prize poem *Cromwell, The Strayed Reveller,* and a volume entitled *New Poems* published in 1869.

As a critic, Arnold holds a high place and, as a poet, he is ranked by some as second only to Tennyson and Browning among Victorian writers. His later prose works were chiefly theological, being attempts to grapple with the supernatural aspects of Christianity from a rationalistic standpoint. His writings include also *St. Paul and Protestantism, Literature and Dogma,* and *God and the Bible.* See *English Literature: Victorian Age.*

Arnold, Thomas (1795-1842), English educator and historian, was born in the Isle of Wight. He was educated at Winchester, and at Corpus Christi College, Oxford. In 1815, he became fellow of Oriel, obtaining in that year the chancellor's prize for the Latin Essay. After taking holy orders, he passed nine years at Laleham, near Staines, in literary occupations, and in preparing young men for the universities. Appointed, in 1828, head master of Rugby School, he raised that institution beyond all precedent, both by the remarkable success of his pupils and by the introduction of new branches of study. He was of the Broad Church school of thought and a vigorous opponent of the tractarian movement. In 1841, he was appointed professor of modern history at Oxford. His best-known works are his edition of *Thucydides,* his *History of Rome,* and his sermons delivered in the chapel of Rugby School.

Arrhenius (*ăr-rā'nĭ-ŭs*), **Svante August (1859-1927),** Swedish chemist, was born at Wijk, Sweden, and was educated at the University of Upsala. In 1895, he was appointed professor of physics in Stockholm and, in 1905, he was made director of the physiochemical department of the Nobel Institute, Stockholm. His most important contribution to science is the theory of ionization, set forth in 1887. He received the Nobel prize for chemistry, 1903, and the Faraday medal, 1914. His works include *Worlds in the Making, Theories of Chemistry,* and *Immunochemistry.*

Artemisia (*ärt'ê-mĭsh'ĭ-ä*) **(?-351 B. C.),** daughter of Hecatomnos and wife of Mausolus, king of Caria, Asia Minor, whom she succeeded as ruler of Caria upon his death in 353 B. C. She defeated an attempt of the Rhodians to free themselves and surprise her capital. She immortalized her name by the honors which she paid to the memory of her husband, erecting for him in Halicarnassus a splendid tomb, called the Mausoleum. This was one of the seven wonders of the ancient world, and from it the name mausoleum was given to all tombs distinguished for their magnificence.

Arthur, Chester Alan (1830-1886), twenty-first president of the United States, was born in Fairfield, Vt. He was graduated at Union College in 1848, studied law, and was admitted to the bar. In 1861, he was appointed inspector general and later quartermaster-general of New York State. From 1871 to 1878, he was United States collector of the port of New York. He was elected vice president of the United States in 1880 and, on the death of President Garfield, September 19, 1881, he became president. Reputed to be a "spoilsman," Arthur nevertheless gave effective support to the Civil Service act of 1883.

Asbury (*ăz'bĕr-ĭ*), **Francis (1745-1816),** the first bishop of the Methodist Episcopal Church ordained in America, was born in Staffordshire, England. At the age of 14, he was apprenticed to a mechanic; two years later he began work as a local preacher. Later, he joined the itinerant ministry and after three years of service was sent to America as a missionary. In 1772, he was appointed general assistant by John Wesley. He brought new life into the work, and, at the outbreak of the Revolution, when many other ministers returned to England, he kept on in his labors. At the end of the war, it was decided to found an independent Methodist Episcopal Church for America, and, in 1784, Asbury was ordained bishop by his colleagues, who had been ordained by Wesley in England.

Ascham (*ăs'kăm*), **Roger (1515-1568),** English humanist, was born at Kirby Wiske, in Yorkshire. His reputation as a classical scholar brought him numerous pupils, and he was appointed by Cambridge University to read lectures in the public schools. He wrote, in 1545, a treatise on archery entitled *Toxophilus,* the pure English style of which entitles it to rank as a classic in English literature. For this treatise, which was dedicated to Henry VIII, he was awarded a pension. In 1548, he became master of languages to Lady Elizabeth, afterward queen, and was subsequently appointed Latin secretary to Edward VI and Queen Mary. After the death of Mary, Elizabeth retained him at court as secretary and tutor. His *Schoolmaster,* a treatise on education, exerted great influence on methods of teaching Latin.

Ashburton, Alexander Baring, Lord (1774-1848), English diplomat, second son of the noted merchant, Sir Francis Baring. Having been employed as special ambassador from England to the United States, he concluded in 1842 the famous treaty, called the Ashburton Treaty, by which the frontier line between the state of Maine and Canada was definitely settled.

Ashmore, Harry Scott (1916-), editor, was born at Greenville, S. C. and was educated at Clemson College and at Harvard University. Newspaper work in his native state was followed, in 1947, by his appointment as editor of *The Arkansas Gazette* at Little Rock. His editorials dealing with the school desegregation crisis there attracted much attention. This was also true of his books, *The Negro and the Schools* (1954), *An Epitaph for Dixie* (1957), and *The Other Side of Jordan* (1960). Since 1960 he has been editor of *The Encyclopedia Britannica.*

Asimov, Isaac (1920-), educator and writer, was born in Russia but has lived in America from infancy. Educated in New York schools and Columbia University, he became professor of biochemistry at Boston University's School of Medicine. He wrote *The Chemicals of Life, The Clock We Live On,* and *The Genetic Code.*

Asoka (*ä-sō'kä*) was an emperor of India from 264 to about 228 B. C. and was chiefly responsible for the spread of the Buddhist religion in India. He conducted many

remarkable missionary enterprises and set up in the country numerous inscriptions outlining Buddahist doctrines. Asoka is often compared to Constantine, who played a similar role in the establishment of Christianity in Europe.

Aspasia (*ăs-pā'shĭ-ă*), a beautiful Athenian woman, a native of Miletus in Asia Minor, noted for her genius, wit, and political influence, flourished about 440 B. C. After her marriage to Pericles, who repudiated his wife in order to wed her, her house became the meeting place for the learned men of Athens. Socrates is said to have been one of her admirers. She was indicted for impiety, but Pericles successfully defended her in court. After his death, she lived for a year with a sheep owner. Later details of her life are unknown.

Asquith, Herbert Henry. See *Oxford and Asquith, Earl of.*

Asser (*ă'sĕr*), **Tobias Michael Carel (1838-1913),** Dutch statesman, born in Amsterdam. He was made professor of law in the Atheneum of Amsterdam in 1862, and from 1876 to 1893 he occupied a similar chair at the University. He was appointed counselor to the foreign office in 1875, and member of the Dutch council of state in 1893. At the Peace Conference at The Hague in 1899 and in the International Court of Arbitration, he was the delegated representative of the Netherlands.

Asser's profound researches in international law and his distinguished efforts in behalf of the peaceful adjustment of international problems extended his reputation far beyond his own country. In 1911, he received the Nobel peace prize jointly with A. H. Fried. His published works include *Outlines of Dutch Commercial Law, Outlines, of Private International Law, Codification of Private International Law,* and *International Arbitration between the United States and Russia.*

Astaire, Fred (1899-), American actor and dancer whose original surname was Austerlitz. He co-starred with his sister Adele in such musical comedies as *Over the Top, Apple Blossoms, Lady Be Good,* and *The Bandwagon.* They were the first to introduce a touch of humor into their dancing. Following his sister's marriage to Lord Charles Cavendish and her retirement from the stage, he starred alone in a succession of musical comedies, among them *Gay Divorcee* (1932). Then in partnership with Ginger Rogers he appeared in a succession of such films as *Roberta* (1935), *Top Hat* (1935), *Follow the Fleet* (1936), and *The Story of Vernon and Irene Castle* (1939). He later had both Rita Hayworth and Judy Garland as partners. Probably his best picture was *Easter Parade* with Judy Garland. Still later he appeared alone in *Ziegfeld's Follies* and *Blue Skies.* An unusually supple dancer, Fred Astaire has excelled in the technique of tap dancing.

Aston, Francis William (1877-1945), English physicist and chemist, was educated at Malvern College, Mason College, and Birmingham University. In 1910, he entered Trinity College and the Cavendish Laboratory, Cambridge University, receiving, in 1912, a research degree and, in 1913, a Clerk-Maxwell studentship. From 1914 to 1919, he was technical assistant in the royal aircraft establishment at Farnsborough. In 1920, he was made fellow of Trinity College, Cambridge, and became president of the Cambridge Philosophical Society. His chief contribution to science is the discovery that many elements are mixtures of atoms having different weights but otherwise similar. These are called isotopes. For this discovery, which opened up new vistas for research, he was awarded the Nobel prize in chemistry for 1922. See *Isotopes.*

Astor, John Jacob (1763-1848), American merchant, founder of the American Fur Company, was born near Heidelberg, Germany. After spending some years in London, he sailed to America in 1783, and soon invested his small capital in furs. By economy and industry, he so increased his means that after six years he had acquired a fortune of $200,000. Although the increasing influence of the English fur companies in North America was unfavorable to his plans, he ventured to fit out two expeditions to Oregon, one by land, and one by sea. The purpose of these was to open up regular commercial intercourse with the natives.

After many mishaps, Astor's object was achieved in 1811, and the fur-trading station of Astoria was established. From this period, in spite of the War of 1812 and other temporary obstacles, his commercial connections extended over the entire globe. When he died, he left property valued at about 30 million dollars. See *Astoria.*

Astor, John Jacob (1864-1912), capitalist and inventor, great-grandson of John Jacob Astor, was born at Rhinebeck, N. Y. He was graduated from Harvard in 1888; traveled abroad, 1888-91; and was manager of the family estates, 1891-1912. In 1897, he built the Astoria hotel, New York, adjoining the Waldorf hotel, which was built by William Waldorf Astor, his cousin, the two forming one building under the name of Waldorf-Astoria hotel, for many years one of the largest and most costly hotels in the world.

In May 1898, he was commissioned lieutenant colonel of United States volunteers in the Spanish-American War and served in Cuba during operations ending in the surrender of Santiago. Among his inventions were a bicycle brake, a pneumatic road improver, and an improved turbine engine. Died at sea in the sinking of the *Titanic.*

Astor, Nancy Witcher Langhorne, Viscountess (1879-1964), first woman member of the British Parliament, was born in Virginia, U. S. A. She married Robert Gould Shaw in 1897. Obtaining a divorce in 1903, she married Viscount Astor in 1906. In 1919, she was elected to the House of Commons, retaining her seat until 1945. There she took a prominent part in debates on social reforms and successfully sponsored a bill prohibiting the sale of liquor to minors. She wrote *My Two Countries.*

Astor, William Waldorf, Viscount (1848-1919), capitalist and author, was born in New York. He was a son of John Jacob, second, and great-grandson of John Jacob, founder of the Astor fortune. He was educated by private tutors, finishing in Europe. In 1871, he entered the office of the Astor estate and, in 1890, succeeded his father as head of the Astor family, with personal fortune estimated at $200,000,000. He served as United States minister to Italy, 1882-85; removed to England, 1890; purchased *Pall Mall Gazette* and *Pall Mall Magazine,* 1893; became British subject, 1899; and was created viscount, 1917. His writings include *Valentino, a Story of Rome; Sforza; Pharaoh's Daughter and Other Stories.* Viscount Astor was succeeded in the title by his oldest son, Waldorf Astor (1879-1952).

Atahualpa (*ă'tä-wäl'pä*), **(?-1533),** was the last Peruvian Inca. In 1525, he succeeded his father, Huayna Capac, on the throne of Quito while his half brother, Huascar, although the rightful heir, obtained only the kingdom of Peru. The two brothers engaged in a struggle for supremacy, in which Huascar was defeated.

The Spaniards under Pizarro, taking advantage of these internal dissensions, invaded Peru. By an act of deliberate perfidy, they obtained possession of the person of Atahualpa and attempted to compel him to acknowledge the king of Spain as master and to embrace the Christian religion. His refusal was made a pretext for a massacre of the Peruvians and the imprisonment of their king, whom the Spaniards induced to raise an enormous treasure in the hope of regaining his throne. After a mock trial, however, he was condemned and executed. See *Peru: History.*

Athanasius (*ăth'ă-nā'shĭ-ŭs*). **Saint (c. 296-373),** was born in Egypt. Entering the Church at an early age, he was chosen bishop of Alexandria in 326. He is esteemed one of the most eminent among the ancient fathers of the Church. He was an energetic opponent of Arius. His earnest advocacy of the Catholic faith, more particularly of the doctrine of the Trinity, subjected him to much persecution from the emperors Constantine and Julian, by both of whom he was several times exiled.

The writings of Athanasius are numerous, but consist chiefly of controversial treatises against his opponents and against Arianism. The more important of his writings are his *Apologies, Two Books on the Incarnation, Conference with the Arians, The Life of St. Anthony, The Abridgment of the Holy Scriptures,* and *Letters to Serapion.*

Atherton, Gertrude Franklin (1857-1948), American novelist, great-grandniece of Benjamin Franklin, was born at San Francisco, Cal. She was educated at Saint Mary's Hall, Benicia, Cal., and Sayre Institute, Lexington, Ky. She married G. H. B. Atherton, and soon after his death, she began, in 1892, her literary career with a series of valuable studies of her native state and people. These included *Before the Gringo Came,* later revised as *The Splendid Idle Forties; American Wives and English Husbands; A Daughter of the Vine;* and *California.*

Later, she pictured, with notable skill, eastern scenery, social conditions, and history in *Patience Sparhawk and Her Times, Aristocrats,* and *Senator North* and presented an epic portrayal of Alexander Hamilton in *The Conqueror.* Among her other writings are *Tower of Ivory, Rulers of Kings, Perch of the Devil, The Avalanche, Black Oxen, The Sophisticates, The Adventures of a Novelist* (autobiography), and her last work *My San Francisco—A Wayward Biography* (1946).

Athlone, Alexander Augustus Frederick William Alfred George Cambridge, Earl of (1874-1957), English administrator, was born at London, a member of the British royal family. Educated at Eton and Sandhurst Military College, he participated in the South African War and in World War I, retiring from the army in 1919. From 1923 to 1931, he was governor general of South Africa and governor general of Canada, 1940-46.

Atholstan, Lord. See *Graham, Hugh.*

Atkinson, (Justin) Brooks (1894-), American newspaperman and drama critic, was born at Melrose, Massachusetts, and was educated at Harvard (1917). After serving an apprenticeship in journalism on various provincial newspapers, he became, in 1922, editor of the

New York Times Book Review, a position he held until 1925, when he was made drama critic of the paper. With the exception of the years 1942-46, when he was news correspondent at Chungking, China, and then at Moscow, he has been the *Times'* drama critic. In 1947 he was awarded the Pulitzer prize in journalism. He is the author of *Skyline Promenades* (1925); *Henry Thoreau, Cosmic Yankee* (1927); *East of the Hudson* (1931); *The Cingalese Prince* (1934); and *Once Around the Sun* (1951).

Atticus Herodes, Tiberius Claudius (**c. 101 A. D.-177 A. D.**), a rich Athenian. To a vast sum of money left him by his father, he added much more by marriage. He was educated by the best masters, devoting special attention to oratory, and became a teacher of rhetoric, having for pupils Marcus Aurelius and Lucius Verus.

The fame of Atticus rests mainly upon his immense expenditures for public purposes. In Athens, he built a race course of Pentelic marble and a splendid theater. In Corinth, he built a theater; in Delphi, a stadium; at Thermopylæ, hot-baths. He also restored several of the partially ruined cities of Greece. Later, he met with family misfortunes, the Athenians became his enemies, and he left the city for his villa near Marathon, where he died.

Attila (*ăt'ĭ-lə*) (**?-453**), king of the Huns, lived in the 5th century. He styled himself "the scourge of God," and, for a period of about 20 years, ruled central Europe practically from the Caspian Sea to the river Rhine. In 451, he sacked Belgic Gaul and invaded what is now northern France, but was defeated by the armies of Theodoric and Aetius in the terrible battle of Châlons. In 452, Attila attacked northern Italy, devasting Milan, Padua, and other cities. The city of Venice was founded by those who fled before him. See *Huns*.

Attlee, Clement Richard, Earl (**1883-**), British politician, was educated at Haileybury College and Oxford. He entered Parliament as a Labor member from the Limehouse district in 1922, held several positions under Labor ministries, and was leader of the opposition from 1935 to 1940. In 1940 he entered the coalition war cabinet as Lord Privy Seal, becoming deputy prime minister in 1941. On the defeat of the war ministry in July, 1945, he succeeded Winston Churchill as prime minister and Churchill in turn succeeded him in 1951. On his retirement as leader of the Labor party in 1955 he was created an earl.

Auber (*ō'bâr'*), **Daniel François Esprit** (**1782-1871**), French composer, was born at Caen, in Normandy. His father was a print seller in Paris, and, being desirous that his son should devote himself to business, he sent him to London to acquire a knowledge of the trade. But his passion for music obtained the upper hand, and he became a pupil of Cherubini. His opera *Masaniello* is considered his best work. Among his other works are the well-known operas *Fra Diavolo* and *Manon Lescaut*. In 1842, after the death of Cherubini, he was appointed director of the Conservatory of Music, Paris.

Aubigné (*ō'bēn'yā'*), **Jean Henri Merle d'**. See *Merle d' Aubigne, Jean Henri*.

Auden, W(ystan) H(ugh) (**1907-**), Anglo-American poet, was born in England and educated at Christ Church, Oxford, where he became one of the leaders of a group of young left-wing writers, which included Stephen Spender, Christopher Isherwood, and C. Day Lewis, all of them more or less under the influence of T. S. Eliot. Auden collaborated with Isherwood in writing several plays, namely, *The Dog Beneath the Skin* (1935), *The Ascent of F6* (1936), and *On the Frontier* (1938). He became a resident of the United States in 1939, a citizen in 1946. In 1947, he won the Pulitzer prize for poetry. Auden also wrote the libretto for Igor Stravinsky's opera *The Rake's Progress* (1951), and compiled *The Oxford Book of Light Verse*. His *Shield of Achilles* was published in 1955.

Audubon (*ô'dŏō-bŏn*), **John James** (**1785-1851**), American naturalist of French descent, was born near New Orleans, La., in 1780, according to his own statement; but it is claimed by some investigators that he was illegitimate and was born at Aux Cayes, Haiti, in 1785. From childhood he was devoted to natural history, but it was not until 1830 that the first of the four volumes of his great work, *The Birds of America*, appeared. This magnificent collection of colored plates, which was sold for $1000 a copy, was quickly followed by an explanatory work entitled *American Ornithological Biography*. Audubon also projected a similar work on the *Quadrupeds of America*, but much of this work was done by his sons, John and Victor.

Audubon was not a learned scientist or a great artist, but his self-denying enthusiasm for his subject and the uniformly pleasing qualities of work made him the most distinguished and best beloved of pioneer American naturalists. Died in New York; was elected to American Hall of Fame, 1900. See *Audubon Societies*.

Auenbrugger von Auenbrug (*ou'ĕn-brŏŏg'ĕr fŏn ou'ĕn-brŏŏĸ*), **Leopold** (**1722-1809**), Austrian physician, was born at Graz. He originated the method of examining the lungs by percussion of the chest and published the results of his investigations in a treatise which marks an important advance in the history of medicine. He died in Vienna.

Augier(*ō'zhyā'*), **Guillaume Victor Emile** (**1820-1889**), French dramatist, was born at Valence. He was of prosperous middle class parentage, a grandson of Pigault Lebrun, the novelist. After receiving a good education, he prepared for the bar but, upon the success of his play, *La ciguë*, in 1844, began a literary career, producing a long series of plays which blazed the trail to realism in modern French drama. With Dumas, the younger, and Sardou, he held front rank on the French stage during the Second Empire. He was elected to the French Academy in 1857. Among his plays are *Le Gendre de M. Poirier*, *Gabrielle*, *Les lionnes pauvres*, *Madame Caverlet*, and *Les Fourchambault*. He died at Croissy. See *French Literature: Nineteenth Century*.

Augustine (*ô-gŭs'tĭn; ô'gŭs-tēn*), **Saint** (**354-430**), one of the Latin church fathers, was born at Tagaste in Numidia. He was sent to school at Madaura and, subsequently, at Carthage, where he mastered rhetoric, logic, geometry, arithmetic, and music. He became a lecturer on rhetoric first at Tagaste and, in 379, at Carthage. Four years later, he departed for Rome, shortly afterward proceeding to Milan, where he continued to pursue his profession.

At Milan, Augustine came under the influence of Neo-Platonism and also heard Christianity preached by Ambrose, the bishop of Milan. His mind was deeply reflective and had led him, as early as 373, to embrace Manichæism, a religion which was, in that age, a rival of Christianity. He deserted this sect and, after a long period of perplexity, decided to become a Christian. Leaving the woman with whom he had lived for about 17 years in what he came to regard as a sinful state, he was baptized with his son, Adeodatus, on April 25, 387 A. D.

In 391, Augustine was ordained a priest. Four years later, he was made colleague of Valerius, as bishop of Hippo. His activity was engaged throughout the remainder of his life in three great religious controversies—against the Manichæans, the Donatists, and the Pelagians. In the course of these controversies, he developed many of the theological doctrines upon which both the Catholic and the Protestant Church are based. As a philosopher, he may be regarded as the father of medieval scholasticism.

His best-known works are his *Confessions* and *De Civitate Dei*, "City of God." The latter, finished in 426, constitutes the first attempt to write a comprehensive philosophy of history. It compares this world with the City of God and describes the triumph of the latter. He died at Hippo, which, at that time, was being besieged by the Vandals.

Augustus, Caius Julius Cæsar Octavianus (**B. C. 63-14 A. D.**), first Roman emperor, was the son of Caius Octavius and Atia, niece of Julius Cæsar, by whom he was adopted when but four years of age. He was in Epirus when Julius Cæsar was assassinated, but speedily returned to claim his inheritance. In association with Antony and Lepidus, he removed most of their prominent opponents by assassination and divided the empire. By a combination of astute intrigue and bold action, he got rid of his colleagues, and, in 29 B. C., was voted the "imperium" or emperorship, for ten years and later renewed. The title Augustus was conferred upon him in 27 B. C.

Augustus brought peace to the empire after 20 years of civil war. While observing republican forms and claiming to be merely the leading citizen, he reorganized the empire, largely rebuilt Rome, and encouraged art, literature, and education. His plans, however, for the conquest of Germany met with disaster. After his death temples and altars were erected to his memory. See *Rome: History*.

Aurelianus (*ô-rē-lĭ-ān'ŭs*), **Claudius** or **Lucius Domitius** (**212 A. D.-275 A. D.**), emperor of Rome, was born in Pannonia, the son of a peasant. He entered the Roman army, in which his exploits attracted the notice of the emperors Valerian and Claudius. On the death of the latter in 270, Aurelianus was proclaimed emperor.

His short reign was a series of brilliant victories: the Goths and Vandals were subdued; the Alemanni, who threatened Rome itself, were exterminated; and Palmyra was sacked. Zenobia, the renowned queen of the East, and Tetricus, the deposed emperor of Gaul, Britain, and Spain, were led captive in the splendid triumph of the emperor. A formidable rebellion at home was crushed with terrible sternness. His severity made him feared even by his friends, who, as they deemed, in pure self-defense, conspired against him and put him to death.

Aurelius, Marcus. See *Marcus Aurelius*.

Ausonius (*ô-sō'nĭ-ŭs*), **Decimus Magnus** (**c. 310 A. D.-394**), Latin poet, was born at Bordeaux, Gaul. He was appointed by Valentinian tutor to his son Gratian; he afterward held the offices of quæstor, prefect of Latinium, and consul of Gaul. On the death of Gratian, Ausonius retired to his estate at Bordeaux, where he wrote pie-

grams and descriptive poems, which give the only clear picture extant of Roman civilization in France. His works include *Idyll of the Moselle*, *In Relatives*, and *List of Great Cities*.

Austen, Jane (1775-1817), English novelist, was born at Steventon, Hampshire, England, of which parish her father was rector. Unmarried, she lived an uneventful life, mostly with her mother and sister. Her principal productions are *Pride and Prejudice*, *Sense and Sensibility*, and *Persuasion*, novels of trivial events of daily life without assistance of passion, crime, or religion yet portrayed with such fidelity, ironic humor, and dramatic progression as to render them classics. She died at Winchester.

Austin, Alfred (1835-1913), English poet laureate, novelist, and journalist, was born near Leeds; was educated at the University of London; and was admitted to the bar, 1857. His published works include *The Human Tragedy*, *Savonarola*, *The Tower of Babel*, *Prince Lucifer*, and the prose idyll *The Garden That I Love*. In 1896, he was made poet laureate of England, succeeding Tennyson. His writing evinces an intimate love of nature.

Avebury (*āv'bĕr-ĭ*), **John Lubbock, Baron (1834-1913),** English naturalist, banker, and politician, was born in London. He was educated at Eton College and entered his father's banking house. In 1870, he became a member of Parliament, where he served at intervals until elevated to the peerage in 1900. In Parliament he promoted measures regulating hours of work and establishing public libraries and parks. He was most widely noted for his achievements in anthropology and entomology. His *Prehistoric Times* was long a standard textbook on archeology and was translated into many languages. His most popular books are his *Ants, Bees and Wasps* and the charming volume entitled *British Wild Flowers Considered in Relation to Insects*. His writings include also *The Origin of Civilization* and the *Primitive Condition of Man, Fifty Years of Science, Pleasures of Life, The Scenery of England,* and *Marriage, Totemism, and Religion*.

Averroës (*ă-vĕr'ō-ēz*) **(1126-c. 1198),** otherwise known as Ibn Roshd, Arabian philosopher, was born at Cordoba, Spain. He was appointed successor to his father as chief mufti and afterward became chief judge in the province of Mauritania. Accused of a departure from the orthodox doctrines of Mohammedanism, he was dismissed from his office and was condemned by the ecclesiastical tribunal of Morocco to recant his heretical opinions and do penance. He later returned to Cordoba and was reinstated in his offices. An enthusiastic student of Aristotle, he transmitted the Aristotelian influence to Europe before Western scholars had access to it in Greek.

Avicenna (*ăv'ĕ-sĕn'ă*), **(980-1037),** otherwise known as Ibn Sina, Arabian physician and philosopher, was born at Efsene, a village near Bokhara. He was physician to several of the Samanide and Dilemite sovereigns, and was also for some time vizier in Hamadan. His work on medicine, *Kanun fi'l tibb*, based on Greek texts, long held first place in Europe, and it is still highly regarded in the Orient. He died at Hamadan.

Avogadro (*ä'vô-gä'drō*), **Amadeo (1776-1856),** Italian chemist and physicist, was born at Turin, where for many years he was professor of higher physics in the university. In 1811, he formulated and published the law known by his name, according to which, under the same conditions of temperature and pressure, equal volumes of gases and vapors contain equal numbers of molecules. This is one of the fundamental principles of chemistry and furnishes the chief method of determining atomic weights. He died at Turin.

Ayeshah (*ī'ĕ-shä*; *ā'ĕ-shä*) **(610** or **611 A. D.-678),** the favorite wife of Mohammed, was born at Medina. She was only nine years of age when she married the prophet Although she bore no children to Mohammed, she was so tenderly beloved by him that he was wont to say that she would be the first of his wives to whom the gates of paradise would be opened. It is stated by Mohammedan historians that to the charms of her beauty she added a knowledge of mathematics, rhetoric, and music. In his last illness, Mohammed, by his request, was carried to her house and expired in her arms. After the prophet's death, Ayeshah headed a force to resist the accession of Ali. She survived Mohammed for 46 years.

Ayub Khan, Mohammed (1908-), military and political leader, was born at Abbottshad, India. He received his military training at Sandhurst, in England, and fought as a member of the British Indian Army in World War II. Later he became a general in Pakistan's army. As leader in a movement to create a strong government, he was made president of Pakistan in 1958. He has always been regarded as a staunch friend of the West, and particularly of the United States.

Babbitt, Isaac (1799-1862), American inventor, was born at Taunton, Mass. Following the trade of a goldsmith, he became interested in the manufacture of alloys. In 1824, he produced the first britannia ware made in the United States. In 1839, he made the discovery of the widely-known anti-friction alloy of copper, tin, and antimony, which bears his name, "Babbitt metal," For this valuable discovery, Congress voted him $20,000. See *Babbitt Metal*.

Babcock, Stephen Moulton (1843-1931), American chemist, was born at Bridgewater, N. Y. A graduate of Göttingen University, he was professor of agricultural chemistry at the University of Wisconsin from 1887 to 1913, serving also as chief chemist of the Wisconsin Agricultural Experimental Station. He developed a simple test for butterfat in milk, known as the Babcock test, which makes possible rapid grading for market and as a guide in breeding cattle for superior milk-giving strains. Skeptical of current theories of nutrition based on caloric content of food, he conducted feeding experiments which led to the discovery of vitamins. After retirement in 1913, he conducted basic researches on the relation of matter to energy.

Babson, Roger Ward (1875-), American statistician. was born at Gloucester, Mass., and was educated at the Massachusetts Institute of Technology. He founded the Babson Statistical organization, which, under his direction, won for itself a leading place among business forecasting agencies. During World War I, he was director general of information and education for the United States. Among his publications are *Business Barometers*, *Bonds and Stocks*, and books dealing with the future of the working class, investments, the churches, world peace, and other topics. He was candidate for the presidency of the United States in 1940 on the ticket of the Prohibition party.

Baccio della Porta. See *Bartolommeo, Fra.*

Bach (*bäĸ*), **Johann Sebastian (1685-1750),** founder of modern music, was born at Eisenach in Saxe Weimar Eisenach, Germany. In the household of his father, the court and city musician, he early learned to love music; but, after his father's death, he received no sympathy from his guardian brother in his ardent devotion to it. This brother died soon, and Bach, destitute and without a protector, went to Luneburg in 1700, where he sang in the choir of Saint Michael's school. Here, also, he began the study of the organ under Boehm and laid the foundation for his career as the greatest master of composition for the organ and one of its greatest players. The seriousness with which he studied is attested by the fact that several times he walked 25 miles to hear Reinken, a noted organist.

When he was eighteen, he was engaged to play the violin in the orchestra of the Duke of Weimar. It was probably then that he became acquainted with the concertos of Vivaldi, to which he later attributed his ideas of the principles of music.

In 1704, he accepted the office of organist at Arnstadt. Three years later, he became organist at Muhlhausen, where he married Maria Barbara Bach, and, in 1708, he returned to Weimar, now as court organist. His new environment quickened his already active musical faculties, and some of his best organ compositions and cantatas were written at Weimar.

In the years 1717-23, he was chapelmaster for Prince Leopold, and here he composed numerous works for the clavichord and orchestra. In 1721, Bach, being now a widower, married Anna Magdalena Wulkens, who, by reason of rare musical gifts, proved to be an industrious helper for her husband. The next year he published *Forty-eight Preludes and Fugues*.

In 1723, Bach received his most important appointment, that of choirmaster of Saint Thomas's school in Leipzig. His playing became more famous, he had constant opportunity for the production of important works, he had many pupils in composition and instruction, and his income was soon increased by his additional appointment as composer to the Duke of Weissenfels. In 1736, he was made chapelmaster to the court of Dresden. This office gave Bach occasion to write masses and other religious pieces.

Bach was persuaded to visit Frederick the Great at Potsdam in 1747, and he extemporized a fugue which he afterward elaborated for the monarch. Bach finished his *Art of Fugue*, and then his eyesight failed.

Bach was the greatest master of counterpoint in the history of music. He disregarded the prevailing custom of writing in a few keys only, and tuned keyed instruments so as to render them nearly perfect for all keys. He was the first to use the thumb and fourth finger on the pianoforte keyboard. His melody is sometimes fantastic, but never commonplace; his harmony is very effective; his integrity and conscientiousness in composition are unsurpassed. Nowhere is the grandeur of religion more worthily felt than in his sacred compositions. All succeeding composers have acknowledged in him the creative mind that placed music on a deep, scientific basis. See *Music: German Classic Masters*.

Bach, Karl Philipp Emanuel (1714-1788), German composer, second son of Johann Sebastian Bach, was born at Weimar. He was probably the most highly gifted of the eleven brothers, and his influence on the development of certain musical forms gives him a prominent place in the history of the art. He studied in the Thomas School, and afterward in the University of Leipzig. In 1738, he went to Berlin, and soon afterward was appointed chamber-musician to Frederick the Great. In 1767, Bach became chapelmaster at Hamburg, where he passed the remainder of his life. His most ambitious composition is the oratorio *Israel in the Wilderness*. His *True Method of Harpsichord Playing* was long a standard work.

Bache (*bāch*), **Franklin (1792-1864),** American physician and chemist, was born at Philadelphia. He published a *System of Chemistry* in 1819; became professor of chemistry in the Philadelphia College of Pharmacy, 1831, and was appointed to a similar chair in Jefferson Medical College, Philadelphia, in 1841. In 1833, in conjunction with Dr. G. B. Wood, he published the first edition of the *Dispensary of the United States of America*, which became the standard authority on drugs with physicians and pharmacists.

Bacon, Francis (1561-1626), English philosopher, jurist, and statesman, was born of distinguished parentage at London. At the age of 12, he was sent to Trinity College, Cambridge. Three years later, he left, strongly convinced of the futility of the Aristotelian philosophy, which was then taught in the schools. In revolt against it, his later intellectual efforts were bent on working out and declaring a philosophy which might confer greater benefits on mankind.

In 1576, his father sent him to France in the suite of the British ambassador, Paulet. Three years later, his father died, and Bacon diligently devoted himself to the study of law. In 1582, he was admitted to the bar and, in 1588, received from Queen Elizabeth the title of "counsel learned in the law extraordinary." In 1596, Bacon wrote his *Maxims of the Law*. The following year, he published the *Essays*, the work by which he is best known to the reading public.

Bacon's political advancement was due in a considerable degree to the favor of James I, by whom he was knighted on July 23, 1603. In 1605, Bacon published the first part of *Advancement of Learning*, which, expanded into *Advancement of Science*, may be said to have introduced a new era in English science. In 1606, he married Alice Barnham, and, the next year, he was appointed solicitor-general of the kingdom. In 1609, he published *Wisdom of the Ancients*.

In 1611, Bacon was appointed joint judge of the knights marshals' court; in 1613, attorney general; in 1617, lord keeper of the great seal; and, in 1618, he was made lord high chancellor and created Baron Verulam. The next year, Bacon received the title of Viscount Saint Albans and opened that fatal Parliament which brought charges of bribery against him, deprived him of his speakership and his seat in Parliament, imposed a heavy fine, and sentenced him to the Tower in disgrace. When he was pardoned, he retired to Gorhambury, where he devoted the remainder of his life to scientific experimentation and the cultivation of philosophy.

The *Novum Organum*, or "New Instrument of Logic," of 1620, has done more perhaps than any other single book toward inculcating into science the spirit of unbiased, careful observation and experimentation. Bacon insisted that all prepossessions were to be abandoned and that nature was to be interrogated by the devising of experiments with a view to discovering the laws of her action. He wrote a utopia of science, *The New Atlantis*. An autobiographical statement of his concept of an educated person is found in *De interpretatione naturae proemium* from which the following is quoted: "*I found that I was fitted for nothing so well as for the study of truth; as having a mind nimble and versatile enough to catch the resemblances of things . . . and at the same time steady enough to fix and distinguish their subtler differences; as being gifted by nature with desire to seek, patience to doubt, fondness to meditate, slowness to assert, readiness to consider, carefulness to dispose and set in order; and as being a man that neither affects what is new nor admits what is old, and that hates every kind of imposture.*"

A persistent attempt has been made to prove that Bacon was the author of Shakespeare's plays, the principal supporters of the view being Delia Bacon, Nathaniel Holmes, and Ignatius Donnelly. The theory has not been accepted, however, by any of the great Shakespearean scholars. Bacon died as the result of a cold caught during an experiment on the refrigeration of fresh meat. See *English Literature: The Elizabethans*.

Bacon, Henry (1866-1924), American architect, was born at Watseka, Ill. He was graduated from the University of Illinois in 1888. In the same year, he entered the offices of McKim, Mead, and White, New York City. Winning the Rotch traveling scholarship, he spent two years, 1889-91, of study in Europe. Returning to America, he continued with McKim, Mead, and White until 1897, when he became a member of the firm of Brite and Bacon. In 1903, he began practice alone. The most notable of many important buildings designed by Bacon is the beautiful Lincoln Memorial in Washington. In recognition of his attainments in architecture, he was elected member of the American Academy of Arts and Letters.

Bacon, Nathaniel (c.1642-1676), American colonist and insurrectionary leader, was born in England. As a member of Governor Berkeley's council in Virginia, he became the leader of an alleged insurrection against the colonial government under pretense of resisting aggressions of the Indians. Berkeley was forced to make many concessions to demands for better government; but he broke his promises. A brief civil war followed, in which Jamestown was burned, 1676, and the governor took shelter in an English vessel. Before completing plans for re-establishing the government, Bacon died, and the rebellion soon came to an end.

Bacon, Roger (c. 1214-1294), English scientist and publicist. The most learned man of his day and a celebrated teacher at Oxford University, he is reputed to have advocated the change since made in the calendar, to have invented gunpowder, and to have manufactured magnifying glasses. His great work, *Opus Majus*, anticipates the methods of modern science, emphasizing mathematics and observation.

Baden-Powell (*bā'dĕn-pō'ĕl*), **Robert Stephenson Smyth Baden-Powell, Baron (1857-1941),** British general, was educated at Charterhouse, London. In 1876, he joined the British army and saw service in India, Afghanistan, and South Africa. In the Boer War, with a force of 1200 men he was besieged in Mafeking, which he held against the Boers from the outbreak of the war, October 12, 1899, until May 17, 1900. In recognition of this successful defense, he was made major general.

In order to promote good citizenship in the rising generation, he founded, in 1908, the organization of Boy Scouts and, in 1910, the Girl Guides, the latter with the co-operation of his sister Agnes Baden-Powell. In 1929, he was created Baron Baden-Powell. His writings include *Scouting for Boys, My Adventures as a Spy, Indian Memories, The Wolf Cub's Handbook, Girl Guiding, Rovering to Success,* and *Birds and Beasts in Africa*. See *Boy Scouts; Girl Scouts*.

Badoglio (*bä-dō'lyō*), **Pietro (1871-1956),** Italian general, was born in Piedmont. He served with distinction in the Abyssinian and Libyan wars and in World War I. After World War I he was made chief of the general staff. Though never in full sympathy with Fascism, he retained his position under Mussolini and was sent on foreign missions. Again made chief of staff, he carried through successfully the conquest of Ethiopia, was made Duke of Addis Ababa, and governed Ethiopia for a year. He opposed Italy's entrance into World War II. After the first disasters of the Greek campaign, he retired as chief of staff. Upon Mussolini's fall the king called him to form a ministry, which made peace with the Allies and declared war upon Germany. He resigned in June 1944.

Baedeker, Karl (1801-1859), German publisher, was born at Essen. Going into the printing business at Coblenz, he began to issue a series of guide books, the first appearing in 1839, the *Rheinreise*. In the course of years they developed so as to cover most of the civilized world. Baedeker's son Fritz (1844-1925) succeeded to the business and transferred it to Leipzig in 1872. He improved the series by full description of entertainment facilities, traveling incognito to observe them personally. The care taken in their preparation, has made the name Baedeker synonymous with the most authoritative travel guides.

Baekeland (*bā'kĕ-länd*), **Leo Hendrik (1863-1944),** chemist and inventor, was born at Ghent, Belgium. He was educated at the university of his native city and studied in England, Scotland, Germany, and the United States. Later he specialized in the study of electrochemistry in the Polytechnical School at Charlottenburg, Germany. He taught chemistry and physics in the University of Ghent and in the Normal School of Science at Bruges until 1889, when he migrated to the United States. In 1893, he established the Nepera Chemical Company for the manufacture of velox and other photographic papers of his invention. Selling this to the Eastman Kodak Company in 1899, he devoted himself chiefly to chemical research and to developing chemical industries. See *Bakelite*.

Baer (*bâr*), **Karl Ernst von (1792-1876),** Russian naturalist, one of the founders of modern embryology, was born in Estonia. He was educated in Germany and became a professor in the University at Konigsberg. In 1828, he published *History of the Development of Animals*, a work

which announces his discovery of the ovum in animals and the process of fertilization. His discovery of the similarity in the earliest stages of development of all forms of animal life was one of the clues leading to the theory of evolution. He died at Dorpat. See *History of Biology*.

Baeyer (*bā'yĕr*), **Johann Friedrich Wilhelm Adolf von** (**1835-1917**), German chemist was born at Berlin. In 1872 he became professor of chemistry at the University of Strasbourg, and, in 1875, he was appointed Liebig's successor at Munich. He discovered the molecular structure of indigo and produced it synthetically. Dye substances which he produced for the first time include cerulein, eosin, and indol. In 1905 he was awarded the Nobel price for chemistry.

Baffin, William (**1584-1622**), English navigator, was born probably at London. He accompanied James Hall in his search for a passage to Asia north of North America in 1612. Three years later, he explored the inlet now named after him, Baffin bay. Baffin was killed when fighting with the Persians against the Portuguese on the island of Ormuz, Iran.

Bagehot (*băj'ŭt; băg'ŭt*), **Walter** (**1826-1877**), English economist and journalist, was born at Langport, Somerset. From a school at Bristol he passed, in 1842, to University College, London, where he took his master's degree in 1848. In 1852, he was admitted to the bar, but joined his father as a banker and shipowner at Langport. In 1858, he married a daughter of James Wilson, founder of the *Economist* newspaper, and, from 1860 until 1877, he was its editor. His influence at the time and later is based on his intimate knowledge of banking operations and government together with a detached point of view which permitted him to describe them understandably and relate them to the entire economic process. His works include *The English Constitution, Physics and Politics, Lombard Street, Literary Studies, Economic Studies*, and *Biographical Studies*.

Bailey, Liberty Hyde (**1858-1954**), American botanist and horticulturist, was born in South Haven, Mich. He was graduated at Michigan Agricultural College, 1882; was assistant to Asa Gray, Harvard, 1882-83; and was professor of horticulture at Michigan Agricultural College, 1883-88. From 1888 to 1903, he was professor of horticulture, and from 1903 to 1913, was dean of the College of Agriculture, Cornell University. In addition to extensive researches in botany and horticulture, he has devoted special attention to rural problems and to rural education.

His writings include *Evolution of our Native Fruits, Lessons with Plants, Principles of Fruit Growing, Plant-Breeding, Principles of Agriculture, Outlook to Nature, The State and the Farmer, The Country-Life Movement, Wind and Weather*, and *The Holy Earth*. He was editor of *Cyclopedia of American Horticulture, Rural Science Series, Garden-Craft Series, Cyclopedia of Agriculture*, and the *Standard Cyclopedia of Horticulture*.

Baillie (*bā'lĭ*), **Joanna** (**1762-1851**), Scotch poet and dramatist, was born in Bathwell manse. In 1784, she went to reside in London and, in 1806, took up her residence at Hampstead, where she remained until her death. At an early age, she began to write poetry, her *Fugitive Verses* appearing anonymously in 1790. Her greatest achievement is the nine *Plays on the Passions*, each of which depicts the effect of one passion on the characters. They are full of impressive poetry and are often characterized by intense dramatic power. The most popular as well as the most powerful of these, the tragedy *De Monfort*, was brought out at Drury Lane, London, in 1800, with Kemble and Mrs. Siddons taking the leading parts. Her *Family Legend* was produced at Edinburgh in 1810 under Sir Walter Scott's auspices.

Bainbridge, William (**1774-1833**), American naval officer, was born at Princeton, N. J. In the War of 1812, he was given command of a squadron, consisting of the *Constitution, Essex*, and *Hornet*, which sailed from Boston in that year. When cruising off the coast of Brazil toward the close of 1812, he captured the British frigate, *Java*, for which act Congress voted him a gold medal together with a share in the prize money. He died at Philadelphia.

Baird, Spencer Fullerton (**1823-1887**), American naturalist, was born at Reading, Pa. He was educated at Dickinson College, Carlisle, Pa., and was afterward professor of natural science in that institution. He became secretary of the Smithsonian Institution at Washington, and later was commissioner of fisheries, the commission having been established at his instance. Under his direction the national museum was begun in 1850. He wrote many papers on birds, reptiles, and fishes, and, in connection with other editors, he published *The Birds of North America, The Mammals of North America*, and *History of the Birds of North America*.

Bairnsfather, Bruce (**1888-1959**), British artist and cartoonist, was born in India. While serving as a member of a Warwickshire regiment in World War I, he gathered impressions for a series of black-and-white sketches of British soldiers in the midst of difficulties, particularly those connected with trench life. These were treated humorously in his characterization of "Old Bill" and his companions. A successful play, *The Better 'Ole*, was based on Bairnsfather's cartoons. His interpretations of soldier problems both in war and in post-war adjustment are given in several collections of his drawings, most popular of which are *Fragments from France, Bullets and Billets, From Mud to Mufti, Back to Blighty*, and *Old Bill, M. P. 1*.

Bajazet I (*băj'ă-zĕt'*) (**1347-1403**), sultan of the Turks. In 1389, he succeeded his father, Murad I, who fell in battle near Kossovo, fighting against the Serbians. In three years he conquered Bulgaria, a part of Serbia, Macedonia, and Thessaly; he also subdued most of the states of Asia Minor. From the rapidity with which these extraordinary conquests were effected he received the name of Ilderim, "Lightning." He even blockaded Istanbul for ten years, thinking to subdue it by famine. In 1396, Bajazet defeated Sigismund of Hungary at Nicopolis. Overthrown by Timur at Angora in 1402, Bajazet died in the camp of his conqueror.

Baker, George Fisher (**1840-1931**), American financier, was born at Troy, N. Y. Graduating from Seward University, Florida, N. Y., in 1856, he worked as clerk in the state banking department. In 1863, he was an organizer of the First National Bank of New York. It expanded rapidly after be became active head in 1865 and president in 1877, attaining to the first rank among the world's financial institutions. He also organized the Southern railroad. Among his numerous benefactions was a gift of 6 million dollars to found the Harvard School of Business Administration.

Baker, George Pierce (**1866-1935**), American educator, was born at Providence, R. I. He was educated at Harvard University, where he began to teach English in 1888, becoming professor in 1905. His course in the drama, known as "English 47," attained a celebrity that passed far beyond the college walls. It was the inspiration of a large number of American dramatists who later won distinction in the theater. In 1925, he became head of a newly organized department of dramatic arts at Yale University. He was elected to the American Academy of Arts and Letters the same year.

Baker, Newton Diehl (**1871-1937**), American cabinet officer, was born at Martinsburg, W. Va. He was graduated at Johns Hopkins University in 1892 and at the law school of Washington and Lee University, 1894. After serving as private secretary to Postmaster-general Wilson, 1896-97, he began legal practice at Martinsburg. Later, he removed to Cleveland, where he was city solicitor from 1902 until 1912. He served as mayor of Cleveland, 1912-16, and his ability won appointment by President Wilson to the secretaryship of war in 1916. He showed extraordinary energy in successfully co-ordinating the military efforts of the United States during World War I. President Coolidge appointed him in 1928 to the International Court of Arbitration at the Hague, and President Hoover chose him to serve on the Wickersham commission on law enforcement in 1929.

Baker, Ray Stannard (**"David Grayson"**) (**1870-1946**), American journalist and author, was born at Lansing, Mich. He was graduated at Michigan Agricultural College in 1889 and studied law and literature at the University of Michigan. He was a reporter on the Chicago *Record*, 1892-97; was associate editor, *McClure's Magazine*, 1899-1905; and was an editor of *The American Magazine*, 1906-15. Baker's writings include *Boys' Book of Inventions, Following the Color Line, A History of the Peace Conference*, and *The Life and Letters of Woodrow Wilson*. As "David Grayson," he wrote a series of works including *Adventures in Friendship, Adventures in Solitude, The Countryman's Year*, and *Under My Elm*.

Baker, Sara Josephine (**1873-1945**), American hygienist, was born at Poughkeepsie, N. Y. After being graduated from the Women's Medical College, New York Infirmary, she became assistant to the commissioner of health, New York City, and, from 1908 to 1923, directed the city's bureau of child hygiene. She organized in New York the first bureau of child hygiene under government control, the influence of which was seen in establishing a lower baby death rate there than was found in any other large city of America or Europe. She wrote, among other works, *Healthy Mothers, Healthy Babies*, and *Fighting for Life*.

Bakst (*băkst*), **Leon** (**1866-1924**), Russian decorative artist, was born in Leningrad. He was a court painter prior to 1900, but thereafter devoted his art chiefly to the designing of theatrical effects, in which his influence throughout the world was revolutionary. He designed scenery for Diaghilev's ballet, Sophoclean tragedies, *Cleopatra, Sheherazade*, and numerous other spectacular dramas. His designs

for scenery and costume aimed at unity of effect, in which color played a characteristically significant role.

Bakunin (*bä-kōō'nyĕn*), **Mikhail (1814-1876),** Russian anarchist and founder of nihilism, was born at Torzhok. A wealthy officer of the imperial guard, he resigned in 1841 to travel in Germany, France, and Switzerland, where he collaborated with radical groups interested in overthrowing the Russian and other oppressive governments. Disobeying a recall to Russia, he was deprived of his estates there. After the failure of the revolutionary movement in Germany in 1849, Bakunin was handed over to the Russian government by Austrian officials and was banished to Siberia. He escaped through Japan and the United States to England, where he became acquainted with Karl Marx.

Balakirev (*bä'lä-kē'rĕf*), **Mili Alexeyevich (1837-1910),** Russian composer, was born at Gorki. In 1855, he was graduated at the University of Kazan. He then went to Leningrad where, encouraged by Glinka, he made a brilliant debut as a pianist. During the revival of patriotic enthusiasm following the Crimean War, he enlisted Cui, Mussorgsky, Rimski-Korsakov, and Borodin in an effort to create a modern Russian school of music based on "truth and nationalism." His own compositions include the symphonic poems *Tamara* and *Russia* and music to *King Lear.*

Balanchine (*bäl'ăn-chĭn*), **George (1904-),** dance director, was born in Leningrad, Russia, where he was a ballet dancer, 1921-24. He was with the Serge Diaghilev company in Paris, 1924-28, and in 1929 was made ballet master of the Royal Opera, Copenhagen, Denmark. He assisted in organizing the Ballet Russe de Monte Carlo in 1932, and the following year came to the United States, where he has since remained. In 1934 he founded the American School of Ballet, and from 1934 to 1937 directed the Metropolitan Opera ballet. He has been director of the New York City ballet since 1948. Balanchine has also done the choreography for a number of motion pictures and plays. He is the author of *Balanchine's Complete Stories of the Great Ballets* (1954).

Balboa, Vasco Nuñez de (c. 1475-1517), Spanish conquistador, was born at Jeres de los Caballeros. In 1501, he took part in the expedition of Rodrigo de Bastidas to the New World. He established himself in Santo Domingo, and began to cultivate the soil. Fortune proving adverse, he joined an expedition to Darien in 1510.

An insurrection obtained for Balboa the supreme command in the new colony, but, owing to intrigues at the Spanish court, he was succeeded by Pedrarias Dávila. In a subordinate position, Balboa made several successful expeditions. Accounts of a great western ocean reaching him, he set out in 1513 in quest of it. On September 25 of that year, from a mountain top in the Isthmus of Panama, he obtained the first sight of the Pacific Ocean. He took possession of it in the name of his sovereign. He was executed on the charge of a contemplated revolt.

Baldwin, James (1924-), novelist, was born in New York City and grew up in Harlem. He attended the DeWitt Clinton High School, where he edited a school magazine. He became a news reporter and soon afterward an essayist and novelist. His writings include *Go, Tell It on the Mountain, Giovanni's Room,* and *Notes of a Native Son.* His novels are noted for their realism.

Baldwin, James Mark (1861-1934), American psychologist, was born at Columbia, S. C., and was graduated at Princeton University, 1884. After a period of study in the universities of Oxford, Leipzig, Tübingen, and Berlin, he held professorships in several American universities.

He was professor of philosophy at Toronto University, 1889-93, where he founded the first psychological laboratory in the British Empire. He founded a second at Princeton University where he was professor of psychology from 1893 to 1903. He then taught at Johns Hopkins University and, 1909-13, in the National University of Mexico. In 1915-16, he was Herbert Spencer lecturer at Oxford University, and, in 1919, was made professor in the School of Advanced Social Study at Paris. He was the chief exponent of the school of experimental psychology in America. His extensive writings include *Mental Development in the Child and the Race, Thought and Things, Darwin and the Humanities, The Super-State,* and *Between Two Wars—Memories and Opinions.*

Baldwin of Bewdley, Stanley Baldwin, Earl (1867-1947), British statesman and prime minister, was born in Worcestershire, England, and was educated at Cambridge University. On his mother's side, he was a cousin of Rudyard Kipling and a nephew of Edward Burne-Jones. Until 40 years of age, he was engaged in the iron manufacturing business. He became member of Parliament in 1908 as a Conservative, and was financial secretary of the treasury from 1917 to 1921. During World War I, he made a voluntary contribution of 25 per cent of his private fortune to the national treasury. He was chosen president of the British board of trade in 1921; sat as member of the British commission which, early in 1923, arranged for the funding of the British war debt to the United States; and, in May 1923, assumed the leadership of the British government. Following the defeat of the Conservatives in the elections held late in 1923, Baldwin resigned the premiership early in 1924 only to be returned to power in November of the same year. Among the achievements of his second administration are to be numbered a leading part in the negotiation of the Locarno treaties and the successful weathering of a general strike in 1926. His government was defeated by the Labor Party in 1929, but he joined the cabinet of Ramsay MacDonald in the national government of 1931. He was again prime minister from 1935 to 1937. On his retirement he was created Earl Baldwin of Bewdley.

Balfe (*bälf*), **Michael William (1808-1870),** operatic composer and singer, was born at Dublin, Ireland. At 16, he was engaged in the Drury Lane orchestra in London. While there, he attracted the attention of an Italian nobleman, Count Mazzara, who took him to Italy to study music. After singing at Paris in the Italian Opera under Rossini, Balfe returned to Italy and produced, in 1830, several operas. In 1835, he went to England as a vocalist and composer of opera. His most popular work, *The Bohemian Girl,* appeared at Drury Lane in 1844 and was followed by several other operas.

Balfour (*bäl'fo͝or*), **Arthur James Balfour, Earl (1848-1930),** British statesman and author, was born in Scotland. He was educated at Eton and at Trinity College, Cambridge. During 1878-80, he was private secretary to Lord Salisbury, attending him at the Congress of Berlin, 1878. He was secretary for Scotland, with a seat in the cabinet, 1886-87; was chief secretary for Ireland, 1887-91; was first lord of the treasury and leader of the house, 1891, and again in 1895-1906.

On the retirement of Lord Salisbury, in 1902, Balfour became prime minister, serving until the end of 1905. In May 1915, he became first lord of the admiralty in Asquith's coalition cabinet, and in December 1916, was made secretary of state for foreign affairs in Lloyd George's war cabinet, serving until 1919. In this capacity he issued the "Balfour Declaration," which led to the establishment of a "Jewish state" in Palestine. In 1917, he headed the British mission to America and, in 1921-22, was the leading member of the British delegation to the Washington Conference. His writings include *A Defense of Philosophic Doubt, The Foundations of Belief, Economic Notes on Insular Free Trade, Speeches of Fiscal Reform, Criticism and Beauty, Theism and Humanism.*

Ballou (*bă-lo͞o'*), **Hosea (1771-1852),** American preacher and one of the founders of Universalism, was born in New Hampshire. He was self-educated; was expelled from his father's church on declaring his belief in the final salvation of all men; began to preach at 21, and became minister of the Second Universalist church in Boston, in which he preached 35 years. He started the *Universalist Magazine* in 1819, and, in 1831, began the *Universalist Expositor.* It is said that he preached over 10,000 sermons, none of which was written before delivery.

Baltimore, George Calvert, first Lord (c. 1580-1632), was born at Kipling, in Yorkshire. He entered Parliament in 1609, was knighted in 1617, and, in 1619, became secretary of state. In 1625, he declared himself a Catholic and, resigning office, was created Baron Baltimore in the Irish peerage and retired to his Irish estates. As early as 1621 he had dispatched colonists to a small settlement in Newfoundland, and, in 1627, he visited the place. The next spring, he returned with his family, and remained until the autumn of 1629. The severe winter induced him to sail southward in search of a more genial country, but his attempts to settle in Virginia led to disputes, and he returned home to obtain a fresh charter. He died in 1632. His son and heir, Cecelius Calvert (1605-75), governed under the new charter, which covered parts of the present Maryland and Virginia, exercising his authority from England through deputies. The third Lord Baltimore, Charles Calvert (1637-1715), governed in person, but his charter was overthrown by a Protestant revolt in 1689. See *American History: The Founding of Maryland.*

Balzac (F. *bäl'zäk'*; E. *bäl'zăk*), **Honoré de (1799-1850),** French novelist and founder of the realistic school of fiction, was born at Tours, France. When twelve years old, he was sent to the College of Vendôme, near Blois. Here he devoted himself so intensely to mystic books and reveries that he injured his health. He next studied law at the Sorbonne, Paris. Being employed as clerk to a notary, he gathered a knowledge of chicanery which was later turned to account in his romances. His occupation, however, proved intolerable, and he was left by his family to work, starve, and struggle for the next ten years on a scanty pittance. He read omnivorously and tried to make money by scribbling unpromising novels under assumed names.

In 1826, he formed a partnership with the printer Barbier and published various works. This business turned out ill, however, and he was laden with a debt which harassed him until the end of his career. His first successful novel was *The Chouans*, which appeared in 1829. His next works, *The Physiology of Marriage* and *The Wild Ass's Skin*, produced in 1830, also proved popular.

Between the years 1831 and 1850, Balzac produced those stories which composed his great *Human Comedy*. Of these, the most widely read was *Father Goriot*. The others include *Eugenie Grandet* and *Lost Illusions*. He was phenomenally industrious and productive, writing 85 novels in 20 years. In them he aimed to represent all ranks, professions, arts, and trades, and all phases of manners in town and country. He exhibited an extraordinary range of knowledge, observation, and sympathy, a steadfast determination for thoroughness, and a keen analysis of character and conduct. His faults include moralizing and an overinsistence on detail. It is impossible to judge justly any one of these tales separately, because each is only a fragment in the development of the *Human Comedy*.

In 1849, Balzac traveled to Poland and visited the rich Countess Hanska, to whom he had dedicated his novel *Seraphita* and whom he had loved for 15 years. In 1850, they were married, and his long-standing debts were paid.

The most striking feature of Balzac's genius is the immensity of his imaginative achievements. He wrote in all, 97 books. His name is one of the greatest in the literature of France since the era of the Revolution. He died three months after his marriage. See *Comedie Humaine*.

Bancroft, George (**1800-1891**), American historian, was born at Worcester, Mass. He was graduated at Harvard College in 1817 and, in 1818, went to Göttingen, where he studied history and philology. At Berlin, he attended the lectures of Hegel and had frequent intercourse with Schleiermacher, Humboldt, Savigny, and other literary men of note. Subsequently, he traveled in Germany, France, Italy, and England. Returning to the United States, he spent some time in teaching and then devoted himself to politics. He rose to prominence as a Democratic politician, and was made collector of customs at Boston. He still continued his literary labors, especially in lectures upon German literature and philosophy.

When Polk was elected president, in 1845, he appointed Bancroft secretary of the navy. While in this office, he established an observatory at Washington and a naval school at Annapolis. In 1846, he was sent by Polk as ambassador to England, where he remained until 1849, collecting additional materials for his monumental *History of the United States*, a work of solid excellence, the last volume of which appeared in 1874. From 1867 to 1874, Bancroft was minister to Germany. He was elected to the American Hall of Fame, 1910.

Bancroft, Hubert Howe (**1832-1918**), American historian, was born at Granville, Ohio. He worked in a bookstore in Buffalo, N. Y., in 1848, and, from 1852 to 1868, was a book dealer and publisher in San Francisco. In connection with his book trade, he made large collections of historical material and finally retired from business in order to devote himself to the production of historical works. With the aid of collaborators, he published *Native Races of the Pacific States* and a monumental *History of the Pacific States of North America*, in 21 volumes, and other historical works. In 1905, his vast historical library, consisting of 60,000 volumes, was acquired by the University of California.

Bandinelli (*bän'dê-nĕl'lē*), **Baccio** (**1493-1560**), Italian sculptor, the son of a famous goldsmith, was born at Florence. He was a jealous rival of Michelangelo, who is said to have repaid his enmity with contempt. His talent, however, secured him many patrons, and Pope Clement VII bestowed on him an estate. Among his works are his colossal "Hercules and Cacus," his "Adam and Eve," his copy of the "Laocoön," and the exquisite *bassirilievi* in the Cathedral of Florence.

Bankhead, Tallulah Brockman (**1903-**), American actress, daughter of William B. Bankhead, was born at Huntsville, Ala. She was educated in convents. Making her first appearance on the stage in 1918, she played in New York until 1923 and then went to London, where for nearly ten years she attracted an appreciative public in numerous plays including *The Green Hat* and *Blackmail*. She returned to America to take leading parts in motion picture plays, including *Tarnished Lady*, *My Sin*, and *Antony and Cleopatra*. Once more turning to the legitimate stage, she starred in *Forsaking All Others*, *Reflected Glory*, and *The Little Foxes*.

Banks, Sir Joseph (**1743-1820**), English naturalist, was born in London. He was educated at Oxford University, where the first lectures on natural history were later established through his efforts. In 1766, he made a voyage to Newfoundland and Labrador, collecting plants; from 1768 to 1771, he sailed with Cook around the world in the capacity of naturalist. The marsupial animals of Australia were made known to science by this expedition. In 1772, he explored Iceland and discovered the great geysers. For 42 years, he served as president of the Royal Society. His valuable library and collections are preserved in the British Museum.

Banting, Sir Frederick Grant (**1891-1941**), Canadian scientist, was born near Alliston, Ont. He was educated in the University of Toronto and served as a captain in the medical department of the Canadian army in World War I. He was wounded at Cambrai and was awarded the military cross for bravery.

Banting later began practice at London, Ont., and, in 1920, became a demonstrator in Western University. Shortly afterward he went to the University of Toronto and, with the help of facilities there made available, carried out investigations that led to the discovery of the insulin method for the treatment of diabetes. This drug was first obtained from the pancreas of cattle and hogs and, more recently, has been prepared from certain fish and clams. In 1923, Banting was awarded, jointly with J. J. R. MacLeod, the Nobel prize for medicine, his share of which he divided with a collaborator, C. H. Best. The Canadian government conferred on Banting an annuity of $7500 in consideration of his contribution to medicine, and the Ontario government provided $10,000 a year for a chair in medicine at the University of Toronto, Banting being appointed the first occupant. He invented a device to free mine air of silica dust, cause of the fatal disease silicosis. He was knighted in 1934. He was killed in an airplane crash while flying to England on a wartime mission.

Bantock, Granville (**1868-1946**), English composer and conductor, was born in London. He was educated for the East India service but his interest in music led him to enter the Royal Academy of Music in 1889, where he won the Macfarren prize during his first year. After editing *The New Quarterly Musical Review*, 1893-1896, he began his career as conductor of opera, attracting attention by producing only English compositions of the most recent date. In 1908, he was made professor of music in Birmingham University. He became one of the most vigorous champions of modern English music and a prolific and able composer. His works include operas, symphonic poems, overtures, an oratorio, a choral symphony, and various other vocal and orchestral compositions. He was knighted in 1930.

Barbarossa (*bär'bà-rŏs'à*). See *Frederick I.*

Barber, Samuel (**1910-**), American composer, born at West Chester, Pennsylvania. He was graduated from the Curtis Institute of Music, Philadelphia, in 1932, and since then his music has been played by all the major orchestras in the United States. His *Symphony in One Movement*, which he has described as "a synthetic treatment of the classical four-movement symphony," was the first American work to be played at the Salzburg Festival (1937). His *Adagio for Strings* and his *Essay for Orchestra* were the first American compositions to be included by Toscanini in his repertoire. He has been awarded the Grand Prix de Rome and the Pulitzer prize for his music.

Barbirolli, John (**1899-**), English orchestra conductor, was born in London. Having received his musical training at Trinity College and the Royal Academy, London, he appeared as a cellist after returning from service in World War I. In 1925, he organized an orchestra, the success of which led to his being chosen as conductor successively of the British National Opera Company in 1926 and of the International opera at Covent Garden theater in 1933. He officiated as conductor at the coronation of George VI in 1936. The same year he became conductor of the Philharmonic Symphony Orchestra in New York, conducting regular broadcasts. In 1943 he became conductor of the Halle Orchestra, England.

Barbour (*bär'bĕr*), **John** (**c. 1316-1395**), early Scottish poet and historian. He was archdeacon of Aberdeen from 1357, or earlier, until his death. His national epic, *The Brus*, was first printed at Edinburgh in 1571.

Barbusse (*bär'büs'*), **Henri** (**1873-1935**), French novelist was born at Asnières, a suburb of Paris. Prior to World War I, he wrote two novels, *Les suppliants* and *L'enfer*, which won considerable success. He attained international fame by *Le feu*, written in 1916 and translated into English as *Under Fire*, which contains perhaps the most unforgettable description of modern warfare in the world's literature. His subsequent books, including *Les enchainements*, *Elevation*, and *Zola*, evince a hatred of war and a favorable attitude toward Russian Communism.

Barclay de Tolly (*bär'klā'dĕ-tŏ'lē'*), **Michael, Prince** (**1761-1818**), Russian general, was born in Livonia. He fought with great bravery in the Turkish war of 1788-89, in the campaign against Sweden in 1790, and in the campaigns against Poland, 1792 and 1794. In 1806, at Pultusk, he

commanded Benningsen's advance guard. He lost an arm at the battle of Eylau. After the defeat of the Russians at Smolensk in 1812, he yielded the chief command to Kutuzov, led the right wing of the army at Borodino, did brilliant service at Bautzen, and afterward took part in the battles of Dresden, Culm, and Leipzig. Although severely disapproved by the Russians at the time, Barclay de Tolly's Fabian military policy of watchful waiting in the end accomplished the ruin of Napoleon.

Barham, Richard Harris (1788-1845), "Thomas Ingoldsby," English poet and humorist, was born at Canterbury. He was clergyman of the Church of England, and, in the latter part of his life, was rector of Saint Augustine's in the city of London. The *Ingoldsby Legends*, which constitute his chief claim to fame, were first contributed to *Bentley's Miscellany*. Some of Barham's previously uncollected writings were published under the title of the *Ingoldsby Lyrics*. He died in London.

Baring-Gould, Sabine (1834-1924), English divine, novelist, and miscellaneous writer, was born at Exeter. He was educated at Clare College, Cambridge, and, after graduation, spent some years in travel. In 1864, he was appointed curate of Horbury; in 1871, he became rector of East Mersea; and, in 1881, he succeeded to his father's estate, which had been in the family for nearly three centuries, and was made rector of Lew Trenchard. He was a versatile writer, with an attractive style, and published numerous books of fiction, history, travel, religion, folklore, and mythology. Among his best novels are *Mehalah*, *John Herring*, *Court Royal*, *Pennycomequicks*, *The Red Spider*, and *Broom Squire*. His interesting contributions to folklore and antiquities include *Book of Were-wolves*, *Curious Myths of the Middle Ages*, and *Curious Survivals*. He wrote also "Onward Christian Soldiers," "Now the Day is Over," and other well-known hymns.

Barker, Harley Granville. See *Granville-Barker, Harley*.

Barkley, Alben William (1877-1956), American politician, was born on a farm in Graves County, Ky. Educated at Marvin and Emory colleges and the law school of the University of Virginia, he practiced law and served as prosecuting attorney and later as judge in McCracken County, Ky. He was a Democratic member of the House of Representatives from 1913 to 1927 and then was elected to the Senate for four terms, 1927-51. After the death of Senator Joseph T. Robinson in 1937, Barkley was elected majority leader in the Senate. In 1948 he was the successful Democratic candidate for the office of vice president. In 1952 he was reelected to the Senate, and in 1955 again became Democratic majority leader.

Barlow, Howard (1892-), American conductor, was born at Plain City, Ohio. He was educated at Reed College, Portland, Ore., and Columbia University. He made his debut as an orchestral conductor in 1919 at the MacDowell Festival at Peterboro, N. H. Although as guest conductor he has held the baton over the leading American orchestras, he is best known for his symphonic conducting over the national radio systems. He was with the Columbia Broadcasting Company from 1927 to 1943, and has since been active with the National Broadcasting Company. Well-known programs he has conducted include the Philco Hour, and the Voice of Firestone on TV as well as radio.

Barlow, Joel (1754-1812), American poet and politician, was born in Connecticut. He served as a military chaplain during the war for independence. In 1787, he published a poem called *The Vision of Columbus*, which, in 1807, appeared anew in an enlarged form as *The Columbiad*. He spent some years in Europe in political, literary, and mercantile pursuits. For a short time he was American consul at Algiers. In 1811, he was appointed ambassador to France.

Barnard (*bär'närd*), **Edward Emerson (1857-1923),** American astronomer, was born at Nashville, Tenn. He was graduated at Vanderbilt University, 1887. From 1887 to 1895, he was astronomer at Lick Observatory, California. In 1895, he became professor of practical astronomy, and astronomer of the Yerkes Observatory, University of Chicago. His discoveries include the fifth satellite of Jupiter and 16 comets. He also did important work in celestial photography, making photographs of the milky way, comets, and nebulæ.

Barnard, Frederick Augustus Porter (1809-1889), American mathematician, physicist, and educator, was born at Sheffield, Mass. He was graduated at Yale in 1828; was professor in the University of Alabama, 1837-54; and was successively professor, president, and chancellor, 1854-61, University of Mississippi. In 1864, he was elected president of Columbia College, New York, and served until 1888. Barnard College, affiliated with Columbia university, is named after him because of his notable interest in higher education for women. His published writings are mostly scientific and educational.

Barnard, George Grey (1863-1938), American sculptor, was born at Bellefonte, Pa. He was educated at the Art Institute, Chicago, and at Paris. His style is distinctly idealistic and is characterized by marked originality and admirable technique, particularly in marble. Among his more noted works are "Two Natures," in the Metropolitan Museum, New York; "The Great God Pan," on Columbia University campus, New York; "Adam and Eve," and "Rising Woman," property of John D. Rockefeller, Pocantico Hills, N. Y.; "Prodigal Son and Father," in the Carnegie Museum, Pittsburgh; the bronze statue of Lincoln, in Lytle Park, Cincinnati; and a group of 31 figures of heroic size in the capitol at Harrisburg, Pa. Elected to the American Academy of Arts and Letters in 1930.

Barnard, Henry (1811-1900), American educational reformer, was born in Hartford, Conn. He was graduated at Yale in 1830 and was admitted to the bar in 1835. As a member of the state legislature, 1837-40, he was an energetic advocate of prison reform. As school commissioner of Rhode Island, 1843-47, he recognized the educational system of the state. He was state superintendent of schools for Connecticut, 1850-54, and principal of the State Normal School at New Britain during the same period.

In 1857, Barnard was made president of the University of Wisconsin and, in 1865, president of Saint John's College at Annapolis. During 1867-70, he was United States commissioner of education, the first to occupy that position. In 1855 he founded the *American Journal of Education*, of which he was editor until 1886. His *American Library of Schools and Education* fills 52 volumes. He ranks as one of the foremost educational pioneers of America.

Barnes, Henry A. (1906-), American traffic engineer, was born in Newark, N. J. One of the pioneers in the new field of traffic control, he has made important contributions to pedestrian safety, relief of congestion, increase of traffic flow and reduction of accidents involving motor vehicles. Plans and experiments worked out by him as director of traffic engineering at Flint, Michigan, Denver and, more recently, at Baltimore, have attracted widespread notice. Although he advocates full use of mechanical aids such as paint ("great quantities"), signs, lights, and safety islands, of regulations governing parking and one-way streets, and of complete patrol systems, he places great emphasis on thorough and continuing education of motorists and pedestrians. Hence his traffic programs call for a strong public relations department.

Barnes, Mary Sheldon (1850-1898), American educator, daughter of E. A. Sheldon, was born at Oswego, N. Y. She was educated at the Oswego Normal School and the University of Michigan, graduating in the first class which admitted women. After further study at Newnham College, Cambridge, England, and at the University of Zurich, she was professor of history at Wellesley College, 1876-80, at Oswego Normal School, 1882-84, and at Stanford University, 1891-96. Following her marriage to Earl Barnes in 1884, she spent seven years in study and travel.

Mrs. Barnes was the first instructor in America to apply the Pestalozzian method to the teaching of history. Her adaptations are embodied in her books entitled *Studies in General History*, *American History*, and *Studies in the Historical Method*. She was also the pioneer American teacher to develop the source method of instruction in history.

Barneveldt (*bär'nē-vělt*), **John van Olden (1547-1619),** Dutch statesman. He was pensionary of Rotterdam in 1576, at a time when the Spanish arms were victorious everywhere in the united provinces. In 1585, he was sent at the head of an embassy to offer the sovereignty of the Netherlands to Queen Elizabeth of England. On his return, he was appointed grand pensionary of The Netherlands After a severe contest with the stadholder Maurice of Nassau and his party, he obtained from the Spaniards recognition of the independence of The Netherlands and, in 1609, concluded a truce for 12 years.

Barneveldt courageously opposed the ambition of Maurice, who aimed at the supreme power, and supported Arminius against the Calvinists, the sect to which Maurice belonged. Arrested in 1618, he was tried by a special commission and condemned to death. This sentence being confirmed by the synod of Dort, the venerable statesman was beheaded.

Barnum, Phineas Taylor (1810-1891), American showman, was born in Bethel, Conn. At the age of 13, he was employed in a country store, and, about five years afterward, went into the lottery business. When 19 years old, he married and removed to Danbury, Conn., where he edited the *Herald of Freedom*. In 1834, he removed to New York, where, hearing of Joyce Heth, nurse of General Washington, he bought her for $1000 and exhibited her, realizing considerable profit.

In 1841, Barnum bought the American Museum in New York, which he raised at once to prosperity by exhibiting

a Japanese mermaid (made of a fish and a monkey), a white negress, a wooly horse, and, finally, a noted dwarf, styled "General Tom Thumb," whom he exhibited later in Europe and elsewhere. He introduced Jenny Lind to the American public, and then became proprietor of "the greatest show on earth." He made and lost several fortunes, and his show was twice destroyed by fire. He published *The Humbugs of the World, Struggles and Triumphs*, and an *Autobiography*.

Baroja (*bä-rō'hä*), **Nessi Pío (1872-1956),** Spanish novelist, was born at San Sebastian. A depictor of the rebels and outcasts of society, he wrote, among other novels, *The Struggle for Existence, The Tree of Knowledge*, and *Youth and Egolatry*. His style is direct; the sardonic drama of his stories arising from the marshaling of badly stated facts. In *Memories of a Man of Action*, he wrote a series of books about the historical character Eugenio de Aviraneta.

Barr, Stringfellow (1897-1956), educator, was born at Suffolk, Virginia. He was educated at the University of Virginia, at Oxford, where he was a Rhodes scholar, and at the University of Paris. After serving as teacher of modern European history and as editor of *The Virginia Quarterly* at the University of Virginia, he was called by President Hutchins of the University of Chicago to assist in revising the course in liberal arts. He is known particularly for the use of "Great Books" as an approach to education, which requires a student to be thoroughly familiar with world classics. As president of St. John's College he had an opportunity to put his educational philosophy into practice. He is the author of *Mazzini: Portrait of an Exile*.

Barras (*bä'rä'*), **Count Paul François Jean Nicolas (1755-1829),** French revolutionist, was born in the department of Var. An original member of the Jacobin club, he represented Var in the national convention, voted for the king's execution, and had a share in the Girondists' downfall. He conducted the siege of Toulon, and suppressed, with great cruelty, the revolt in the south of France. Hated by Robespierre, he played the chief part in the tyrant's overthrow, and by the terrified convention was appointed virtual dictator.

In 1795, being again appointed dictator, Barras called to his aid his young friend Bonaparte, who assured his own future with the historical "whiff of grapeshot." The directory being appointed, Barras was nominated one of the five members. Once more dictator in 1797, he guided the state almost alone until Bonaparte, with the help of Sieyès, overthrew him, 1799. Compelled to remove from Paris, he resided in Brussels, Marseilles, Rome, and Montpellier; in 1815, he returned, and purchased an estate near Paris with part of the great fortune acquired during the Revolution. See *France: History*.

Barrett, Lawrence (1838-1891), American actor, was born at Paterson, N. J. His first appearance was at Detroit, 1853. He was leading actor in the Boston Museum, 1858; served as captain of the Massachusetts volunteers in the Civil War; from 1864, continued as leading actor and manager; and, beginning in 1866, was closely associated with Edwin Booth. His most notable role was that of Cassius; but he played Hamlet, Shylock, King Lear, and Richelieu with great distinction. He did much to elevate the American stage and to encourage dramatic authorship. He wrote *The Life of Edwin Forrest* and the biography of Booth in *Actors and Actresses of the Time*.

Barrie (*băr'ĭ*), **Sir James Matthew (1860-1937),** British novelist and dramatist, was born at Kirriemuir, Scotland; was educated at Edinburgh University; and, after a year and a half as a journalist in Nottingham, settled in London, becoming a regular contributor to leading periodicals. His first volume, *Better Dead*, was largely a satire on London life; in *Auld Licht Idylls*, he opened a new and rich vein, the humor and the pathos of his native village. *The Little Minister*, his first novel, came out in 1891 and was dramatized in 1897. *Walker, London*, a farcical comedy, had a prodigious run in 1892; *Jane Annie* was written with Sir Conan Doyle. Other pieces, nearly all notably successful, are *The Professor's Love Story, The Admirable Crichton, Peter Pan, Quality Street, What Every Woman Knows, Sentimental Tommy, Der Tag*, and *Mary Rose*. See *English Literature: Contemporary Drama*.

Barrows, David Prescott (1873-1954), American educator and ethnologist, was born in Chicago. He was graduated at Pomona College in 1894 and studied at the University of California, Columbia University, and the University of Chicago. He became city superintendent of schools at Manila, P. I., in 1900, chief of the bureau of non-Christian tribes in 1901, and was director of education for the Philippine Islands, 1903-09.

In 1910, he was made professor of education at the University of California and, in 1911, was elected to the chair of political science. He served as a cavalry officer in the Philippines and in Siberia in 1917-19. From the latter year until 1923, he was president of the University of California. His publications include *The Ethno-Botany of the Coahuilla Indians, A History of the Philippines*, and *Berbers and Blacks*.

Barry, John (1745-1803), American naval officer, was born in Ireland. Coming to America about 1766, he acquired wealth as a vessel owner. He was appointed to command the brig *Lexington* in 1776. By taking the tender *Edward*, he was one of the first commissioned officers of the United States navy to capture a ship. Subsequent exploits led to his choice, in 1794, as ranking captain of the United States navy.

Barrymore, Ethel (1879-1959), American actress, a niece of John Drew, was born at Philadelphia. Barrymore is a stage name, adopted in place of Blythe. She was educated at the Convent of Notre Dame, Philadelphia. She made her first appearance as Julia in *The Rivals*, 1894; played Priscilla in *Secret Service*, London; later appeared in leading roles with Henry Irving; first starred in *Captain Jinks*, 1900; later appeared in *Cousin Kate, A Doll's House, The Silver Box, The Twelve Pound Look, The Witness for the Defense, The Constant Wife*, and *Rasputin and the Empress*.

Barrymore, John (1882-1942), American actor, was born at Philadelphia, Pa. Making his debut at Chicago in 1903 as Max in Sudermann's *Magda*, he played increasingly ambitious roles both in the United States and other English speaking countries. As a co-star with his brother, Lionel, he won memorable success in *The Jest*. His playing of the title role in Shakespeare's *Richard III* and *Hamlet* added greatly to his reputation, which was widened by successes in motion pictures. Among the screen plays in which he played the chief role are *The Sea Beast, A Bill of Divorcement*, and *Reunion in Vienna*.

Barrymore, Lionel (1878-1954), American actor, older brother of Ethel and John Barrymore, was born at Philadelphia. His debut was at Philadelphia in a minor role in *The Rivals*, in which his grandmother, Mrs. John Drew, played Mrs. Malaprop. He starred in *Squire Kate, The Fires of Hate*. and, with John Barrymore, in *The Jest*. His reputation on the stage was paralleled on the screen, where he was one of the first to take advantage of the opportunities afforded by the sound films.

Barth (*bärt*), **Heinrich (1821-1865),** German geographer and explorer, was born in Hamburg. He was educated at the University of Berlin. After visiting Italy in 1845, he began explorations in Tunis, Tripoli, and Barca. Later he extended his journeys into Egypt, Palestine, and Greece, publishing a valuable account of these researches in 1849.

With Dr. Overweg and James Richardson he set out for central Africa early in 1850. They covered a region previously almost entirely unknown, nearly two million square miles in extent. After the death of both Overweg and Richardson, who succumbed to the climate, Barth continued alone. He returned to Tripoli in 1855, after having traveled more than 12,000 miles. In this notable journey he revealed the true nature of the Sahara Desert, determined the course of the Niger and its tributaries, and made many other important discoveries. The scientific thoroughness and vast extent of his investigations place him in the front rank of African explorers.

Bartholdi (*bär'tôl'dē'*), **Frédéric Auguste (1834-1904),** sculptor, was born at Colmar, Alsace, of Italian ancestry on his father's side. His best-known work is the colossal bronze "Liberty Enlightening the World," which was unveiled on Bedloe Island, New York harbor, in 1886; the statue itself is 151 feet high, and the top of the torch rises over 305 feet above low-water mark. His chief sculptural works are likewise conceived on a colossal scale, combined with massive architectural effects. Among these are the group presented by France to Switzerland and "The Lion of Belfort," an immense monument, generally regarded as his masterpiece. Statues of Lafayette in New York and of Lafayette and Washington in Paris are representative of the patriotic and national spirit of his work. He received the cross of the Legion of Honor in 1887.

Bartlett, Paul Wayland (1865-1925), American sculptor, was born at New Haven, Conn.; studied at Boston under Frémiet and in Paris under Cavelier. At first he devoted himself to animal sculpture, notable examples of which are his "Dying Lion" and "Bear Tamer." In nearly all his work, he preferred the realistic to the symbolic, and his thoroughly modern technique is fundamentally French in character. He produced statues of General McClellan, General Joseph Warren, Columbus, Michelangelo, and Benjamin Franklin in this country; Lafayette in Paris; the pediment over the House wing of the Capitol; and many decorative groups and numerous other works in the art collections of Philadelphia, Boston, Chicago, and Paris. He was made an officer of the Legion of Honor and a member of the American Academy of Arts and Letters. See *Sculpture*.

Bartolommeo (*bär'tô-lôm-mē'ō*), **Fra (1475-1517),** otherwise known as Baccio della Porta, Italian painter, was

born near Florence. His first teacher was Cosimo Rosselli; but he owed his more advanced training to the study of the works of Leonardo da Vinci. He won considerable fame in early life. After the tragic death of Savonarola, however, with whom he enjoyed an intimate friendship, he renounced painting and became, in 1500, a Dominican monk.

The visit of young Raphael to Florence in 1504 appears to have stimulated Bartolommeo to resume his art. He imparted to Raphael his own method of coloring and acquired from him a more perfect knowledge of perspective. His subjects are mostly devotional and the greater part of his pictures belong to the later period of his life. His figures are clothed with finely treated masses of drapery, and he is said to have been the first painter to use the lay figure. His most important works are preserved in Italy, chiefly in Florence, where he died.

Barton, Clara (**1821-1912**), American philanthropist, was born in Oxford, Mass. She was graduated from Clinton Liberal Institute, New York; taught school ten years; during the Civil War, did relief work on battlefields and organized search for missing men; and aided in the founding of hospitals during the Franco-Prussian War.

By her efforts, the American Red Cross Society was founded in 1881, and she was its president until 1904. She secured adoption of the Treaty of Geneva, 1882; was appointed to represent the United States at various international conferences, 1884-1903; inaugurated an amendment empowering the Red Cross Society to provide relief during great calamities; and superintended relief activities at the Johnstown flood, 1889, the Russian famine, 1892, the Armenian massacre, 1896, and on various other occasions. She wrote *History of the Red Cross, America's Relief Expedition to Asia Minor*, and *Story of My Childhood*.

Bartram, John (**1699-1777**), American botanist, was born at Darby, Pa., of Quaker parentage. He was appointed American botanist to George III and corresponded extensively with Linnæus and the leading naturalists of Europe, exchanging his collections of American plants for scientific books. At Kingsessing, in 1728, he established the first botanical garden in America.

Baruch (*bȧ-rōōk'*), **Bernard Mannes** (**1870-**), American financier, was born at Camden, S. C. During World War I, he discharged many important duties connected with the supply of war materials. In 1919, he was made a member of the supreme economic council of the Peace Conference at Paris. As a trusted elder statesman, he was often consulted during F. D. Roosevelt's administration, and he was later chairman of a committee to prepare a plan for international control of atomic energy.

Barye (*bȧ'rē'*), **Antoine Louis** (**1795-1875**), French sculptor of animals, was born at Paris. He was at first an engraver and metal worker. In 1831, he exhibited his widely known "Tiger Tearing a Crocodile," and, in 1832, his still more famous "Lion Battling with a Serpent," which secured for him the cross of the Legion of Honor. He excelled in accurate delineation of the anatomy, character, and movements of animals.

Barzun, Jacques (**1907-**), American educator, writer, critic, was born in Paris. He came to America in 1919 and became a naturalized citizen of the United States in 1933. At Columbia University, where he studied and received his Ph.D. degree, he has been lecturer and more recently professor in history. His writings, noted for their interesting style and challenging opinions, have reached a large public outside the field of education. They include *Berlioz and the Romantic Century, Pleasures of Music, God's Country and Mine*, and the widely quoted book *Teacher in America*. Later works are *Berlioz and the Romantic Century* (1950), *God's Country and Mine* (1954), and *Music in American Life* (1956).

Basedow (*bȧ'zē-dō*), **Johann Bernhard** (**1723-1790**), German educational reformer, was born at Hamburg. He was educated in philosophy and theology at the University of Leipzig. He became professor of moral philosophy at Soro, Denmark, in 1753 and at Altona in 1763. At Altona, he fell under the Influence of Rousseau's *Emile*, which resulted in his abandoning theology for educational work in 1767.

His *Elementarwerk*, issued in 1774, combining the methods of Comenius with the principles of Bacon and the revolutionary ideas of Rousseau, met with wide approval and led to the establishment of his celebrated Philanthropinum at Dessau in 1774. This continued in existence until 1793, exerting a great influence on the education of children throughout Germany. The fundamental idea of his reform was "education according to nature." Many of his ideas were later carried out by more practical educators, such as Pestalozzi and Froebel. See *History of Educational Reformers*.

Basil (*bȧz''l*), **Saint** (**c. 329-379**), surnamed the Great, bishop of Cæsarea, was born there about 329. Converted to Christianity by his sister, Saint Macrina, he became one of the most eminent of the Christian fathers, succeeding Eusebius in the see of Cæsarea in 370. His leadership in this capacity was a principal factor in the triumph of Christianity in the Eastern Empire. In his *Rule of St. Basil*, he laid down a constitution for monastic institutions long followed in the East. Saint Basil made several unsuccessful attempts to reunite the two hostile churches of the East and the West.

Bates, Henry Walter (**1825-1892**), English naturalist and traveler, was born at Leicester. He began life as a hosiery clerk, but became interested in natural science through early acquaintance with A. R. Wallace, whom he joined on a collecting trip to the Amazon. He spent three years collecting in the vicinity of Para and seven years on the upper Amazon. After many hardships, he returned to England in 1859, having found 8000 species of insects new to science.

After returning from the tropics, in 1863, he published a delightful book, *The Naturalist on the River Amazon*, which is a classic of scientific travel. In 1864, he became assistant secretary of the Royal Geographical Society, editing the *Transactions* and numerous books, including Belt's *Naturalist in Nicaragua*. In his paper on *Fauna of the Amazon Valley*, he stated and solved the problem of mimicry and protective coloration. According to Darwin, Bates is second only to Humboldt in describing the animal and plant life of the tropical forest.

Bates, Katharine Lee (**1859-1929**), American author and educator, was born in Falmouth, Mass. Following graduation from Wellesley College, 1880, she taught in Natick High School, 1880-81, and in Dana Hall, 1881-85. She became instructor in English at Wellesley College in 1885 and was professor of English literature there from 1891 to 1925. Besides charming poetry for children, she wrote the hymn "America the Beautiful." Her works include *Rose and Thorn, Fairy Gold, Sigurd, The Golden Collie and Other Comrades of the Road*, and *Yellow Clover*.

Baudelaire (*bō'd'-lâr'*), **Charles Pierre** (**1821-1867**), French poet, was born at Paris. Orphaned of his father at six years of age, he was brought up by guardians who sent him on a trip to India in 1841 on account of the irregularities of his conduct. His two-year stay there left its imprint on his poetry, the first volume of which appeared in 1857 under the title *Fleurs du mal*, "Flowers of Evil." The consummate art which these poems displayed impressed the public less than his selection of morbid subjects and many of them were banned at the time as obscene. Full appreciation of their merit was delayed until the 20th century. Attracted to the works of Edgar Allan Poe, he produced masterpieces of translation in rendering them into French. Involved in the failure of his publisher, he settled in Belgium, where he resorted to drink and opium and spent his last two years in sanitariums.

Bayard (*bȧ'yȧr'*), **Pierre du Terrail, Chevalier** (**1473-1524**), French knight, was born near Grenoble. In an expedition against Naples, serving under Charles VIII, and in the wars against the English and the Spaniards, he distinguished himself by his bravery and nobility of character. In the reign of Francis I, he gained a great victory for the king at Marignano and defended the city of Mezieres against Charles V, for which he was called the "savior of his country." He is known as "the knight without fear and without reproach," without rival as an exemplar of chivalric virtue. He was killed in a battle at the river Sesia, Italy.

Bayle (*bēl*), **Pierre** (**1647-1706**), French philosopher and critic, was born at Carlat. He studied philosophy under the Jesuits at Toulouse and, for a year and a half, turned Catholic. To escape ecclesiastical censure, he withdrew to Geneva and from there to Coppet, on the lake of Geneva, where he studied the philosophy of Descartes. After a few years, he returned to France; in 1675, he was elected to the chair of philosophy at Sedan and, in 1681, at Rotterdam.

In 1684, Bayle began to write *Nouvelles de la republique des lettres*, one of the most successful attempts at a popular journal of literary criticism. He devoted much of his leisure to the *Dictionnaire historique et critique*. This work, the first published under his own name, exercised an immense influence over literature and philosophy; its destructive criticism of accepted history and philosophy became the foundation of 18th century rationalism.

Bazin, Germain (**1901-**), art critic and historian, was born in a suburb of Paris. His education, beyond the University of Paris and the Sorbonne, included study at the *École du Louvre*, where, in 1951, he became curator in chief of the museum. He writes chiefly on paintings.

Beach, Rex Ellingwood (**1877-1949**), American author and playwright, was born at Atwood, Mich.; was educated at Rollins College, Winter Park, Fla.; studied law in Chicago two years between 1896 and 1900. Devoting himself to writing, he became widely known for his stories of adventure, which include *Pardners, The Spoilers, Going*

Some, The Ne'er-Do-Well, The Net, The Mating Call, and *Jungle Gold.* He dramatized *Going Some* (with Armstrong) and *The Spoilers* (with McArthur).

Beaconsfield, Earl of. See *Disraeli, Benjamin.*

Beadle, George Wells (1903-), biologist, was born at Wahoo, Nebraska. Specializing in genetics, he studied at the University of Nebraska and Cornell University and later at the *Institut de Biologie* in Paris. After further study and research at Harvard and Stanford universities he served as professor of biology at the California Institute of Technology (1946-1961). Since 1961 he has been chancellor of the University of Chicago. He was a co-recipient of the Nobel Prize for biology in 1958.

Beard, Charles Austin (1874-1948), American historian, was born near Knightstown, Ind. He was educated at De Pauw, Oxford, Cornell, and Columbia universities, in the last of which he taught from 1907 to 1917. He was director of the Training School for Public Service, New York City, from 1917 to 1922 and adviser on municipal affairs to Japanese authorities for the next two years. Beginning in 1904, he wrote and edited a long series of books, mainly historical and written from an economic viewpoint, which placed him in the front rank of interpreters of contemporary life. His *Rise of American Civilization,* written with his wife Mary, is the best known of his works, which include also *American City Government, The Economic Basis of Politics,* and *America in Midpassage.*

Beardsley, Aubrey Vincent (1872-1898), English black-and-white illustrator, was born at Brighton, England. Encouraged by Whistler, he became art editor of *The Yellow Book* at the age of twenty-two, but much of his own work appeared later in *The Savoy.* His strikingly original and highly decorative style of drawing attracted much attention and influenced many artists. Among the books which he illustrated now sought for by collectors are Mallory's *Morte d' Arthur,* Oscar Wilde's *Salome,* Pope's *Rape of the Lock,* and Jonson's *Volpone.*

Beatty (*bē'tĭ*), **David, Earl (1871-1936),** British admiral, was born in Wexford, Ireland. Entering the navy in 1884, he served with distinction in Sudan operations, 1896-98, and in China, 1900, rising to the rank of captain. In 1901, he married Ethel Field, only daughter of Marshall Field, the noted Chicago merchant. In 1910, he was made rear admiral and, in 1912, was placed in command of the first British battle-cruiser squadron.

Beatty played a distinguished part in World War I. On January 24, 1915, his squadron encountered a German squadron of fast cruisers. After sinking the German cruiser *Blücher,* Beatty drove the remaining enemy vessels to the shelter of their mine fields. On May 31, 1916, he led his squadron against the entire German high seas fleet in the great battle of Jutland, suffering and inflicting terrible losses, until the arrival of the main British fleet. Following this action, which forced the German fleet to flight to its protected base never to reappear in battle formation, Beatty was made vice admiral and was placed in command of the grand fleet. On November 21, 1918, he received, off the coast of Scotland, the surrender of all the important components of the German navy, 90 ships in all, besides 87 U-boats—the greatest naval surrender of modern times. In 1919, he became an earl and also first sea lord of the British admiralty, in which capacity he attended, in 1921, the Washington Conference on the limitation of armaments. He retired in 1924. See *World War: The Battle of Jutland.*

Beaumarchais (*bō'mär'shĕ'*), **Pierre Augustin Caron de (1732-1799),** French dramatist and poet, the son of a watchmaker named Caron, was born at Paris. He married a widow, Madame Franquet, in 1757 and from a little property of hers took the aristocratic name of Beaumarchais. In 1768, he married a second time, obtaining on this occasion a splendid fortune with his wife. Meanwhile devoting himself to literature, he produced *Eugenie,* a drama in five acts; *Les deux amis, ou Le negociant de Lyon; Le barbier de Séville;* and *Le mariage de Figaro.* On the last two of the foregoing his fame now rests. These brilliant comedies inspired the noted operas of Rossini and Mozart that bear the same names as the dramas. In plot, construction, and dialogue, his works represent the culmination of 18th century dramatic writing in France.

Beaumont (*bō'mŏnt*), **Francis (1584-1616),** English poet and dramatist, best known by his literary partnership with John Fletcher, was born at Grace Dieu, Leicestershire. He was educated at Oxford. At 19, he became the friend of Ben Jonson. About 1607, his famous friendship with Fletcher began, and so intimate did the two friends become that they lived in the same house until Beaumont's marriage in 1613. Their joint works comprise some fifty plays, among the best of which are *Philaster, The Maid's Tragedy,* and *The Faithful Shepherdess.* In some of their plays Massinger collaborated, and certain passages in *The Two Noble Kinsmen* are by Shakespeare. See *English Literature: The Elizabethans.*

Beauregard (*bō'rē-gärd*), **Pierre Gustave Toutant (1818-1893),** general of the army of the Confederate states during the Civil War, was born near New Orleans, La. He was graduated at West Point in 1838 and served with distinction in the Mexican War. He resigned the superintendency of West Point to join the Confederate army early in 1861; was assigned command at Charleston, S. C., where, on April 12-13, he began the war by the bombardment of Fort Sumter; July 21, he won the battle of Bull Run; was defeated, April 7, at Pittsburg Landing; in 1863, he defended Charleston and aided in the defense of Richmond. After the war, he became a railroad president and, in 1878, adjutant general of Louisiana.

Beaux (*bō*), **Cecilia (1863-1942),** American painter, was born at Philadelphia, of French descent. She studied painting in her native city under William Sartain, and, in 1889-90, she worked at Paris under Bouguereau and other masters. Returning to America, she settled in New York, where she attained distinction as a portrait painter, especially of women and children. She won many prizes and, in 1902, was made a member of the National Academy. Among her best-known paintings are "Last Days of Infancy," "Mother and Daughter," "The Dreamer," "A New England Woman," "Dorothea and Francesca," "Banner Bearer," and "Girl with Cat."

Beaverbrook, William Maxwell Aitken, First Baron (1879-1964), British publisher and administrator, was born at Newcastle, N. B., Canada. He entered the brokerage business in Montreal, acquiring a seat on the stock exchange in 1907. Asked by a bank to examine a merger plan for three cement mills, he succeeded in 1910 in bringing about an amalgamation of all Canadian cement companies, from which operation he netted a large fortune.

Having thus reached his predetermined goal of making a million pounds sterling, he retired from business to enter politics in England. Winning a seat in the House of Commons, he became secretary to Bonar Law, who was leader of the Conservative party from 1911. During World War I he acted as Canadian "Eye Witness" at the front and, in 1918, joined the British cabinet as minister in charge of propaganda. He was raised to the peerage in 1917. He abandoned politics in 1919 and entered publishing, taking over or establishing the *Daily Express,* the *Sunday Express,* and the *Evening Standard,* three London papers whose success brought their publisher into the front rank of British journalism.

In 1940, when Germany conquered France, and it became evident that air power was of paramount importance, Lord Beaverbrook was placed in charge of aircraft production, which he succeeded in increasing many fold. He was made minister of state and minister of supply in 1941 and was Lord Privy Seal, 1943-45.

Beck, Sir Adam (1857-1925), Canadian manufacturer, politician, and administrator, the chief founder of the Ontario hydroelectric system, was born at Baden, Ont. He was graduated at Western University, London, Ont., and entered his father's foundry business at Baden. Beginning a wood-veneer and box making enterprise at Galt in 1880, he expanded it rapidly, establishing headquarters in London with branches in other leading cities of Canada.

A year after his election to the provincial parliament in 1902, he was appointed to a commission to study the development of electric power. Largely through his influence, the Ontario Hydroelectric Commission was created in 1906, which, under his chairmanship, developed into one of the largest and most successful public power projects in the world. He was knighted in 1914.

Becket, Thomas à (c. 1118-1170), English prelate, son of a merchant, was born at London; studied at Oxford, Paris, and Bologna; and, on his return home, entered the Church. Henry II made him high chancellor and preceptor to Prince Henry in 1155, admitted him to the closest intimacy and confidence, and, in 1162, raised him to the archbishopric of Canterbury. Becket immediately gave up his courtier habits, assumed a rigid austerity of manner, and became an uncompromising champion of the privileges of the clergy. A violent contest ensued between the sovereign and the prelate, and the latter was at length obliged to flee from the kingdom. In 1170, however, he was restored, and he instantly renewed his resistance to the monarch. Irritated by this fresh provocation, Henry uttered a hasty speech, which four of his knights not unnaturally construed into a command to rid him of the pertinacious archbishop. They accordingly hastened to Canterbury and murdered Becket in the cathedral. He was canonized in 1172. The king later did penance at Becket's tomb. See *England: History, Beginnings of Constitutional Government.*

Becque (*bĕk*), **Henri François (1837-1899),** French dramatist, was born at Paris. He was a journalist and, for a time, was engaged in banking. His literary abilities were first made known by his libretto for the opera *Sardanapale*

in 1867; but his earliest plays, *Michel Pauper* and *The Elopement*, written about 1870, met with little recognition, and his most important plays were rejected for several years. The production of *The Crows*, however, at the National Theater at Paris in 1882, together with that of *The Parisian Woman* in 1885, marked the beginning of the modern French naturalistic school, of which Becque is now universally acknowledged as the originator.

Becquerel (*bĕk'rĕl'*), **Alexandre Edmond** (**1820-1891**), French physicist, son of Antoine César Becquerel, was born in Paris. He manifested scientific tastes and talents similar to those of his father, with whom he collaborated in important investigations, succeeding him as professor of physics in the Conservatoire des Arts et Métiers in 1878. He conducted researches on electricity, light, and phosphorescence; invented the phosphoroscope; and did important work on the solar spectrum and the spectrum of the electric light. He published numerous scientific papers, was the author of *La Lumière, ses causes et ses effets*, and, jointly with his father, produced *Eléments de physique terrestre et de metéorologie* and other works.

Becquerel, Antoine César (**1788-1878**), French physicist, the first of three generations of eminent French scientists, was born at Loiret. While studying the physical properties of yellow amber, he had occasion to make experiments on the liberation of electricity by pressure. The result of his inquiries was the overthrow of Volta's theory of contact and the construction by him of the first constant pile. He next discovered a method of determining the internal temperature of human and animal bodies and, by physiological applications, demonstrated that when a muscle contracts there is a development of heat. He was one of the creators of electrochemistry, and he invented a method of electrotyping.

Becquerel, Antoine Henri (**1852-1908**), French physicist, son of Alexandre Edmond Becquerel, was born in Paris. He received his education in scientific schools in Paris and became professor of physics in the Museum of Natural History in 1878 and at the Ecole Polytechnique in 1895. His researches were chiefly concerned with optical subjects, including phosphorescence, magnetic rotation of polarized light, ultra-red rays, and the invisible radiation from uranium, now named Becquerel rays in honor of his discovery, for which he received the Rumford Medal. In 1903, the Nobel prize for physics was divided between M. Becquerel and M. and Mme. Curie in recognition of the value of their researches in radioactivity. See *Radioactivity*.

Bede (*bēd*), or **Bæda** (*bē'dȧ*) (**c. 673-735**), surnamed "the Venerable," English monk, scholar, and church historian, was born in the county of Durham. He is said to have been the most learned Englishman of his day. In the seclusion of his cell, he wrote his important *Ecclesiastical History of England*, which was translated from the Latin into Anglo-Saxon by King Alfred; also a number of commentaries, homilies, hymns, and lives of the saints.

Beebe, William (**1877-1962**), American ornithologist and author, was born at Brooklyn, N. Y., and was educated at Columbia University. In 1899, he was appointed honorary curator of ornithology by the New York Zoological society and became director of the British Guiana Zoological Station in the same year. In 1934, with Otis Barton, he descended into the ocean in a bathysphere to a depth of over 3000 feet, a feat which he later described in *Half Mile Down*. To his skill as an observer he added an artistry of language exemplified in these works among others: *Edge of the Jungle, Galapagos, Arcturus, Beneath Tropic Seas*, and *Zaca Venture*. His more recent books include *Unseen Life of New York* (1953) and *Adventuring with Beebe* (1955).

Beech, Olive Ann (**1903-**), aircraft executive, was born at Waverly, Kansas. Married to Walter H. Beech, president of the Travel Air Manufacturing Company, she assisted him in founding the Beech Aircraft Company, of Wichita, Kansas, and since his death has been president of the company.

Beecham, Sir Thomas (**1879-1961**), English conductor, composer, and operatic impresario, was born at St. Helen's, Lancashire, England, a son of Sir Joseph Beecham, proprietor of Beecham's pills and a patron of music. A church organist in St. Helen's gave Sir Thomas his first music lessons when he was a small boy. By the time he was seven he could read Wagner's scores, and at ten he conducted an amateur orchestra. After going to Oxford, he studied music in Paris under Moszkowsky. He first made a name for himself in London by his work with Beecham's Orchestra which he organized in 1909. The following year he established the Beecham Opera Company, and in 1911 became conductor at Covent Garden, introducing many new works and making England opera conscious. Knighted in 1914 for his services to British music, he inherited his father's baronetcy in 1916. On his first visit to America in 1928, Sir Thomas was described in the press as the most athletic conductor seen in this country in many years. "He does everything," said one critic, "short of turning a somersault backwards."

Beecher, Henry Ward (**1813-1887**), preacher, theologian, lecturer, orator, third son of Lyman Beecher, was born at Litchfield, Conn., was graduated at Amherst College in 1834; and studied theology under his father at Lane Seminary, Cincinnati. After a pastorate of ten years in two churches in Indiana, he removed to Brooklyn and assumed charge of Plymouth Church, "an organization of orthodox Congregational believers." For many years he drew one of the largest and most influential regular congregations in the United States. On the slavery question, he was emphatically an abolitionist. For nearly 20 years, he was editor of the New York *Independent*, and, in 1870, he became editor of the *Christian Union*. His most important works include *Lectures to Young Men, Industry and Idleness*, and the *Life of Christ*. Elected to the American Hall of Fame, 1900.

Beecher, Lyman (**1775-1863**), preacher and theologian, was born at New Haven, Conn.; was graduated at Yale College; and began preaching at East Hampton, L. I., where he remained until 1810. He then went to Litchfield, Conn., where were born the two most famous of his thirteen children, –Henry Ward and Harriet (Mrs. Stowe). All his sons, of whom there were seven, became clergymen. In 1826, he became pastor of Hanover Street church, Boston, from which he went to Cincinnati as head of Lane Theological Seminary. He remained there 20 years, in the course of which he was tried and acquitted by the Church courts on the charge of preaching false doctrine. Beecher ranked among the foremost orators and preachers of his time.

Beerbohm, Sir Max (**1872-1956**), writer and caricaturist, was born in London; was educated at Oxford; in 1910, married Florence Kahn, of Memphis, Tenn.; and afterward took up his residence in Rapallo, Italy. His publications include *The Happy Hypocrite, Zuleika Dobson*, and *And Even Now*. His caricatures, noted for their delicate and incisive satire, have been exhibited in art galleries at London and elsewhere. Many of them have been collected and published under various titles, including *The Second Childhood of John Bull, The Poet's Corner*, and *Fifty Caricatures*. He was knighted in 1939.

Beers, Clifford Whittingham (**1876-1943**), American reformer, founder of the mental hygiene movement, was born in New Haven, Conn. Three years after being graduated from Yale University in 1897, he became insane. Despite the cruel treatment he received, which was at that time usual in handling insane patients, he recovered his sanity by 1903 and devoted his later years to the creation of a more wholesome and scientific attitude toward mental disease, its prevention, and its treatment. He wrote his experiences in *A Mind That Found Itself*. Through the National Committee for Mental Hygiene, organized in 1909, he was the leading spirit in carrying forward an educational movement directed toward the removal of emotional maladjustments which underlie much juvenile delinquency, crime, mental disease, and personal unhappiness.

Beethoven (*bā'tō-vĕn; bāt'hō-*), **Ludwig van** (**1770-1827**), German composer of instrumental music, was born at Bonn, Prussia. In his fourth year, he was compelled by his father to practice daily on the harpsichord. Beethoven's musical taste was intellectual rather than intuitive, and it had to be awakened before his interest was excited. Pfeiffer and Van der Eden laid the foundation of his technical skill, and Neefe made him familiar with the grand conceptions of Bach and Handel.

When eleven years old, Beethoven appeared in The Netherlands as a piano virtuoso, chiefly in Bach's music, and was made the assistant of Neefe at the organ in the Elector's chapel. In 1787, he went to Vienna, at the expense of the Elector of Cologne, to study with Mozart; but he was soon recalled to Bonn by the illness of his mother, and, at her death, he became the main support of the family. He now began giving lessons and making occasional public appearances.

Life In Vienna. In 1792, Beethoven went to Vienna, where, with the exception of a few short journeys for business or pleasure, he remained for the rest of his life. The first five years of his residence there were the happiest he ever knew. He had excellent patrons; he was received in the best society; and, in his study under Haydn and Albrechtsberger, he made rapid progress in the study of musical form.

About 1795, he made his debut in Vienna as a pianist, and, with his "Concerto in C major," he won instant recognition. His "Opus I," containing three trios for the piano, appeared this same year. As a relaxation from music, Beethoven's ardent interest in general literature

received a fresh impetus at this time. His absorption in reading tended in some measure to soften the afflictions which afterward fell to his lot. From about 1798, he was troubled with a defect in hearing, and his sensitive nature was greatly perturbed. By 1814, the loss of his hearing was complete, and this so sorely affected him that his compositions were tinged with a passionate melancholy.

Before the end of 1800, Beethoven had composed twenty sonatas for the pianoforte, a large number of trios and quartets, and his first and second symphonies. A pension was at length settled upon him on condition that he continue to reside in Austria. These years were productive; among his works were a sonata containing the well-known funeral march, the "Moonlight Sonata," the "Kreutzer Sonata," the "Heroic Symphony," and his one opera *Fidelio*, written in 1805.

Beethoven's fourth, fifth, and sixth symphonies were composed between 1805 and 1810; the music to Kotzebue's "Ruins of Athens" was first performed in 1812; the "Battle Symphony," in 1813; the cantata "The Glorious Moment," in 1814; and the eighth symphony was written in 1814, when he was totally deaf. The principal productions of the last ten years of his life were several sonatas for the pianoforte; the grand "Mass in D," a three years' labor; the "Overture in C, opus 115"; the ninth symphony with chorus, the greatest of his productions, completed in 1823; and the last grand quartets.

Though he was surrounded in Vienna by friends and admirers, Beethoven led a solitary life. During his last four years, he lived in want and privation in order that he might bequeath more to a nephew, who, although ungrateful for kindnesses, nevertheless continued to receive from the musician a lifelong and extravagant affection.

Character And Genius. Beethoven was characterized by genuine simplicity and sincerity. His temperament, reacted upon by his deafness, led him to turn the energies of his soul within, and it is to his music that we look for the deepest expressions of his heart. He felt all phases of human emotion and expressed all. The simple emotion of confiding youth, then a sense of life's perplexities with the courage that surmounts them, and, finally, the exhaustion of a soul broken by struggle, which renounces earthly affections and thirsts for ideal, solitary communion with the Infinite—such is the immense circle which his genius embraced. Beethoven's principal title to fame lies in his unchallenged superiority as a composer of symphonies. In the symphony, music finds its highest intellectual dignity; in Beethoven, the symphony found its loftiest master. See *Music: German Classic Masters*.

Behring (*bā'rĭng*), **Emil Adolf von (1854-1917),** German physician, was born at Hansdorf. He studied medicine in Berlin, became an army surgeon in 1880, and was appointed professor at the University of Halle in 1894. In 1895, he accepted the directorship of the Hygienic Institute at Marburg. His greatest contributions to medical science were his discovery of diphtheria antitoxin and his researches in the study of immunity. In 1905, he announced the discovery of a substance produced from the virus of tuberculosis and called bovi-vaccine, which prevents tuberculosis in cattle. His publications include *Die Blutserumtherapie, Bekämpfung der Infektionskrankheiten*, and *Die Beiträge zur experimentellen Therapie*. In 1901, he received the Nobel prize in medicine in recognition of his discovery of diphtheria serum.

Belasco (*bĕ-lăs'kō*), **David (1854-1931),** dramatic manager and playwright, was born at San Francisco, and was educated at Lincoln College, California. Through his skill in training actors for specific roles and the remarkable success of his methods of stage lighting and stage setting, he became widely known as a producing manager. He is also the author or collaborator of 200 plays, including *Zaza, The Wife, The Girl of the Golden West, The Return of Peter Grimm.*

Belisarius (*bĕl'ĭ-sā'rĭ-ŭs*) **(c. 505-565),** Byzantine general under Justinian, was born in Illyria. After commanding an expedition against the king of Iran about 530, he suppressed an insurrection at Istanbul, conquered Gelimer, king of the Vandals, and put an end to the latter's dominion in Africa. In 535, he was sent to Italy to carry on war with the Goths, from whom he captured Rome in 536. He was afterward sent against the Iranians and the Huns. In 563, he was charged with conspiracy against Justinian, but was acquitted.

Bell, Alexander Graham (1847-1922), scientist and inventor, was born at Edinburgh, Scotland, the son of Alexander Melville Bell, whose system of "visible speech," a universal phonetic alphabet, has been widely used in teaching deaf-mutes to speak. He received a professional training from his father, a lecturer at Edinburgh University from 1843 to 1865. His formal education was obtained at the universities of Edinburgh and London, his father having removed to the latter city in 1865. His family settled in Brantford, Canada, in 1870, and in the following year he delivered lectures on vocal physiology at Boston University, taking up his residence in Boston in 1872. He applied for American citizenship in 1874, becoming later a naturalized citizen of the United States.

After some three years of experiment, Bell succeeded in constructing a practical device for transforming the sound vibrations of speech into equivalent variations of electric current, which, after transmission over a wire, might be reconverted to sound waves and heard as speech. He obtained a patent for a transmitter, the basic telephone patent, on March 7, 1876. The first telephone line was installed at the residence of his father at Brantford, Ontario, June 25, 1876. Despite many years of litigation, Bell realized a substantial fortune from his invention. Litigation was with Elisha Gray, who filed notice of invention of a transmitter the same day Bell applied for his patent. Gray claimed also to have had priority in exhibiting a receiver.

Bell's life after 1876 was devoted mainly to further inventions, to the encouragement of scientific research, and to promoting the proper education of deaf-mutes. Among the many patents he secured were those for the telephone probe, an electrical device for detecting the presence of foreign metal masses in the body; the Volta graphophone; the photophone, by which variations of light may be registered as sounds; the spectrophone, enabling invisible colors of the spectrum to be detected by means of sounds; and a device for stabilizing the balance of flying machines.

Bell devoted much of his wealth to scientific and humanitarian projects. With donations of over $300,000, he founded the American Association to Promote the Teaching of Speech to the Deaf. His other benefactions include $50,000 to found *Science*, later the official journal of the American Association for the Advancement of Science; $30,000 to conduct investigations in the art of flying; and $5000 to found the Astrophysical Observatory at the Smithsonian Institution. Elected to American Hall of Fame, 1950. See *Telephone*.

Bell, Andrew (1753-1832), Scottish educational reformer, was born at Saint Andrews, and was educated at the University of Saint Andrews. He was a tutor in Virginia, 1774-81, but returned to Great Britain and took orders in the Church of England.

In 1787, he went to India, becoming an army chaplain, and, in 1789, was placed in charge of an orphan school at Madras. Being unable to secure competent teachers, he conceived the plan of conducting the school by the aid of the pupils themselves, thus originating the famous "monitorial system." He wrote numerous books on education and left £120,000 to found educational institutions in Scotland.

Bellamy (*bĕl'ā-mĭ*), **Edward (1850-1898),** American novelist and economist, was born at Chicopee Falls, Mass. He was educated in Germany; was admitted to the bar; was on the staff of the New York *Evening Post* in 1871-72; and, on his return from the Hawaiian Islands in 1877, founded the Springfield *News*. He is best known by his novels *Looking Backward* and *Equality*, both socialistic works.

Bellini (*bĕl-lē'nē*), **Gentile (c. 1427-1507),** Venetian painter, son of Jacopo Bellini. He was employed with his brother Giovanni to decorate the great council chamber of the Venetian senate house. Among his most important works are "Procession of Corpus Domini" and "Miracle of the True Cross" at Venice; "Sermon of St. Mark," now in the Brera Gallery, Milan; and portraits in the Academy, Venice, and in the Louvre, Paris.

Bellini, Giovanni (1426-1516), Venetian painter, brother to Gentile Bellini and, with him, the founder of the Venetian school of painting. He first studied with his father, Jacopo Bellini. He was greatly influenced in his work by his famous brother-in-law, Andrea Mantegna, and by the sculptures of Donatello. His best works are altarpieces. Among his more famous pictures are his "Infant Jesus," "Holy Virgin," and "Christ and the Woman of Samaria." There is a well-known picture of Bellini's, "Christ on the Mount," in the National Gallery, London, and another, "The Circumcision," at Castle Howard. Among Bellini's many pupils the most distinguished were Giorgione and Titian.

Bellini, Vincenzo (1801-1835), Italian composer of operas, was born at Catania, Sicily. He was sent to the conservatory of Naples, where he studied composition. After a number of early operas had made him known in Italy, he wrote, in 1827, the opera *Il Pirata*, which gave him a name in the musical world. Bellini's music is notably well adapted to the voice, and the greatest singers from Jenny Lind and Lilli Lehmann to Patti, Nilsson, and Rosa Ponselle have included roles from his operas in their repertoires. Among his best works are *Norma, I Puritani*, and *La Sonnambula*.

Bellman (*bĕl'mān*), **Karl Mikael (1740-1795),** Swedish poet, was born at Stockholm. He became court secretary in 1775. His later and more brilliant pieces are chiefly idyllic

or humorous songs, for which he also furnished original melodies. The best specimens of his genius, which is of a rare order, are to be found in the collections prepared by himself—*Bachanaliske Ordenskapitlets Handbibliothek*, *Fredmans Epistlar*, and *Fredmans Sanger*. A monument was erected to his memory at Stockholm in 1829. See *Swedish Literature*.

Belloc (*bĕ-lŏk'*), **Hilaire Joseph Peter** (**1870-1953**), English writer and politician, was born in France, of French-English parentage. He was graduated at Balliol College, Oxford, 1895, and soon devoted himself to writing. By the range and the quality of his novels, essays, books of travel, and other works, he won an enviable position in English letters. He was member of the House of Commons, 1906-10. His numerous writings, many of which support a Roman Catholic point of view, include *The Bad Child's Book of Beasts*, *The Moral Alphabet*, *The Path to Rome*, *General Sketch of the European War*, *Joan of Arc*, *The Crisis of Our Civilization*, and *The Great Heresies*.

Bembo (*bĕm'bō*), **Pietro** (**1470-1547**), Italian scholar, was born at Venice. In 1513, he was made secretary to Pope Leo X and, in 1539, was made a cardinal by Paul III, who afterward appointed him to the dioceses of Gubbio and Bergamo. Bembo was the restorer of the classic style in both Latin and Italian literature. Among the most famous of his works are a short treatise on Italian prose, which marked an era in Italian grammar; *Gli Asolani*, a dialogue; and a *History of Venice*. See *Italian Literature: The Renaissance*.

Benavente, Jacinto (**1866-1954**), Spanish poet and dramatist, was born at Madrid, son of a noted physician. He was educated in his native city and studied law at the university there. Upon his father's death in 1885, he gave up plans for a legal career and devoted himself to literature. From 1885 to 1892, he traveled in France, England, and Russia, and later became an actor. In 1893, he published a small book of verse and a volume of plays entitled *The Fantastic Theater*. This was the beginning of a career of great brilliance and fertility as a dramatic writer and satirist of social institutions. The production in 1913 of the popular *La Malquerida*, was followed by his election to a chair in the Spanish academy. In 1922, he was awarded the Nobel prize for literature. His other works include *Other Birds' Nests*, *The Passion Flower*, *Bonds of Interest*, and *The Fabricated Truth*.

Benedict XV, Pope (**1854-1922**), Giacomo della Chiesa, successor to Pius X, was born at Pegli, near Genoa. He was the son of a nobleman of wealth; was educated in Genoa and Rome; and was ordained to the priesthood in 1878. He was associated with Cardinal Rampolla at Madrid, 1883-87, and later at Rome, where he became consultor of the holy office in 1901; was appointed archbishop of Bologna in 1907 and cardinal in May 1914; became pope later in the same year. He was known as a determined foe of modernism in religion. During World War I, he made repeated efforts to effect peace.

Benedict, Saint (**c. 480-c. 543**), one of the originators of monastic institutions in the West, was born at Nursia, in Italy. Early in life he retired into a desert and spent three years in a cavern. Being discovered, his sanctity drew to him such numbers of people that he founded twelve convents. In 529, he went to Monte Cassino; built a monastery, afterward one of the most famous in Italy; and established the Benedictine order.

Benes (*bĕ'nāsh*), **Edward** (**1884-1948**), Czechoslovak statesman, was born at Kozlany, Czechoslovakia. Despite the handicap of early poverty, he acquired an education at the University of Prague and principal French universities. Prior to and during World War I he took a leading part in the agitation for Czechoslovak independence, and, in 1918, became foreign minister of the newly formed nation of Czechoslovakia. In this office he made himself one of the most influential statesmen of Europe, being the chief organizer of the Little Entente. In 1935, he was elected president. It was his lot in 1938 to surrender his country to Germany. Resigning, he accepted a professorship at the University of Chicago. In 1945 he returned to Czechoslovakia as president. He again resigned in 1948, refusing to accept the constitution put forward by the Communists after their seizure of the government. He wrote *Democracy Today and Tomorrow*.

Benét, Stephen Vincent (**1898-1943**), American poet, was born at Bethlehem, Pa. After being graduated from Yale University, he devoted his time chiefly to writing. *Five Men and Pompey*, a product of his student days, is the first of a number of works of increasing caliber culminating in the historic poem of epiclike quality, *John Brown's Body*, which won the Pultizer prize in 1928. Later works include *Burning City*, *The Devil and Daniel Webster*, and *Tales Before Midnight*. Elected to the American Academy of Arts and Letters in 1938.

Ben-Gurion, David (**1886-**), Israeli statesman, born at Plonsk, Poland. Following the pogroms of 1905, he escaped to Palestine, where he became active in the Zionist movement. During World War I he was exiled by the Turkish government for his opposition to Turkish rule in Palestine. Coming to the United States, he was active in organizing the Jewish Legion, with which he fought against the Turks under Allenby in Asia Minor. As prime minister of Israel since 1948, when that country achieved its independence, he has weathered heavy storms of domestic and foreign opposition.

Bennett, (Enoch) Arnold (**1867-1931**), English novelist, was born at Hanley in the Potteries. He was educated at Newcastle Middle School and at the University of London. He began life as a law clerk; became editor of a woman's magazine; and, beginning with 1900, devoted himself entirely to literary work, producing, besides numerous essays and plays, a group of novels which rank among the most notable in recent English fiction. This series includes *Anna of the Five Towns*, *The Old Wives' Tale*, and *The Matador of the Five Towns*. Among his other works are *Clayhanger*, *Lenora*, *Denry the Audacious*, *Your United States*, *Paris Nights*, and *Our Women*.

Bennett, James Gordon (**1795-1872**), journalist, was born in Scotland. He studied for the Roman Catholic priesthood, but never took orders. In 1819, he emigrated to America; after teaching in Halifax and later serving as proofreader in Boston, he became a journalist in New York. In 1825, he purchased the *Sunday Courier;* subsequently, 1832, he started the *Globe*, neither project succeeding. In 1835, he issued the first number of *The Herald*, a journal which, through his great ability and enterprise, soon commanded world-wide attention.

His paper was the first to publish the stock lists and a daily financial review; many other original features were afterward added. The collection and dissemination of news was ever his paramount object. His news-gathering staff for four years during the Civil War involved an expense of a half million dollars. At the time of his death, *The Herald* was the most valuable newspaper property in the United States. The first speech ever reported in full by telegraph was sent to *The Herald*.

His son of the same name (1841-1918) carried on and broadened the same journalistic policy, in furtherance of which he financed the expedition of Stanley into Central Africa to find David Livingstone, 1869-71. He established trophies for international yacht, balloon, and airplane races.

Bennett, Richard Bedford (**1870-1947**), Canadian lawyer and politician, was born at Hopewell, N. B. Graduating from Dalhousie University, he was called to the bar in 1893. He removed to Calgary, Alta., in 1897 and was elected to the legislature of the Northwest Territories in 1898. As a lawyer, he was counsel for the Canadian Pacific railway and the Hudson's Bay Company. He controlled through gift the E. B. Eddy Company and became director of other important corporations. He sat in the Alberta legislature from 1909 to 1911 and then in the Dominion House of Commons, where he was minister of justice and attorney general in the government of Arthur Meighan. On the latter's retirement in 1927, Bennett was chosen leader of the Conservative party. He was prime minister of Canada, 1930-35, championing a policy independent of British or American influence. He initiated several measures of social legislation, most of which were later declared unconstitutional. In 1939 he retired to private life in England. In 1941 he was created Viscount Bennett of Mickleham and of Calgary and Hopewell.

Benson, Ezra Taft (**1899-**), agriculturist and marketing specialist, was born at Whitney, Idaho. After taking extended courses at various agricultural colleges, he operated his own farm for several years in Idaho. From 1930 to 1939 he was agricultural economist and marketing specialist for the University of Idaho extension service and the the State of Idaho department of agriculture. He was then for five years secretary of the National Council of Farmer Co-operatives. As a member of the Church of Jesus Christ of Latter Day Saints, he served for two years as a missionary and for ten years as a high official of the Church. Appointed Secretary of Agriculture by President Eisenhower in 1953, he consistently opposed high price supports for farm products.

Benson, Frank Weston (**1862-1951**), American painter, was born at Salem, Mass. He studied art at the Boston Museum, 1880-83, and with Lefebvre and Boulanger in Paris, 1883-85. In 1889, he was made instructor of drawing and painting in the art school of the Boston museum. He excelled as a painter of women and children, usually in outdoor scenes abounding in light and color. His influence as a teacher has been far-reaching and beneficial, and his paintings have won high rank in present-day American art. His works include "My Little Girl," "In the Spruce Woods," "Pomona," "Against the Sky," "Moonlight at Sea," "Eleanor," "My Daughter," and decorations in the Congressional Library, Washington, entitled "The Seasons" and "The Three Graces."

Bentham, Jeremy (1748-1832), English writer on ethics and jurisprudence, was born at London. He was admitted to the bar in 1772. Turning from the practice of law to its theory, he became the greatest critic of legislation and government in his day. In all his ethical and political writings the doctrine of utility is the leading and pervading principle, and his favorite vehicle for its expression is the phrase, "the greatest happiness of the greatest number." This phrase was coined by Priestley, though its prominence in politics was due to Bentham.

Benton, Thomas Hart (1782-1858), American statesman, was born near Hillsboro, N. C.; began legal practice at Nashville, Tenn., in 1811; settled at Saint Louis, Mo., in 1815; and was elected United States senator in 1820, becoming a prominent supporter of General Jackson. Re-elected in 1826, he became a noted advocate of the gold and silver monetary policy and supported Jackson in the latter's antagonism to the United States bank. He held a seat in Congress for a period of thirty years, voting for the annexation of Texas and against the doctrines of nullification and states' rights. He wrote *A Thirty Years' View*, a valuable political retrospect.

Benz, Karl (1844-1929), German engineer and constructor of the first automobile, was born at Karlsruhe. In 1879, he built a model one-cylinder gas engine and erected a factory to manufacture it. His financial sponsors refusing to countenance the making of any but fixed engines, he left the firm and devised a light two-cylinder engine which he attached to a three-wheel vehicle and, in 1885, demonstrated to the inhabitants of Mannheim the first vehicle to move under its own power. Its speed was about 12 miles an hour. He discovered the differential gear, battery ignition system, and carburetor.

Béranger (*bā′rän′zhā′*), **Pierre Jean de (1780-1857),** French lyric poet, was born of humble parentage in Paris. He became apprenticed to a printer. In 1815, he began to bring out a series of national and other songs, which created a powerful sensation; many of them were satires upon the government and procured for their author a heavy fine and several months' imprisonment. Admiring friends paid the fine, and his cell was the reception room for many of the most distinguished men of the time. His poems contributed in no small degree to the revolution of 1830. In 1848, he was elected to the constituent assembly, but declined to serve. He was an intense believer in democracy.

Bergerac (*bĕr′ zhē-rāk′*) **Savinien Cyrano de (1619-1655),** French novelist and dramatist, was born in Perigord, 1619. He attended the College Beauvais, later studied science with Gassendi, and learned some astrology from Campanella. In youth, he divided his time between literature and adventure; served two years as a soldier, in the course of which he was twice wounded; and carried through life the reputation of a reckless duelist.

During his short and restless career, he published a volume of letters; a political satire on Mazarin; *Agrippine*, a tragedy; and *La Pédant joué*, a comedy that was followed by his most famous book, *The Comic History of The States and Empires of the Moon and of the Sun*. He was the earliest writer to employ the novel to teach natural science and was thus a forerunner of Jules Verne and H. G. Wells. He was also the first writer of French drama to break with the rule of the unities in tragedy, which, adopted from Aristotle's dictum, had long been observed in France. In his comic histories, he made startling forecasts of modern discoveries, such as the phonograph, and of a universal language, such as Esperanto. He has been immortalized in Rostand's famous drama *Cyrano de Bergerac*. See *French Literature: The Nineteenth Century, Rostand*.

Bergius (*bĕr′gĭ-ŏŏs*), **Friedrich (1884-1949),** German chemist, was born at Goldschmieden, near Breslau. After being trained at Breslau, Leipzig, and Berlin universities and at technical institutes, he established a private laboratory, where he investigated the effect of high pressures on chemical reactions. One outcome was a method of converting coal dust and low grade coal into oil and gasoline. This discovery was made the basis of a great industry of especial importance to Germany because of the vulnerability of her petroleum supplies in time of war. Bergius discovered also a means of converting wood into sugar. He was awarded one-half of the Nobel prize in chemistry for 1931.

Bergson (*bĕrg′sôN′*), **Henri (1859-1941),** French philosopher, was born in Paris. He was graduated at the Ecole Normale in 1881, and became a teacher. He was professor of philosophy in the College de France, 1900-21, and, in 1901, was elected to the Institute. His books, *Time and Free Will*, published in 1889, *Matter and Memory*, 1896, and *Creative Evolution*, 1907, attracted wide attention and placed him in the front rank of contemporary philosophers.

According to his view, nearly all previous philosophies have been developed either by intellect alone or by intellect chiefly. He endeavors to avoid the limitations of intellect by depending upon intuition, maintaining that intellect is unable to comprehend the nature of life and of spirit. He asserts that instinct would empower us to understand life except that its object is not concerned with understanding it. He argues that what is needed for full understanding is intuition, which has at once the immediate certainty of instinct and the wide range of intellect. He was elected to the French Academy in 1914, and received the 1927 Nobel prize for literature. His works include also *Laughter*, *Intellectual Energy*, and *Thought and Motion*.

Bergström (*bĕrĸ′strōm*), **Hjalmar (1868-1914),** Danish playwright. He completed a university education, obtaining the degree of Ph.D. in 1893, and became a teacher in the Brockske Commercial School, where he taught until 1905. Turning his attention to the drama, he became a director of the Danish Dramatic Society and member of an organization for preserving neglected writings of Danish playwrights. Among his plays are *When King David Grew Old*, *Karen Borneman*, *Together in the Dance*, and *The Way to God*—all of which were presented in the Royal Theater. *Karen Borneman* was forbidden by censor, but the ban was afterward removed.

Bering, Vitus Janassen (1680-1741), Russian navigator, was born at Horsens, Denmark. He was employed on an expedition planned by Peter the Great to determine the limits of Asia. Setting out in 1725, he crossed Siberia and, after three years, reached the northeastern extremity of Asia. In 1741, under the instruction of Empress Anne of Russia, he crossed the strait later known as Bering and landed in North America. On his return voyage, his ship was wrecked on the desert island still known by his name, and he died there of exposure.

Bériot (*bā′rê-ô′*), **Charles Auguste de (1802-1870),** Belgian composer and violinist, was born in Louvain. He displayed precocious and original talent, and his playing was distinguished by refined taste and purity of tone. In 1836, he became the husband of the famous singer, Mme. Malibran. About 1842, he was made professor in the Brussels Conservatory, but resigned nine years later in consequence of failing eyesight. He wrote a complete manual for the violin, and many popular compositions for that instrument.

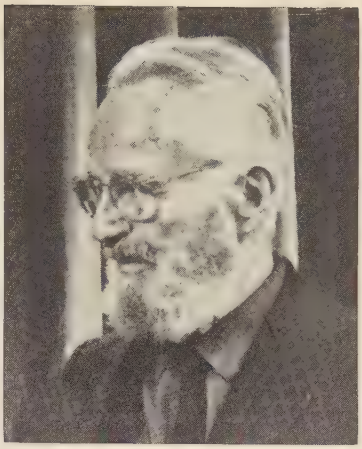
Berkeley, George (1685-1753), Irish clergyman and philosopher, was born in Ireland. He was educated at Kilkenny School and Trinity College, Dublin, where he enjoyed the society of Dean Swift. On his return from a visit to America, he was made bishop of Cloyne. In philosophy, he was an idealist. He held that all things exist only in so far as they are perceived or known and that the existence of the universe is due to its being known by God. Berkeley, Cal., was named for him because of his saying, "Westward the course of empire takes its way." His most important works are the *Principles of Human Knowledge*, *Minute Philosopher*, and *Theory of Vision*.

Berkeley, Sir William (1610-1677), colonial governor of Virginia, was born at London, England. He was appointed governor of Virginia in 1641, but resigned in 1651 upon Cromwell's rise to power. He remained in the colony, however, and, in 1660, was chosen governor by the general assembly. Some years later, he lost the favor of the people by failing to protect them from the Indians, and a rebellion led by Nathaniel Bacon broke out against the governor. It failed because of Bacon's sudden death. Berkeley was recalled in 1676. He wrote *A Discourse and View of Virginia* and a drama called *The Lost Lady*.

Berlichingen (*bĕr′lĭĸ-ĭng-ĕn*), **Götz** or **Gottfried von (1480-1562),** German knight and soldier of fortune, was born in Jagsthausen. He took part in the war of the peasants against the nobles and was sentenced by Maximilian I to pay a heavy fine. He wore an artificial hand which replaced one lost in battle, and was surnamed the "Iron Hand." He was a staunch supporter of Luther; took part in a campaign against the Turks in 1542; and espoused the cause of Charles V against Francis I in 1544. While in retirement, he wrote his autobiography, which Goethe made the subject of his famous drama *Götz von Berlichingen*. This play initiated the *"Sturm und Drang"* movement in German literature. He was mortally wounded defending his own castle.

Berlin, Irving (1888-), is the adopted name of Israel Baline, American song writer, born in Russia. He was brought to the United States in 1893. At 14, he earned his living as a singing waiter in Chinatown restaurants of New York City. He composed his own songs, the increasing popularity of which brought him wealth and the distinction of being the "father" of ragtime and jazz music. "Alexander's Ragtime Band," "Pack up your Sins," "Russian Lullaby," "God Bless America," and "This is the Army" are examples of his numerous songs. In 1954 President Eisenhower signed a bill giving him a gold medal in recognition of his services in composing many popular songs, including "God Bless America."

A keen interpreter of fads and foibles among his contemporaries, Whitney Darrow, Jr. has caught and preserved many amusing situations in his cartoons.



Demonstrating his theories concerning photography as a fine art, Edward Steichen has specialized in portraiture.

UPI Photo

Left Yousuf Karsh, internationally known photographer, has recorded for history the likenesses of many eminent persons in Europe and America.

Right Walter Dorwin Teague, industrial designer, has applied the principles of art to improve the efficiency as well as the appearance of various manufactured products.

Lower left Henry Dreyfuss, industrial designer, who began by restyling unattractive small articles of merchandise, has used his creative imagination to design many large items for manufacturers.

Lower right As a designer of contemporary furniture, Paul McCobb has given particular attention to the space requirements of modern living.

World Wide

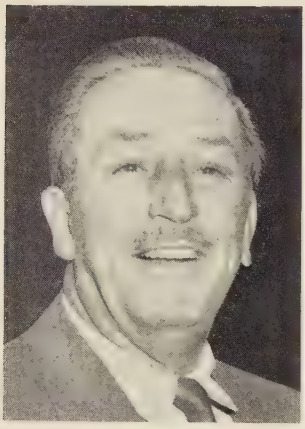
DESIGNERS—PHOTOGRAPHERS

Russian-born impressario Sol Hurok has promoted entertainment in America for half a century.

Choreographer for operas and plays, George Balanchine is co-founder of the American School of Ballet.

Typical of Meredith Willson's work as composer and lyricist is his popular play *The Music Man.*

ENTERTAINMENT PERSONALITIES



Left Walt Disney's productions range from animated cartoons and nature studies to elaborate expositions combining fantasy and history.

United Press

Right Having acquired a reputation for unusual talents, Actress Helen Hayes has enjoyed a long and successful career in the theater.

Friedman-Abeles

Below left As author, director, and producer, Joshua Logan has been associated with many well-known plays and motion pictures.

Center Gifted with exceptional talent, Sidney Poitier has established his reputation on the strength of his acting ability alone.

Below right From actor and playwright, Dore Schary has gone on to become a director and producer of award-winning film plays.

Berliner (*bûr'lĭn-ĕr*), **Emile** **(1851-1929)**, inventor, was born at Hanover, Germany; was graduated at Samson School, Wolfenbuttel, 1865; and came to the United States, 1870. In 1878, he was appointed chief inspector of instruments for the Bell Telephone Company, where his inventive skill was applied to perfecting various features of the telephone. In 1877, he invented the loose contact telephone transmitter, known as the Berliner microphone, and was the first to use an induction coil in connection with transmitters, 1878. In 1887, he invented the gramophone. He invented also the present method of duplicating disk records and was the first to construct the revolving cylinder internal combustion motor, extensively used on airplanes. See *Phonograph*.

Berlioz (*bĕr'lĭ-ōz*), **Hector** **(1803-1869)**, French composer, was born at La Cote Saint Andre. While inferior in melodic invention to the leading composers of his century, his accurate knowledge of instrumentation enabled him to make great advances in orchestral technique. The progress made by Wagner, Liszt, and Richard Strauss is founded on developments originally worked out by Berlioz. Among his most notable productions are *The Damnation of Faust*, *Harold, Romeo and Juliet*, and *The Trojans*. He was chief of the romantic school of music.

Bernard (*bûr'närd; bĕr-närd'*), **Saint** **(1091-1153)**, of Clairvaux, was born of a noble family at Fontaines, near Dijon, France. In 1113, he entered the Cistercian monastery of Citeaux and, in 1115, became the first abbot of the newly founded monastery of Clairvaux, in Champagne. His studious, ascetic life and stirring eloquence made him the oracle of Christendom. He founded 160 monasteries. The "mellifluous doctor" is regarded by the Catholic Church as the last of the fathers. He drew up the statutes of the Knights Templars in 1128; secured the recognition of Pope Innocent II; and kindled the enthusiasm of France for the Second Crusade.

The influence of Saint Bernard as a spiritual teacher, through his fervid piety and living grasp of Christian doctrine, was a wholesome antidote to the dry and cold scholasticism of the age. He was one of the greatest of the Latin hymn writers, many modern hymns being based on his *Jesu Dulcis Memoria*. He was canonized in 1171.

Bernard of Cluny **(c. 1100-c. 1156)**, Benedictine monk, was born of English parents at Morlaix, Brittany. He is known principally for a poetical description of heaven which, translated, has given rise to three famous hymns—"Jerusalem the Golden," "The World is Very Evil," and "For Thee, O Dear, Dear Country." The original description was in Latin verse, the introduction to his *De Contemptu Mundi*, "On Contempt of the World."

Bernhardt, Rosine Sarah **(1844-1923)**, French tragic actress, was born at Paris. Her parents were Jewish, of French-Dutch descent, but she was educated in Grandchamp Convent at Versailles. She made her first appearance on the stage in 1862 at the Thèâtre Français, but at first attracted little notice. In 1867, her playing of the part of the queen in Victor Hugo's *Ruy Blas* made her famous. The war of 1870-71 interrupted her career, and for a while she became a nurse. She then won a position in the Thèâtre Français, the troupe of which she accompanied in 1879 to London, where her triumphs were repeated in succeeding years and where, in 1882, she married Jacques Damala, a Greek actor, from whom she separated the next year. She toured with great success in America and in all the principal countries of Europe. In 1893, she established a theater of her own in Paris. Endowed with a matchless voice and a remarkable gift of artistic poise and movement, she was excelled in dramatic art by no actress of her time. She was also a painter and sculptor and she wrote two plays—*L'aveu* and *Adrienne Lecouvreur*—in addition to a volume of memoirs. Despite an accident necessitating the amputation of a leg, she continued to act in restricted roles until the end of her life.

Bernini (*bĕr-nē'nē*), **Giovanni Lorenzo** **(1598-1680)**, known as the Cavalier Bernini, Italian painter, architect, and sculptor, was born at Naples. His "Apollo and Daphne," produced from a single block, when he was but 18 years of age, was considered a masterpiece, but his finest works are found in the colonnade at Rome. He became one of the architects of Saint Peter's at Rome, completed the famous Barberini palace, restored the bridge of Sant' Angelo, designed or completed about 40 busts, over 50 statues, and some 50 architectural works. During his lifetime, he was loaded with honors such as few artists have ever received. His ideals of sculpture profoundly influenced the art of Europe for a century. In architecture, he was a leader in development of the baroque style.

Bernoulli (*bĕr'nōō'yē'*), **James** **(1654-1705)**, Swiss mathematician, was born at Basel. He devoted his life to the study of mathematics, of which he became professor in the University of Basel. Among his first works were *A Method of Teaching Mathematics to the Blind* and *Universal Tables on Dialling*. These were followed by *Conamen Novi Systematis Cometarum* and an essay *De Gravitate Ætheris*. Among his triumphs are to be recorded his solution of Leibnitz's problem of the isochronous curve, his determination of the catenary, and his investigation of the properties of isoperimetrical figures.

Bernoulli, John **(1667-1748)**, brother of the preceding, was born at Basel, 1667. He and James were the first two foreigners honored by the Academy of Sciences at Paris. John devoted himself to chemical as well as to mathematical science. In 1694, he became a doctor of medicine and, soon after, professor of mathematics at Groningen, whence he later removed to succeed his brother James in the University of Basel. His forte was pure mathematics, in which he had no superior in Europe in his day. Among his achievements were the determination of the "line of swiftest descent," and the invention of the "exponential calculus." His son Daniel (1700-82) developed the kinetic theory of gases.

Bernstein (*bĕrn'stīn*), **Henry Leon Gustave Charles** **(1875-1953)**, French dramatist of Jewish parentage, was born in Paris. He received his education in Paris and early turned his attention to the drama. Beginning in 1900, he produced many popular plays, several of which have been presented on the English and the American stage. Exhibiting much technical skill in the construction of plots, his work is characterized by bold execution and intense emotion. His first play, *Le marche*, was produced at the Free Theater in Paris by Antoine. His subsequent plays include *La détour*, *La griffe*, *La rafale*, *Le voleur*, *Samson*, and *Israel*. These plays depict the conflict of the human will to outer forces. Later, he portrayed the soul in conflict with itself. Among his later dramas are *L'assaut*, *Le venien*, and *Le coeur*.

Bernstein, Leonard **(1918-)**, American conductor, pianist, and composer, was born at Lawrence, Mass. He was educated at Harvard (1939) and the Curtis Institute of Music (1941). He sprang into prominence as a conductor one night in November 1943 when, owing to the illness of Bruno Walter, he was called upon at short notice to conduct the New York Philharmonic Orchestra. This brought him many engagements with major orchestras in this country and Europe.

Bernstein first became known as a composer in 1944 with the performance of his symphony *Jeremiah* which won the critics' award. His humorous ballet about three sailors on shore leave, *Fancy Free*, came later the same year, as did his musical comedy on the same theme, *On The Town*, which was a Broadway success. His second symphony, *The Age of Anxiety*, was first performed in 1949.

Bernstein has been on the faculty of the Berkshire Musical Center since 1948, and professor of music at Brandeis University since 1951.

Berry, Martha McChesney **(1866-1942)**, American philanthropist, was born near Rome, Ga. Her early education was received at a private school and through European travel, after which she won a degree at the University of Georgia when 44 years of age. In the meantime she had devoted her efforts to founding a group of schools at Mount Berry for the children of mountaineers in Georgia. For her work in thus extending educational opportunities to an underprivileged group, she was voted a "distinguished citizen" by the Georgia legislature in 1924 and, in 1931, was chosen as one of the twelve greatest American women in the *Pictorial Review* poll.

Berthelot (*bĕr't'-lō'*), **Pierre Eugène Marcellin** **(1827-1907)**, French chemist, was born at Paris. He served as professor of organic chemistry at the Ecole Superieure de Pharmacie, 1859-65, and then accepted a similar chair, created for him, in the College de France. He succeeded Louis Pasteur in 1889 as permanent secretary to the Academy of Sciences. His work in synthesizing organic compounds for the first time disproved the theory that a "vital force" was necessary for their formation and laid the foundation for the modern science of inorganic chemistry.

Berthollet (*bĕr'tô'-lĕ'*), **Claude Louis, Count de** **(1748-1822)**, French chemist, was born at Talloire, in Savoy. He studied medicine at the University of Turin. After obtaining his degree in 1768, he proceeded to Paris, where he studied chemistry, becoming associated with Lavoisier. In 1785, he pointed out the use of chlorine for bleaching purposes. He was appointed professor at the Ecole Normale in 1794 and accompanied Napoleon's expedition to Egypt, 1798-99. Returning, he was made senator, count, and grand officer of the Legion of Honor. Among his many inventions and discoveries were processes for preserving water in ships, glazing linen, bleaching fabrics, and the artificial production of niter. He was the first to introduce the idea of equilibrium into chemical theory, and he did much to reform chemical nomenclature.

Bertillon (*bĕr'tē'yôN'*), **Alphonse** **(1853-1914)**, French anthropologist, was born at Paris. He was long head of the identification department in the prefecture of police of Paris and, in 1880, founded the "Bertillon system" for

identifying people by means of bodily measurements. It has been widely adopted in American penal institutions. His publications include *La photographie judiciaire, Identification anthropométrique,* and *Anthropologie métrique et photographique.*

Berzelius (*bĕr-zē'lĭ-ŭs*), **Jöns Jakob (1779-1848),** Swedish chemist, was born at Westerlosa, in East Gothland, Sweden. He was permanent secretary of the Academy of Sciences at Stockholm and was made baron in recognition of his scientific discoveries.

He is the author of the dualistic (binary) theory of the chemical constitution of compounds and devised the system of chemical symbols now in use. He determined with great accuracy the combining weight of a number of elements and thus placed Dalton's atomic theory on a firm quantitative basis. He discovered the elements selenium, cerium, and thorium and was the first to produce columbium, tantalum, and silicon in an isolated state. The range, number, and accuracy of his investigations were remarkably great, and the science of inorganic chemistry largely rests upon his theories and discoveries. See *Selenium; Symbols, Chemical.*

Besant (*bĕs'ănt; bĕz'ănt*), **Annie (1847-1933),** née Annie Wood, English theosophist, was born in London. She was educated privately in England, Germany, and France. At first a devout ritualist, she married Rev. Frank Besant in 1867, from whom she was separated in 1873. In the following year, she joined the National Secular Society and worked in the free thought and radical movements led by Charles Bradlaugh, with whom she was coeditor of the *National Reformer.* She joined the Theosophical Society in 1889, became a devoted pupil of Mme. Blavatsky, and traveled to all parts of the globe in service of theosophy. She founded the Central Hindu College in 1898 and, in 1904, the Central Hindu Girls' School, Benares. She also helped to found the Hindu University. Espousing the cause of Indian independence she organized the India Home Rule League; and, in 1917, was president of the Indian National Congress. In 1926-27, she traveled in the West with her protégé, J. Krishnamurti, whom she heralded as a messiah or world teacher, although he later renounced the role. Her publications include *Reincarnation, Death and After, Karma, Man and His Bodies, The Religious Problem in India, Theosophy and the New Psychology, India,* and *The New Civilization.*

Bessborough, Vere Brabazon Ponsonby, Earl of (1880-1956), 13th governor general of Canada, was born in County Kilkenny, Ireland. He graduated from Trinity college, Cambridge, qualified as a lawyer, and was a member of the House of Commons from 1907 to 1920, when he succeeded to his father's title. During World War I, he served in the Gallipoli campaign and on the British military staff in France. He was prominently identified later with mining and railroad corporations. From 1931 to 1935 he was governor general of Canada.

Bessel (*bĕs'ĕl*), **Friedrich Wilhelm (1784-1846),** German astronomer, was born at Minden, Prussia. He attracted attention by his computation of the orbit of the comet of 1607. In 1810, he was appointed director of the new observatory at Königsberg, where the rest of his active life was passed. His *Fundamenta Astronomiæ* and *Tabulæ Regiomontanæ* were epoch-making works. His determinations of the parallax of stars ushered in a new era in sidereal science. He has been called the father of modern observational astronomy.

Bessemer, Sir Henry (1813-1898), English engineer and inventor, was born at Charlton, England. Of his many inventions, the chief is the process, named after him, of converting pig iron into steel by blowing a blast of air through the iron while in fusion until everything extraneous is expelled and only a definite quantity of carbon is left in combination. This process revolutionized the iron and steel industry throughout the world, enormously increasing production and reducing the cost to a small fraction of that of earlier methods. He was knighted in 1879. See *Bessemer Steel.*

Bethmann-Hollweg (*bāt'măn-hôl'vĕĸ*), **Theobald von (1856-1921),** German statesman, was born of Jewish lineage at Hohenfinow, near Berlin; was educated at the College of Pforta and at the universities of Strasbourg, Leipzig, and Berlin; and was elected to the Reichstag in 1890. In 1909, he became chancellor of the German Empire and, as such, was a friend and adviser of Emperor William II. In an interview with Sir Edward Grey in 1914, Bethmann-Hollweg referred to the Belgian neutrality treaty as a "scrap of paper"—a phrase that became historic. See *World War I.*

Bethune (*bŭ-thōōn'*), **Mary McLeod (1875-1955),** American Negro educator, was born at Mayesville, S.C. After she was graduated from the Moody Bible Institute, Chicago, in 1895, she became a teacher, and in 1904 founded the Daytona (Florida) Normal and Industrial School for Girls (now Bethune-Cookman College), of which she was president from 1904 to 1942. Active with many organizations concerned with the welfare of the colored people, Mrs. Bethune served as adviser on minority matters to officials of the Federal government.

Bevan, Aneurin (1897-1960), British socialist statesman, was born at Tredegar, Monmouthshire, England. The son of a coal miner, he followed the same occupation when he left school, at the age of 13. He became active in the South Wales Miner's Association. From 1929 he was a Labor party member of Parliament, noted for his skill in debate. In 1945 Prime Minister Clement Attlee made him minister of health, a cabinet post which he held until 1951, when he was appointed minister of labor and national services. He resigned the same year because of difference with the Labor party leadership. In 1957, again active in the party, he was considered as a possible future minister of foreign affairs. His book, *In Place of Fear,* was published in 1952.

Beveridge, Albert Jeremiah (1862-1927), American publicist, was born on a farm in southwestern Ohio. His family removed to Illinois after the Civil War. He was graduated at DePauw University, Indiana, 1885, read law, was admitted to the bar, and began practice. He was identified with many important cases and, in 1899, was elected to the United States Senate, continuing to sit until 1911. He was well known as an orator and Republican campaign speaker and became a leader of the Progressive party in 1912. His publications include *The Young Man and the World, The Meaning of the Times,* and *Life of John Marshall.* He was elected to the American Academy of Arts and Letters in 1924.

Bevin, Ernest (1884-1951), English labor leader and politician. As a dock worker in London he joined the Transport and General Workers union. He was secretary of the union in 1924, when the union called a strike of 100,000 workers in demands for a pay increase of 2 shillings a day and regularity of employment. He was credited with tipping the scales toward a favorable settlement by producing at the conference table food in the actual amount which the average worker was able to buy in a week on his current earnings. In 1937, he was made chairman of the Trades Union Congress, where he supported the government in its policy of non-intervention in Spain, although his more radical opponents warned that a Fascist victory in Spain would threaten the safety of democratic countries. When the threat of invasion by Germany overhung England in 1940, Bevin was made minister of labor supply. With the Labor party's victory in 1945, he became secretary for foreign affairs. He resigned shortly before his death.

Bewick (*bū'ĭk*), **Thomas (1753-1828),** English wood engraver, was born near Newcastle. He was apprenticed to Ralph Beilby at Newcastle at the age of 14. His first important work was a series of cuts for Gay's *Fables* in 1775, followed by enlarged editions in 1779 and 1784. His first cuts from his own original designs appeared in the *General History of Quadrupeds* in 1790. His greatest work is the *History of British Birds.* He illustrated many books, including Thomson's *Seasons,* Burns's *Poems,* and *Æsop's Fables.*

Bewick revived the art of wood engraving. He was the first to cut into the end of the block instead of the side and was the inventor of the white line, which is the characterizing feature of modern engraving, the design being cut into the block instead of remaining in relief.

Bidault (*bē'dō'*), **Georges (1899-),** French statesman, was born in Moulins. He fought in World War I, was graduated from the Sorbonne, and engaged in teaching and journalism. He served in World War II, was taken prisoner, and on his return to France in 1941 joined the underground, and became president of the National Council of Resistance. In 1944 Bidault became minister of foreign affairs in DeGaulle's provisional government, and continued to hold that position, except for the interlude of Blum's ministry, until the fall of Schuman's government in 1948. He was also provisional president and premier in 1946. He represented France in the San Francisco convention and in the first United Nations assembly. He was minister of national defense in 1951-52 and minister of foreign affairs in 1953.

Biddle, John (1615-1662), founder of English Unitarianism, was born at Wotton under Edge, Gloucestershire. For preaching heretical doctrines he was thrown into jail in 1645 and twice during the Commonwealth, until Cromwell, to save his life, banished him for three years to the Scilly isles. Returning, he preached in London, where he was again committed to jail in 1662.

Bierce, Ambrose (1842-c. 1913), American satirist and story writer, was born in Meigs County, Ohio. He was self-educated with the aid of his father's ample library. Having served through the Civil War, in which he was breveted a major for bravery, he entered journalism as editor of the *News Letter* in San Francisco. Going to London in 1872, he won the name "Bitter Bierce" for his caustic humor in the periodical *Fun* and several books,

including *The Fiend's Delight*. Returning to San Francisco in 1876, he wrote a column "Prattle" in the *Examiner*, which, by making or unmaking literary and political reputations, rendered him a power to reckon with on the West Coast for a quarter of a century. His books include *Fantastic Tales, The Cynic's Word Book* (republished as *The Devil's Dictionary*) and *The Shadow on the Dial*. In 1913 he departed for Mexico, and was never heard of again.

Bigelow, Poultney (**1855-1954**), American author and journalist, was born in New York. He was graduated from Yale, 1879, and from Columbia Law School, 1882; was admitted to the bar, 1882, but gave up law practice for travel and journalism. During 1875-76, he went around the world in a sailing ship, visited shores of New Guinea, and was wrecked on the Japanese coast. He circumnavigated the world three times, studying tropical colonization, and lectured at leading universities on colonial administration. He became intimate with William II of Germany. During the Spanish-American War, he was correspondent for the London *Times*.

"Billings, Josh." See *Shaw, Henry Wheeler*.

Binet (*bē'nĕ'*), **Alfred** (**1857-1911**), French psychologist, was born at Nice, France. He was one of the editors of *L'Année Psychologique*, and director of the psychological laboratory at the Sorbonne, Paris. His works treat many subjects in physiological psychology, particularly with reference to the study of practical, social, and educational questions. In this field, he collaborated with Thomas Simon, endeavoring to find a standard by which degrees of intelligence may be measured. Their combined researches resulted in the publication, in 1905, of the *Binet-Simon Tests*, which have been widely employed by educators. See *Education: General Intelligence Tests*.

Bing, Rudolf (**1902-**), musical director, was born at Vienna and received his early musical training there. His varied experience in Europe was obtained as director of the Hessian State Theatre at Darmstadt, director of Berlin and Charlottenburg Civic Opera, and Artistic Director of the Edinburgh Festival, 1947–49. Since 1950 he has been General Manager of the Metropolitan Opera Company in New York.

Biot (*b'yō'*), **Jean Baptiste** (**1774-1862**), French astronomer and physicist, was born at Paris. He is noted for his researches in the circular polarization of light and was the founder of saccharimetry by use of the polariscope.

Birdseye, Clarence (**1886-1956**), pioneer frozen food industrialist, was born in Brooklyn, New York. Soon after he was graduated from Amherst College in 1910, he became a fur trader in Labrador, where he discovered that he had a taste for frozen seal, whale, and caribou. Devising a machine which would freeze foods quickly, he organized a company at Gloucester, Massachusetts, which specialized in processing and selling frozen seafoods. In 1929 he sold out to the Postum Company, which became General Foods Corporation. Continuing as consultant to that company, he carried on his work of developing processes for the preservation of food. In this field and in that of incandescent light he has been granted about 250 patents in the United States and foreign countries.

Birmingham, George A. See *Hannay, James Owen*.

Bishop, Sir Henry Rowley (**1786-1855**), English composer, was born at London. At an early age, he devoted himself to the composition of dramatic music, and, in 1809, produced his *Circassian Bride*, which was a marked success. In 1810, he became director of music at Covent Garden theater, and, while engaged in this position, produced many operas, including *The Lady of the Lake, Guy Mannering*, and *The Slave*. In 1840, his dramatic piece, *The Fortunate Isles*, was produced in honor of Queen Victoria's wedding. In 1842, he was knighted and, in 1848, became professor of music at Oxford. He wrote the familiar melody to John Howard Payne's "Home, Sweet Home."

Bismarck-Schönhausen (*bĭs'märk - shûn'hou'zĕn*), **Prince Karl Otto Eduard Leopold von** (**1815-1898**), German statesman and the creator of German unity, was born at Schönhausen, Prussia. He studied at the universities of Göttingen and Berlin. He obtained his degree in jurisprudence in 1835 and, the next year, entered the army. In 1839, his help was needed at home to settle the property left in sadly embarrassed circumstances by his father. There he evinced a shrewd business tact and knowledge of men, the provident calculation, and the habit of organizing and commanding others that, in other circumstances, operated toward his later success as diplomat, economist, and chief of a government.

In 1847, Bismarck married Johanna von Puttkamer. In the same year, he won attention in the new Prussian diet as an ultraroyalist, and, in 1849, he was elected to the second chamber of the diet. His diplomatic career began in 1851, when he was appointed Prussian member of the resuscitated Germanic diet at Frankfort. There he manifested the zeal for the interests and aggrandizement of Prussia that undeviatingly guided him thereafter.

In 1859, Bismarck was sent as minister to Saint Petersburg, now Leningrad. In the spring of 1862, he was transferred as ambassador to Paris, and he had interviews with Palmerston and Disraeli in London. In the autumn, he was recalled to take the portfolio of the ministry for foreign affairs and the presidency of the cabinet. Throughout the events that ended in the humiliation of Austria at Königgrätz in 1866 and in the reorganization of Germany under the leadership of Prussia, Bismarck was the guiding spirit, and he logically became chancellor in 1867.

During the Franco-Prussian War of 1870-71, Bismarck was the spokesman for Germany. By falsifying a telegram, he had been largely responsible for the war, and he dictated the terms of peace to France. These included the cession of Alsace and Lorraine to Germany and an indemnity of one billion dollars, which was paid in gold in two years. He had been made a count in 1866, and he now became a prince. He was the first chancellor of the German Empire. The sole aim of his policy, domestic and foreign, was to consolidate the young empire by stabilizing its institutions and by making it secure, through alliances and political combinations, from attack by other nations.

Soon after the accession of William II, differences arose between him and the chancellor, and Bismarck resigned in March 1890. He spent the remainder of his life in open denunciation of the government, although a formal reconciliation took place between him and the emperor in 1894. Died at Friedrichsruh. See *History: Germany*.

Bitter, Karl Theodore Francis (**1867-1915**), sculptor, was born at Vienna, Austria. He studied sculpture in the Vienna Academy. In 1889, he came to the United States and soon rose to distinction as a sculptor. He won the competition for the Astor memorial bronze doors in Trinity Church, New York. He executed sculpture on the Administration building, World's Columbian Exposition, Chicago, and on the residences of C. P. Huntington and Cornelius Vanderbilt, New York.

In 1901, he was director of sculpture at the Pan-American Exposition, Buffalo, and, in 1904, was chief of department of sculpture, Saint Louis Exposition, contributing his notable "Louisiana Purchase" group.

Bizet (*bē'zĕ'*), **Georges** (**1838-1875**), French composer, was born at Paris. He studied at the Paris Conservatory under Halévy, and in Italy. His best-known works are *Les pecheurs de perles, La jolie fille de Perth, L' Arlésienne, Djamileh*, the overture *Patrie*, and *Carmen*. The last named, which is founded on Mérimée's novel, has become one of the most popular of modern operas.

Björnson (*byûrn'sŭn*), **Björnstjerne** (**1832-1910**), Norwegian poet, novelist, and dramatist, was born in Kvikne. He entered the University of Oslo in 1852 and soon after began work as a journalist and dramatic critic. His first novel, *Synnöve Solbakken*, a story of peasant life, published in 1857, was followed by *Arne, A Happy Boy, The Fisher Maiden*, and many other pieces. In 1858, he became director of the theater at Bergen and produced two dramas, *Between the Battles* and *Lame Hulda*. An ambition to create a new national saga in a peasant setting was substantially realized in *Sigurd the Bastard*. Among his later well-known plays are *Mary Stuart in Scotland, Sigurd Slembe*, and *The Newly Married*. Björnson was the foremost novelist and poet and, excepting only Ibsen, the chief dramatist of his time in Norway. He received the Nobel prize for literature in 1903. See *Norwegian Literature*.

Black, Eugene R. (**1898-**), business executive, was born at Atlanta, Ga. After graduation from the University of Georgia, he was employed by Harris, Forbes & Co. of Atlanta. In 1933 he went to New York City where he was connected with the Chase National Bank. Since the close of World War II, he has held positions successively as president of the International Bank for Reconstruction and Development and as director of the International Finance Corporation. In 1964 he became chairman of the John Fitzgerald Kennedy Library, Inc.

Black, Hugo Lafayette (**1886-**), American legislator and jurist, was born at Harlan, Ala. Obtaining a law degree at the University of Alabama in 1906, he entered practice at Birmingham, Ala., served as police judge for 18 months in 1910-11, and was prosecuting attorney for Jefferson county, 1915-17. In 1927, and again in 1934, he was elected, as a Democrat, to the United States Senate.

While in the Senate, Black was a leader among those who asserted the power of Congress to regulate economic activities and to prevent the Supreme Court from blocking its efforts in this direction through what he called a tortured construction of the Constitution. He favored increasing the court's membership to bring about this result.

When Justice Van Devanter retired in 1937 from the tribunal, President Roosevelt nominated Senator Black to

succeed him. His opinions on the court established his reputation as an able and liberal jurist.

Black Hawk (**1767-1838**), American Indian warrior, was born at the Sauk village on Rock River, near the Mississippi, in what is now Illinois. He was Chief of the Sacs and Foxes, who attempted in 1831 to recover their tribal lands east of the Mississippi, which previously by treaty had been ceded to the United States government. This caused the "Black Hawk War," which resulted in the defeat and surrender of Black Hawk in Wisconsin in August 1832. The capture of Black Hawk terminated all serious resistance and the rapid settlement of Iowa and other disputed territory followed. Black Hawk died on the Sauk and Fox reservation on the Des Moines River, in Iowa. See *American History: Black Hawk War*.

Blackie, John Stuart (**1809-1895**), Scottish scholar and man of letters, was born at Glasgow. He was educated at Marischal College, Aberdeen, and at the University of Edinburgh. For three years, he was a student of theology at the University of Aberdeen. In 1829, he went to Germany, studying at Göttingen and at Berlin. Returning to Scotland, he made extensive preparations for the law, but his strong love of the classics and his taste for letters led him to adopt a literary and scholastic career. In 1839, he was made professor of Latin in Marischal College, and from 1852 to 1882 was professor of Greek at Edinburgh University.

Blackie was a zealous educational reformer, took an active interest in the remodeling of the Scottish universities, founded a Celtic chair in Edinburgh University, and spoke and wrote on a wide variety of subjects. Among his works, which are numerous, are *Self-Culture, Four Phases of Morals, The Language and Literature of the Scottish Highlands, Life of Burns, Christianity and the Ideal of Humanity*, a translation of Æschylus, and several volumes of verse.

Blackmore, Richard Doddridge (**1825-1900**), British novelist, was born at Longworth, Berkshire. He graduated at Exeter College, Oxford, in 1847; afterward studied law; was admitted to the bar; and practiced for a time as a conveyancer. Of his novels the earliest were *Clara Vaughan* and *Cradock Nowell;* but his greatest success was *Lorna Doone*, a 17th century romance with notably beautiful descriptions in rhythmic prose, which has become a classic of English fiction. Blackmore's other novels include *The Maid of Sker, Alice Lorraine, Cripps the Carrier, Erema, Mary Anerley, Christowell, Tommy Upmore, Springhaven, Perlycross*, and *Dariel*.

Blackstone, Sir William (**1723-1780**), English jurist, was born at London. He was a judge, a member of Parliament, and author of the well-known *Commentaries on the Laws of England*. At the bar, after seven years' practice, his prospects were so indifferent that he retired to Oxford on his fellowship and there gave public lectures on English law. Their success is supposed to have suggested to Viner the propriety of establishing a professorship of law in the university, to which office Blackstone was elected in 1758, being the first Vinerian lecturer. In 1770, he became one of the judges of the common pleas.

Blackwell, Elizabeth (**1821-1910**), physician and writer, was born in Bristol, England. She emigrated to the United States in 1832, was educated in private schools in New York, and taught school in Kentucky and in the Carolinas. After being refused admission to several medical colleges, she entered the Medical School at Geneva, N. Y., 1847. She was the first woman in the United States to receive the degree of doctor of medicine.

After establishing a practice in New York, 1851, she founded a hospital and, in 1867, with her sister, Dr. Emily Blackwell, organized the Woman's Medical College of New York infirmary. She lectured in England, 1858-59; registered as a physician in England, 1859; and, after 1869, practiced in London and in Hastings. Her writings include *Physical Education of Girls, Religion of Health, Counsel to Parents on Moral Education, Pioneer Work in Opening the Medical Profession to Women, The Human Element in Sex*, and *Scientific Method in Biology*.

Blaine, James Gillespie (**1830-1893**), American statesman, was born at Brownsville, Pa. At 17 he graduated from Washington College, Pa.; he taught school at Georgetown, Ky., 1848-51, and in Philadelphia, 1852-54. In 1854, he went to Maine to engage in journalism, which he relinquished four years later for a seat in the legislature. He served there until 1862, when he was elected to Congress, where he remained 18 years. From 1869 to 1875, he was speaker of the House of Representatives. At the Republican national convention of 1876, Blaine was balloted on for the presidency and received 351 votes out of a total of 754. He was then elected United States senator, and four years later was again an unsuccessful aspirant for nomination to the presidency.

In 1881, President Garfield appointed him secretary of state but he resigned from the cabinet soon after Garfield's death. In 1884, he received the Republican nomination for president, but was defeated by Grover Cleveland by a very narrow margin. A change of less than a thousand votes in New York State would have made Blaine president. In 1889, he again became secretary of state, in the cabinet of President Harrison. Blaine was a parliamentarian of great ability, a brillant orator, and a notably resourceful and popular party leader. He wrote *Twenty Years of Congress* and *Political Discussions*. See *Mugwumps, Mulligan Letters*.

Blake, Eugene Carson (**1906-**), American religious leader, was born at St. Louis, Mo. He was graduated from Princeton University in 1928, and from Princeton Theological Seminary in 1932. He was assistant pastor of the Collegiate Church of St. Nicholas in New York (1932-35), and then successively pastor of the First Presbyterian Church, Albany, N. Y. (1935–40), and the Pasadena (California) Presbyterian Church (1940–51). From 1954 to 1957 he was president of the National Council of Churches of Christ in the United States.

Blake, Robert (**1599-1657**), English admiral, who, more than any other, contributed to render England mistress of the seas, was born at Bridgewater, in Somersetshire. In 1649, in conjunction with two other officers of equal rank, he was appointed "general of the sea." After practically destroying the squadron of Prince Rupert, which had sought safety in the Tagus in 1651, Blake forced the Royalists to surrender Guernsey, Jersey, and the Scilly Islands.

In 1652, Blake was made sole admiral of the fleet and, during this year, fought four engagements with Dutch fleets under Tromp, Ruyter, and DeWitt. In the first, on May 19, the Dutch retreated under cover of darkness, with the loss of one man-of-war captured and another sunk. In the next engagement, a squadron of twelve ships was captured; in the third, on September 28, three Dutch vessels were destroyed and the rear admiral was taken.

In 1654, Blake was appointed by Cromwell to command an English fleet in the Mediterranean, where he soon made the British flag respected by Dutch, Spanish, and French alike. He next sailed to Algiers and Tripoli, and set free all the English who were detained as slaves. With Venice and Tuscany he concluded alliances highly favorable to England. In 1657, he defeated the Spaniards at Santa Cruz, one of the most daring actions in his career. He died at Plymouth harbor.

Blake, William (**1757-1827**), English artist and poet, was born at London. After studying art for some years, he began to paint in water colors and to engrave illustrations for magazines. At the same time, he wrote poetry which showed great power and beauty. His *Poetical Sketches, Songs of Experience*, and *Songs of Innocence* are among his best works. Most of his other poems are valuable chiefly because of the way, which he claimed had been revealed to him, of illustrating and printing them in various colors. He firmly believed that he held converse with the spirits of Homer, Virgil, Dante, and other great men. Among these quaint and now rare editions are *Books of Prophecies, Gates of Paradise, Vision of the Daughters of Albion*, and *America*.

Blakelock, Ralph Albert (**1847-1919**), American painter, was born in New York City. He was graduated from the College of the City of New York in 1869. He early abandoned the career of a physician and determined to become a painter. With no training in art and without guidance or assistance, he opened a studio in New York. While at length he produced many excellent pictures, recognition of their merits was exceedingly slow. Finally, the hardships and privations which he endured unsettled his mind. For about 18 years he was confined in an insane asylum. In 1916, he was released, seemingly completely recovered, and resumed painting.

Blakelock ranks with Inness, Wyant, and Homer among the foremost American painters of landscape. He is essentially a colorist and is distinguished for his evening and moonlight scenes and for his studies of the Indians of the West. Characteristic landscapes are his "Autumn," "Sunset," "Navarra Range," "Solitude," "Abode of the Stately Deer," and "Morning." Among his notable Indian pictures are "The Pipe Dance" (in the Metropolitan Museum of Art, New York), "Uintah Tribe," "Indian Girl," and "Shooting the Arrow."

Blasco Ibañez (*blās'kō ē-bā'nyāth*), **Vicente** (**1867-1928**), Spanish novelist, was born in Valencia. His earliest works, such as the *Mayflower*, are sketchy pictures of life in his native province. Later, he developed a more minute and realistic style, somewhat resembling that of Zola, and produced novels which are characterized by great keenness of observation and descriptive power. Among his works, several of which have been translated into English, French, and other languages, are *The Shadow of the Cathedral, The Four Horsemen of the Apocalypse, Our Sea, Woman Triumphant, Blood and Sand*, and *The Temptress*. He was imprisoned 30 times for his political activities and views.

His *Alfonso XIII Unmasked*, in 1925, led to his exile from Spain. See *Spanish Literature: Contemporary Writers*.

Blashfield, Edwin Howland (1848-1936), American artist, was born in New York, and was educated in Boston Latin School. He studied painting at Paris, 1867, under Léon Bonnat; exhibited at several Paris salons, 1874-92, and also at the Royal Academy, London. He returned to the United States in 1881 and produced many genre pictures, portraits, and mural decorations. Among his paintings are "Christmas Bells" and "Angel with the Flaming Sword." He decorated the central dome of the Library of Congress, portions of the State capitols of Minnesota, Iowa, South Dakota, and Wisconsin, and other public buildings, and executed much private work. In recognition of his achievements, he was elected a member of the American Academy of Arts and Letters. He wrote *Mural Painting in America*, and, with his wife, Evangeline Wilbur Blashfield, was coauthor of *Italian Cities*. Jointly with Mrs. Blashfield and A. A. Hopkins, he edited Vasari's *Lives of the Painters*.

Blavatsky (*blä-vät's'kĭ*), **Helena Petrovna (1831-1891),** theosophist, was born in Ekaterinoslav. She was of noble descent and married a Russian councilor of state, from whom she separated soon after their marriage. She visited Tibet, where, she claimed, she discovered the doctrines later formulated as the tenets of the Theosophical Society. From 1873 to 1879, she was a resident of New York, became a naturalized American citizen and, with Col. H. S. Olcott and others, founded the Theosophical Society in 1875. Its purpose is to form the nucleus of the universal brotherhood of man, to promote the study of comparative religion, philosophy, and science, and to investigate the unexplained laws of nature and the powers latent in man. In 1876 she published *Isis Unveiled*, a book basic to the movement. Her other writings include *The Secret Doctrine*, and *The Voice of Silence*.

Bliss, Tasker Howard (1853-1930), American general, was born at Lewisburg, Pa. He was educated at Lewisburg Academy, Lewisburg University (now Bucknell), and at the United States Military Academy at West Point, from which he was graduated in 1875. Entering the army, he rose steadily, becoming divisional chief of staff in the Puerto Rican campaign, 1898. He was collector of customs, Havana, 1898-1902. He was then promoted brigadier general and made member of the Army War College Board. After serving on the general staff, 1903-05, he commanded departments in the Philippines until 1909, when he became assistant chief of staff. Following service in various commands, including the Mexican border, 1911, he was made major general, 1915, chief of staff, 1917, and general, 1917, in the United States army. He was also made member of the Supreme War Council in France and, in 1919, served as military delegate of the United States to the Peace Conference at Versailles.

Blough, Roger M. (1904-), American lawyer and business executive, was born at Riverside, Pennsylvania. He received his bachelor of arts degree from Susquehanna University in 1925 and his legal degree from Yale in 1931. He practiced law in New York City from 1931 until 1942, when he was made general solicitor of the United States Steel Corporation, a position he held until 1951, at which time he was made vice president in charge of law and secretary of the company. Since 1952 he has been chairman and chief executive officer of the corporation.

Blücher (*blü'kĕr*), **Gebhard Leberecht von (1742-1819),** Prussian field marshall, was born at Rostock, Germany. He first entered the Swedish army but soon passed to the Prussian army, in which he served during the Seven Years' War. He went through the Polish campaign of 1772, and gained rapid promotion during the struggle with the French invaders, which began in 1792. In the campaign of 1814, Blücher held high command and,though defeated by Napoleon, he beat Marshal Marmont and entered Paris with the allies. In the Waterloo campaign, he commanded the Prussian army in Belgium, and was severely defeated by Napoleon at Ligny. However, by outmaneuvering Grouchy, he was able to arrive at Waterloo in time to decide the victory for the allies and to pursue the routed French army. See *Napoleonic Wars*.

Blum (*blüm*), **Leon (1872-1950),** French political leader, was born at Paris. A graduate of the Ecole Normale Supèrieure, Paris, and a man of means, he devoted himself to literary work. When 53 years old, he obtained election to the Chamber of Deputies as an orthodox Socialist. Becoming leader of the Socialist party he long held the balance of power, but never served in the cabinet until 1936. In that year, organizing a "popular front" by alliance with the Communist party, he won an electoral victory which elevated him to the post of prime minister. Among his first laws were those securing governmental authority over the privately controlled Bank of France, increasing wages of laborers, and otherwise seeking to redistribute income. His ministry fell in 1937. He was arrested by the Vichy government and later taken to Germany, but returned when the war ended. He headed an economic mission to the United States in 1946, and in 1946-47 headed an interim government preceding the inauguration of the Fourth Republic.

Blumenbach (*blōō'mĕn-bäĸ*), **Johann Friedrich (1752-1840),** German physiologist and anthropologist, was born at Gotha. In 1776, he was made professor of medicine in the University of Göttingen, a chair which he filled with distinction for nearly 60 years. He was the founder of anthropology and his works gave a great impulse to scientific research. His chief writings are *Institutiones Physiologicæ*, *Manual of Natural History*, and *Manual of Comparative Anatomy and Physiology*. He was the first to classify the human species as Caucasian, Mongolian, African, American, and Malay.

Boabdil (*bō'ăb-dĕl'*) **(?-1536),** or Abu-Abdallah, was the last Moorish king of Granada. He dethroned his father, Abu-l-Hasan, in 1481, and, two years later, was defeated and taken prisoner by the Castilians near Lucena. He was set free on condition of paying tribute. The Spaniards later besieged Granada, which was finally starved out in 1491, in spite of the reckless courage of the Moors and of Boabdil, whose weak and vacillating nature fell from him in the hour of battle. The spot from which he looked his last on Granada, after giving up to Ferdinand the keys of the city, still bears the name of *el ultimo sospiro del Moro*, "the last sigh of the Moor." Boabdil soon crossed to Africa, where he died in battle.

Boccaccio (*bōk-kä'chō*), **Giovanni (1313-1375),** Italian story-teller, was born probably in Paris. From an early period he displayed a love for poetry. In 1350, he formed an intimate friendship with Petrarch, and, following his friend's example, collected books and copied rare manuscripts which he could not afford to buy. It is said that he was the first Italian who ever procured from Greece a copy of the *Iliad* and of the *Odyssey*. Boccaccio was not only one of the most learned men of his time, but he was also one of the most enlightened in his scholarship.

While in Naples, about 1334, Boccaccio fell passionately in love with a young woman, called by him Fiammetta, who was generally supposed to be a daughter of King Robert. His passion was returned, and, to gratify her, he wrote *Il Filocopo*, a prose romance, and afterward *La Teseide*, the first attempt at romantic epic poetry, of which Boccaccio may be considered the inventor. In 1344, he wrote his *Amorosa Fiammetta*. He composed his humorous and lusty *Decameron* in Naples, to please Joanna, the daughter and successor of King Robert. In abundance of incident it is almost inexhaustible, though many of the stories are taken from older collections. See *Italian Literature: Early Period*.

Bode (*bō'dĕ*), **Johann Elert (1747-1826),** German astronomer, was born at Hamburg. At the age of 18 he foretold by calculation an eclipse of the sun. The next year he wrote an elementary treatise on astronomy. In 1774, he commenced the *Astronomical Year Book*. His fame rests chiefly on the *Uranographia*, published in 1801, in which he gives observations on 17,240 stars, or about 12,000 more than can be found in any previous charts. He reproduced the statement of the relations of the planetary distances, previously made known by Titus of Wittenberg, but afterward called "Bode's law." He died at Berlin.

Bodin (*bō'dăN'*), **Jean (1530-1596),** French publicist and economist, was born at Angers. He served as attorney to Henry III, exerting an influence in favor of freedom of conscience. He wrote one of the earliest treatises on the theory of prices. According to Bodin's greatest work, *Les six livres de la republique*, property and the family form the basis of society, and a limited monarchy is the best possible form of government, a theory which was at variance with the then current doctrine of the divine right of kings. He died at Laon.

Bodley, Sir Thomas (1545-1613), English diplomat and scholar. His family being forced to flee from England during the persecutions of Mary, he settled at Geneva. On the accession of Elizabeth, he returned to England and completed his studies at Oxford, thereafter becoming a member of the faculty. He was employed by the queen in diplomatic missions to Denmark, France, and the Netherlands, whence he returned to Oxford in 1596 and devoted himself to restoring and enlarging the library originally established there by Humphrey, Duke of Gloucester. The library was named Bodleian, in recognition of his work and his benefactions to it.

Boerhaave (D., *bōōr'hä-ve;* E., *bōr'hāv*), **Hermann (1668-1738),** Dutch physician, was born near Leiden, the Netherlands. In 1689, he was made doctor of philosophy; in 1693, he gained his medical degree at Harderwijk and returned to Leiden, where, in 1701, he was appointed lecturer on the theory of medicine. To combine practice

with theory, he caused a hospital to be opened, where he gave clinical instructions to his pupils.

In 1718, he undertook the professorship of chemistry, and published, in 1724, his *Elementa Chemiæ*, a work which occupies a high place in the history of chemistry. Peter the Great of Russia visited him at Leiden. His best-known works are his *Institutiones Medicæ* and *Aphorismi de Cognoscendis et Curandis Morbis.*

Boethius (*bō-ē'thĭ-ŭs*) or **Boetius** (*bō-ē'shĭ-ŭs*), **Anicius Manlius Torquatus Severinus** (**c. 480-524**), Roman statesman and philosopher. He absorbed most of the learning of his time and also filled the highest offices under the government of Theodoric the Goth. He became consul in 510 and was long the oracle of his sovereign and the idol of the people; but his strict integrity and inflexible justice incited enemies, to whose machinations he at last fell a victim. Falsely accused of a treasonable correspondence with the court of Istanbul, he was imprisoned and condemned to death. His *Consolations of Philosophy*, written in prison, and his translations of Aristotelian writings formed for centuries Europe's chief source of a knowledge of Greek philosophy. He was executed. See *Latin Literature: Period of Decline.*

Bogardus, James (**1800-1874**), American inventor, was born in Catskill, New York. He became a watchmaker and engraver, and manifested a marked aptitude for invention. His improvements on timepieces include the eight-day, three-wheeled chronometer clock. He invented the ring-flyer for cotton spinning, the eccentric mill where both stones turn in the same direction but with different speeds, and an engraving machine for engine turning. In 1833, he invented the dry gas meter; in 1839, he won the prize offered by the British government for the best machine for making postage stamps. In 1847, he built in New York for his factory the first structure erected entirely of cast iron. He also constructed implements for working india rubber and for deep sea sounding.

Bohlen, Charles Eustis (**1904- **), American diplomat, was born at Clayton, New York, and was educated at St. Paul's School and Harvard (1927). A career man in the United States Foreign Service, which he entered in 1929, he was vice consul at Prague (1929-31), Paris (1931-34), and Moscow (1934). In 1936 he was with the Department of State in Washington, and then second secretary at Moscow (1937) and consul (1938). He served as second secretary at Tokyo (1940-41); Department of State (1942); assistant chief, Division of European Affairs (1943); first secretary, Moscow (1943); chief, Division of Eastern European Affairs (1943); assistant to Secretary of State for White House Liaison (1944); special assistant to Secretary of State (1946); counselor, Department of State (1947); minister at Paris (1949); and again counselor, Department of State (1950-53). More recently he has served as U.S. ambassador to the U.S.S.R. and as adviser to the State Department on Russian affairs.

Bohr, Niels Henrik David (**1885-1962**), Danish physicist, was born at Copenhagen. He entered the University of Copenhagen in 1903. After receiving, in 1911, the degree of doctor of philosophy from the University of Copenhagen, he studied in England, first at the University of Cambridge under J. J. Thompson and later at the University of Manchester under E. Rutherford. He was an instructor in physics in the University of Manchester from 1914 to 1916, when he was elected professor of physics at the University of Copenhagen.

Bohr indicated how to fix mathematically the orbit of the electrons in the inner part of the atom and how to calculate the processes taking place there. According to his theory, supported by later verifications, electrons may jump from one orbit to another, the jump being accompanied by the emission of light. He thus adapted the quantum theory to atomic structure. In 1922 Bohr was awarded the Nobel prize for physics. In 1940 he escaped from Denmark to England, and took part in the work on the atomic bomb. In 1948 he came to the United States to join the Institute for Advanced Study at Princeton. He wrote *Theory of Spectra and Atomic Constitution* and *Atomic Theory and Description of Nature.*

Boito (*bō'ē-tō*), **Arrigo** (**1842-1918**), Italian composer and librettist, was born at Padua. He received his musical education at the Milan Conservatory where, about 1856, he composed parts of his opera *Mefistofele* which was a pronounced failure as first produced in 1868 at La Scala, Milan. After extensive revision it was successfully presented in Bologna in 1875 and in New York in 1880.

Boito won fame as the author of the librettos for Verdi's *Otello* and *Falstaff* and for Ponchielli's *Gioconda.* He also published several novels. He owes his chief distinction to the fact that his *Mefistofele* marks the epoch-making change in Italian opera from mere tunefulness and coloratura display to the new dramatic school exemplified by the later works of Verdi and by Ponchielli, Mascagni, Puccini, and Leoncavallo. See *Italian Opera.*

Bok (*bŏk*), **Edward William** (**1863-1930**), editor, was born in Helder, in the Netherlands. He came to the United States at the age of six; was educated in the public schools of Brooklyn, N. Y.; and was employed for a time by Henry Holt & Co. and by Charles Scribner's Sons, publishers. In 1886, he organized the Bok Syndicate Press, which handled Beecher's sermons with notable success. In 1887, he edited *The Beecher Memorial.* From 1889 to 1919, he was editor in chief of *The Ladies' Home Journal.* His writings include *The Young Man in Business, Successward, Why I Believe in Poverty, The Americanization of Edward Bok,* and *Twice Thirty.* In 1923, he gave a prize of $100,000 for an essay containing the most promising suggestions for the insurance of world peace. He was buried within his "singing tower," a bird refuge with a famous carillon of bells at Mountain Lake, Florida.

Boleyn (*bōōl'ĭn*), **Anne** (**c. 1507-1536**), queen of England and daughter of Sir Thomas Boleyn, was brought up at the French court. She became maid of honor to Queen Catherine of England. King Henry VIII, attracted by her beauty, had his marriage with Catherine declared void, and was married privately to Anne. She soon lost his favor, and, on a charge of unfaithfulness, was tried, condemned, and beheaded. She was the mother of Queen Elizabeth.

Bolingbroke (*bŏl'ĭn-brōōk*), **Henry Saint John, Viscount** (**1678-1751**), English statesman, was born in Battersea. Having studied at Eton, he entered Parliament in 1701, and, in 1704, became secretary for war. He afterward became secretary of state for foreign affairs, and negotiated the Treaty of Utrecht, which ended the War of the Spanish Succession by transferring French territory in the New World to England. In 1712 he was raised to the peerage. On the accession of George I, he was impeached on a charge of high treason, including the charge of having a secret understanding with France during the war. He fled from the country and was secretary of state to the first pretender, James Stuart, claimant to the English throne, for a short time prior to the pretender's defeat in 1715. Bolingbroke's property was confiscated but, in 1723, he was permitted to return. His estates were restored but he was not allowed to sit in the House of Lords. As a Tory leader, he opposed Walpole by intrigue and the pen. After 1735, he retired to his estates in France. There he wrote *The Idea of a Patriot King* and other works much admired in their time.

Bolivar (*bŏl'ĭ-vär;* Sp., *bō-lē'vär*), **Simon** (**1783-1830**), South American statesman, founder and first president of the republic of Colombia, is known as 'the liberator of South America." He was born in Caracas, Venezuela; was educated in Madrid; and traveled in Europe and the United States. When the revolt against the Spanish yoke broke out in Venezuela, he joined the rebels, but was compelled to flee. In 1813, he returned and, gathering a force, defeated General Monteverde at Caracas. The tide then turned against Bolivar, who fled to Jamaica. He soon returned and, after varying fortunes, won decisive battles in 1819. These victories resulted in the establishment of the republic of Venezuela, to which was afterward united New Granada.

In 1822, Bolivar went to the aid of the Peruvians in their struggle for liberty, and was given the chief command. After long campaigns, the Spaniards were driven from Peru in 1825. A large area in southeastern Peru called Upper Peru, was constituted a separate republic, with the title of Bolivia in honor of the liberator. Later, Bolivar became president of Colombia. While circumstances compelled him to use dictatorial power, there is no proof that he was ever insincere in his devotion to the cause of liberty for which he spent his large fortune. In 1921, an equestrian statue of Bolivar was erected in Central Park, New York. See *History: Latin America, Bolivia, Colombia, Venezuela.*

Bonaparte, Charles Louis Napoleon. See *Napoleon III.*

Bonaparte, Jérôme (**1784-1860**), youngest brother of Napoleon I, was born at Ajaccio. He served as naval lieutenant in the expedition to Haiti. When war broke out between France and England in 1803, Jerome was cruising off the West Indies, but he was soon compelled to take refuge in New York. While in the United States, he married, in 1803, Elizabeth Patterson, daughter of a Baltimore merchant. Subsequently, he was employed by Napoleon in the liberation of Genoese prisoners who had been captured by the dey of Algiers. In the war with Prussia, he commanded an army corps in Silesia, and, in 1807, was made king of Westphalia.

After his brother's abdication, Jerome left Paris, 1814, and visited Switzerland and Austria, but ultimately settled in Florence. His request to be allowed to return to France was at first rejected, but was afterward granted. In 1848, he was appointed governor of the Invalides and, in 1850, was made a French marshal.

Bonaparte, Joseph (1768-1844), oldest brother of Napoleon I, was born at Corte, in Corsica, and was educated at Autun. On the death of his father, he returned to Corsica, exerted himself to support the younger members of the family, and removed with them to Marseilles in 1793. In 1797, he was elected a member of the council of five hundred and, in the same year, was sent as ambassador from the republic to Rome. In 1800, having proved his ability in several offices of state, he was chosen by the first consul as plenipotentiary to conclude a treaty of friendship with the United States.

After the coronation of Napoleon, Joseph was made commander in chief of the army of Naples and, in 1806, king of Naples. In 1808, he was summarily transferred by his brother to the throne of Spain, and Murat took his place as king of Naples. For Joseph this was an unfavorable change; he found himself unprepared to cope with the Spanish insurgents, and, after the defeat of the French at Vitoria, he returned to his estate at Morfontaine, in France. From 1815 to 1832, he lived in the United States.

Bonaparte, Josephine (wife of Napoleon I). See *Josephine, Marie Josèphe.*

Bonaparte, Louis (1778-1846), brother of Napoleon I and father of Napoleon III. After receiving various honors, he was nominally made king of the Netherlands, being, however, little more than a subordinate to his brother. Although a foreigner, he administered the affairs of the kingdom in the interest of his people. He refused to accept the crown of Spain, and did not enrich himself by his reign. After the restoration of the house of Orange, Louis considered himself free from all responsibility, and returned to Paris, 1814.

Bonaparte, Lucien (1775-1840), brother of Napoleon I, and prince of Canino. He received his education in the College of Autun. Rising gradually from one office to another, he was elected deputy for the department of Liamone, and in the council of five hundred spoke against the squandering of state property, and formed a party favorable to the views of his brother Napoleon. Shortly before the 18th Brumaire, 1799, he was elected president of the council of five hundred, and was of great assistance to his brother in securing the dictatorship of France.

As ambassador to Madrid, 1800, Lucien contrived to gain the confidence of King Charles IV. It is said that for his services in the treaty of peace concluded between Spain and Portugal, 1801, he received five million francs. His opposition to Napoleon's progress toward monarchy involved the brothers in many quarrels and, finally, Lucien was exiled from France. In 1810, he sailed for America, was captured, and was taken to England. There, after a debate in Parliament, he was declared a prisoner, but was treated with distinction. After his brother's downfall, he lived for some years in or near Rome.

Bonaparte, Napoleon. See *Napoleon Bonaparte.*

Bonaventura (*bŏ'nà-vĕn-tōō'rà*), **Saint (1221-1274),** cardinal, surnamed the "seraphic doctor," his real name being Giovanni Fidanza, was born in Tuscany. He entered the Franciscan order in 1238; was chosen general of the order in 1257; and was made cardinal in 1273. Of a mystical cast of mind but possessed of great subtlety in theological argument, he opposed the Aristotelian wing of thought represented by Roger Bacon. His piety and strict orthodoxy won him wide-spread veneration. He was canonized in 1482.

Bond, Carrie Jacobs (1862-1946), American song writer, was born at Janesville, Wis. She was educated in the public schools and, in 1887, married Dr. Frank L. Bond of Iron River, Mich., who died in 1895. In 1903, she published a group entitled *Seven Songs,* which became widely popular. These were followed in 1904 by the groups entitled *Ten Songs* and *Eleven Songs.* She won success as a program entertainer, singing her own songs and reading her own sketches and poems, which are simple in style and homely in sentiment. Her published works include also *Path o' Life; Stories in Verse; Animal Stories; The Roads of Melody,* an autobiography; and numerous songs among which are "A Perfect Day," "God Remembers When the World Forgets," and "Do You Remember." With her son, she established a music publishing business in Chicago, producing chiefly her own compositions.

Bondfield, Margaret Grace (1873-1953), English politician and first woman member of the British cabinet, was born at Chard, Somerset. Employed as a clerk in a store, she joined the Shop Assistants' Union, in which her executive and platform ability brought her the assistant secretaryship of the union in 1898. She was later an official in the Union of General and Municipal Workers. She became widely known as a lecturer on socialism and labor, and served as official of various national and international labor groups, representing England at the International Labour Office for six years. She was a member of Parliament in 1923-24 and 1926-31. Under Ramsay Macdonald's premiership she served as minister of labor.

Bone, Sir Muirhead (1876-1953), English etcher and painter, was born at Glasgow. Studying architecture, drawing, and painting at the Glasgow School of Art, he made numerous pencil and dry point illustrations of buildings in the city. He removed to London in 1901 and, in 1903, gave an exhibition of his work which established his reputation. His skill in depicting intricate scaffolding appears in "The Great Gantry," showing Charing Cross station being repaired in 1905. Among his other well-known illustrations are "Ayr Prison," "The Shot Tower," and "Liberty's Clock." While official artist for the British army and navy during World War I, he produced a series of illustrations entitled "The Western Front." He was knighted in 1937.

Bonheur (*bō'nûr'*), **Marie Rosalie** (more commonly called Rosa) **(1822-1899),** French artist and painter of animals, was born at Bordeaux. Her first master was her father, Raymond Bonheur, an artist of merit, who died in 1853. In 1841, she contributed two small pictures entitled "Two Rabbits" and "Goats and Sheep" to the French exhibition. These were followed by a succession of highly finished compositions. In 1849, she produced what some consider her finest picture, "Tillage in Nivernais," which was placed in the Luxembourg. In 1853, her famous "Horse Fair" was principal attraction of the Paris Exhibition, and, in 1865, she exhibited a new landscape of large dimensions, "Hay-making Season in Auvergne."

During the siege of Paris, 1870-71, her studio and residence at Fontainebleau were spared by special order of the crown prince of Prussia. The "Horse Fair" came into the possession of A. T. Stewart, of New York, and at the sale of his pictures in 1887 was bought for $55,500 by Cornelius Vanderbilt, and by him presented to the Metropolitan Museum, New York.

Boniface (*bŏn'ĭ-fās*), **Saint (680-755),** was born at Crediton, in Devonshire, England. His real name was Winfrid. Sent in 717 by Pope Gregory II to evangelize Germany, he performed the task so satisfactorily that he was made bishop in 723. His subsequent labors there, under the protection of Charles Martel, included also the extirpation of heresy and bringing German Christendom securely under the papal influence. Popularly known as "the apostle of Germany," he was named archbishop of Germany in 732 by Gregory III and primate of Germany in 748 by Pope Zachary. He was killed by a mob of armed pagans at Dokkum, in West Friesland.

Bonner, Edmund (c. 1500-1569), English prelate. A reputation he gained at Oxford by his knowledge of the canon law recommended him to the notice of Wolsey, who promoted him to several offices in the Church. After the fall of Wolsey, Bonner took an active share in the work of the Reformation and received due promotion from Henry VIII. In 1533, he was deputed to appear before the pope at Marseilles, to appeal for the excommunicated monarch to a general council. In 1540, he was made bishop of London. Bonner's Protestantism, however, extended only to the supremacy of the monarch over the pope. When Henry died, and the movement was extended to doctrine under Edward VI, he proved recalcitrant and was imprisoned, 1549.

The accession of Queen Mary restored Bonner to office, and gave him the opportunity of revenge. As vicegerent and president of the convocation, he was the principal agent in the persecution which was directed against the Reformers during the reign of Mary. After the accession of Elizabeth he refused to take the oath of supremacy. He was accordingly ejected from his bishopric and imprisoned in the Marshalsea, where he died.

Bonnet (*bō'nĕ'*), **Charles (1720-1793),** Swiss naturalist and philosopher, was born at Geneva. His *Recherches sur l' usage des feuilles dans les plantes* argues, on the basis of observations, that plants possess powers of sensation and discernment. In his *Considerations sur les corps organises,* he examined the theories of generation and described for the first time parthenogenesis among insects (aphids). He originated the term "evolution," and, by constructing a hierarchy of animals and contending that the same germ cells persist from generation to generation of individuals, he prepared the way for the content given by Darwin and Wallace to the term.

Bonnivard (*bō'nē'vär'*) **François de (1496-1570),** Swiss patriot and hero of Byron's *Prisoner of Chillon,* was born at Seyssel. He was educated at Turin, and became prior of Saint Victor, near Geneva, 1510, at the age of 14 years. An ardent republican, he took sides with the Genevese against Duke Charles III of Savoy. Having fallen into the hands of robbers who delivered him into the power of the Duke of Savoy, he was imprisoned in 1530 in the castle of Chillon. The Genevese, aided by the Bernese, effected his liberation in 1536. On his return to Geneva, he was awarded a pension. Byron's account of him draws heavily on legend.

Bonsels, Waldemar (1881-1952), German writer and traveler, was born at Ahrensburg, Holstein. Rebelling

against the business career marked out for him, he traveled widely as a vagabond in Europe and later made journeys through India, Ceylon, Egypt, and South America. His writings in large part are blends of descriptive material and reflections on life and society worked into a texture of rare artistry. Others are imaginative tales with allegorical overtones. Among his works translated into English are *Adventures of Maya the Bee, Heaven Folk*, and *An Indian Journey*.

Boone, Daniel (1734-1820), American frontiersman, was born near the present city of Reading, Pa. With no formal schooling, he became proficient in the use of the rifle and in woodcraft. In his 16th year he removed with his parents to the Yadkin Valley of North Carolina. In 1755, he was a volunteer in Braddock's unsuccessful expedition against Fort Duquesne and later fought in the French and Indian wars. Organizing a party of "thirty guns," he cut the 200 mile Wilderness Road through the Cumberland Gap to the Kentucky River, on which, in 1775, he established a settlement called Boonesborough, one of the first in Kentucky. Surprised outside the fort, he was captured by Indians, among whom he won such respect for his skill and character that he was adopted into their tribe. Several months later, in 1778, he escaped to Boonesborough in time to warn the Kentuckians of an impending attack on that fort, which attack the small force of Kentuckians, under Boone, withstood successfully against superior numbers, Boone being advanced to the rank of major as a result.

In 1786, he removed to Maysville, Ky., and later to West Virginia, where he was appointed lieutenant colonel of the Kanawha County militia. In 1791, he was elected to the Virginia assembly. Finally, he removed to Missouri, where he took up land and served as magistrate until 1804. Elected to the American Hall of Fame, 1915.

Booth, Edwin Thomas (1833-1893), American actor, son of Junius Brutus Booth, was born in Bel Air, Md. He first appeared on the stage in 1849 in *Richard III* and speedily rose in his profession. He visited England and the continent of Europe in 1861, 1880, and 1883, and met with enthusiastic receptions. From 1886 to 1891 he appeared with Lawrence Barrett. His last appearance was in *Hamlet* in 1891. He opened Booth's theater in New York, 1869, and did more than any other individual to keep the tone of dramatic art up to a moral and literary standard. He played Hamlet, Lear, and Othello with notable distinction. In his efforts to improve the American stage, he founded and endowed the Players' club. Elected to the American Hall of Fame, 1925.

Booth, Evangeline Cory (1865-1950), Salvation Army commander, was born in England, the daughter of William Booth, who founded the organization. She was director of field operations for the Salvation Army in London for five years, commander of the Army in Canada for nine years, and, 1904-34, was commander for the United States. In 1934 she was made general of the world wide Army, retiring in 1939. She was a distinguished orator. She composed the words and music of many Salvation Army songs and wrote, among other books, *The War Romance of the Salvation Army* and *Woman*.

Booth, William (1829-1912), founder and commander in chief of the Salvation Army, was born in Nottingham, England. He was converted among the Wesleyans and became a minister of the Methodist New Connection in 1852. He resigned in 1861, began evangelistic work, and, in 1865, organized the Christian Mission in the east end of London. Out of this grew, in 1878, the Salvation Army, whose ramifications spread later throughout the world.

He wrote *Orders and Regulations for Officers and Soldiers, Letters to my Soldiers, Religion for Every Day, Salvation Soldiery Visions, In Darkest England and the Way Out*, and numerous other books and pamphlets. He also published the newspapers entitled *War Cry, Young Soldier, Social Gazette*, and *Bandsman and Songster*, some of which were issued in as many as 20 languages. He repeatedly visited the United States, Canada, Australasia, South Africa, India, Japan, and several European countries.

Borah, William Edgar (1865-1940), American lawyer and statesman, was born in Fairfield, Ill. He was educated at Southern Illinois Academy, Enfield, Ill., and at Kansas State University. He was admitted to the bar in 1889, practiced law at Lyons, Kans., 1890-91. In 1891, he removed to Boise, Idaho, and devoted himself to the practice of law until he was elected to the United States Senate in 1907. He was re-elected for succeeding terms and, during 1924-33, was chairman of the Foreign Relations Committee. In this capacity he pressed strongly for early settlement of Allied debts owing to the United States. While favoring the "outlawry" of war, he consistently opposed both the entry of the United States into the League of Nations and American adherence to the World Court. His reputation rested more on his powerful opposition to legislative measures than to his positive influence in the adoption of policies or laws.

Borchgrevink (*bôrk'grĕ-vĭngk*), **Carsten Egeberg (1864-1934)**, Norwegian scientist and antarctic explorer, was born in Oslo. He was educated at Gjertsen College, Oslo, and at the Royal College, Tharandt, Saxony. Emigrating to Australia in 1888, he became a surveyor, and, later an instructor in Cooerwull College, New South Wales, where he founded the Cooerwull Museum.

Sailing from London in 1898 in command of the *Southern Cross* expedition, Borchgrevink landed in South Victoria Land early in 1899. There he spent a year in exploration, mapping the coast, studying the flora and fauna, locating the south magnetic pole, and with sledges attaining the then "farthest south," latitude 78° 50′. The results were published in 1901 in his *First on the Antarctic Continent*.

Borden, Gail (1801-1874), American inventor, was born at Norwich, N. Y. During boyhood he emigrated with his parents to Kentucky and thence to Indiana. On account of impaired health, he removed in 1822 to Mississippi, where he became a teacher and a land surveyor. In 1829, he went to Texas and engaged in land surveying; compiled topographic maps; conducted a land office; and, with his brother, established at Houston the only newspaper published in Texas during the war for the independence of that colony from Mexico. After the establishment of the republic of Texas, Borden was appointed first collector of the port of Galveston and made the first surveys for laying out the city.

At the time of the gold rush to California in 1849, Borden turned his attention to providing suitable food supplies for emigrants crossing the plains. He produced the "pemmican," which Dr. Kane took with him on his arctic expeditions of 1850 and 1853. At this time Borden invented also the "meat biscuit," a highly concentrated portable food. In 1856, he secured a patent for producing condensed milk by evaporation in a vacuum, and soon afterward he established condensed milk factories in New York and Illinois. During the Civil War, his condensed milk was widely used in the army and navy. Borden experimented extensively upon condensing various other staple foods and produced an extract of beef of superior quality and many valuable preparations of condensed coffee, cocoa, tea, and fruit juices. From his various patents Borden amassed a large fortune.

Borden, Sir Robert Laird (1854-1937), Canadian statesman, was born at Grand Pre, Nova Scotia. He was educated at Acacia Villa Academy, Horton; began the study of law, 1874; and was admitted to the bar, 1878. He had an extensive practice in the supreme court of Nova Scotia and in the supreme court of Canada. Entering the Dominion Parliament in 1896, he took a leading part in important debates. In 1901, upon the resignation of Sir Charles Tupper, he was elected leader of the Conservative party in the Dominion House of Commons. Upon the defeat of the Laurier government in the elections of 1911, he became premier of Canada, and continued in the premiership until his resignation in 1920. He followed a strong imperial policy and opposed closer trade ties with the United States. He was member of the Imperial war cabinet, 1917-18; was the representative of Canada at the Peace Conference at Versailles, 1919, and at the Washington Conference, 1921-22. From 1924 to 1929 he was chancellor of Queen's University.

Borgia (*bôr'jä*), **Cesare (1476-1507)**, Italian ecclesiastic and soldier, was the fourth son of Pope Alexander VI by Rosa Vanozza. In 1493, he was created a cardinal but resigned the office in 1498. He is said to have caused the death of his brother Giovanni, who was the Duke of Gandia, in order to gain complete ascendency in the papal government. In 1498, having been sent as nuncio to Louis XII of France, he was created Duke of Valentinois and married, in 1499, the sister of Jean d'Albret, king of Navarre.

After accompanying Louis XII in his Italian campaign, Borgia conceived the idea of founding a kingdom in central Italy, and, by force, treachery, and murder, he had almost succeeded in obtaining ascendency throughout the Roman states, when the death of his father deprived him of his great source of power. His name has become a synonym for treachery, cruelty, and complete absence of scruples. In 1504, he was sent as a prisoner to Spain by Pope Julius II, but escaped and joined the king of Navarre's army against Castile. In this campaign he was killed.

Borgia, Lucrezia (1480-1519), Italian patroness of art, sister of Cesare Borgia. Her father compelled her twice to marriage and divorce before she became the wife of the duke of Bisceglie. After her third husband had been murdered by Cesare Borgia, she married Alfonso of Este, and passed her life in the court of Ferrara, cultivating and lending patronage to literature and art. Her life had been largely managed to suit the political ambitions of her brother, a fact which gave rise to legend, since proved false, that she was addicted to innumerable vices.

Borglum (*bôr'glŭm*), **Gutzon** **(1867-1941)**, American sculptor and painter, was born in Idaho. Beginning the study of art in San Francisco, he went to Paris in 1890 and studied in the Académie Julien and in the Ecole des Beaux-Arts. After exhibiting both paintings and sculptures in Paris, London, and Spain, he returned to America and became established in New York in 1901. In painting, his works include figures, animals, portraits, and mural decorations. His sculptural works comprise figures, horses, and groups in bronze. Among these are the gargoyles of the dormitory at Princeton University, the 42-figure bronze group "Wars of America" in Military Park, Newark, N. J., and "North America," the Sheridan Monument, and the colossal head of Lincoln in the Capitol, at Washington.

Borglum was chosen as the sculptor for the Stone Mountain Memorial to the army of the Confederacy, near Atlanta, Ga., and for the colossal patriotic monument on the face of Mount Rushmore in South Dakota. Borglum reflects the influence of Whistler in his painting and of Rodin in his sculpture. Congress authorized his and his wife's burial at the foot of Mount Rushmore.

Borglum, Solon Hannibal **(1868-1922)**, American sculptor, brother of Gutzon Borglum, was born at Ogden, Utah, and spent his early life on a cattle ranch; at 24 he began to study art with his brother Gutzon. Later, he became a pupil in the Cincinnati Art School and studied under Louis Rebisso and Frémiét, Paris. He made special study of Western life, living among cowboys and Indians. In 1899, he was awarded honorable mention at the Paris Salon for his "Lame Horse." Among his chief works are "Stampede of Wild Horses," "The Last Roundup," "On the Borders of White Man's Land," "The Bucking Broncho," "Burial on the Plains," "Just Born," and "Evening." His later works include statues and portrait busts.

Bori (*bō'rē*), **Lucrezia** **(1887-1960)**, Spanish singer, was born at Valencia. Educated in convents, she made her debut in the title role of *Carmen* at Rome in 1908, where her lyric soprano voice brought assurance of an outstanding career. After appearances in France and Latin America, she joined the Metropolitan Opera Company, New York, in 1912, taking principal roles in *La Traviata*, *Rigoletto*, *Madame Butterfly*, and two score other operas

Borodin (*bŭ-rŭ-dyēn'*), **Alexander Porfiryevich** **(1834-1887)**, Russian composer and chemist, was born at Leningrad. He studied medicine and chemistry, practiced medicine, and was made professor of chemistry at the Medicosurgical Academy. He went to Paris, Heidelberg, and Italy to prepare for his duties in this chair, in connection with which he made important researches and wrote many valuable monographs. About 1860, he championed the cause of university education for women in Russia and from 1872 until his death gave free instruction in chemistry at the Medical School for Women.

As a recreation from professional duties, Borodin devoted himself to musical studies and composition. While studying in Germany, he met Liszt, who regarded him highly and made his compositions known. He composed symphonies, orchestral pieces, piano music, and songs, but his most important work is the opera, *Prince Igor*, which he left unfinished at his death. It was completed by Rimski-Korsakov and Glazunov, and met with great success.

Boscawen (*bŏs'kä-wĕn; -kwĕn*), **Edward** **(1711-1761)**, English admiral, familiarly styled "Old Dreadnought," was born in Cornwall. He distinguished himself at the taking of Porto Bello, 1739, and at the siege of Cartagena, 1741. In command of the *Dreadnought*, in 1744, he captured the French *Médée*, taking 800 prisoners. He had an important share in the victory of Cape Finisterre, 1747, and, in command of the East Indian expedition, displayed high military skill in the retreat from Pondicherry. In 1755, he intercepted the French fleet off Newfoundland, capturing two 64-gun ships and 1500 men; in 1758, he was commander in chief of the successful expedition against Cape Breton. Boscawen crowned his career by his victory over the French Toulon fleet in Lagos Bay, 1759. He received the thanks of Parliament, a pension of £3000 a year, a seat in the privy council, and the command of the marines.

Bossuet (*bō'sü-ĕ'*), **Jacques Bénigne** **(1627-1704)**, French orator and prelate, was born in Dijon, France. He became bishop of Condom and of Meaux, and tutor to the dauphin, the son of Louis XIV. He wrote several controversial works, all in defense of the Roman Catholic doctrine; but his fame rests chiefly on his *Sermons*. As an ecclesiastical orator he has had no superior in France. Several of his compositions, written for the use of the dauphin, and especially his *Discourse on Universal History*, long retained a high reputation.

Boswell, James **(1740-1795)**, Scottish writer and biographer, was born in Edinburgh. He early showed a penchant for writing and an admiration for literary men. He fell in with Dr. Samuel Johnson on a visit to London in 1763, and conceived for him the most devoted regard. In 1773, Boswell made a tour with him to the Hebrides, the *Journal* of which he afterward published. Boswell settled in London and was admitted to the English bar. In 1782, he succeeded to his father's estate, Auchinleck, in Ayrshire, with an income of 1600 pounds a year. Johnson died in 1784. In 1791 appeared Boswell's *Life of Johnson*, a unique biography which has done more to perpetuate Johnson's fame than any of the latter's celebrated writings. See *Johnson, Samuel*.

Botha (*bō'tä*), **Louis** **(1862-1919)**, Boer soldier and statesman, was born at Greytown in Natal. He was a member of the Transvaal Volksraad, succeeded Joubert as commander in chief of the Boer forces in the South African war, 1899-1902, and, from 1907 to 1910, was prime minister of the Transvaal colony under the new constitution. In 1907, he visited England, attended the British colonial conference and received various honors. During 1914-15, he commanded the united British and colonial forces in southwest Africa with notable success, and received the surrender of the German army.

Böttger (*bŭt'gĕr*), **Johann Friedrich** **(1682-1719)**, Saxon alchemist and inventor, was born in Schleiz. While apprenticed to an apothecary in Berlin, he became interested in the search for the philosopher's stone and later conducted extensive investigations at Dresden. He was led to make use of the chemical knowledge he had thus gained in experimenting upon clays to ascertain their suitability for the manufacture of porcelain. Factories for this purpose were built under royal patronage and the discovery of the process of making Meissen, or Saxon, porcelain was the result. In 1708, Böttger was employed to superintend the factories and soon afterward Meissen porcelain was brought out.

Botticelli (*bŏt'tê-chĕl'lē*), **Alessandro** **(1444-1510)**, properly Alessandro Filipepi, Italian painter. He was a pupil of Fra Filippo Lippi and became one of the most important Florentine painters of the early Renaissance. In response to the invitation of Pope Sixtus IV, he went to Rome and executed some fine paintings for the chapel of the Vatican. Among his most noted works are "Allegory of Spring," "Calumny," "Adoration of the Magi," "Birth of Venus," "Mars and Venus," "Magnificat," and several frescoes and madonnas. See *Painting: The Study of Anatomy*.

Bougainville (*bōō'gĕN'vēl'*), **Louis Antoine de** **(1729-1811)**, French navigator, was born in Paris. In 1755, he went to London as secretary of the French embassy. In 1756, he acted as aide-de-camp to the Marquis de Montcalm, to whom the defense of Canada was intrusted. He made a voyage around the world, 1766-69, the first circumnavigation accomplished by a French navigator. The details of this voyage are described in his *Voyage autour du monde*. The scientific and geographic discoveries made on this expedition won fame for France similar to that secured for England by Cook's circumnavigations.

Boughton (*bō'tŏn*), **George Henry** **(1833-1905)**, English painter, was born near Norwich, England, and was brought to the United States when three years old. He studied art in New York, Paris, and London, and, after 1861, resided in London. He became an associate of the Royal Academy in 1879 and a member of the Royal Academy in 1896. Among his paintings are "The Return of the Mayflower," "Evangeline," "Milton Visited by Andrew Marvell," "Passing into Shade," "Coming from Church," "Cold Without," "Morning Prayer," "The Scarlet Letter," "The Idyl of the Birds," "Puritans Going to Church," and "Clarissa Harlowe." He died in London.

Bouguereau (*bōō'gĕ-rō'*), **William Adolphe** **(1825-1905)**, French painter, was born at La Rochelle. After a youth of hardship, he succeeded in reaching Paris, where he obtained admission to the studio of Picot, and later to the Beaux Arts. In 1850, he won the *prix de Rome*, and went to Italy to study. His first notable success was "The Body of St. Cecilia Borne to the Catacombs," exhibited in the Paris Salon of 1854 and later placed in the Luxembourg. From that time his reputation was made. He painted some portraits, but his subjects are chiefly ideal, idyllic, and religious. Many examples of his work are found in American galleries.

Bourbon (*bōōr'bŭn; bōōr'bôN'*), **Charles** **(1490-1527)**, French general, known as "the constable de Boubon." For his bravery at the battle of Marignano in 1515 he was made constable of France. But powerful enemies strove to undermine him in the favor of Francis I. Threatened with the loss of some of his lands and dignities, he renounced the service of France and concluded a private alliance with the emperor Charles V and with Henry VIII of England.

At the head of a force of German mercenaries, Bourbon joined the Spanish army in Lombardy in 1523, but, invading France in 1524, failed at the siege of Marseilles. The next year, however, he was chief commander at the

great victory of Pavia, in which Francis I was taken prisoner. But Charles V distrusted him, though he made him Duke of Milan and Spanish commander in northern Italy. With George of Frundsberg, he led the mixed army of Spanish and German mercenaries that stormed and plundered Rome in 1527. In this fierce struggle, Bourbon was mortally wounded by a bullet said to have been fired by Benvenuto Cellini.

Bourdaloue (*bōōr'dȧ'lōō'*), **Louis (1632-1704),** French preacher, was born at Bourges. After being educated for the Church by the Jesuits, he lectured for some time on humanity and theological ethics. In 1669, he began to preach at Paris, where his discourses brought great crowds to hear him, the audiences including even Louis XIV and his court. His sermons, based chiefly on the texts of Isaiah, Saint Paul, and Saint Augustine, were marked by profound moral earnestness and great logical power.

Bourget (*bōōr'zhē'*), **Paul (1852-1935),** French poet, critic, and novelist, was born at Amiens. In 1873, he first showed his gifts as a critic in an article contributed to the *Revue des Deux Mondes*. In a collection of poems which followed and in his prose *Studies*, he revealed the chief characteristics of his style and thought. He wrote many realistic and analytical books, chiefly studies of the scientific and pessimistic tendencies of the time. Among these are *Cosmopolis, Pastels of Men, Antigone and Other Portraits of Women, Domestic Dramas, Outre-Mer, Impressions of America, The Two Sisters, The Emigrant, A Divorce, The Night Cometh, A Saint, The Sense of Death,* and *Our Acts Follow Us*. In 1894, Bourget was elected to the French Academy.

Bourguiba, Habib (1904-), Tunisian political leader, was born at Monastir, Tunisia. He was educated first at Tunis and later at Paris. He has been a leader in his country's fight for self-rule. Being anti-communist and friendly toward the West, he has had a difficult time owing to border incidents in the fighting between French and Algerian rebel forces. The most serious of these was the French bombing of a Tunisian village.

Bourinot (*bōō'rĭ-nō'*), **Sir John George (1837-1902),** Canadian historian, was born at Sydney, Nova Scotia. He was educated at Trinity College, Toronto, established the Halifax *Reporter*, and, in 1880, became clerk of the Dominion House of Commons. His publications deal with both the political and the constitutional history of the Canadian dominion. Among them are *How Canada is Governed, Constitutional History of Canada, Parliamentary Practice and Procedure, History of Canada* (in the Story of the Nations series), and *Canada Under British Rule*.

Bourke-White, Margaret (1906-), American photographer, was born in New York City. Immediately after graduating at Cornell University, she began commercial photography, specializing on industrial scenes. She made the first industrial photographs to show the progress of Russia's "five year plan," and produced the motion pictures *Eyes on Russia* and *Red Republic*. Her pictures illustrate scenes in more than 20 countries, including the Arctic regions Her photomurals adorn the rotunda of National Broadcasting Company at Rockefeller Center, New York. She was associate editor of *Fortune* from 1929 to 1933 and of *Life* after 1936. In 1939, she married Erskine Caldwell, the novelist, with whom she published *You Have Seen Their Faces* and *North of the Danube*. They were divorced in 1942.

Bowditch (*bou'dĭch*), **Nathaniel (1773-1838),** American astronomer, was born at Salem, Mass. At an early age, he showed an inclination for mathematics, in which he attained great proficiency without attending a university. His work, *The New American Practical Navigator*, became the standard authority for the United States Navy. He published also a translation of Laplace's *Mécanique Celeste*, to which he added valuable annotations.

Bowles, Samuel (1826-1878), American journalist, was born at Springfield, Mass. He was the son of Samuel Bowles (1797-1851), who, in 1824, founded the Springfield *Republican*. In 1844, this became a daily newspaper, and to it Samuel Bowles Junior devoted practically all his life, serving as editor for more than 30 years.

As a practical editor, Bowles stood in the first rank, satisfied with nothing less than the best work, sparing neither his own nor his subordinates' strength, not hampered in his work by either fear or friendship. He was an accomplished and fascinating conversationalist, cosmopolitan in taste, and liberal in opinion. He wrote *Across the Continent, Our New West,* and *The Switzerland of America*, which, with his numerous editorial writings, show his mastery of clear and vigorous English. As publisher and editor in chief of the Springfield *Republican*, he was succeeded by his son Samuel Bowles (1851-1915).

Boyesen (*boi'ĕ-sĕn*), **Hjalmar Hjorth (1848-1895),** Norwegian American novelist, was born at Frederiksvarn, Norway. He was educated in Oslo and Leipzig, and came to America in 1869. After editing *Fremad*, a Scandinavian journal in Chicago, he was professor of German at Cornell University, 1874-80. He held a professorship in Columbia University from 1880 until 1895. He mastered English with remarkable facility and became a widely popular writer of English prose. Among his best-known works are *Gunnar, Tales from Two Hemispheres, Falconberg, Ilka on the Hilltop, Queen Titania, A Daughter of the Philistines, Social Strugglers,* and *The Golden Calf*. His *Ilka on the Hilltop* was dramatized in 1884 and met with notable success. He wrote also a play entitled *Alpine Roses*, published a volume of poems called *Idyls of Norway*, and achieved wide reputation as a lecturer.

Boyle, Robert (1627-1691), English physicist and chemist, was born at Lismore Castle, Waterford, Ireland. After studying at Eton and under the rector of Stalbridge, Dorset, he went to the continent for six years. On his return in 1644, he found himself in possession, by his father's death, of the manor of Stalbridge, where he devoted himself to chemistry and natural philosophy. Settling at Oxford in 1654, he experimented in pneumatics, and improved the air pump. As a director of the East India Company, he worked for the propagation of Christianity in the East, circulated at his own expense translations of the Scriptures, and by bequest founded the "Boyle lectures" in defense of Christianity.

In 1660, Boyle formulated the important law of physics that the volume of a gas varies inversely as the pressure. This is known in English-speaking countries as Boyle's law, and in most other countries as Mariotte's law, although Mariotte in France did not publish his discovery until 1676.

Bracton, Henry de, British ecclesiastic and jurist, was born at Breton Clovelly, England, and was educated in law at Oxford. He was a "justice itinerant" in 1245 and soon after became judge. In 1264, he was made archdeacon of Barnstaple and chancellor of Exeter cathedral and is said to have become chief justice of England in 1267. His *De Legibus et Consuetudinibus Angliæ* was the earliest attempt at a systematic treatment of the body of English law and had no successor until Blackstone published his celebrated *Commentaries* 500 years later. The dates of his birth and his death are unknown.

Braddock, Edward (1695-1755), British general. He commanded against the French in America in 1755. With a force of 2000 British regulars and provincials, he moved forward to invest Fort du Quesne, now Pittsburgh, Pa.; his troops, in passing through a deep forest ravine, fell into an ambuscade of Indians, while they were attacked in the front by the French, and half of them were slain. The survivors effected a hasty retreat under Colonel, afterward General, Washington, Braddock's aide-de-camp. Braddock, mortally wounded, was carried 50 miles to Great Meadows where he died.

Bradford, William (1590-1657), one of the Pilgrims and second governor of Plymouth colony, was born in Austerfield, England. He sailed from Leyden, the Netherlands, in the *Mayflower*, 1620. One of his first acts, as the successor of Governor Carver in 1621, was to confirm the treaty with Massasoit just in time to supress a dangerous Indian conspiracy. By his tact, sound judgment, and marked ability as an administrator, he contributed greatly to the success of the struggling colony. He was governor, with some brief interruptions, for 31 years. He wrote a valuable *History of Plymouth Plantation (from 1602 to 1647)*. See *Mayflower*.

Bradlaugh (*brăd'lô*), **Charles (1833-1891),** English reformer and politician, was born in London. He entered a solicitor's office, and soon achieved a great influence with workingmen, as an advocate of self-organization into unions. By lectures in the Hall of Science, London, on social, political, and religious questions, he won a reputation as the leading exponent of woman suffrage, birth control, and atheism. In 1860, he started the *National Reformer*, against which a government prosecution was instituted for obscenity on account of the publication of birth-control information. After a verdict of guilty, the indictment was quashed on a technical point. In 1872, he published his *Impeachment of the House of Brunswick*.

In 1880, he was elected to Parliament, but, refusing to take the oath, he was not allowed to take his seat until after the election of 1885, although he was repeatedly returned by his constituency. Afterward he earned a high reputation in the House of Commons as a spokesman for radical causes. He opposed socialism, however.

Bradley, James (1693-1762), English astronomer, was born in Sherborne. He was educated at Oxford and studied with his uncle, James Pound, who was a prominent astronomer. In his 29th year, he became Savilian professor of astronomy at Oxford; in 1727, he published his theory of the aberration of the fixed stars and announced the important discovery of the aberration. His discovery that the inclination of the earth's axis to the ecliptic is not constant enabled him to explain the precession of the equinoxes and the nutation of the earth's axis. Later he

became astronomer-royal at Greenwich, doing much to lay the foundations of modern astronomy.

Bradley, Omar Nelson (1893-), American general, was born at Clark, Missouri. He graduated at West Point in 1915, pursued advanced studies, and was promoted through grades to major general. In the Tunisian campaign he commanded the 2d Corps and was made lieutenant general. His part in this campaign led to his choice as general in command of American ground forces in the reconquest of France in 1944 and in the subsequent invasion of Germany. In 1945-48 he headed the Veterans Administration. He was chief of staff of United States Army 1948-49, and chairman of the Joint Chiefs of Staff 1949-53.

Brady, Matthew (1823-1896), American photographer, was born in Warren County, New York. Utilizing as soon as available the Daguerre process of photography, he established a studio in New York about 1842 and later one in Washington. He accompanied the Union armies in the Civil War to make photographic records. His photographs, many of them taken under fire, have been the basis of all later illustrations of the war. The government purchased a part of his collection.

Bragg, Braxton (1817-1876), American general, was born in Warren County, North Carolina. He served with distinction in the Mexican War. Joining the Confederacy, he succeeded General Beauregard in command of the army in Mississippi in 1862. He was unsuccessful against General Buell at Perryville; was defeated by Rosecrans at Murfreesboro; defeated Rosecrans at Chickamauga; and was defeated by General Grant at Chattanooga. He then was appointed chief of staff to President Davis.

Bragg, Sir William Lawrence (1890-), English physicist, was born at Adelaide, South Australia, son of Sir William Henry Bragg. He was educated at Saint Peter's College, Adelaide, and Trinity College, Cambridge. In 1914, he was made fellow and lecturer in natural sciences at Cambridge; in 1919, he was appointed professor of physics at Victoria University, Manchester; in 1938, Cavendish professor of experimental physics at Cambridge. He received the Nobel prize for physics jointly with his father in 1915. He was knighted in 1941.

Brahe (*brä;* Dan., *brä'ĕ*), **Tycho (1546-1601)**, Danish astronomer, was born at Knudstrup, Denmark; studied at Copenhagen; attended law classes at Leipzig in 1562; but soon devoted himself wholly to astronomy. After some years of travel abroad, he returned to Denmark and obtained the patronage of the Danish king, who, in 1576, built for his use a commodious observatory, called Uraniborg, on the Island of Hven. On the death of the king, in 1588, Brahe's position became insecure, and, in 1597, having obtained the protection of Emperor Rudolph II, he settled at Prague, where Kepler joined him in 1600.

Brahe introduced into the study of astronomy the use of better instruments and, by the accuracy with which he observed and recorded the position of stars and planets, he paved the way for later discoveries. It was due largely to the exactness of his observations that Kepler was led to the conception of the three fundamental laws of planetary motion. Brahe did not accept the Copernican theory that the earth revolves about the sun. He considered that the planets do, however.

Brahms (*bräms*), **Johannes**, **(1833-1897)**, German composer, was born at Hamburg. Schumann early expressed the highest opinion of Brahms's genius, which, however, for many years, was not appreciated by the general public. In 1861, Brahms went to Vienna, where he acquired a high reputation and held several important musical posts. In 1868, he composed the *Deutsches Requiem*, which, after the Franco-Prussian War, was performed throughout Germany. His compositions include four great symphonies; many overtures, serenades, and other orchestral pieces and concertos; much chamber and piano music; also organ pieces, choral works and numerous songs.

His music belongs to the classical school; seeks intellectual effects, but with intense underlying feeling; is always sane, well balanced, and never commonplace. Critics since his death have agreed in ranking him with Bach and Beethoven. See *Music: Masters Since Wagner.*

Braille (*brāl*), **Louis (1809-1852)**, French teacher of the blind, was born at Coupvray. He became blind in his third year and, at the age of ten, went as a foundling to the institute for the blind at Paris. He became proficient in music and held the position of organist in a church in Paris. He began teaching the blind in 1828 and, while professor at the national institution, devised and perfected his system of point writing for literature and music, known as the Braille system. It is now widely used in institutions for the instruction of the blind throughout the world.

Bramante (*brä-män'tā*) **(1444-1514)**, otherwise known as Donato d'Agnolo and often called Lazzari, Italian architect, was born near Urbino, Italy. He was employed at Rome by Popes Alexander VI and Julius II, for the latter of whom he planned, and partly executed, the buildings connecting the Belvedere and the Vatican. He later designed the great Church of Saint Peter's, completed by Michelangelo. Bramante first introduced Raphael at the court of Rome. See *Architecture.*

Brandeis (*brăn'dīs*), **Louis Dembitz (1856-1941)**, American jurist and publicist, was born in Louisville, Ky. He was educated in Louisville; at Dresden, Germany; and at Harvard Law School, where he was graduated in 1877. Although a successful lawyer, he became more widely known by reason of his active interest in social, economic, and political questions.

He was one of the first advocates of a radical policy of conservation of natural resources by the government. He acted as counsel for the people throughout proceedings testing the constitutionality of the Oregon and Illinois ten-hour laws for women. He was chairman of the arbitration board for the New York garment-workers' strike in 1910. From 1916 till his retirement in 1939 he was a member of the United States Supreme Court. On questions having social significance, he often dissented from decisions made by his more conservative colleagues.

Brandes (*brän'dĕs*), **Georg (1842-1927)**, Danish literary critic, was born of Jewish parentage, in Copenhagen, where he graduated at the University in 1864. He taught at the University of Copenhagen, 1872-77, and lived in Berlin, 1877-82, where he wrote biographies of Lasalle, Tegner, and Beaconsfield. In 1882, he resumed residence in Copenhagen as a public lecturer with a subscribed guarantee.

In *Main Currents in Nineteenth Century Literature*, Brandes depicts the chief tendencies in European literature from the beginning of the nineteenth century. His study of *William Shakespeare* has been translated into English. Among his other works are *French Romanticism, Impressions of Poland*, and *A Study of Ibsen.*

Brandt, Willy (1913-), political leader, was born at Lübeck, Germany. He was educated there and at the University of Oslo. Being out of sympathy with the Hitler regime he fled to Norway in 1933 and engaged in journalistic work. Returning to Germany after World War II, he became editor of the Berlin *Stadtblatt* and was active in politics as a leader of the Social Democratic party. As mayor of West Berlin he has firmly opposed concessions by West Germany to East Germany and Soviet Russia.

Brangwyn, Sir Frank (1867-1956), English painter, was born at Bruges, Belgium. His family brought him to England where he studied in the studio of William Morris and then traveled in the Orient, the decorative art of which had a continuing influence on him as seen in his harmonious designs and coloring of sumptuous richness. His works include the mural "King John Signing the Magna Charta," in the Cleveland, Ohio Courthouse; decorative panels in Rockefeller Center, New York; "Trade on the Beach," a painting in the Luxembourg Gallery, Paris; and an etching "The Bridge of Sighs." He applied his skill also to stained glass, furniture, books, metalwork, and pottery. He was knighted in 1941.

Brant, Joseph (c. 1742-1807), Indian chief of the Mohawk nation, was born in Ohio; held a commission in the British service; and fought against the American colonists in the Revolution. After the war, he was influential in preserving peace between the whites and the Indian tribes, spending much effort in instructing Indians in the methods of agriculture. He afterward went to England, where he became acquainted with Burke and Sheridan. He translated the gospel of Saint Mark into Mohawk. According to John Fiske, "he was perhaps the greatest Indian of whom we have any knowledge."

Branting, Hjalmar (1860-1925), Swedish socialist. At an early age, engaged in journalism. As the editor of the *Social Democrat*, of Stockholm, he acquired wide influence. During and immediately following the close of World War I, he was a leading figure at socialist conventions and took a prominent part in discussions of international policy. At the Peace Conference at Versailles, in 1919, he was a strong advocate of peace in accordance with the plans proposed by Woodrow Wilson. In 1920, Branting was made prime minister of Sweden, being the first socialist to be chosen for that office. Jointly with Christian Lange of Norway, Branting was awarded, in 1921, the Nobel prize for peace.

Braque (*brăk*), **Georges (1882-1963)**, French abstract painter, was born at Argenteuil, France. With Pablo Picasso, he launched the cubist movement in art at Paris about 1910. It was one of the first manifestations of modern abstract art. Geometrical forms were used to produce a definite aesthetic effect. From cubism Braque developed his own individual style of painting. Although in later years he was less purely cubist than formerly, he remained an abstractionist. He was the recipient of many prizes in the United States and France.

Brassey, Thomas (1805-1870), English engineer and railroad contractor, was born at Buerton, England. After

receiving a common school education, he was, at the age of 16, apprenticed to a surveyor, whom he succeeded in business. After building part of the Grand Junction and also the London and Southampton railroad, he contracted. 1840, in partnership with another, to build a railroad from Paris to Rouen. In a few years, he held ten railroads under contract in England and France, his contracts involving a capital of $175,000,000 and giving employment to 75,000 men. In partnership with Betts and Peto, he undertook to build the Grand Trunk railroad of Canada, 1100 miles in length, including a great bridge at Montreal, His army of men was employed in Europe, South America, Australia, and India.

Brauchitsch (*fŏn brou'kĭch*), **Walther von (1881-1948),** German general, was born in Berlin. Receiving a military education, he became a lieutenant in 1900. Twelve years later he was made a member of the general staff of the German army, serving in this capacity in World War I. After Hitler came to power, Brauchitsch was made inspector of artillery in 1932, commander of the East Prussia army district in 1935, and commander in chief of the Germany army in 1938. With the outbreak of the European war in 1939, he put to trial for the first time on a large scale the Blitzkrieg method for rapidly breaking an enemy's power by coordinated use of mechanized weapons. Within six weeks, the German army subjugated Poland, except the part assigned to Russia. In early May, 1940, the army under his leadership broke the power of France in four weeks. He was less successful against the Russians in 1941. At the surrender he was sent as a prisoner to England.

Braun, Karl Ferdinand (1850-1918), German physicist, was born at Fulda. He was educated in the universities of Marburg and Berlin. In 1895, he became professor of physics at the University of Strasbourg. In 1902, he discovered a method of increasing at will the energy of the sending station and gained control of effective radiation by the arrangement of the antennæ. He also made important investigations concerned with the electromagnetic theory of light and invented a cathode ray tube. In 1909, he was awarded the Nobel prize for physics jointly with Marconi.

Braun, Wernher von (1912-), engineer, was born at Wirsitz, Germany, and received his technical education mainly in Berlin, Germany. As a rocket expert, he was one of the creators of the long-range German V-2 rocket used in World War II. Since coming to the United States in 1945, he has worked with the U.S. Department of Defense as a specialist in rocket design and controls, development of liquid fuel rockets and rocket power for planes, and guided missiles. Dr. Braun, who is a citizen of the United States, is now chief of the Guided Missile Development Division at Redstone Arsenal, Huntsville, Ala. Among the books he has written are *The Mars Project* and *Conquest of the Moon.* The Army satellites Explorer I and Explorer II, launched in 1958, are products of his genius.

Breasted, James Henry (1865-1935), American Oriental scholar and archeologist, was born at Rockford, Ill.; he was educated at North Central College, Chicago Theological Seminary, Yale University, and the University of Berlin. He became a member of the faculty of the University of Chicago in 1894, rising, by 1915, to be chairman of the department of Oriental languages there. He was the director of archeological expeditions to Egypt, Iraq, and Palestine. His ability to explain clearly and interestingly the bearing of archeology on modern knowledge gave him a place in the public eye seldom occupied by a worker in his chosen field. His *History of Egypt* has been translated into a number of foreign languages. Among his other publications are *Development of Religion and Thought in Early Egypt* and *Survey of the Ancient World.*

Breckinridge, John Cabell (1821-1875), American politician and soldier, was born near Lexington, Ky.; entered Congress in 1851; and, in 1856, was elected vice president under Buchanan. In 1860, he was the presidential candidate of the extreme proslavery Democrats, but was defeated by Lincoln. He denounced Lincoln's address as a declaration of war and was expelled from the House of Representatives. He was immediately elected United States senator, but resigned to accept a command in the Confederate army, where he rose to the rank of major general. In 1865, he was Confederate secretary of war.

Bremer (*brē'mĕr*), **Fredrika (1801-1865),** Swedish novelist, was born in Finland, but was brought up near Stockholm, Sweden. Her novel *The Neighbors* was published in 1937 and gave her wide fame. She traveled through many countries and wrote descriptions of the people for her *Homes of the New World, Life in the Old World,* and many other works. She spent two years in the United States. She has been called the "Jane Austen" of Sweden. Among her best books are *The Diary, The President's Daughters,* and *Brothers and Sisters.*

Brennan, William Joseph (1906-), American jurist, was born at Newark, N. J. and was educated at the University of Pennsylvania (1928) and Harvard Law School (1931). He practiced law in New Jersey until 1942, when he joined the U.S. Army, for which he did legal work in the ordnance division. He entered the service as a major and left in 1945 as a full colonel. He returned to the practice of law in Newark, remaining there until 1949, when he was appointed to the New Jersey Superior Court. The following year he was named to the New Jersey Supreme Court. In 1956 he was appointed Associate Justice of the United States Supreme Court by President Eisenhower.

Brent, Charles Henry (1862-1929), American clergyman, was born at Newcastle, Ont.; was graduated from Trinity College, Toronto, 1884; and was ordained deacon of the Protestant Episcopal Church in 1886 and priest in 1887. After a distinguished ministry in Buffalo and Boston, he was elected, 1901, bishop of the Philippine Islands, where he later became actively identified with the antiopium crusade. In 1918, he was elected bishop of western New York and, in 1918-19, was head of the chaplain service of the American army in France. In 1927, he was chairman of the World Congress on Religions, held at Lausanne, Switzerland. His publications include *With God in the World, The Consolations of the Cross, The Splendor of the Human Body,* and *The Sixth Sense.*

Breton (*brē'tôn'*), **Jules Adolphe (1827-1906),** French painter and author. His reputation greatly increased after the extraordinary sale of one of his pictures, "The First Communion," which brought $45,000 in 1886. His pictures usually represent scenes from rural life and are much admired for their sweet, pathetic sentiment. Among the most noted of his works are "Blessing the Grain," "Return of the Gleaners," and "The Reaper," in the Luxembourg; "The Pardon of Kergoat," in the Metropolitan Museum, New York; and "The Song of the Lark," in the Art Institute, Chicago.

Brewster, Sir David (1781-1868), Scotch physicist, was born at Jedburgh, Scotland. He was educated for the Church of Scotland, but undertook instead the editorship of the *Edinburgh Encyclopædia.* He invented the kaleidoscope in 1816 and shares with Wheaton the honor of inventing the stereoscope. In 1817, in conjunction with Professor Jameson, he established the *Edinburgh Philosophical Journal;* in 1831, he was one of the chief originators of the British Association for the Advancement of Science.

In 1819, the Royal Society awarded him the Rumford gold and silver medals for his discoveries on the polarization of light; in 1832, he was knighted and had a pension conferred upon him; in 1849, he was elected one of the eight foreign associates of the French Institute, the highest scientific distinction in Europe. He presided over the British Association and, in 1851, over the Peace Congress held in London. In 1859, he was chosen vice chancellor of Edinburgh University. See *Polarization of Light.*

Brezhnev, Leonid (1906-), engineer and political leader, was born in the Ukraine, where he was educated for a career in engineering. He was graduated from the Institute of Metallurgy at Dneprodzerzhinsk, his native town. In connection with his industrial tasks he was interested in social work and became an active member of the Communist party. Advancing from leadership in a local area, he was appointed to the Central Committee in 1952 and, in 1957, he became a member of the Presidium of the Supreme Soviet of the U.S.S.R. in Moscow. Here he was closely associated with Nikita Khrushchev, whom he succeeded as Soviet leader in 1964.

Brian Boroihme (*bō-roim'*), or **Brian Boru** (*bô-rōō'*), **(926-1014),** king of Ireland; ascended the throne of both Munsters—answering to Tipperary and Clare—in 978. Some time afterward, he became supreme ruler of Ireland. The vigor of his reign brought prosperity to his country. He defeated the Danes in many pitched battles and greatly restricted their influence. In the battle of Clontarf, 1014, in which he was killed, he gained a signal victory over a united army of revolted natives and Danes, the power of the latter receiving a shock from which it never recovered.

Briand (*brê-äN'*), **Aristide (1862-1932),** French statesman, was born at Nantes. He was educated for the law, which he abandoned for journalism and politics. In 1902, he was elected to the Chamber of Deputies as a socialist Radical. By his brilliant handling of difficult governmental problems, he advanced rapidly, becoming prime minister in 1909-11, and again in 1913. He settled a railroad strike in 1910 by calling the workmen to the colors. In October 1915 he became prime minister and minister of foreign affairs and held these posts again in 1921, when he represented France at the Washington disarmament conference. His part in negotiating the Locarno treaties in 1925 won him the award of one-half of the Nobel peace prize for 1926.

Bricker, John William (1893-), American politician, was born on a farm in Madison County, Ohio, and

was educated at Ohio State University, where he received his academic degree in 1916 and his law degree in 1920. He served as a chaplain during World War I. He has practiced law in Columbus since 1920, except when holding public office. He served two terms as attorney general of Ohio and three terms as governor. He was the unsuccessful Republican candidate for vice president in 1944. In 1946 he was elected to the United States Senate and was re-elected in 1952.

Bridges, Robert (1844-1930), English poet, was born at Walmer, England; was educated at Eton and Oxford; studied medicine in London and practiced in hospitals until 1882, after which he devoted himself to literature, writing numerous plays, poems, and essays on English verse. The list of his plays includes *Ulysses, Christian Captives, Achilles in Scyros, Humours of the Court, Feast of Bacchus, Demeter,* and *Nero,* the last of which is perhaps most widely known. Of his poems, *Prometheus* and *Eros and Psyche* are ranked among the best produced in the late Victorian period. In 1913, he was appointed poet laureate of England, succeeding Alfred Austin. See *English Literature: Contemporary Poetry.*

Brieux (*brē'ē'*), **Eugène (1858-1932),** French dramatist, was born in Paris. He entered journalism but his deep interest in social reform led him to write plays.

Many of his plays have become well known throughout the world. Nearly all of them deal with social problems which he treats with marked seriousness of purpose and notable insight. The list of his plays includes *Les bienfaiteur, L'Evasion, La robe rouge, Maternité, La française, La femme seule,* and *Les Américains chez nous.*

Briggs, Henry (1561-1631), English mathematician, was born in Warley Wood, Yorkshire. He was educated at Cambridge University, where he was made lecturer in 1592. In 1596, he became professor of geometry in Gresham college, London, and, in 1619, was appointed professor of astronomy at Oxford. While he made other interesting contributions to mathematics and astronomy, his great gift to the world was his invention of the decimal system of logarithms now in use. He devoted many years to the calculation of logarithmic tables and published several books on the subject. See *Logarithms.*

Bright, John (1811-1889), English orator and statesman, was born at Rochdale, of Quaker parentage. After receiving a limited schooling, he entered his father's business at the age of 15. In 1835, he went abroad, visiting Palestine, and, after his return, began to lecture on travel and economic subjects. With his friend Cobden, he first became prominent in the agitation for the repeal of the corn laws; entered Parliament for Durham, afterward for Manchester, but lost his seat through his opposition to the Crimean War. In 1857, he was returned for Birmingham and held that seat until his death.

Bright joined Gladstone's government which disestablished the Irish Church, but opposed his home rule policy in 1886, dying in the unshaken conviction that it was a fatal error. By his notable eloquence and burning moral appeal, he rendered inestimable service to the cause of the North during the American Civil War, although the continuance of hostilities was disastrous to his interests as a cotton spinner.

Bright, Richard (1789-1858), English physician, was educated at Edinburgh; and practiced with great success in London. He discovered that an albuminous condition of the urine accompanied with dropsical effusions is often dependent on a peculiar degeneration of the kidneys. The disease in which these conditions occur was called after him, "Bright's disease." His first publications on this subject were made in 1827.

Brillat-Savarin (*brē'yà' sà'và'răN'*), **Anthelme (1755-1826),** French lawyer, judge, and gourmet, was born at Belley, Ain, France. He was famous for his classic work on the art of dining, *Physiologie du gôut* (1825), translated into English under the title *Physiology of Taste.* Brillat-Savarin spent several years of enforced exile in New York during the French Revolution. He has been called the "poet laureate of gastronomy."

Brinkley, David (1920-), news reporter and commentator, was born at Wilmington, North Carolina. He began his career as reporter for the Wilmington *Star-News,* then became news writer and bureau manager in several cities for the United Press Association. Since 1943 he has been engaged in radio and TV broadcasting for NBC, with headquarters at Washington, D. C.

Brisbane, Arthur (1864-1936), American newspaper editor, was born at Buffalo, N. Y. He was educated in the public schools and devoted five years to study in France and Germany. He began newspaper work in 1883, as a reporter for the New York *Sun,* later being made its London correspondent. He then became editor of the *Evening Sun* and, later managing editor of the *World.* In the years following 1896, he became editor of the new York *Evening Journal,* the Chicago *Herald and Examiner,* and other newspapers of the Hearst group. His comments on events were widely published. The popularity of his forcible and direct style notably affected the form of American newspaper editorials.

Britten, (Edward) Benjamin (1913-), English composer, was born at Lowestoft, England, and began composing music before the age of ten. He studied at the Royal Academy of Music, and privately with Frank Bridge and Harold Samuel. After finishing at the Royal Academy he became a free lance composer and concert artist, writing much music for radio, theater, and screen. From 1939 to 1942 he worked in America. He has collaborated a number of times with W. H. Auden, the poet. Following the success of his opera, *Peter Grimes,* in 1945, he has been chiefly a composer of this form of music, writing such operas as *The Rape of Lucretia* (1946), *Albert Herring* (1947), *Let's Make an Opera* (written for young people, 1949), *Billy Budd* (1951), *Gloriana* (1953), which was written for the coronation of Queen Elizabeth and had a royal premiere at Covent Garden, and *The Turn of the Screw* (1954). Other works by Britten include *Simple Symphony* (1934), and *Variations on a Theme of Frank Bridge* (1937), which within two years was performed more than fifty times in Europe and America.

Brock, Sir Isaac (1769-1812), British officer, was born in Guernsey. In the War of 1812, when an American army under General Hull invaded Canada, the measures adopted by Brock were so effectual that the Americans surrendered at Detroit without striking a blow. He did not long enjoy the fame he had won. He was killed leading a charge up Queenston Heights, 1812. A monument to his memory stands on this eminence, on the western bank of the Niagara river.

Brockhous (*brŏk'hous*), **Frederick Arnold (1772-1823),** German publisher, was born in Dortmund. He was the founder of the Leipzig firm bearing his name, chiefly associated with the encyclopedia entitled *Brockhaus's Konversations-Lexikon.* This work has been the pattern for nearly all modern encyclopedias. In 1808, he purchased this work in an unfinished form. He completed the first edition in Altenburg in 1811 and began the second edition in 1812. In 1818, he removed the business to Leipzig, where his descendants carried the *Konversations-Lexikon* through many editions, and also published Ersch and Gruber's *Universal Encyclopœdia.*

Broglie (*brô'y'*), **Louis, Prince de (1892-),** French physicist, writer, university professor. Although he is identified officially as secretary of the *Academie des Sciences,* he is perhaps more widely known for his work in atomic physics and particularly for his important discovery of the wave nature of the electron, which earned for him the Nobel prize in 1929. Besides teaching at the University of Paris, he has done much writing on scientific subjects. His books include *Selected Papers on Wave Mechanics, Matter and Light,* and *The Revolution in Physics; a Non-mathematical Survey of Quanta.* His work has been chiefly in theoretical physics, but he is also much interested in peacetime uses of atomic power.

Broglie, Maurice, Duc de (1875-1960), French physicist, was born at Paris of a distinguished aristocratic family. After a brilliant career at Stanislas College and the French Naval Academy, he devoted himself to research in radiations and atomic physics. He was elected to the French Academy in 1934.

Bromfield, Louis (1896-1956), American novelist, was born at Mansfield, Ohio. He studied at Cornell and Columbia universities, the latter giving him an honorary degree because of his war service. After several years in journalism, he became advertising manager of G. P. Putnam's Sons, publishers. He spent much of his time in France and traveled in India and other countries but settled on a farm "Malabar," near Lucas, Ohio, after World War II broke out. His novels and several plays reveal a keen interest in social problems and show familiarity with many countries, folklore, and the psychology of sex. They include *The Green Bay Tree, Early Autumn, A Modern Hero, The Rains Came,* and *Until the Day Break.* Partly autobiographical books dealing with country life are *Pleasant Valley* and *Malabar Farm.*

Brongniart (*brôN'nyár'*) **(1801-1876), Adolphe Théodore,** French botanist, son of Alexandre Brongniart, was born at Paris. He studied medicine and received his doctor's degree in 1826, but soon turned his attention exclusively to plant physiology and paleobotany. In 1834, he was elected to the Academy of Sciences. In 1839, he became professor of botany at the Museum of Natural History in Paris. His work on fossil plants, entitled *Histoire des végétaux fossiles,* gave him wide fame. His catalogue of the genera of the plants cultivated at the Paris Museum of Natural History had a marked influence on modern systems of classification.

Brongniart, Alexandre (1770-1847), French naturalist, was born in Paris. After serving for a time on the medical staff of the army, he devoted his attention to porcelain manufacture, making a scientific examination of mines and pottery works in Derbyshire, England. In 1797, he was made professor of natural history in the Ecole Centrale. In 1800, he became director of the noted porcelain manufactory of Sèvres, where he revised and developed the art of painting on glass. His *Classification of Reptiles* and his *Elementary Treatise on Mineralogy* were long considered authoritative works. He published also a *Treatise on Ceramic Arts and Pottery.*

Bronowski, Jacob (1908-), British scientist and author, is a graduate of Jesus College, Cambridge. He has served as lecturer at University College, Hull, and as visiting professor at the Massachusetts Institute of Technology. For the British government he has done statistical research in the economics of building and has also been Director-General of Process Development Department of the National Coal Board. His writings include *The Poet's Defence* (1939), *The Common Sense of Science* (1951), *Science and Human Values* (1958), and *The Western Intellectual Tradition* (1960).

Brontë (*brŏn'tē*), **Charlotte (1816-1855),** English novelist, was born at Thornton, England. She was the eldest of three sisters, all of whom were notable as writers. After some experience as a governess, she published in 1846, with her sisters Emily and Anne, a small volume of poems under the names of Currer, Ellis, and Acton Bell. In 1847, she published the story *Jane Eyre.* Its success was instantaneous. Although adversely and severely criticized, it is admitted to be one of the most remarkable of English novels. Her second story, *Shirley,* was published in 1849, and her third and last, *Villette,* in 1853. Another story, *The Professor,* which had been refused by the publisher before *Jane Eyre* had made its author famous, was published after her death. In 1854, she married Arthur Bell Nicholls. The Brontë novels show an extraordinary intensity of feeling. They shocked contemporaries by depicting women loving, instead of merely being loved as the Victorian tradition called for. See *English Literature.*

Brooke, Rupert (1887-1915), English poet and writer, was born at Rugby. He was educated at Rugby School and Cambridge University. He manifested marked poetic talent at an early age and, while residing in the vicinity of Cambridge, wrote a volume of verse, which appeared in 1911. At the outbreak of World War I, he enlisted in the British army. His premature death in the Dardanelles campaign removed one of the most promising literary figures in England.

Brooks, Phillips (1835-1893), American preacher and orator, was born at Boston, Mass.; was graduated from Harvard, 1855; was rector of Episcopal churches in Philadelphia and Boston, 1859-91; and became bishop of Massachusetts in the latter year. He was celebrated as a pulpit orator and as a vigorous and independent thinker. His freedom from the usual sectarian limitations, his liberal ideas concerning doctrine, together with his profound convictions as to vital Christian truths and his spiritual yet intensely practical preaching, gave him a wide popularity. He was elected to the American Hall of Fame, 1910.

Brooks, Van Wyck (1886-1963), American author and literary critic, was born at Plainfield, N. J. After being graduated from Harvard in 1907, he worked at different times for the publishing firms of Doubleday, Page and Company and the Century Company and taught English at Leland Stanford University. He was associate editor of *The Freeman,* 1920-24, revealing himself as one of America's outstanding literary critics. Among his published works are *The Wine of the Puritans, America's Coming-of-Age, Emerson: a Portrait,* and *The Flowering of New England (1815-1865).* He was elected in 1937 to the American Academy of Arts and Letters. His later books include *The World of Washington Irving* (1944), *The Writer in America* (1953), *Scenes and Portraits* (1954), and *John Sloan: A Painter's Life* (1955).

Brougham (*brōō'ăm; brōōm*) **and Vaux, Henry Peter Brougham, Baron (1778-1868),** British jurist, philosopher, and statesman, was born at Edinburgh. After being graduated at Edinburgh University, he was called to the Scottish bar and, in 1802, became one of the founders and editors of the *Edinburgh Review.* In 1808, he joined the English bar and speedily acquired a high reputation.

In 1810, Brougham entered Parliament, where he became a chief of the Liberal party. In 1820-21, he was engaged as attorney general for Queen Caroline and succeeded in obtaining her acquittal. In 1830, he became the acknowledged champion of parliamentary reform; was called to the House of Lords; and was appointed lord high chancellor of England, which office he resigned in 1834. He devoted the remainder of his life almost exclusively to science and literature at his chateau at Cannes, France. His fame rests principally upon his achievements in the cause of popular education and political and legal reform.

Brown, Charles Brockden (1771-1810), American novelist, was born at Philadelphia, Pa. His two best-known stories are *Wieland, or the Transformation* and *Arthur Mervyn.* His other novels are *Ormond, Edgar Huntley, Jane Talbot, Philip Stanley,* and *Clara Howard.* While his stories are morbid, sentimental, and improbable, they contain scenes of great power and were immensely popular in their time. He is considered the chief American writer of fiction before Cooper and Hawthorne.

Brown, Henry Kirke (1814-1886), American sculptor and painter, was born in Leyden, Mass. He is the author of the colossal statue of General Washington in Union square, New York; "The Angel of the Resurrection," in Greenwood Cemetery, Brooklyn; the statue of Governor Clinton at Washington; and numerous other sculptures. Although he spent four years, 1842-46, in Italy, his entire artistic life was a protest against Italian influence. To this end he studied distinctively American subjects, producing, among other works, his "Indian and Panther," probably the first bronze sculpture cast in the United States.

Brown, John (1800-1859), American abolitionist, was descended from a Puritan carpenter, one of the *Mayflower* emigrants, and was born at Torrington, Conn. In 1855, he went to Kansas, where he took a conspicuous part in the border warfare. Later he traveled through the southern and eastern states, declaiming against slavery and endeavoring to organize an armed attack upon it. Plans were laid, in a convention at Chatham, Ont., for establishing an armed refuge in which fugitive slaves might protect themselves and where revolts might be fostered.

In 1859, at the head of 17 white men and 5 blacks, Brown commenced active hostilities by a descent upon Harpers Ferry, where there was an arsenal containing from 100,000 to 200,000 stand of arms. The arsenal was captured, and 40 or 50 of the principal inhabitants were made prisoners; but, instead of retreating to the mountains with arms and hostages in accordance with his original design, Brown lingered in the town until evening. By this time, 1500 militiamen had arrived. He was captured, tried for treason, and executed. See *John Brown's Raid.*

Brown, John Mason (1900-), American critic, author, and lecturer, was born at Louisville, Ky. After graduation from Harvard University, he wrote dramatic criticism for the *Theatre Arts Monthly,* the *New York Evening Post,* and later the *New York World Telegram.* He gave lectures on the drama at Harvard and Yale universities and before general audiences throughout the United States. For a time he conducted the CBS radio program, "Of Men and Books," and recently he has served as permanent panel member on the television program, "The Last Word." His books include *Two on the Aisle* (1938), *Many a Watchful Night* (1944), based on experience in the U. S. Navy during World War II, *Seeing Things* (1946), *The Opening of the Wilderness* (1952), and *Through These Men* (1956).

Brown, Robert (1773-1858), Scottish botanist, was born at Montrose. He was educated at Marischal College, Aberdeen, and studied medicine at the University of Edinburgh. In 1801, he was employed as naturalist for the survey expedition in charge of Captain Flinders to the Australian coasts, where he collected and brought to England in 1805 nearly 4000 species of Australian plants, most of which were new to science. In 1810, he published the first volume of his great work on the plants of Australia and Tasmania.

Brown was the first English botanical author who adopted the natural system of Jussieu for classification of plants and led the way to its universal substitution for the Linnæan method. By making the microscope and the study of development the basis of classification, he notably advanced the scientific knowledge of plants. He discovered gymnospermy and made the separation of gymnosperms and angiosperms that is now universally recognized. He also first detected the so-called Brownian movements in pollen grains.

Browne, Charles Farrar (1834-1867), American humorist, known by the pseudonym of "Artemus Ward," was born at Waterford, Maine. His first literary effort was that of writing as a showman to an imaginary traveling menagerie. He later traveled over America lecturing, carrying with him a whimsical panorama which afforded texts for his numerous jokes. His humor depended in considerable part on misspelled words and quaint or surprising turns of language. In 1866, he undertook a highly successful tour of England, where he died. See *American Literature: Humor.*

Browne, Sir Thomas (1605-1682), English physician and philosopher, was born at London. After studying at Winchester, at Oxford, and on the continent, he settled as a physician at Norwich, where he spent the rest of his life. During the civil wars and the protectorate, he remained in the seclusion of his study, indifferent to either party. He was knighted in 1671. His chief works are *Religio*

Medici; Pseudodoxia Epidemica, or Inquiry into Vulgar and Common Errors; Hydriotaphia or the Urn Burial; and *The Garden of Cyrus*. He possessed a wonderful charm of style. In richness and majesty of diction, the concluding chapter of his *Urn Burial* is ranked with the finest passages of Jeremy Taylor and Milton.

Browning, Elizabeth Barrett (1806-1861), English poet, was born in Durham County. Her first important essay in authorship was a translation of the *Prometheus* of Æschylus in 1833. *The Seraphim and Other Poems* appeared in 1838. In 1846, she married Robert Browning, with whom she resided in Italy throughout the remainder of her life. In 1850, Mrs. Browning published her collected works together with several new poems, including *Sonnets from the Portugese*, which rank among the finest love poems in English. In 1851 appeared the *Casa Guidi Windows*, a poem whose theme was the struggle made by the Tuscans for freedom in 1849. *Aurora Leigh*, her longest production, was published in 1856. *Poems Before Congress* appeared in 1860. Her poetry is distinguished by its depth of feeling and generous sentiment.

Browning, John Moses (1855-1926), American inventor, was born in Utah, the son of a gunsmith. He obtained numerous patents for rapid fire guns, including the machine rifle which bears his name and which was adopted for army use by the governments of the United States and several other countries. Associated for many years with the Colt Firearms Co., he designed the Colt automatic pistol and the Colt machine gun.

Browning, Oscar (1837-1923), English historian and critic, was born at London; was educated at Eton and at Cambridge University; and taught at Eton, 1860-75, and at Cambridge from 1876 to 1909. Works edited or written by him include *Modern England, Modern France, Life o George Eliot, Milton's Tractate on Education, Guelphs and Ghibellines, Life of Peter the Great, The Fall of Napoleon, General History of the World,* and *General History of Italy*.

Browning, Robert (1812-1889), English poet, was born at Camberwell, London. His education was informal, largely under private tutors, until he entered University College, London, for the session of 1829-30. His boyhood foreshadowed exceptional intelligence and literary qualities, though his first poem, *Pauline*, written at the age of 19, did not evince extraordinary powers. The most important event of his youth was his sojourn in Russia and in Italy, 1833-34.

Earlier Work. After the appearance of his *Paracelsus* in 1835, Browning determined to devote himself to the art of poetry and ordered his life to this calling. His drama *Strafford* was produced, but without success, in 1837, *Sordello*, appearing in 1840, illustrated Browning's delight in erudition at the expense of clarity. It abounds in involutions of thought and obscure allusions to medieval history. For the next six years, Browning was engaged in writing a series of plays, tragedies, and lyrics, issued, at irregular intervals, under the title *Bells and Pomegranates*. This series contained his famous *Pippa Passes, A Blot on the 'Scutcheon,* and "The Pied Piper of Hamelin." Some of the lyrics in this group are the most popular of Browning's works.

Marriage. In 1846, Browning married, in London, Elizabeth Barrett, herself a gifted poet, and with her he went to Florence, where they lived for 15 years and where, in 1849, their only son was born. After the death of his wife in 1861, Browning settled permanently in London.

Later Poems. In 1850, Browning published *Christmas Eve and Easter Day* and, in 1855, his volume entitled *Men and Women*, which contains some of his finest works. These poems, which included "Fra Lippo Lippi," "Childe Roland," "Andrea del Sarto," and "Evelyn Hope," are unsurpassed in the English language for their profound analysis of character. In 1864, he issued the volume entitled *Dramatis Personæ*, which attested his dramatic gifts in monologue and unfolded his views upon higher questions affecting life and immortality. His generally accepted masterpiece, the product of stupendous intellectual labor, *The Ring and the Book*, was written in epic form and published four years later. It is based on legal records in a trial for murder motivated by jealousy.

From that time, works by Browning appeared in rapid succession; among them was *Fifine at the Fair*, in 1872, which handled a question in morals very powerfully. In 1879-80 came the two volumes of *Dramatic Idyls*, which may be described as vigorous character sketches. His last volume of poems, *Asolando: Fancies and Facts*, was published December 12, 1889.

Qualities. Browning is distinguished for the depth of his spiritual insight, his dramatic energy, his power of psychological analysis, and his capacity to create real men and women. Besides being one of the most erudite of poets, he has intense human sympathies, high imaginative gifts, and a profound and vigorous faith. On the other hand, his style is frequently obscure and difficult, his versification hard and rugged, and his rimes forced or fantastic. He died while visiting his son in Venice. His remains were placed in Westminster Abbey.

Bruce, James (1730-1794), Scottish traveler and explorer, was born in Kinnaird, Stirlingshire. He received his education at Harrow and at Edinburgh University. In 1763, he became consul at Algiers, resigning in 1765 to travel in Tunis, Tripoli, Cyprus, and Asia Minor, where he studied, and secured drawings of the ruins of Palmyra, Baalbek, and other noted remains of antiquity. In 1768, he began a journey of exploration through Abyssinia. In 1770, he discovered the sources of the Blue Nile, then supposed to be the main stream, and, after great hardships, reached Egypt late in 1772. His interesting *Travels to Discover the Source of the Nile*, in five massive volumes, has been translated into several languages.

Bruce, Robert (1274-1329), king of Scotland, did homage for a time to Edward I, king of England, but joined the Scottish national party and became one of a regency of four, with Comyn for rival; stabbed Comyn in a quarrel at Dumfries, 1306; and was that same year crowned king at Scone. He was defeated by an English army sent against him and was obliged to flee to Ireland; returned and landed in Carrick; cleared the English out of all the fortresses except Stirling and, in 1314, defeated them under Edward II at Bannockburn, after which, in 1328, Scotland's independence, as well as Bruce's right to the crown, was acknowledged. Suffering from leprosy, Bruce spent his last two years at Cardross Castle on the Clyde, where he died.

Bruce, Stanley Melbourne, 1st Viscount Bruce of Melbourne (1883-), Australian statesman, was born in Victoria. He was educated at the Melbourne Grammar School and at the University of Cambridge, England. Upon leaving the university, he studied law; was admitted to the bar; and practiced in London. He devoted considerable time also to the London branch of the mercantile business of which his father was a founder.

At the outbreak of World War I, Bruce joined a British regiment and fought side by side with his fellow countrymen, the Anzacs, at Suvla bay and Gallipoli. He was wounded twice.

In 1917, Bruce was elected to the Australian Parliament; in 1921, he represented Australia at the League of Nations in Geneva; and, in 1922, he was appointed treasurer of the Commonwealth of Australia. Following the success of the National party in the Australian elections held early in 1923, he was prime minister until 1929, when he appealed unsuccessfully to the country on the issue of abolishing Federal arbitration of trade union disputes. His views favoring association short of federation among British self-governing countries were substantially written into the Westminster statute in 1931. From 1933 to 1945 he was High Commissioner for Australia in London.

Bruch (*brōōk*), **Max (1838-1920),** German composer, was born in Cologne, of Jewish parents. He manifested early a great talent for music, producing a symphony at the age of 14. From 1853 to 1857, he studied under Hiller, Reinecke, and Breuning and later became musical director successively at Coblenz, Berlin, Liverpool, and Breslau. In 1883, he visited the United States and conducted his oratorio *Arminius* in Boston. His four concertos for the violin and orchestra are classed among the greatest works of their kind; he is also pre-eminent as a composer of the epic cantata. His works include the operas *Jungfrau von Orleans* and *Hermione;* the cantatas *Frithjof, Salamis, Beautiful Ellen, Odysseus,* and *Achilleus;* also orchestral works, concertos, and chamber music.

Brucker, Wilber M. (1894-), American lawyer and political leader, was appointed Secretary of the Army by President Eisenhower in 1955. Brucker was born at Saginaw, Michigan and received his education there and at the University of Michigan. At the close of World War I, in which he served with distinction in General Pershing's "Rainbow Division," he established a law practice in Saginaw. He was Governor of Michigan, 1931–33. At the time of his appointment, he was general counsel to the Department of Defense

Bruckner (*brōōk'nĕr*), **Anton (1824-1896),** Austrian organist and composer, was born at Ansfelden. Although an orphan and largely self-instructed, in 1855, in open competition, he won the post of organist at Lienz. He then frequently visited Vienna. There he studied under Sechter, whom he succeeded in 1867 as court organist at Vienna, at the same time he was also made professor in the Conservatory. In 1869, he made a concert tour of France and, in 1871, toured England, establishing his fame as one of the leading organists of his time. Bruckner was also one of the greatest recent masters of counterpoint.

The large plan and serious purpose of his compositions entitle him to a high rank among modern composers. In his works, chiefly instrumental, he attempts to adapt Wagner's principles of dramatic art for the opera to the orchestral symphony. The result is a certain lack of coherence and unity in Bruckner's works, notwithstand-

ing their notable brilliancy and power. His reputation rests chiefly upon eight important symphonies. He composed a masterly *Te Deum* in 1886 and wrote masses, a requiem, and choral works.

Brueghel (*brû'gĕl*), **Pieter** (**c. 1525-1569**), Flemish painter, called "The Elder" or "The Droll," was born at Brueghel in the Netherlands and spent most of his productive years in Antwerp and Brussels. He was of peasant extraction and is noted for his colorful landscapes and his lively detailed depictions of peasants at work and at play. Modern reproductions of his paintings of the peasantry in festive mood, eating, drinking, dancing, courting, and marrying, are extremely popular.

His oldest son, Pieter Brueghel (1564-1637), called "The Younger," and nicknamed "Hell Brueghel" because of his penchant for painting Stygian scenes, some of them rather terrifying, is also admired as a Renaissance painter.

The Elder Brueghel's younger son, Jan Brueghel (1568-1625), called "Velvet Brueghel" because of his addiction to painting people in that fabric, seems, like his father, to have possessed a sense of humor.

Brummell (*brŭm'ĕl*), **George Bryan** (**1778-1840**), "Beau Brummell," an Englishman of wealth and fashion, was born at London. He was educated at Eton and Oxford, where already he posed as the prince of dandies. He was patronized by the Prince of Wales, afterward George IV. During the heyday of royal favor, he was immensely popular as a story-teller and wit, and became the recognized arbiter of fashion. At length, his means were exhausted; he quarreled with the prince; and fled from his creditors to Calais, where, reduced to destitution, he yet lived some years in the same reckless fashion. He settled at length in Caen, where he died insane. He is the subject of the successful comedy, *Beau Brummell*, by Clyde Fitch, in which Richard Mansfield starred.

Brunelleschi (*brōō'nĕl-lĕs'kē*), **Filippo** (**1377-1446**), Italian architect, was born at Florence. He is reckoned the first who established on a sound basis the theory of perspective. When still a young man, he went to Rome, where he acquired a profound knowledge of ancient architecture. In 1407, he returned to Florence. In 1420, it was proposed to complete the structure of the Cathedral of Santa Maria del Fiore, founded in 1298 and then wanting only a dome. The work was intrusted to him and was finished in his lifetime with the exception of the lantern designed to crown the whole. This lantern was later added according to his plans; Brunelleschi's dome, measured diametrically, is one of the largest in the world and served as a model to Michelangelo for that of Saint Peter's. His final masterpiece was the Pitti Palace in Florence. See *Architecture*.

Brunhilde (*brŭn'hĕld'*) (**c. 550-613**), (Brunehaut, Brunhilda or Brunhildis), daughter of the Visigothic king, Athanagild; married King Sigebert of Austrasia; and was afterward regent for her two grandsons—Theodebert II, king of Austrasia, and Theodoric II, king of Burgundy. She divided the government of the whole Frankish world with her rival Fredegond, who governed Neustria for the youthful Clotaire II. On Fredegond's death in 598, Brunhilde seized Neustria and, for a while, united under her rule the whole Merovingian dominions. She was overthrown, however, in 613 by the Austrasian nobles under Clotaire II and was put to death by being dragged at the heels of a wild horse.

Bruno, Saint (**c. 1030-1101**), founder of the Carthusian order, was born at Cologne; became rector of the cathedral school at Reims; but, oppressed by what he considered the wickedness of his time, withdrew in 1084 to the wild mountain of Chartreuse, near Grenoble. Here, with six friends, he founded the austere order of the Carthusians. In 1094, he established a second Carthusian monastery, at Della Torre in Calabria, where he died.

Bruno (*brōō'nō*), **Giordano** (**1548-1600**), Italian philosopher, was born at Nola, near Naples; was trained as a Dominican; but, doubting the Christian dogmas, fled to Geneva, whence Calvinist suspicion of his skepticism drove him to Paris. Here the zeal of the orthodox Aristotelians forced him to withdraw to London in 1583 and to Oxford, where he repeatedly gave lectures. In 1585, he was in Paris again; in 1586, in Wittenberg; in 1588, in Prague; then in Helmstedt, Frankfort, Padua; in 1592, in Venice, he was arrested by the officers of the Inquisition and was conveyed in 1593 to Rome, where he was imprisoned and condemned to death as a heretic.

Bayle styled him "the knight-errant of philosophy." His teachings embodied the essentials of pantheism later expressed by Spinoza. His published writings display throughout a strong, courageous soul, susceptible of deep enthusiasm and laboring to attain the truth.

Brush, George de Forest (**1855-1941**), American portrait painter, was born in Shelbyville, Tenn. He was a pupil of Gérôme in Paris and first became known to the American public in 1883 by "The Silence Broken," "The Indian and the Lily," "The Moose Chase," and other pictures of Indian life. After returning from further study in Paris, he devoted his efforts chiefly to figure composition, particularly to the portrayal of mother and child, producing many family groups and portraits which won much popularity. He was elected to the National Academy of Design and to the American Academy of Arts and Letters. Examples of his work are found in the Boston Museum, Metropolitan Museum of Art, New York, Pennsylvania Academy of Fine Arts, Philadelphia, and the Corcoran Art Gallery, Washington.

Brutus, Marcus Junius (**c. 85 B. C-42 B. C.**), was born about 85 B. C. He joined Pompey in his war against Cæsar; but, after Pompey's defeat, he was kindly treated by Cæsar and was made governor of Cisalpine Gaul. In 44 B. C., in his eagerness to preserve the republic, he was persuaded by Cassius to join a conspiracy against Cæsar, who had become virtually an emperor. Brutus aided in the assassination of Cæsar. The people, instead of rejoicing at Cæsar's death, were enraged, and Brutus fled from Rome. Soon after, he and Cassius were defeated at Philippi by Antony and Octavius. Feeling their cause was lost, Brutus fell upon his sword and died. He was an earnest student and something of a philosopher.

Bryan, Ruth (**1885-1954**), American politician and the first American woman to be appointed minister to a foreign country, was born at Jacksonville, Ill., the daughter of William Jennings Bryan. She was secretary to her father in the presidential campaign of 1908. Two years later she married Major Reginald Owen, a British engineer, who died in 1927 after a long period as an invalid. She was a popular platform lecturer on political subjects and, from 1929 to 1933, served as a Democratic member of Congress from Florida. In 1933, President Roosevelt appointed her minister to Denmark. She served until 1936, in which year she married Borga Rohde, gentleman in waiting to King Christian X of Denmark.

Bryan, William Jennings (**1860-1925**), American political leader and orator, was born in Salem, Ill.; was graduated at Illinois College, Jacksonville, and at Union College of Law, Chicago; practiced at Jacksonville, Ill., 1883-87; then at Lincoln, Nebr. He was a member of Congress, 1891-95; received the Democratic vote for United States senator in Nebraska legislature, 1893; and edited the Omaha *World-Herald*, 1894-96.

He was a delegate to the national Democratic convention, 1896; wrote the "silver plank" in its platform; and was nominated for president of the United States after delivery of a stirring address known later as the "Cross of Gold" speech. He received 176 electoral votes against 271 for William McKinley. In May 1898, he raised the 3d regiment of Nebraska volunteer infantry for the war against Spain, becoming its colonel. He was nominated for president in 1900 by the Democratic, Populist, and Silver Republican conventions, but was again defeated by William McKinley. After the election, he established a weekly political magazine, *The Commoner*. He was again nominated for president in 1908, but was defeated by W. H. Taft.

In 1913, President Wilson appointed Bryan secretary of state, in which office he negotiated 30 treaties of arbitration. He resigned in 1915 in protest against the administration's attitude toward Germany. In 1921, he identified himself with the Fundamentalist movement and with popular efforts to prevent the teaching of Darwinian evolution in the schools. He died suddenly at Dayton, Tenn., while assisting at the prosecution of J. T. Scopes, charged with violating an anti-evolution law in that state. See *Free Silver Movement*.

Bryant, William Cullen (**1794-1878**), American poet and journalist, was born at Cummington, Mass. At the age of 10, he published translations from Latin poets; at 13, he wrote a terse and vigorous political poem, entitled *The Embargo;* and, at 18, he composed the popular poem *Thanatopsis*. He established *The New York Review*, to which he contributed many of his best works. In 1826, he became principal editor of *The Evening Post*, a leading paper of New York. The first collected edition of his poems appeared in 1832 and was regarded as the highest effort of the American muse up to that time. In 1842, he published *The Fountain, and Other Poems*. He visited Europe several times and recorded his observations in *Letters of a Traveler in Europe and America*. In 1870 appeared his metrical translation of the *Iliad*, followed in 1871, by that of the *Odyssey*. Bryant was elected to the American Hall of Fame in 1910.

Bryce (*brīs*), **James, Viscount** (**1838-1922**), British historian, diplomat, and statesman, was born at Belfast, Ireland; was educated at Glasgow University and Oxford. He was admitted to the bar, 1867; became regius professor of civil law at Oxford University in 1870; and sat in Parliament, 1880-1907. He also served successively as chancellor of the Duchy of Lancaster, president of the British Board of Trade, chief secretary for Ireland, and ambassador to the United States. In 1913, he was ap-

pointed member of the Permanent Court of Arbitration at The Hague and was created viscount, 1914. He was a conspicuous advocate of home rule for Ireland and of international copyright, supporting the Liberal party throughout his parliamentary career.

While a prominent figure in political affairs, he became still more widely known as a writer, notably for his *American Commonwealth*, a valuable treatise on the political institutions of the United States. His other works include *The Holy Roman Empire* and *Modern Democracies*.

Buchanan (*bŭ-kăn'ăn; bû-kăn'ăn*), **James (1791-1868)**, 15th president of the United States, was born near Mercersburg, Pa.; was graduated at Dickinson College, 1809; was admitted to the bar, 1812; and was a member of Congress, 1821-31. He also served successively as minister to Russia, United States senator, secretary of state, and minister to England. He became president in 1857. In his last message, President Buchanan censured the Northern people for the imminent disruption of the Union, holding that neither the executive nor Congress had power to coerce a state. In 1866, he wrote a book to defend his administration.

Buchman, Frank Nathan Daniel (1878-1961), American religious leader, was born at Pennsburg, Pa. Educated at Muhlenberg College and Mount Airy Lutheran Theological Seminary, he was ordained a Lutheran minister in 1902; had a pastorate at Overbrook, Pa., until 1905; after a period in which he organized Lutheran hospices, foreshadowing the "house parties" of his later career, entered Y. M. C. A. work, traveling widely; and, in 1921, visited Oxford University, where he founded a new religious movement known first as Buchmanism and later as the Oxford Group movement. Religious experiences were shared at "house parties," the participants holding that, by following what they felt to be the Divine will, they would solve their personal problems and collectively solve national and social problems. The movement spread through most countries of the world by means of conferences and personal contact evangelism.

Buchner (*bōōk'nĕr*), **Eduard (1860-1917)**, German chemist, was born in Munich. He was educated at the universities of Munich and Erlangen. In 1893, he became professor at Kiel; in 1896, at Tübingen; and, in 1898, at the Agricultural College in Berlin. He was appointed professor at Breslau in 1909 and was made privy councilor in 1910. He made the remarkable discovery that the alcoholic fermentation of sugars is not caused by the physiological processes going on in living yeast plants but by the purely chemical action of an enzyme. In recognition of this contribution to science, he received the Nobel prize for chemistry in 1907.

Buck, Dudley (1839-1909), American organist and composer, was born in Hartford, Conn.; studied at Trinity College; then at Leipzig Conservatory of Music and at Dresden and Paris. For several years, he was organist at Music Hall, Boston; was organist at Holy Trinity Church, Brooklyn, and director and organist at the Apollo Club for 25 years, retiring in 1903. Among his compositions are the *Centennial Cantata, Golden Legend, Light of Asia, Deseret, Marmion*, and *The Christian Year*. He wrote *Illustrations in Choir Accompaniment*.

Buck, Frank (1884-1950), American wild animal hunter and motion picture producer, was born at Gainesville, Tex. Educated in the public schools, he evinced great interest in animals at an early age. After working on newspapers in Chicago until 1911, he made the first of many expeditions for the purpose of capturing wild animals in Malaya, Borneo, India, and Africa. He worked out successful techniques for taking the animals alive and capitalized on his success by the production of motion picture films which, together with his books, brought him a wide reputation as an intrepid and skillful hunter. He wrote, in collaboration, *Bring 'Em Back Alive* and *Fang and Claw*. His other writings include *On Jungle Trails* and *Animals Are Like That*.

Buck, Pearl Sydenstricker (1892-), American novelist, was born at Hillsboro, W. Va., while her parents, who were missionaries to China, were on furlough. Her childhood was spent in China, and she was educated at home and later in Shanghai, Europe, and Randolph-Macon Woman's College, Va., where she graduated in 1914. Returning to China, she married a missionary, John L. Buck, who taught at Nanking University, where she also lectured.

Mrs. Buck's first novel, *East Wind: West Wind*, was followed in 1931 by *The Good Earth*, a story in Chinese setting which, by its evident fidelity to life and its moving biblical simplicity of language, conveys a sense of the universal drama of mankind. Her other works include *Sons, The Young Revolutionist, Fighting Angel*, and *The Patriot*. Her unorthodox views on Christian missions aroused a controversy, as a result of which she resigned her mission post in 1933. In 1935, she married Richard J. Walsh, having divorced her previous husband. The 1938 Nobel prize in literature was awarded to her. She has written a number of books for children, examples of which are *Water Buffalo* and *The Big Wave*. Important recent books are *Come, My Beloved* (1953), *My Several Worlds* (1954), and *Imperial Woman* (1956).

Budæus, or **Budé** (*bü'dā'*), **Guillaume (1467-1540)**, French scholar was born in Paris. He was educated in Paris and Orléans. Beginning with his 24th year, he devoted himself to belles-lettres, philosophy, and Greek. As a Greek scholar, he attained notable fame, and he was held in great esteem as a citizen and man of affairs. He became royal librarian, and, at his suggestion, Francis I founded the Library at Fontainebleau which, upon being removed to Paris, became the celebrated Bibliothèque Nationale, the National Library. Likewise at his suggestion, Francis established the corporation of the royal readers, out of which grew the Collège de France. His *Commentarii Linguæ Græcæ* greatly stimulated the study of Greek literature in France, and his *Annotationes in XXIV Libros Pandectorum* marked an era in the study of Roman law.

Buddha (*bōōd'ä*) is the title of the Hindu sage Gautama, or Siddhartha, the founder of Buddhism. The term signifies "the wise, or enlightened" and is applied in the East as an analogue of our word "saint." Oriental scholars concur in fixing the time of the great Buddha in the 6th century B. C. He was the son of a king, named Suddhodana. His father, fearing lest his son should desert his high station and take to a religious life, had him early married to a charming princess and surrounded with all the splendor and dissipation of a luxurious court. Twelve years spent in this environment only deepened his conviction that all life could offer was vanity, and he therefore resolved to learn whether a life of austerity would lead to peace.

Search for Spiritual Peace. Gautama escaped from the palace and entered on the life of a religious mendicant when about 30 years of age. He began by studying all that the Brahmans could teach him, but, finding their doctrine unsatisfactory, he turned to asceticism. He resolved to conquer the secret of peace by sheer force of thinking. He arrived at the conclusion that ignorance is the ultimate cause of existence and that, therefore, with the removal of ignorance, existence and all its anxieties would be cut off at their source. Passing through successive periods of contemplation, he realized this truth in his person and attained the perfect wisdom of the Buddha, "the Enlightened."

Ministry. Having acquired the knowledge of the causes of misery and the means by which these causes are to be counteracted, the Buddha was now ready to lead others on the road to salvation. He first preached at Benares; but the most important of his early converts was the sovereign of Magadha, whose dynasty continued for many years to encourage the new faith. Buddha traversed a great part of northern India, combating the teaching of the Brahmans and everywhere making numerous converts.

Spread of Buddhism. His disciples, well trained and organized, continued his work after him. The doctrines and rules of discipline were settled in general councils, the most important of which convened about 250 B. C. in the reign of Asoka. Buddhism was carried into Ceylon, Burma, and Thailand. By the beginning of the Christian era, it had become the religion of the northwesterly parts of India and adjacent regions. It was adopted in China in 62 A. D., whence it extended into Korea and Japan.

Doctrines. Buddha was one of the first religious leaders to proclaim universal brotherhood. It was this doctrine of equality which gave Buddhism so strong a hold in caste-ridden India. He taught that salvation came to all through self-denial and charity. Purity of conduct, suppression of desire, and continuous contemplation were sufficient to raise one to the highest state of bliss, or Nirvana, which amounted eventually to the extinction of consciousness.

The three main doctrines of Buddhism are: the transmigration of souls, the desirability of Nirvana, and the chain of cause and effect. As a result of this last doctrine, the idea of sin has little place in the religion. Buddhism is highly philosophic, yet, modified and combined with other systems, it is today one of the great religions of the world. Buddha died at Kusinagara, India, at the age of 80.

Buffon (*bŭf'ŭn; bü'fôn'*), **Georges Louis Leclerc, Count de (1707-1788)**, French naturalist, was born in Montbard. He was educated for the law but after traveling for a time, devoted himself to science. In 1739, he was elected a member of the Academy of Sciences and was appointed director of the Royal Garden. His *Natural History*, in 44 volumes, was the first attempt to collect all the facts of natural history and bring them together in a popular and intelligible form. It may, therefore, be considered one of the stepping stones which led to the formulation of the theory of evolution. Rousseau is said to have kissed the steps of the pavilion in which the book was written.

Bulfinch, Charles (1763-1844), American architect, was born in Boston, Mass. He was graduated from Harvard,

1781, and was the first American to prepare himself for his profession by careful study abroad. His chief works are the Massachusetts State House, Boston; McLean Hospital, Somerville; Massachusetts General Hospital, Boston; and the west porticoes of the Capitol at Washington.

Bulganin (*bŏŏl-gä'nyĕn*), **Nikolai A.** (**1895-**), was born in Gorki (formerly Nishni-Novgorod), Russia. In 1917, he joined what is now the Communist party, advancing in its ranks through positions in the secret police, the economic administration, the state bank, and the foreign service. He was mayor of Moscow, 1931-1936, and during World War II he was assistant minister of defense. After the death of Stalin in 1953, he became vice-premier, then premier succeeding Georgi Malenkov. In 1958 he was in turn displaced by Nikita Khrushchev, after which he was assigned to subordinate tasks in Outer Mongolia and other remote areas. In his last year as premier he wrote letters warning Turkey not to antagonize Syria and cautioning Adenauer against accepting atomic weapons.

Bull, Ole Bornemann (**1810-1880**), violinist, was born in Bergen, Norway, in 1810. Largely self-taught, he specialized as a virtuoso, his rendering of difficult works evoking great enthusiasm, which was heightened by his expressive playing of national airs. He amassed a fortune, which he lost in a scheme to found a colony of his countrymen in Pennsylvania. He afterward settled at Cambridge, Mass., and had a summer residence in Norway, where he died.

Bulwer, Sir Henry (**1801-1872**), is the name commonly applied to William Henry Lytton Earle Bulwer, Baron Dalling and Bulwer, English diplomatist and author, an elder brother of Bulwer-Lytton, the novelist. He was born in London. In 1837, he became secretary of the British embassy at Istanbul, where he negotiated and concluded a treaty that became the foundation of the commercial system of England in the East. In 1843, he was made minister plenipotentiary to the court of Madrid and negotiated peace between Spain and Morocco the following year. In 1849, he came to Washington, where he evinced equal art in negotiating the Clayton-Bulwer Treaty. Among his works are *An Autumn in Greece; France: Social, Literary, and Political; Life of Byron;* and *Historical Characters.*

Bunche, Ralph J. (**1904-**), American diplomat, political scientist, and educator, was born at Detroit, Michigan, the grandson of an American slave. His studies at the University of California and later at Harvard University were mainly in the field of political science, a subject which he taught for several years at Howard University. During World II he was co-ordinator of information for the U. S. Government in Africa and the Near East. In 1946 he was "loaned" by the State department to the United Nations. His most notable service for that organization was in taking over the task of mediator in Palestine following the assassination of Count Bernadotte in 1948. As a result of protracted negotiations, Dr. Bunche finally succeeded in bringing about a peaceful settlement of the dispute between Israel and the Arabs. He was awarded the Nobel peace prize, 1950.

Bunin (*bŏŏ'nyĕn*), **Ivan** (**1870-1953**), Russian novelist, was born at Veronezh, in an impoverished family of the aristocracy. Early honors came to him for his poetry and, after 1892, for his novels, which, with little plot, depicted chiefly Russian peasants and the declining landed class, adolescence, and Oriental tales. He traveled widely. His style imparts a sense of universality to local themes. After the Russian revolution, he lived in exile, although the personal dislocation involved produced little visible effect either on his themes, spirit, or productivity. Award of the Nobel prize in literature for 1933 brought official recognition for a series of novels that include *The Village, The Well of Days, Grammar of Love,* and *Tolstoy's Liberation.*

Bunner, Henry Cuyler (**1855-1896**), American humorist and short-story writer, was born in Oswego, New York, and was educated in New York City. He began journalism as a reporter and, in 1877, joined the editorial staff of *Puck,* which soon after, under his editorship, assumed a dignity and influence unusual in the comic press. His satirical editorials became a powerful social and political force.

In 1886, he published a novel, *The Midge,* followed in 1887 by *The Story of a New York House,* but his permanent fame rests upon his mastery of the short story. The best of his short stories are included in volumes entitled *Short Sixes, Zadok Pine, Love in Old Cloathes,* and *Made in France,* which are models of story-telling and character drawing.

Bunsen, Robert Wilhelm (**1811-1899**), German chemist, was born at Göttingen. He was the first to produce magnesium in large quantities, and, in 1860, he invented the magnesium light, important in photography. His greatest discovery was that of spectrum analysis, made in conjunction with Kirchhoff. Bunsen will always be remembered by physicists and chemists for the much-used photometer and gas burner which bear the Bunsen name. The principle of the Bunsen burner is now widely utilized in gas stoves for cooking purposes. He also made valuable discoveries in organic chemistry and invented the ice calorimeter, a filter pump, and other apparatus.

Bunyan, John (**1628-1688**), English writer, was born at Elstow, near Bedford. For some years, he followed his father's trade of traveling tinker. After a short service in the parliamentary army, he married at the age of 19. His marriage was followed by his conversion, or religious "awakening." In 1655, he became a member of the Baptist congregation at Bedford and subsequently its pastor.

After the Restoration, he was convicted in 1660 under the act forbidding divine services other than those of the Anglican Church and was thrown into Bedford jail, where he remained for more than 12 years, supporting his family by making tagged laces. There he wrote his most famous book—*The Pilgrim's Progress.* He was released from prison in 1672 and again became pastor of the Bedford congregation. Of Bunyan's other works, the chief are his *Grace Abounding to the Chief of Sinners,* an autobiography, and the allegorical *Holy War.* He wrote also a volume of verse entitled *Divine Emblems.* Died in London.

Burbank, Luther (**1849-1926**), American plant breeder and horticulturist, was born in Lancaster, Mass.; was educated at Lancaster Academy; and early devoted himself to the study of plant life. He removed to Santa Rosa, Cal., 1875, where he established experiment farms and was later appointed special lecturer at Leland Stanford University. His success in developing valuable new forms of plant life aroused wide interest in plant breeding. These new varieties include the Burbank potato introduced in 1872; a spineless opuntia, for feeding cattle in the desert; gold, Wickson, apple, October purple, chalco, America, and climax plums; giant, splendor, sugar, and stoneless prunes; a new fruit, the plumcot; peachblow, Burbank, and Santa Rosa roses; gigantic forms of amaryllis; the Shasta daisy; giant and fragrance callas; and various new apples, peaches, nuts, and berries. He wrote *How Plants are Trained to Work for Man.*

Burchard, John E. (**1898-**), architect, was born at Marshall, Minn. He studied liberal arts and medicine at the University of Minnesota and architecture at the Massachusetts Institute of Technology, where he is now dean of the school of humanities and social studies. He has served as consultant architect and has lectured extensively on the Fine Arts. His writings include *Religious Faith and World Culture* and *The Metropolis in Modern Life.*

Burchfield, Charles Ephraim (**1893-**), artist, was born in Ashtabula, Ohio. He studied at the Cleveland School of Art, and in 1921 became a wallpaper designer in Buffalo, N.Y. Since 1929 he has been a landscape painter mainly in water colors. He is represented by pictures in the leading art museums of the country, including the Boston Museum of Fine Arts, and the Metropolitan Museum and the Museum of Modern Art in New York. In 1960, he received the Gold Medal Award from the National Institute of Arts & Letters.

Burgess, Frank Gelett (**1866-1951**), American humorous writer and illustrator, was born in Boston; graduated at Massachusetts Institute of Technology, 1887; and became a draftsman with the Southern Pacific railway in 1887. He was instructor in topographical drawing at the University of California, 1891-94. In the latter year, he became designer and associate editor of *The Wave* and later was editor of the *Lark* in San Francisco and writer for various magazines in New York. In 1898, he removed to London and resided later successively in San Francisco, Boston, and New York. He is the author and illustrator of many delightfully whimsical books, among which are *Goops and How to Be Them, The Purple Cow, The Rubaiyat of Omar Cayenne,* and *Short Words Are Words of Might.*

Burgoyne (*bûr-goin'*), **John** (**1722-1792**), British general. He early entered the army and, in 1762, displayed much talent and enterprise in command of British troops in Portugal. In the American war, he led the army which was to penetrate from Canada into the revolting provinces. At first he was successful, but was ultimately compelled to surrender at Saratoga, 1777. Displeased by the conduct of the ministry after his return to England, he retired and devoted himself to writing, producing several successful books and a comic opera.

Burke, Arleigh A. (**1901-**), naval commander, is a native of Boulder, Colorado, from where he was appointed to the U. S. Naval Academy. Except for an interval spent n graduate study at the University of Michigan, he has served through a continuous series of progressively more responsible assignments. He was commander of a destroyer squadron in World War II, then chief of staff of the Atlantic Fleet. He commanded a cruiser force during the Korean War and was a member of the Armistice Commission. From 1955 to 1961 he was chief of the U. S. Naval Operations.

Burke, Edmund (**1729-1797**), Br ish statesman and orator, was born at Dublin and was educated at Trinity College in his native city. Going to London, he attracted

attention by his essays on the *Sublime and Beautiful*, and devoted himself to literature, founding, in 1759, *The Annual Register*. In 1761, he became private secretary to Hamilton, the chief secretary for Ireland, and served Lord Rockingham in the same capacity when that nobleman became prime minister. In 1766, Burke entered Parliament, where his speeches on American affairs created a deep impression.

In 1782, Burke became paymaster in Lord Rockingham's government. He again took office in the Duke of Portland's coalition ministry, when he made a famous speech on the India bill. In the impeachment of Warren Hastings, Burke played a leading part, his opening speech extending over four days. The outbreak of the French Revolution was the occasion of one of his finest efforts of oratory. Burke's hostile attitude to the Revolution severed many of his political friendships, and he seceded from the Whig party. In 1794, he retired from parliamentary life, though he continued to produce pamphlets on political affairs. His other chief works are *A Vindication of Natural Society*, *Thoughts on the Causes of Present Discontents*, and *Reflections on the Revolution in France*.

Burleigh (*bĕr'lĭ*), **William Cecil, Baron (1520-1598)**, English statesman, was born at Bourne. Entering Gray's Inn at the age of 21, he devoted himself assiduously to the study of law. His manifold abilities recommended him to the notice of Henry VIII, who presented him with an office in the common pleas. In 1547, he was appointed master of requests, and his talents soon procured for him the office of secretary of state. When Queen Mary ascended the throne, Burleigh, being a Protestant, resigned his official employment, but, as a private gentleman, he maintained amicable relations with the Roman Catholic party. Elizabeth made him secretary of state upon her accession in 1558, and, for 40 years, he was responsible for the wise constructive policy that made her reign famous.

Burne-Jones, Sir Edward (1833-1898), English painter, was born of Welsh ancestry at Birmingham, England. He was educated at Exeter College, Oxford, where William Morris, the poet, was his friend. In 1856, they left Oxford to devote themselves to art and settled in London, where they studied together under the guidance of Rossetti until 1859. In 1860, Burne-Jones married Georgiana McDonald; in 1862, traveled in Italy with John Ruskin; and, in 1865, removed from London to Fulham.

He is properly classed with the pre-Raphaelite group of English painters. His pictures, which are half-classic, half-romantic in character, are highly decorative and notably excellent in color. He furnished striking designs for stained glass at Christ Church, Oxford, and elsewhere, and powerfully influenced decorative art in England.

Burnett (*bûr'nĕt*), **Frances Hodgson (1849-1924)**, née Frances Eliza Hodgson, author and playwright, was born in Manchester, England, and, at 7 years of age, was brought to Knoxville, Tenn. In 1873, she married Dr. L. M. Burnett, from whom she obtained a divorce in 1898, and, in 1900, married Stephen Townesend, an English author who died in 1914. Her story, *Surly Tim's Trouble*, in *Scribner's Magazine*, 1872, attracted attention and, in 1877, she won wide literary recognition by *That Lass o' Lowrie's*. Her most successful book *Little Lord Fauntleroy*, which she later dramatized, appeared in 1886.

Burnham, Daniel Hudson (1846-1912), American architect, was born in Henderson, N. Y. He received his education in Chicago and under tutors at Waltham, Mass. In 1872, he formed a partnership with John W. Root, a designer of taste and ability and, upon the death of the latter, in 1891, was joined by C. B. Atwood.

The planning of the World's Columbian Exposition at Chicago, 1893, was commissioned to this firm. The excellent administrative generalship, professional skill, and artistic taste which he displayed in this vast project, as well as in the various other undertakings of his firm, won him a world-wide reputation, and his influence upon contemporary architects was great. He designed many notable public and commercial structures such as the Rookery, Masonic Temple, and Railway Exchange in Chicago, the Flatiron Building in New York, the Pennsylvania Railway station, Pittsburgh, and the Union passenger station at Washington. He also gained great fame as a city planner and was chairman of the national committee for beautifying Washington.

Burns, Arthur F. (1904-), economist, was born at Stanislav, Austria, but grew up in New York City and was educated at Columbia University. After serving as director of the Nation Wide Securities Company, he became chairman of President Eisenhower's Council of Economic Advisers and also of the President's Advisory Board on Economic Growth and Stability. Burns is looked upon as one of the more conservative economists among American teachers and writers. He is the author of *Frontiers of Economic Knowledge* and of *Prosperity without Inflation*.

Burns, Robert (1759-1796), Scottish poet, was born at Alloway, near Ayr, Scotland, 1759. He was the son of a small farmer and was brought up amidst indigence and adversity. He received, however, the advantages of a common school education, though his chief advances in general knowledge he owed to the books he read, among which were *The Spectator*, the works of Pope, and the poems of Allan Ramsay. He was familiar also with songs and ballads, mostly of unknown authorship, which then circulated in that part of Scotland.

When 16 years of age, he fell in love, and his feelings, as he tells us, at once burst into song. His first volume of poetry was issued in 1786, and it at once became popular. The success of this volume, which was speedily republished in Edinburgh, induced him to take the farm of Ellisland, near Dumfries, where he married his "bonny Jean" in 1788. Farming proving a failure, he removed to Dumfries in 1791 and, having been appointed to a position as exciseman which had been obtained for him by a friend, he subsisted entirely upon his income from that office, which yielded approximately £70 a year. In 1792, he wrote about 100 songs as accompaniments to the melodies of Scotland, and for these, which are now among the world's priceless possessions, he received the sum of £5.

Disappointment now embittered him; in his office, a dangerous one to men of his tendencies, intemperance gradually gained upon h m, while want threatened him, and, in his 38th year, he sank into an untimely grave. During his short and sad life, he wrote some of the finest poems in the language, the appreciation of which has become world-wide and has made sure his lasting fame.

Burnside, Ambrose Everett (1824-1881), American soldier, was born at Liberty, Indiana; served an apprenticeship to a tailor; but was graduated from West Point in 1847. He left the army as first lieutenant in 1852, but returned as colonel of volunteers for the Federal cause in 1861; commanded a brigade at Bull Run; and, in February 1862, captured Roanoke Island. Having rendered important service at South Mountain and Antietam, he, in November, reluctantly superseded McClellan as general of the army of the Potomac. In December 1862, he crossed the Rappahannock and attacked Lee near Fredericksburg, but was defeated with a loss of over 10,000 men. In 1863, he successfully held Knoxville and, in 1864, led a corps under Grant through the battles of the Wilderness and Cold Harbor. He resigned in April 1865; was governor of Rhode Island, 1866-68; and was elected United States senator in 1875. Died at Bristol, R. I.

Burr, Aaron (1756-1836), American statesman, was born at Newark, N. J. He was a lieutenant colonel in the Revolutionary War; became attorney general of New York in 1789 and was United States senator, 1791-97 and vice president of the United States, 1801-05. In a duel, the culmination of bitter political animosity, he mortally wounded Alexander Hamilton, 1804. In 1807, he was charged with treason on the ground that he intended to subdue and rule Mexico, but was acquitted. After unsuccessful attempts to raise money in Europe for various ambitious schemes, he returned in poverty to New York and practiced law there until shortly before his death.

Burritt, Elihu (1810-1879), "the learned blacksmith," was born at New Britain, Conn. He worked as a blacksmith in his native place and at Worcester, Mass., but devoted all his leisure to mathematics and languages—Latin, Greek, Hebrew, Arabic, and most of the modern European languages. He was best known to the world as an earnest apostle of peace, through his *Christian Citizen*, and by lectures given in Europe and in the United States. Among his works are *Sparks from the Anvil*, *Olive Leaves*, *Peace Papers*, *Walks in the Black Country*, and *Chips from Many Blocks*. He took a prominent part in advocating an ocean penny-postage. For many years he lived in England, and from 1865 to 1870 he was United States consul at Birmingham. Died in his native city.

Burroughs (*bŭr'ōz*), **John (1837-1921)**, American essayist and naturalist, was born in Roxbury, N. Y.; received an academic education and taught school about eight years; became a treasury clerk in 1864; and was a national bank examiner, 1873-84. In 1874, he retired to a farm at Esopus, N. Y., where he devoted his time to literature and fruit culture. Besides numerous essays, studies of nature and animal life contributed to magazines, he wrote many books. Among his writings are *Birds and Poets*, *Locusts and Wild Honey*, *Indoor Studies*, *Squirrels and other Fur Bearers*, *Literary Values*, *Bird and Bough*, *The Breath of Life*, and *Field and Study*. In 1904, by an article in *The Atlantic Monthly*, he criticized sham natural history and precipitated a widespread controversy over "nature fakers." He was a member of the American Academy of Arts and Letters.

Burton, Harold Hitz (1888-1964), American jurist, was born at Jamaica Plain, Mass. A graduate of Bowdoin College and of Harvard Law School, he began the practice of law in Cleveland, Ohio, in 1912. From 1935 to 1940

was mayor of Cleveland. In 1941 he became a Republican senator from Ohio. In 1945 President Truman appointed him an associate justice of the Supreme Court.

Burton, Sir Richard Francis (1821-1890), English traveler, was born in Hertfordshire. He entered the Indian army in 1842. Having mastered Hindustani, Persian, and Arabic, he disguised himself as an Afghan pilgrim, and made the daring journey described in his *Pilgrimage to El Medinah and Meccah*. In 1858 he, with Speke, discovered Lake Tanganyika. He afterward traveled in America. He was British consul at Damascus, Trieste, and elsewhere. He was knighted in 1886. Among Burton's many works are *First Footsteps in East Africa, City of the Saints, The Nile Basin, Vikram and the Vampire,* and a celebrated translation of the *Arabian Nights*. Died at Trieste.

Bush, Vannevar (1890-), American administrator, was born in Everett, Mass., and studied at Tufts College, Massachusetts Institute of Technology, and Harvard. He was professor and later dean of engineering at Massachusetts Institute of Technology, 1919-38. He became president of the Carnegie Institution of Washington in 1939. After directing defense research during World War II he was made chairman of the joint research and development board in 1946. He took part in work on the atomic bomb.

Bushnell, Horace (1802-1876), American theologian, was born at New Preston, Conn. He was graduated at Yale, 1827; was for some time an editor of the New York *Journal of Commerce*, and, in 1833, was ordained to the Congregational ministry. He preached with distinction at Hartford, Conn., from 1833 to 1839, resigning because of ill health. His influence grew rather from his spiritual earnestness and the force of his thought than from his theological teaching. His works include *God in Christ, Christ in Theology,* and *Vicarious Sacrifice*.

Butler, Benjamin Franklin (1818-1893), American politician and general, was born in Deerfield, N. H. He studied law and settled in Massachusetts, where he became recognized as one of the leading Democrats of New England. In 1860 he took a prominent part in the movement which nominated Breckinridge and split the Democratic party. In the Union army during the Civil War he commanded the departments of the Gulf and of the South Atlantic. His reputation came chiefly from his civil regulations.

In 1866 and again in 1868, he was elected to Congress by the Republicans of his district in Massachusetts. Defeated in 1874, he deserted the Republican party, and, in 1882, was elected governor by the Democrats. In 1884, after bitterly opposing the nomination of Grover Cleveland for the presidency by the Democratic party, he became the presidential nominee of the Greenback party. He was an able but erratic administrator and soldier.

Butler, Joseph (1692-1752), English theologian, was born at Wantage, in Berkshire. After being graduated from Oriel College, Oxford, in 1718, he was appointed preacher at the Rolls chapel, where he delivered a series of remarkable sermons. In 1738, he was made bishop of Bristol: in 1740, he became dean of Saint Paul's; and, in 1750, he was appointed bishop of Durham. In 1736, he published *Analogy of Religion*, which long stood as the principal answer to the school of deism in theology.

Butler, Nicholas Murray (1862-1947), American educator and publicist, was born at Elizabeth, N. J. He was graduated from Columbia College in 1882, was fellow in philosophy, 1883-84, and spent a year in advanced study in Berlin and in Paris. Returning to Columbia in 1885, he became assistant in philosophy and, later, professor of philosophy and education. Upon the reorganization of Columbia College as Columbia University in 1890, he was chosen dean of the faculty of philosophy, ethics, and psychology. In 1887, he organized the New York College for the training of teachers, now Teachers College, affiliated with Columbia University. Butler was made acting president of Columbia University in 1901 and, in 1902, was chosen president. His administration was characterized by marked interest in the broader relations of the university. He retired in October, 1945.

In 1911, he was elected member of the American Academy of Arts and Letters, becoming president in 1928. In 1912, Butler was selected by the Republican national committee as candidate for vice president of the United States. He was awarded one-half the Nobel prize for peace in 1931. Intimacy with people in public life both in the United States and other countries gave his opinion weight in public affairs. His writings include *The Meaning of Education, The Faith of a Liberal, Between Two Worlds, Across the Busy Years,* and *The World Today*.

Butler, Samuel (1612-1680), English satirist, was born at Strensham, Eng.; in his 17th year, he became attached to the household of the Earl of Kent, when he frequently attended meetings at the house of a Sir Samuel Luke, a strict Puritan and Parliamentarian. The experiences of this time furnished him with the material for his famous work *Hudibras*, a kind of Don Quixote in verse, in which the Puritans were the subject of ridicule.

Butler, Samuel (1835-1902), English author, was born at Langar. Refusing to enter the Church as his father wished, he went to New Zealand and successfully operated a sheep ranch for five years. Returning to England he took up painting and musical composition with moderate success. His pen, however, was destined to bring him fame. *Erewhon* appeared in 1872, an account of a visit to an imaginary country by means of which he satirized his contemporaries. His one novel, *The Way of All Flesh*, largely autobiographical, is an attack on the pattern of middle class family life of the day. Butler wrote in criticism of Darwin's theory of evolution, holding that unconscious memory and conscious striving for adaptation to environment constitute the mechanism of biological evolution.

Byng (*bing*), **Julian Hedworth Byng, Viscount (1862-1935),** British general, son of the earl of Strafford. He served in the Sudan expedition, 1884, and in the South African War, 1899-1902. For services at the Dardanelles, 1915, he was made lieutenant general and, in 1916, had command of the Canadian division on the western front.

In November 1917, Byng won a signal victory at Cambrai, breaking through the strongest trench systems by means of tanks, which he was the first to employ on a large scale. In March 1918, after the disaster to Gough's army in Picardy, Byng thwarted the efforts of the Germans to extend their gains, crushing their most powerful attacks against Arras and Vimy Ridge. For this and his subsequent service, he was made, in 1919, earl of Vimy and of Thorpe le Soken. He served as governor general of Canada, 1921-26, and was head of Scotland Yard, 1928-31.

Byrd, Harry Flood (1887-), American statesman, newspaper publisher, and farmer, was born at Martinsburg, W. Va., and was educated in the public schools and Shenandoah Valley Academy, Winchester, Virginia. At the age of fifteen, he went to work for the *Winchester Star*. He is now publisher of that paper and also the Harrisonburg (Va.) *Daily News and Record*. He was elected to the Virginia Senate in 1915, in which he served until elected governor of the Commonwealth for the term 1926-30. He has been United States Senator since 1933. Through continuous service as a member of the Senate Finance Committee and, since 1941, as chairman of the Joint Committee on Reduction of Non-essential Federal Expenditures, he has come to be regarded as the foremost advocate of the pay-as-you-go principle in government financing. In this way he earned the nickname of "Mr. Economy." He is a brother of Commander Richard E. Byrd. His farming interests include apple growing and peach culture.

Byrd, Richard Evelyn (1888-1957), American aviator, was born at Winchester, Va. At the age of 12 he made a trip alone around the world. He entered the Navy and, although retired in 1916 on account of an injury, he continued the service of an officer on active duty, organizing the Navy department's commission on training camps and, in 1918, commanding the U. S. air forces in Canada. He learned to fly and, after World War I, devoted himself to aviation. The rank of commander was conferred on him by special act of Congress. In 1926, he made the first flight over the North Pole and, on June 29-30, 1927, he flew from New York to France. In 1928-30 and in 1933-35, he led successful expeditions to Antarctica for polar exploration. In 1934, Byrd spent about 5 months in isolation making meteorological observations, his experience being recorded in *Alone*. In the course of his first expedition, he flew over the South Pole. Returning again to Antarctica in 1939 and 1946-47, he continued his explorations. His works include *Skyward, Little America,* and *Alone*.

In 1955-56 he led an expedition to Antarctica to establish observation bases for American participation in the International Geophysical Year, 1957-58.

Byrnes, James Francis (1879-), American jurist, was born at Charleston, S. C. Employed in a law office, he became a court reporter and was admitted to the bar in 1903. After 14 years' service as representative and 11 years as senator from South Carolina, he was, in 1941, appointed an associate justice of the Supreme Court. In 1942 he resigned to become director of economic stabilization. In the following year he was made head of the office of war mobilization. He was secretary of state, 1945-47. His book, *Speaking Frankly*, gives an account of his administration. He was governor of South Carolina, 1951-55.

Byron, George Gordon Byron, Baron (1788-1824), English poet, was born in London. In his 11th year, he succeeded his great-uncle, William, Lord Byron. He was sent to Harrow and, in 1805, to Trinity College, Cambridge. Two years later he published his first volume of verse, *Hours of Idleness*.

This volume was fiercely assailed by Lord Brougham in the *Edinburgh Review*, and his sarcasms stung Byron into writing *English Bards and Scotch Reviewers*. In the babble of praise that immediately arose, Byron withdrew from

England, visited the shores of the Mediterranean, and sojourned in Turkey and Greece. On his return in 1812, he published the first two cantos of *Childe Harold*, which met with immediate success, and its author was at once enrolled among the great poets of his country. Six months' stay at Geneva resulted in the third canto of *Childe Harold* and *The Prisoner of Chillon*. *Manfred* and *The Lament of Tasso* were written in 1817. The next year, he was at Venice and finished *Childe Harold* there.

In the next three years, he produced the first five cantos of *Don Juan* and a number of dramas of differing merit, *Cain* and *Werner* being at opposite poles. In 1822, he removed to Pisa and worked there at *Don Juan*, which poem, with the exception of *The Vision of Judgment*, occupied his pen almost up to the close of his life.

In the summer of 1823, Byron sailed for Greece, to aid in that country's struggle for independence. His health, however, began to fail and he died at Missolonghi.

Cabell, James Branch (1879-1958), American novelist, was born at Richmond, Va. He was graduated from William and Mary College in 1898, worked for various newspapers, operated coal mines, and, during 1916-29, was engaged in genealogical and historical investigations. He wrote a series of novels presenting a central conception of human life fitted chiefly to an imaginary medieval country, Poictesme. Among his books are *The Soul of Melicent*, *The Cream of the Jest*, *Jurgen*, and *Hamlet Had an Uncle*. Later books written by him are *Let Me Lie* (1947), *Devil's Own Dear Son* (1949), *Quiet, Please* (1952), and *As I Remember It* (1955).

Cabet (*kȧ'bĕ'*), **Etienne (1788-1856),** French communist, was born at Dijon. In 1848, he went to Texas to found an "Icarian community," so named after his *Voyage en Icarie*, a "philosophical and social romance" describing a communistic utopia. The Texas project was soon abandoned, but the colony was successfully re-established at Nauvoo, Ill., in 1852. In 1856, Cabet was deprived of the directorship of the colony and withdrew to Saint Louis. He was the founder and inspirer of modern communism in its voluntary form. See *Icarian Community*.

Cable, George Washington (1844-1925), American author, was born in New Orleans; was educated in the public schools; served in the fourth Mississippi cavalry of the Confederate army, 1863-65; and was clerk in a cotton factor's office. He was a reporter on the New Orleans *Picayune*, 1865-79, and, from the latter year, devoted himself to literature. Among his writings are *Old Creole Days*, *Madame Delphine*, *The Creoles of Louisiana*, *The Negro Question*, *Gideon's Band*, and *The Amateur Garden*. Cable founded, 1887, the home culture clubs, now called the Northampton People's Institute, for the educational and æsthetic improvement of wage earning people. He was elected a member of the American Academy of Arts and Letters in 1908.

Cabot, John (1450-c. 1498), Italian navigator in English service, was born at Genoa. Being compelled by his business to reside much in Bristol, England, he was appointed by Henry VII, 1496, to the command of a squadron of five vessels on a voyage of discovery in the Atlantic Ocean. In this expedition, he is said to have been accompanied by his sons—Ludovico, Sebastian, and Sanzio. In June 1497, Cabot landed on the North American coast, probably near Cape Breton Island. He is, therefore, entitled to be called the discoverer of North America.

Cabot, Sebastian (1474-c. 1558), Italian navigator, was born at Genoa; was a cartographer of repute; and is said to have accompanied his father, John Cabot, on the latter's voyage of discovery to North America. In 1526, he headed an expedition to South America, where he discovered and named the Rio de la Plata. He spent three years in an unsuccessful attempt to find large silver deposits near this river.

Cabrini, Saint Frances Xavier (1850-1917), first American citizen to be canonized, was born near Lodi, Italy. From her efforts grew the order of Missionary Sisters of the Sacred Heart of Jesus, which, at her death, numbered 3000 religious with 70 houses. Her greatest activity was in the United States, but she traveled extensively in Latin America. She was canonized in 1946.

Cadman, Charles Wakefield (1881-1946), American composer, was born at Johnstown, Pa. He received his musical education in harmony, organ playing, and orchestration in Pittsburgh. He became musical critic on the Pittsburgh *Dispatch* and later an organist in the city and the conductor of the Pittsburgh male chours. His first published compositions appeared in 1904. He wrote many popular Indian songs as well as several Indian operas. These include *The Land of the Misty Water*, *The Garden of Mystery*, and *Shanewis*. His works include *The Vision of Sir Launfal*, *From Wigwam and Tepee*, and *A Witch of Salem*.

Cadorna (*kȧ-dôr'nȧ*), **Count Luigi (1850-1928),** Italian general, member of a famous noble family, was born at Pallanza. After distinguished military service, he was placed in command of the Italian armies when Italy entered World War I. He conducted the Gorizia campaign with success, but after the defeat of Caporetto gave up the chief command to become a member of the Allied supreme war counsel. He was made a field marshal in 1924.

Cædmon (*kȧd'mŭn; kâd'-*) **(?-c. 680),** "the father of English song," was the first Anglo-Saxon who composed in his own language works that are extant. Born in the early 7th century, he was originally a cowherd, attached to the monastery of Whitby. According to a legend, he was commanded in a dream to sing "the beginning of created things." He accordingly produced metrical paraphrases of *Genesis* and other parts of the Bible. Other religious verses have been credited to him, but their authorship is uncertain.

Cæsar, Caius Julius (100 B. C.-44 B. C.), Roman general and statesman. The marriage of his aunt to Marius, an outstanding popular leader, probably helped to determine Cæsar's sympathies in favor of the democratic faction. At the age of 17, he married Cornelia, the daughter of Lucius Cinna. This alliance with Cinna, who headed the popular party, brought upon Cæsar the anger of Sulla, the leader of the victorious oligarchic party. Sulla, who, by 81 B. C., had become dictator of Rome, proceeded to offer rewards for the death of his political enemies. Cæsar was called on to divorce Cornelia. With characteristic intrepidity, however, he refused, preferring to sacrifice his rank and property and even to risk his life rather than to submit. He escaped death only by flight.

Political Career. On his return to Rome after the death of Sulla, 78 B. C., Cæsar found the popular party in a state of great ferment, but he took no part in the attempts of Lepidus to overthrow the oligarchy. To improve his eloquence, Cæsar went to Rhodes to study under the rhetorician Apollonius Molo. In 74 B. C., once again in Rome, he was elected pontifex maximus, and, for the first time, he threw himself earnestly into public life.

In the year 70 B. C., Cæsar first attached himself to Pompey, whose political actions at this time were extremely democratic. In 68 B. C., Cæsar obtained a quæstorship in Spain. In 67 B. C., having divorced Cornelia, he married Pompeia, a relative of Pompey, with whom he was daily becoming more intimate. Two years later, Cæsar entered upon the office of curule ædile and greatly increased his popularity by lavishing money on games and public buildings. In 63 B. C., he was elected pontifex maximus and, shortly afterward, prætor. At the expiration of his prætorship, he was assigned the governorship of Hispania Ulterior.

By rare tact and sagacity, Cæsar effected a reconciliation between the two strongest statesmen of Rome, Pompey and Crassus, and, in 60 B. C., he made with them an alliance, known in history as the First Triumvirate. Both of these men aided him in carrying an agrarian law, by which he consolidated his position in the popular favor. In 59 B. C., Cæsar was elected consul. On the expiration of his term of office, he obtained for himself, by popular vote, the governorship of the province of Gallia Cisalpina and Illyricum for five years, to which the senate added the province of Gallia Transalpina. The term was later extended to ten years.

Military Campaigns. When Cæsar took up his duties as governor of Transalpine Gaul, the province was a small strip of territory north of Italy. Nine years later, it consisted of the whole of what is now France. He had also twice invaded Britain and had received the submission of the principal British tribes. The German migrations, which, for several generations, had intimidated the Gauls and beaten against the walls of Rome itself, were so effectively checked that Italy was never again invaded by a barbarian leader until the 5th century A. D. Moreover, Gaul was so completely pacified that, after the last desperate revolt under Vercingetorix in 52 B. C., the province never renewed its effort to separate its fortunes from those of Rome.

Meanwhile, Pompey, partly from jealousy of Cæsar's growing power, turned to the aristocracy. The senate carried a motion that Cæsar should disband his army by a certain day or else be regarded as an enemy of the state. Perceiving that the time for decisive action had come, Cæsar led his army across the little river Rubicon, by which act he stepped over the boundary between his province and Italy. He then moved swiftly toward Rome amid the acclamations of the people. Pompey fled to Greece, 49 B. C., and in three months Cæsar was master of all Italy.

He next subdued Pompey's legates in Spain, and then, on the plains of Pharsalia in Thessaly, August 9, 48 B. C., Pompey's army was utterly routed. Cæsar was appointed dictator for a year and consul for five years. He did not at once return to Rome, however, but went to Egypt, where he established Cleopatra on the throne of Egypt. Then followed victories in Africa against Scipio and Cato, and Cæsar was received in triumph on his return to Rome.

Character and Achievements. Like all the greatest military leaders, Cæsar inspired in his army and his

officers the most absolute devotion to himself. Always daring and decisive in action, he nevertheless showed, particularly in the war with Pompey, a magnanimity in victory which contrasted strongly with the implacable hatred exhibited by his enemies. Besides being one of the greatest generals, Cæsar was, after Cicero, the greatest orator of his day. His *Gallic War* and *Civil War* are models of clear and vigorous historical narrative. He was known also as a mathematician, philologist, jurist, and architect.

When he became head of the state, he effected, besides many other improvements, the reform of the calendar. He did not live, however, to carry out the vaster designs of his statesmanship—the codification of Roman law, the founding of libraries, the draining of the Pontine marshes, the enlargement of Rome's harbor, the construction of a canal through the Isthmus of Corinth, and the suppression of inroads made by the barbarians on the eastern frontiers. He was assassinated on the Ides (15th) of March by a conspiracy of nobles.

Cagliari (*kăl'yä-rē*), **Paolo Veronese (1528-1588),** Italian painter, was born at Verona. He was a contemporary of both Titian and Tintoretto and was held in equal admiration with these famous painters. The church of San Sebastiano in Venice contains many of his productions, which are reckoned the most important of his earlier period, before he became acquainted with the masterpieces of Raphael and Michelangelo. The influence of these artists on his style was so happy that, on his return, he received the honor of knighthood from the doge. Among his celebrated productions are the "Marriage of Cana," in the Louvre, Paris; "Feast of the Levite," Venice Academy; "The Feast of Simon," Brera Gallery, Milan; "Family of Darius," National Gallery, London; and "Mars and Venus," Metropolitan Museum, New York.

Cailletet (*kä'yĕ-tā'*), **Louis Paul (1832-1913),** French chemist, was born at Chatillon sur Seine. He studied at the school of mines in order to prepare himself to conduct an iron industry in his native town. In connection with his business as ironmaster, he devoted himself to chemical researches, particularly to metallurgy and the liquefaction of gases. In 1877, he succeeded in liquefying oxygen and nitrogen. For this work, he was made a member of the French Academy of Sciences in 1884 and an officer of the Legion of Honor in 1889. A few days after Cailletet's success, Raoul Pictet, a Swiss chemist, liquefied the same gases by another method.

Caine, Sir Thomas Henry Hall (1853-1931), British novelist and dramatist, was born at Runcorn, Cheshire, of Manx and Cumberland parentage, and was educated at schools in the Isle of Man and Liverpool. He went to London at the invitation of D. G. Rossetti and lived with the poet-painter until the latter's death in 1882. He began his literary career in that year, publishing *Sonnets of Three Centuries, Recollections of Rossetti, Life of Coleridge,* and *Cobwebs of Criticism.* His first novel was the *Shadow of a Crime.* Later ones include *Son of Hagar, The Bondman, The Christian, The Eternal City, The Prodigal Son, The Woman Thou Gavest Me, The Master of Man,* and *The Woman of Knockaloe.*

Calder, Alexander (1898-), American sculptor born at Philadelphia, is chiefly known for his abstract sculptures called "mobiles" and "stabiles." The former composed of wire, metal, or other materials when suspended in space move in response to the action of the air, while the latter are static. His mobiles were first exhibited at Paris in 1932. Both the Museum of Modern Art and the Metropolitan Museum of Art in New York possess examples of his sculptures.

Calderón (*kôl'dĕr-ŏn*) **de la Barca, Pedro (1600-1681),** Spanish dramatist, was born at Madrid. He was educated at the University of Salamanca. He entered the army and served in several campaigns in Italy and in Flanders, gaining a knowledge of men and things which he afterward made use of in his plays, the first of which was written when he was 14. He became a priest and royal chaplain, devoting his leisure hours to literary labors. He wrote about 500 dramas, of which the greater ones include *The Constant Prince, Love Is No Joke, Life Is a Dream,* and *The Physician of His Own Honor.* In later life, he wrote many religious plays. His imagination was brilliant, and his writings abound in beautiful passages. See *Spanish Literature: The Drama.*

Caldwell, Erskine Preston (1903-), American novelist, was born at White Oak, Ga. He was without formal education until he was 14 years old because his father, home mission secretary of the Presbyterian Church, was obliged to travel. After studying at the universities of Virginia and Pennsylvania, he worked at a succession of occupations, including journalism, cotton picking, professional football, and writing for motion pictures.

Caldwell became the novelist of "poor whites" of the South. His *Tobacco Road,* depicting the slow starvation and degeneration of people trying to subsist on submarginal land, was dramatized, the play breaking all records for length of run. *God's Little Acre* and volumes of short stories including *We Are the Living* and *South-Ways* further document his observations. With Margaret Bourke-White, the photographer, whom he married in 1939, he wrote *You Have Seen Their Faces* and *North of the Danube. Trouble in July* is a fictional study of the relation of the races in the South. His later books include *The Years of Learning How to Write* (1951), *Lamp for Nightfall* (1952), and *Love and Money* (1954).

Calhoun (*kăl'hōōn'*), **John Caldwell (1782-1850),** American statesman, was born in Abbeville district, South Carolina. He was graduated at Yale, 1804, and became a successful lawyer. He was elected to Congress, 1811, where he supported the measures that led to the War of 1812 with Great Britain. He also supported the protective tariff. In 1817, he entered Monroe's cabinet as secretary of war, and did valuable work in reorganizing the war department. He was vice president under John Q. Adams, 1825-29, and then under Jackson.

Calhoun declared in 1829 that a state can nullify unconstitutional laws, and his *Address to the People of South Carolina* in 1831 set forth this theory of state sovereignty. On the passing of the nullification ordinance by South Carolina in 1832, he resigned the vice presidency and entered the United States Senate, becoming a leader of the state rights movement and a champion of the slaveholding states. In 1844, as secretary of state, he signed a treaty annexing Texas, but he strenuously opposed the war of 1846-47 with Mexico. Calhoun, Henry Clay, and Daniel Webster are often called "the great triumvirate" of American political orators of their time.

Caligula (*kă-lĭg'ū-lă*), **Caius Cæsar Augustus Germanicus (12 A. D.- 41 A. D.),** Roman emperor, 37-41 A. D., was born at Antium. He was educated in the camp, where the soldiers gave him the by-name Caligula, from the *caligæ,* "military shoes," which he wore. On the death of Tiberius, 37 A. D., it was found that Caligula had been appointed coheir with the grandson of Tiberius, but the senate and the people allowed Caligula supreme and sole authority. The first eight months of his rule was marked by lavish generosity, but, after a serious illness, he displayed the most barbarous cruelty. Among other extravagant absurdies, he had his favorite horse raised to the consulship. He was assassinated by his soldiers.

Calkins, Earnest Elmo (1868-), advertising executive and author, was born in Geneseo, Ill., and received his education at Knox College. He is credited with organizing the first advertising agency to operate along modern lines. Besides conducting the business of his firm, he has done much writing and lecturing on art, printing, and various aspects of advertising and commerce. Among his books are *The Advertising Man, Printing for Commerce, Business the Civilizer,* and *On the Care and Feeding of Hobby Horses.* How he overcame the handicap of impaired hearing is told in *Louder, Please!;* other biographical data are found in his more recent book *And Hearing Not—Annals of an Adman.*

Callas, Maria (1923-), singer, was born in New York City. Although she attended elementary schools there and has sung with the Metropolitan Opera Company, her training (*Conservatoire d'Athene et National*) and her appearances at La Scala, Covent Garden, and the opera houses of Paris and Vienna have identified her largely with Europe.

Calles (*kăl'yās*), **Plutarco Elias (1877-1945),** Mexican statesman, was born at Guaymas, Sonora. He taught school and farmed in his younger days. His sympathies with the lower classes led him to join in the revolution which overthrew Porfirio Diaz in 1911. In 1915 he served under Obregon against Villa. Two years later he was made governor of Sonora, where he secured legislation favorable to labor and improving education. Heading the labor party in national politics, he was elected president of Mexico in 1924. He pressed toward the objectives in the constitution of 1915—separation of church and state, division of large landed estates, and national ownership of subsoil rights. The result was a diplomatic controversy with foreign governments whose nationals had obtained mineral rights in Mexico. Calles stood firm, as he did also in the face of opposition from the Catholic Church, and brought cohesion to the revolutionary party, which was able to force continuation of Calles' policies through succeeding administrations. He retired to private life in 1928. He was banished by President Cardenas in 1937 but later was allowed to return and died at Mexico City.

Callicrates, Greek architect, lived at Athens in the 5th century B. C. In conjunction with Ictinus, he constructed the famous Parthenon, the sculptures and decorations of which were the work of Phidias. The exact date of his birth and of his death are unknown. See *Parthenon.*

Callimachus (*kă-lĭm'ă-kŭs*), Greek artist, a native of Corinth, flourished toward the end of the 5th century B. C. and was celebrated as an architect, sculptor, and painter. To him is ascribed the invention of the Corin-

thian column, or capital, and he is said to have been the first to use the running drill in cutting folds of drapery and other deep lines in sculpture. He made a famous gold lamp for the Erechtheum in the Acropolis at Athens and produced a noted group of dancing maidens.

Calvert, George, Lord Baltimore. See *Baltimore, George Calvert, First Lord.*

Calvin, John (1509-1564), religious reformer, was born at Noyon, France. He entered the Collège de la Marche at Paris in 1521 and there laid the foundation of a mastery of Latin which enabled him to make this international language a vehicle for the ideas he was later to spread. He was then sent to Orleans University to study law under Peter de Stella, but religion began to claim his chief interest. Later he continued his studies at Bourges. He learned Greek, began to preach the reformed doctrines, and, in 1528, openly avowed himself a disciple of the Reformation. The next year, he preached at Noyon, and, shortly afterward, he proceeded to Paris, whence he was obliged to flee because of a sermon which he preached on justification by faith.

Religious persecution forced Calvin to betake himself to Basel, where, in 1536, he published in Latin the first edition of the *Institutes of the Christian Religion.* In this work, he elaborated a system of theology based upon the sovereignty of the will of God and including as integral parts the doctrines of predestination, election, and reprobation.

From Basel, Calvin went to Ferrara. Driven thence by the Inquisition, he returned to Paris, and, as he still found no security there, he went to Geneva in August 1536, intending to proceed shortly to Basel. In Geneva, he was constrained to join Farel in his struggle to establish over that city a theocratic government, in which license and frivolity should be replaced by a strict moral severity. Calvin and Farel were successful for a time; but a rebellion broke out in 1538, and Calvin was expelled from the city. He went to Strasbourg, where, the next year, he married Idelette de Bure.

In 1541, Calvin was recalled by the Genevans and established a thoroughly theocratic rule under his own direction. It was marked by controversies with various heretics, one of whom, named Servetus, was burned at the stake in 1553. The party opposed to Calvin, known as the Libertines, was expelled two years later. The power of Calvin, thus firmly established, was used vigorously for the defense of Protestantism throughout Europe.

The amount of Calvin's literary work seems incredible, when considered with his other labors. He established an academy at Geneva in 1559, where he taught theology. His zeal brought into one body of doctrine the scattered and unsystematized reformed opinions of Europe. As a religious teacher, social legislator, and writer, Calvin's fame is second to none in his age.

Cambacérès (*kän'bä'sä'rĕs'*) **Jean Jacques (1753-1824),** duke of Parma, French statesman and jurist, was born in Montpellier. He was educated for the legal profession and became president of the French convention in 1792. He voted for pronouncing Louis XVI guilty, but denied the right of the convention to execute the king, wishing that the unfortunate monarch might be detained in prison and put to death only in case of invasion. He was afterward president of the committee of public safety and of the council of five hundred. When Napoleon Bonaparte was named first consul, Cambacérès was made second consul. During the hundred days after Bonaparte's return, he was president of the chamber of peers. He left France when the Bourbons were a second time restored, but was permitted to return later. His *Projet de code civil* formed the basis of the *Code Napoleon.*

Cambyses (*kăm-bī'sēz*) **(?-521 B. C.),** king of the Medes and Persians, succeeded his father Cyrus in 529 or 528 B. C. He put his brother Smerdis to death and, in 527 or 525, invaded and conquered Egypt. He meditated a conquest of Carthage, but the Phœnician mariners refused to serve against their kindred. An army sent to seize the temple of Ammon perished in the desert, and one which Cambyses led in person to Nubia purchased some conquests at the price of myriads of lives. According to Herodotus, the king then gave himself up to drunkenness and hideous cruelties. In 522, news came that Gaumata, a Magian, had assumed Smerdis's character and usurped the Persian throne. Cambyses marched against him from Egypt, but died on the way.

Camillus (*kă-mĭl'ŭs*), **Marcus Furius (c. 445 B. C.-c. 365 B. C.),** Roman soldier and statesman; took Veii, a rival town, after a ten-years' siege; and retired into voluntary exile at Ardea on account of the envy of his enemies in Rome. Recalled from exile, he saved Rome from destruction by the Gauls under Brennus; was five times elected dictator; and gained a succession of victories over rival Italian tribes. He died of the plague, at 80 years of age, lamented by the whole nation, and remembered for generations as one of the noblest and most heroic figures in Roman history.

Cammaerts (*kä'märts*), **Emile (1878-1953),** Belgian poet, was born at Brussels. His first literary work was the translation of Ruskin into French. In 1908, he removed to England and became professor of Belgian institutions and studies at the University of London. After Belgium was invaded by Germany in 1914, he wrote a series of poems of his country's misfortunes which attained wide circulation both in French and in English translations. Later works published by him include *Poèms intimes, The Poetry of Nonsense, The Laughing Prophet, The Child of Divorce,* and *The Keystone of Europe.*

Camoëns (*kăm'ô-ĕns*), **Luiz Vaz de (c. 1524-1580),** Portuguese poet, was born of an illustrious family at Lisbon. He studied the ancient classics at Coimbra. Youthful rashness, brought him into disfavor with the authorities and with the court. Rejected by Catherina de Ataide, who was destined to become in his life what Beatrice was to Dante, he joined the army. After campaigning two years and losing an eye, he sailed in 1553 for further service in India. Offended by certain abuses of the Portuguese authorities at Goa, he ventured to expose them in a satire entitled *Follies in India,* which led to further clashes with officials.

In 1556, Camoens went to Macao, where he lived several years while engaged in writing *Os Lusiadas,* "The Lusitanians," generally styled the *Lusiad,* an epic masterpiece which celebrates the feats of Portuguese explorers and heroes. Returning to Spain about 1770 after many years of hardships, which included shipwreck and imprisonment, he dedicated the *Lusiad* to the young king Sebastian, who granted him a small pension and permission to remain at the court of Lisbon. Besides his epic, which has an assured place in the world's literature, he wrote numerous sonnets, odes, elegies, satires, and comedies. See *Lusiad.*

Camp, Walter (1859-1925), athletic specialist and author, was born at New Haven, Conn.; was graduated from Yale, 1880; became active in the management of Yale's athletics; and was made a member of the Yale University council. His role in establishing rules for football brought him the title of "father" of this sport. He also took a prominent part in the direction of athletics in training camps. His publications include *Book of College Sports, American Football,* and *Drives and Puts* (with Lillian Brooks). He was also editor in chief of the *Library of Young People.*

Campanella (*kăm'pä-nĕl'lä*), **Tommaso (1568-1639),** Italian poet and philosopher, was born in Stilo, Calabria, and was educated in Naples and Cosenza. He published his first work on philosophy in 1591, exhibiting a mingling of scholasticism with the new scientific thought. He taught at Naples and at Rome. In 1599, he was accused of heresy and of conspiracy against the Spanish rule. In consequence, he was imprisoned at Naples for 27 years, during which time he wrote the *City of the Sun,* other philosophic writings, and numerous sonnets. Through the intervention of Pope Urban VIII, he was set free and found refuge in France. In his *City of the Sun,* a utopia modeled somewhat after Plato's *Republic,* he advocated education as the best guarantee of capacity. While he devoutly accepted the authority of faith in theology, he considered philosophy to be based on perception. Died in Paris.

Campbell, Alexander (1788-1866), American theologian, was born at Shane's Castle, Ireland; attended Glasgow University; came to the United States; and served as pastor of a Presbyterian church in Washington County, Pa. He later became a Baptist. In 1810, he adopted the Bible as the sole recognized creed of his church and, in 1827, founded the Disciples of Christ, a sect that grew rapidly, especially in Virginia, Tennessee, and Kentucky, and now numbers over a million members. His followers are known also as Christians, Church of Christ, and Campbellites. In 1841, Campbell founded and became the first president of Bethany College, West Virginia. He was an ardent believer in the imminent second coming of Christ.

Campbell, Sir Colin. See *Clyde, Baron.*

Campbell, Mrs. Patrick (1867-1940), née Beatrice Stella Tanner, English actress, was born in London. In 1884, she married Patrick Campbell, who was killed in the South African war, 1900. After much amateur encouragement, she made her professional entrance upon the stage in 1888. She achieved notable success in *The Second Mrs. Tanqueray,* 1893, following which she played in *The Masqueraders* and *John-a-Dreams,* 1893, and in *The Notorious Mrs. Ebbsmith,* 1895. She appeared with Forbes-Robertson in the roles of Ophelia, Juliet, and Lady Macbeth, 1895-98; also in *Fédora* and *Little Eyolf.* Subsequently she made several visits to the United States, playing with marked distinction in *Magda, The Joy of Living, The Whirlwind, The Bondman, Hedda Gabler, The Thunder-*

bolt, Bella Donna, Lady Patricia, Pygmalion, and *The Matriarch.* In 1904, she appeared with Sarah Bernhardt in *Pelléas et Melisande.* In 1914, she married George Cornwallis West.

Campbell, Thomas (1777-1844), British poet, was born in Glasgow. His first poem, *The Pleasures of Hope,* was published in 1799 and went through four editions within a year. His *Gertrude of Wyoming* and the short poem *The Last Man* are well known; but it is for his war lyrics, such as *Hohenlinden, Ye Mariners of England,* and *The Battle of the Baltic,* that Campbell will be best remembered. He was buried in Westminster Abbey.

Campbell, William Wallace (1862-1938), American astronomer, was born in Hancock County, Ohio; and was graduated at the University of Michigan. After teaching successively at the University of Colorado and the University of Michigan, he became associated in 1891 with the Lick Observatory, of which he was appointed director 10 years later. Campbell was president of the University of California from 1923 to 1930. He conducted many expeditions to different parts of the world in order to observe solar eclipses, and his scientific work brought him numerous marks of distinction in his own country and abroad. His publications include *The Elements of Practical Astronomy* and *Stellar Motions.*

Canby, Henry Seidel (1878-1961), American editor and literary critic, was born at Wilmington, Del. After being graduated from Yale University, he taught there from 1900 to 1922 and thereafter acted as university lecturer, leaving most of his time free for literary activities. In 1924 he became editor of the newly established *Saturday Review of Literature,* through whose columns he evaluated literary trends for the public for many years. His publications include *Definitions, Classic Americans, The Age of Confidence,* and *Thoreau: A Biography.* To these he has added *Walt Whitman, An American* (1943), *American Memoir* (1947), and *Turn West, Turn East* (1951).

Candler, Asa G. (1851-1929), American capitalist, was born near Villa Rica, Ga. He was educated in the common schools and learned the drug business in Carterville. In 1873, he located in Atlanta and, in 1878, became a member of the firm of Hallman and Candler, laying the foundation for his large fortune by the manufacture of Coca-Cola. In addition to extensive interests in connection with banking, warehousing, and investment companies, he became active in movements to improve the public school system. He contributed a million dollars to Emory University at Atlanta and made many donations to other philanthropic enterprises.

Candler, Warren A. (1857-1941), American preacher, was born in Carroll County, Ga.; was educated at Emory University; and entered the North Georgia conference of the Methodist Episcopal Church in 1875. He was president of Emory University from 1888 to 1898 and, in the latter year, was made a bishop. His publications include *History of Sunday Schools, High Lives, Practical Studies in the Fourth Gospel,* and *Christ and the Creed.*

Canfield, Dorothy. See *Fisher, Dorothy Canfield.*

Canham, Erwin (1904-), editor, was born at Auburn, Maine. He studied at Boston University and later at Oxford University, where he was a Rhodes Scholar. He became general news editor of *The Christian Science Monitor* in 1939 and was advanced to the position of editor in 1945. He has edited several books on current problems, the latest of which, published in 1959, is *Man's Great Future.*

Canisius (*kä-nē'sē-ŭs*), **Petrus (1521-1597),** Dutch Jesuit missionary and scholar, was born at Nimwegen, Netherlands. He was the first provincial of the Jesuits in Germany; distinguished himself at the council of Trent, 1545; and was appointed Court preacher to Ferdinand I. He wrote the celebrated Cathechism entitled *Summa Doctrinæ Christianæ.* He was beatified in 1869.

Canning, George (1770-1827), British statesman and orator, was born in London. He entered the House of Commons for Newport, Isle of Wight, in 1793 as the protégé and supporter of the minister Pitt. In 1796, he was appointed as undersecretary of state. In 1801, Pitt resigned office, and Canning joined the opposition against the Addington ministry. When Pitt again became premier, in 1804, Canning was made treasurer of the navy, an office which he held until Pitt's death, in 1806. When the Portland ministry was formed, in 1807, Canning was appointed minister of foreign affairs.

In the course of his public life, he arranged the relations of Brazil and Portugal; drew the French cabinet into agreement with the British respecting Spanish American affairs; was the first to recognize the free states of Spanish America; promoted the treaty by which England, France, and Russia undertook to settle the affairs of Greece in 1827; protected Portugal from Spanish invasion; contended earnestly for Catholic emancipation; and prepared the way for the repeal of the Corn laws.

Cannizzaro (*kän-nē-tsä'rō*), **Stanislao (1826-1910),** Italian chemist, was born in Palermo. He was educated in chemistry and medicine at Palermo and Pisa and was made professor of chemistry at Alexandria in 1851, at Geneva in 1855, at Palermo in 1861, and at the University of Rome in 1871. He defined with notable clearness the difference between atomic and molecular weights and thereby became one of the most influential agents in establishing Avogadro's law as a working rule in chemical science. He discovered benzyl alcohol and cyanamid.

Cannon, Annie Jump (1863-1941), American astronomer, was born at Dover, Del. After being graduated from Wellesley College in 1884, she pursued special studies in astronomy at Radcliffe College. In 1897, she became assistant astronomer at Harvard College Observatory and, in 1911, was made also curator of astronomical photographs. She discovered also 5 new stars and numerous stars having variable spectra. She completed a bibliography of variable stars comprising 200,000 references, and a catalog of about 300,000 stellar spectra.

Cannon, Joseph Gurney (1836-1926), American politician, was born in Guilford, N. C.; was admitted to the Illinois bar; and became state's attorney for the 27th judicial district of Illinois in 1861. He became a Republican member of Congress in 1873, and, with two interruptions, continued to sit until 1923, thereby spending nearly 46 years as a Federal legislator. Speaker of the House of Representatives from 1903 to 1911, he used his power of appointing legislative committees to support the "Old Guard," the most conservative branch of the party. This policy of "Cannonism" was terminated in 1910, when the House assumed the power of appointing the rules committee and disqualified the speaker from sitting on it.

Canova (*kä-nō'vä*) **Antonio, (1757-1822),** Italian sculptor, was born at the Venetian village of Possagno and studied at Venice and Rome. His "Theseus," 1782, was one of the most important works in modern sculpture and marked the return from the baroque to the classic style. Other noted works followed, and Canova soon became the foremost sculptor of his day and one of the greatest of modern times. His "Cupid and Psyche" was produced soon after he had completed, in 1787, the monument of Pope Clement XIV. Among his most widely known works are "Winged Cupid," "Venus and Adonis," "Psyche Holding a Butterfly," and "Penitent Magdalen." In 1802, he was called to Paris to model a colossal statue of Napoleon. He was created Marquis of Ischia. He died in Venice. See *Sculpture.*

Canute (*kä-nūt'*), or **Cnut** (*k'nōōt*) **(c. 995-1035),** king of the English, Danes, and Norwegians. On the death of his father, Sweyn, king of Denmark, he proclaimed himself king of England. After a struggle with the Saxon king Ethelred and, later, with Ethelred's son Edmund, Canute agreed to divide the sovereignty of all England with Edmund. On the subsequent death of the latter, Canute became king of England and administered the country in an enlightened spirit. In 1019, he went to claim the kingdom of Denmark and, in 1028, extended his rule also over Norway, becoming one of the most powerful rulers of Europe. To moderate his subjects' exaggerated views of his power, he is said to have sat on the shore when the tide was coming in and to have commanded it (in vain) to recede.

Capper, Arthur (1865-1951), American editor and publisher, was born at Garnett, Kans. Upon graduation from Garnett High School in 1884, he entered newspaper work as a compositor on the Topeka *Daily Capital,* of which he became, at different times, reporter, city editor, Washington correspondent, publisher, and proprietor. He also became publisher and proprietor of the *Farmers' Mail and Breeze, Household Magazine,* and *Capper's Weekly,* of which the last named attained, under his management, a wide influence and a total circulation exceeding a million. He was governor of Kansas, 1915-19, and United States senator, 1919-48, affiliated with the Republican party.

Caracalla (*kăr'ă-kăl'ă*), **Marcus Aurelius Antoninus Bassianus (188-217),** Roman emperor, the son of the emperor Septimius Severus, was born at Lyon. By his father he was playfully named Caracalla from his wearing of a long-hooded tunic, so called in the Gallic language. After his father's death, 211, he ascended the throne as coregent with his brother Publius Septimius Antoninus Geta, whom he afterward caused to be murdered. Having bribed the pretorians to make him sole emperor, Caracalla next directed his cruelty against all the friends and adherents of Geta, of whom 20,000 of both sexes—including the great jurist Papinianus—were put to death. He bestowed Roman citizenship on all free inhabitants of the empire, probably in order to levy a greater amount of taxes. He was assassinated.

Cardan (*kär'dăn*), **Jerome (1501-1576),** Italian mathematician, naturalist, physician, and philosopher, was born at Pavia, and was graduated in medicine at Padua. In 1534,

he was made professor of mathematics at Milan. In 1559, he became professor of medicine at Pavia and later at Bologna, where he remained from 1562 until 1570. While in Bologna, he was imprisoned for heresy or debt, or both. Having regained his liberty in 1571, he went to Rome, where Gregory XIII pensioned him. He wrote a large number of treatises on mathematics, astronomy, astrology, rheotoric, history, ethics, natural history, music, and medicine. His *Ars Magna*, 1545, contains the solution of the cubic equation, the greatest mathematical discovery of the century. This was first discovered by Tartaglia in 1541 but Cardan published it as his own, precipitating a controversy which remained unsettled at Tartaglia's death.

Cardenas, Lazaro (**1897-**), Mexican political leader, was born at Jiquilpam de Juarez, Michoacan. Leaving school at 11, he learned the printer's trade and followed it for some years before turning to soldiering. He saw service under Madero, Carranza, and Obregon, rising to the rank of divisional commander.

Cardenas became governor of Michoacan in 1928 and, in 1930, was made president of the executive committee of the Revolutionary party. After serving as minister of war under President Calles, he was elected president of Mexico with the backing of Calles, whose policies of land distribution and weakening of the Church as a political and economic force he vigorously prosecuted. He later broke with Calles and had him deported. He retired from office in 1940.

Cardozo, Benjamin Nathan (**1870-1938**), American jurist, was born in New York. After being graduated from Columbia University in 1889, he was admitted to the bar in New York two years later. He was a judge of the Supreme Court of New York from 1914 to 1928; was made associate judge of the New York Court of Appeals in 1917 and chief judge in 1927; and, in 1932, was appointed by President Hoover to the United States Supreme Court. He was one of the liberal group of justices during the period of split decisions under the "New Deal." By his decisions and his writings Cardozo showed himself to be one of the ablest jurists of recent times. His published works include *The Nature of the Judicial Process*, *The Growth of the Law*, and *The Paradoxes of Legal Science*.

Carducci (*kär-dōōt'chē*), **Giosuè** (**1836-1907**), Italian poet, was born at Valdicastello in the province of Pisa. In 1861, he became professor of Italian literature at Bologna; in 1876, was returned to the Italian Parliament as a Republican; and, in 1890, was made a senator. As a poet, he rejected romanticism for classical ideals and forms; as a thinker, he sought to inspire an appreciation of paganism. A complete edition of his poems in 20 volumes appeared at Bologna. He was awarded the Nobel prize for literature in 1906.

Carew, Mrs. James. See *Terry, Ellen*.

Carissimi (*kä-rēs'sē-mē*), **Giacomo** (**c. 1604-1674**), Italian composer, was born at Marino. He was Kapellmeister at Assisi from 1624 to 1628 and at Saint Apollinaris in Rome from 1628 until his death. He was the originator of the chamber cantata and developed the instrumental accompaniment. He composed many cantatas, masses, motets, and even comic music. His works mark the transition from the polyphonic style of the Palestrina school to the monodic style of the originators of opera, and he is regarded as one of the chief founders of the oratorio. His published works include "Jephthah," "Judicium Salomonis," "Baltazar," and "Jonas," in Chrysander's *Denkmäler der Tonkunst; Arie de Camera;* and *Ars Cantandi*.

Carlyle (*kär-līl'*), **Thomas** (**1795-1881**), British essayist, historian, and philosopher, was born at Ecclefechan, Scotland. Having acquired an elementary education from his parents, he entered Annan Academy in 1805. Eight years later he completed indifferently well his academic course at Edinburgh University. He subsequently taught in several small schools; but, considering this occupation intolerable, he removed to Edinburgh in 1818. Here he studied law and theology. During this period, he was harassed by religious problems and was absorbed in the study of Schiller and of Goethe.

Carlyle now formed the intention of making literature his life work. He planned a history of England under Cromwell and a translation of Goethe's *Wilhelm Meister*. Writing a *Life of Schiller*, he went to London in 1824 to superintend its publication. The following year he spent on a farm near Hoddam Hill translating German romances.

Carlyle married Jane Welsh in October 1826. They settled in Edinburgh, where he completed several translations from German and contributed to the *Edinburgh Review*. In 1828, they removed to a small estate at Craigenputtoch, which Mrs. Carlyle had inherited. Here Carlyle wrote his *Specimens of German Romance*.

Carlyle's chief work, *Sartor Resartus*, occupied him in 1833-34. Bearing evidence of inward agonies, and tortured speculations, its theme may be described as the thesis that all creeds, rituals, and systems of philosophy are only the successive garbs in which the human intellect has been clothed. In 1834, Carlyle removed to London, where he published his fiery prose epic, *The French Revolution*, in 1837. Then followed, in 1839, an arraignment of contemporary society, entitled *Chartism*.

Henceforth, Carlyle dedicated himself to his largest work, the highly laudatory *History of Frederick the Great*, which was completed in 1865. This same year, he was elected lord rector of Edinburgh University. Carlyle wrote no important work after his wife's death in 1866; he lived quietly in London, devoting himself to various reminiscences and articles.

Carlyle exercised an unrivaled influence on British literature during the mid-19th century and on the contemporary moral, religious, and political beliefs. The power of his eruptive, ejaculatory style is thoroughly individual. His critical biographical essays were the first to place the riches of modern German thought before the English-reading world but his influence waned when the name "German" came to be associated with political conquest. See *English Literature: Victorian Age*.

Carman (*kär'mǎn*), **William Bliss** (**1861-1929**), journalist and poet, was born at Fredericton, New Brunswick, and was graduated at the University of New Brunswick, 1881; studied also at Edinburgh and Harvard. At different times, he taught school, practiced engineering, and, beginning in 1890, was an editor on the New York *Independent*. By his first book of verse, *Low Tide on Grand Pré*, 1893, he won wide recognition, which was extended by many subsequent volumes. Among them are *Behind the Arras*, *Songs from Vagabondia* (with Richard Hovey), *By the Aurelian Wall*, *Pipes of Pan*, *The Friendship of Art*, *The Poetry of Life*, *Sappho*, *The Rough Rider*, *Daughters of Dawn*, *April Airs*, and *Far Horizons*.

Carmer, Carl (**1893-**), American writer and folklorist, born at Cortland, New York, and educated at Hamilton College and Harvard. After teaching English in several American universities, including the University of Alabama (1921-27), he spent a number of years in magazine editorial work in New York (1928-33). His successful book *Stars Fell on Alabama* was published in 1933. Among his other works are *Listen for a Lonesome Drum* (1936), *Genesee Fever* (1941), and *Dark Trees to the Wind* (1950). He is editor of the American Rivers Series to which he has contributed *The Hudson* (1939) and *The Susquehanna* (1955).

Carnegie (*kär'nĕ-gĭ*), **Andrew** (**1835-1919**), capitalist, manufacturer, philanthropist, and author, was born in Dunfermline, Scotland; came with his family to the United States in 1848, settling in Pittsburgh; and first worked as a weaver's assistant in a cotton factory. He became a telegraph messenger boy in 1851; learned telegraphy; entered the employ of the Pennsylvania Railroad; and became a telegraph operator, advancing by promotions until he became superintendent of the Pittsburgh division of the Pennsylvania system. He joined Woodruff, the inventor of the sleeping car, in organizing the Woodruff Sleeping Car Company and thereby gained the nucleus of his fortune.

After the Civil War, he developed iron works of various kinds and established at Pittsburgh the Keystone Bridge Works and the Union Ironworks. He introduced into the United States the Bessemer process of making steel, 1868, and, a few years later, was the principal owner of the Homestead and Edgar Thomson steelworks and other large plants, which were consolidated, 1899, in the Carnegie Steel Company. In 1901, this company was merged in the United States Steel Corporation.

Carnegie then retired from business and devoted himself to philanthropic and literary activities. He gave libraries to many towns and cities in the United States, Canada, and Great Britain, and contributed large sums to other benefactions, the total exceeding $300,000,000. He built, also, the Peace Palace at The Hague and, in Washington, a home for the International Bureau of American Republics, later known as the Pan-American Union. At the close of 1912, his philanthropic gifts exceeded those of any other American, his gifts for that year alone amounting to $130,000,000. In 1912, he announced that he had given all his remaining fortune except $25,000,000 to the Carnegie Corporation, organized in New York in 1911. His writings include *Triumphant Democracy*, *The Gospel of Wealth*, and *The Life of James Watt*.

Carnot (*kär'nô'*), **Lazare Nicolas Marguerite** (**1753-1823**), French revolutionary leader, was born at Nolay, France. In 1791, he became a member of the National Assembly and voted in the Convention for the death of Louis XVI. After taking command of the army of the North and gaining the victory of Wattignies, he was made a member of the committee of public safety; was intrusted with the chief direction of military affairs; and contributed greatly to the successes of the French army.

In 1797, having opposed the extreme measures of Barras, his colleague in the Directory, Carnot was suspected of favoring the Royalists and was sentenced to deportation. He escaped into Germany and wrote his defense, which conduced to the overthrow of his colleagues in 1799. On his return to Paris, he was made minister of war, 1800. He succeeded so brilliantly in this office that he was called the "organizer of victory." He was also a noted mathematician and was the author of numerous writings on mathematics and military tactics.

Carnot, Nicolas Leonard Sadi (1796-1832), French scientist, was born at Paris. In his *Reflexions sur la Puissance motrice du feu,* he described a cycle and reversible engine and announced important principles of thermodynamics. He stated that motive power is invariable in nature and that, accurately speaking, it is never produced or destroyed. He thus made clear that he appreciated the great law now known as the conservation of energy. His pioneer work was extended and adapted to modern theories by Lord Kelvin.

Carpaccio (*kär-pät'chō*), **Vittore (c. 1455-c. 1525),** Italian painter, was born in Venice. Showing the influence of Vivarini and Gentile Bellini, his works, though sometimes faulty in drawing, are harmonious in color and abound in charming pictorial qualities. Among his most noted paintings are "The Presentation in the Temple," and scenes in the life of Saint Ursula, now in Venice; "Death of the Virgin," in Ferrara; and "Enthroned Madonna," in London.

Carpenter, John Alden (1876-1951), American composer, was born at Park Ridge, Ill. He was graduated from Harvard in 1897 and studied music under Bernard Ziehn and Sir Edward Elgar. He then entered business in Chicago, devoting his leisure time to music. With his wife, he is the coauthor of *When Little Boys Sing* and *Improving Songs for Anxious Children.* In 1912, he published a sonata for violin and piano, and, in 1914, he produced a large orchestral suite entitled *Adventures in a Perambulator,* picturing the impressions of an infant, in six movements for the full modern orchestra. His publications include a concertino for piano and orchestra, numerous songs, *The Birthday of the Infanta,* the jazz opera *Skyscrapers,* and the symphonic poem *Sea Drift.*

Carracci (*kär-rät'chē*), or **Caracci, Agostino (1557-1602),** Italian painter and engraver, was born at Bologna. He became a pupil of his uncle Lodovico, the painter, continuing to work with him and Annibale Carracci, a brother, with interruptions for most of his life. Among his greatest paintings are the "Communion of Saint Jerome" and "Celestial, Terrestrial, and Venal Love." With his brother Annibale, he executed the celebrated frescoes in the Farnese Palace, Rome. He died in Parma.

Carracci, Annibale (1560-1609), was born at Bologna. He was brought up as a tailor, but under the instruction of Lodovico Carracci he rapidly became a great painter. The influence of Correggio and of Raphael largely molded his style. His fame reached Rome, where he was employed with his brother to execute the frescoes in the Farnese palace. One of his most celebrated easel pictures is the "Three Marys," now in Castle Howard, Yorkshire, England. He is considered the greatest painter of the Carracci family. He was buried near Raphael in the Pantheon at Rome.

Carracci, Lodovico (1555-1619), Italian painter, the son of a butcher was born at Bologna. He studied at Venice and Parma and, with his two nephews, Agostino and Annibale, established in Bologna an "eclectic" school of painting. Some of his finest works are preserved at Bologna. They include the "Madonna and Child Throned," "Madonna and Child Standing," the "Transfiguration," and the "Nativity of Saint John the Baptist."

Carranza (*kär-rän'sä*), **Venustiano (1859-1920),** Mexican statesman, was born in Cuatro Cienegas, Coahuila, of an old Mexican family of pure Spanish blood. He became a senator from Coahuila and resided in Mexico City for many years.

He was a lifelong friend and supporter of Felix Madero, after whose assassination in 1913 he published the plan of Guadalupe, which disavowed the newly established Huerta government. In July 1914, Huerta was forced to resign and Carranza was made minister of foreign relations under Carbajal as president.

Carranza soon openly took the position of leader, but differences among his associates led to the open revolt of Villa and Zapata. Nevertheless, Carranza's government was recognized late in 1915 by leading nations, and, in March 1917, Carranza was elected president of Mexico by an overwhelming majority. A new constitution was adopted nationalizing subsoil rights, calling for breaking up of large estates, and restraining the power of the Church. Carranza made a beginning in enforcing the program despite friction with foreign governments whose nationals found their property interests adversely affected. A successful revolt led by Obregon resulted in the flight and death of Carranza.

Carrel (*kä-rĕl'*), **Alexis (1873-1944),** American biologist and surgeon, was born in France, and was educated at the University of Lyon, where he received his medical degree in 1900. He came to America in 1905 and took charge of laboratory investigation first at McGill University and later at the University of Chicago. In 1912 he became a member of the Rockefeller Institute for Medical Research in New York, where his brilliant discoveries in experimental surgery won world-wide recognition.

His investigations proved that life in tissues may be prolonged after removal from the body and, with Col. Charles A. Lindbergh, in 1935, he devised a machine in which animal organs can be made to live indefinitely. He proved also that certain arteries, organs, and even limbs may be successfully transplanted. In 1912, he received the first Nobel prize for medicine bestowed upon an American. During 1915-19, he was engaged in medical work in France, where he assisted in devising the Carrel-Dakin solution for antiseptic treatment of wounds. He returned there in 1939 and remained during the German occupation. Among his most valuable publications are *Anastomosis and Transplantation of Blood Vessels, The Preservation of Tissues, The Transplantation of Limbs, The Transplantation of Veins and Organs,* and *Man the Unknown.*

Carrère (*kä'râr'*), **John Merven (1858-1911),** American architect, was born of American parents in Rio de Janeiro, Brazil. He received his early education in Switzerland and studied architecture four years at the Ecole des Beaux-Arts, Paris. After two years' work in the office of McKim, Mead, and White in New York, he entered into partnership with Thomas Hastings.

Among the first important buildings designed by this firm were the Ponce de Leon Hotel and the Alcazar, both at Saint Augustine, Fla. Later came such notable works as the buildings for the Saint Louis Exposition of 1904 and the New York Public Library.

Carroll, Charles (1737-1832), of Carrollton, American patriot, was born at Annapolis, Md. When the Revolutionary War began, he was one of the richest men in the English colonies; but, though he had much to lose, he made the most daring speeches and helped the patriot cause in every way. He was elected a member of Congress, 1776, and was among the first signers of the Declaration of Independence. When he wrote his name, some one said: "There are many Charles Carrolls, and the British will not know which one it is." He at once added to his name "of Carrollton," and was ever afterward known by that title. He outlived all the other signers of the Declaration of Independence.

Carroll, Lewis (1832-1898), is the pseudonym of Rev. Charles Lutwidge Dodgson, English humorist and author. He was graduated at Christ Church, Oxford, 1854; took orders in the Anglican Church, 1861; and was a lecturer at Oxford, 1855-81. He wrote *Alice in Wonderland, Through the Looking-glass, The Hunting of the Snark,* and other classic juvenile works with an adult interest.

Carson, Christopher (1809-1868), popularly known as Kit Carson, American frontiersman, was born in Kentucky. He was successively a saddler's apprentice, trapper, hunter, guide in Frémont's explorations, lieutenant in the rifle corps of the army, and Indian agent. During the Civil War he rendered important services in the territories and was brevetted brigadier general. He was everywhere regarded as a typical frontiersman, fearless in danger, unerring with the rifle, and excelling even the Indians in woodcraft.

Carson, Rachel (1907-1964), scientist and writer, was born at Springdale, Pennsylvania. She was educated at the Pennsylvania College for Women (1929) and Johns Hopkins (1932). Specializing in marine biology, she joined the staff of the Bureau of Fisheries (now the Fish and Wild Life Service) as a biologist in 1936. It was while she was editor in chief of the Fish and Wild Life Service in 1951 that her best known book, *The Sea Around Us,* was published. It quickly became a non-fiction bestseller and brought her many honors. *Under the Sea* (revised edition) was published in 1952, and *The Edge of the Sea* in 1955. Her widely discussed book *Silent Spring* (1962) warned that extensive use of pesticides could destroy birds and many other desirable forms of wild life.

Cartier (*kär'tyā'*), **Jacques (1491-c. 1557),** French explorer, was born at Saint Malo, Brittany. Employed by Francis I of France to make explorations on the North American coast, he completed, in three successive expeditions, 1534-43, the discovery and the exploration of the Gulf of Saint Lawrence and the river as far as Quebec, Montreal, and Lachine rapids.

Cartwright, Edmund (1743-1823), English inventor, was born at Marnham, England. He was educated at University College, Oxford. In 1779, he became rector of Goadby Marwood, Leicestershire, where he made improvements

in agriculture. A visit in 1784 to Arkwright's cotton-spinning mills posed in his mind the problem which he solved by invention of the power loom. Attempts to employ it at Doncaster and Manchester met with fierce opposition, and it was not until the 19th century that it came into practical use. Cartwright took out patents also for combing wool and for various other inventions; he even joined Robert Fulton in his efforts toward steam navigation. All these labors brought him no direct gain, but, in 1809, the government made him a grant of 10,000 pounds. He died at Hastings.

Caruso (*kä-ōōr'zō*), **Enrico** (**1873-1921**), Italian tenor, was born at Naples and began life as an engineer with no thought of singing until a friend assured him that there was a fortune in his voice. He studied under Lamperti and Concone and sang at Naples in 1896 with great success in *Traviata*, following which he made engagements in leading cities of the world. His first appearance at the Metropolitan Opera House, New York, was in 1904 and met with immediate and extraordinary success. His voice was one of unusual beauty and power, and his repertoire included more than 40 operas. He originated roles in *Fédora*, *Germania*, *La Bohème*, *Madame Butterfly*, and *The Girl of the Golden West*.

Carver, George Washington (**c.1864-1943**), American Negro scientist, was born of slave parents near Diamond Grove, Mo. Stolen and ransomed for a $300 racehorse, he attended public schools and Iowa State College. In 1896, he was appointed to the faculty of Tuskegee Institute, where he became director of agricultural research. With laboratory equipment originally constructed from scrap-heap oddments, he developed from the peanut more than 300 synthetic products and from the sweet potato over 100, including cheese, soap, and shoe polish. He was collaborator in the United States Bureau of Plant Industry.

Carver, John (**c. 1575-1621**), the first governor of Plymouth colony, was born in England. He was one of the Pilgrims who came over in the *Mayflower* and was chosen governor soon after landing. He assisted in settling his people in their new homes, but died within a few months.

Cary, Alice (**1820-1871**), and Phoebe (1824-1871), sister poets, were born near Cincinnati, Ohio, where they began their writing career. In 1850 they published jointly *The Poems of Alice and Phoebe Cary*, a volume which attracted much favorable attention. At this time they moved to New York City. Phoebe is remembered especially for her hymn beginning "One Sweetly Solemn Thought." Alice published *Lyra and other Poems*. Their works had a strong popular appeal.

Cary, Henry Francis (**1772-1844**), English writer, was born at Gibraltar. He was educated at Oxford and, in 1796, took holy orders. In 1805, he published a translation of Dante's *Inferno* and, in 1814, of the whole *Divine Comedy*, a translation remarkable for fidelity, force, and expressiveness. He afterward translated Pindar's *Odes* and Aristophanes' *Birds*, and wrote memoirs in continuation of Johnson's *Lives of the Poets*. He was buried in Westminster Abbey.

Casals, Pablo (**1876-**), cellist, composer, and conductor, was born at Vendrell, Spain, and studied chiefly at Barcelona and Madrid. Widely known as a concert soloist and recording artist, he has also been guest conductor of symphony orchestras in cities all over the world. Although he makes his home in France, he spends much time in Puerto Rico.

Casanova de Seingalt (*kä'sä-nō'vä dȧ sin'gält*), **Giovanni Jacopo** (**1725-1798**), Italian adventurer, was born at Venice. From the time when, at 16 years of age, he was expelled from a seminary in Venice for immoral conduct, until late in life, when he recounted his adventures in his *Memoirs*, his career was a succession of intrigues, daring seductions, and narrow escapes which made his name a synonym for amorous roguery. He was, however, able and possessed of a magnetic personality, by reason of which he was received by kings and the pope. He was at different times a preacher, prisoner, director of state lotteries in France, police spy for Venetian inquisitors, and a librarian.

Cass, Lewis (**1782-1866**), American statesman, was born at Exeter, N. H.; was admitted to the Ohio bar in 1802; and became brigadier general in the War of 1812. He was then for 18 years governor of Michigan, which, under his skillful administration, became a settled state. In 1831-36, he was secretary of war and, in 1836-42, minister at Paris. He sat in the United States Senate, 1845-57; was an unsuccessful candidate for the presidency in 1848; and was secretary of state, 1857-60. In the controversy over slavery, he stood with Webster and Clay for conciliation, for union, and for the Constitution as then established. Called a "Northern man with Southern principles" he reservedly supported the slaveholding party.

Cassini (*käs-sē'nē*), **Giovanni Domenico** (**1625-1712**), Italian astronomer and savant, was born at Perinaldo, near Nice. In 1650, he was appointed to the astronomical chair in the University of Bologna and later became director of the Paris Observatory. He discovered four of Saturn's satellites; determined the rotations of Jupiter, Venus, and Mars; and determined the parallax of the sun and the eccentricity of the earth's orbit.

Cassiodorus, Flavius Magnus Aurelius (**490 A. D.-580**), Roman statesman and writer, was born at Scylaceum in southern Italy. He held many public positions under the reigns of Odoacer and Theodoric. About 540, he retired from public life and devoted himself to literature. The extant fragments of his *History of the Goths* and his *Letters* mark him as the most profound scholar of his age. In a monastery which he founded, he required the monks to copy manuscripts as part of their duty. The practice thus instituted resulted in the preservation of most of the classical literature.

Cassius (*kăsh'ĭ-ŭs*), or, in full, **Gaius Cassius Longinus** (**?-42 B. C.**), Roman general and politician, was quæstor to Crassus in the Parthian war, 54-53 B. C., and saved the credit of Roman arms after the commander's disastrous defeat and death. As tribune of the people in 49 B. C., he attached himself to Pompey. After the battle of Pharsalus, he was taken prisoner and pardoned by Cæsar. In 44 B. C., he organized the conspiracy which resulted in Cæsar's assassination. Driven from Rome by the enraged populace, Cassius fled to the East; united his forces with those of Brutus; and, being routed at Philippi, compelled his freedman to kill him.

Castelar (*käs'tȧ'lär'*), **Emilio** (**1832-1899**), Spanish-orator, statesman, and writer, was born at Cadiz; was for some years professor of history and philosophy in the University of Madrid; and took part in several political uprisings, including that which brought about the downfall of King Amadeus in 1873. He became dictator, but, when Alfonso XII was crowned in 1874, Castelar went into voluntary exile. He returned to Spain in 1876 and continued to work for republican government, but through evolutionary rather than revolutionary means. He was a strong advocate of universal suffrage.

Castlereagh (*kȧs'l-rā'; kȧs''l-rā*), **Robert Stewart, Viscount** (**1769-1822**), British statesman, eldest son of the Marquis of Londonderry. At an early period he entered public life. Becoming secretary of war in 1805, he gained rapidly in influence through measures for combatting Napoleon. In 1812, he became foreign secretary and leader of the House of Commons. In this dual capacity he kept together the alliance against Napoleon until the achievement of ultimate victory and then took measures to dissociate England from the reactionary Holy Alliance for the suppression of liberal movements throughout the world. His mind gave way and he committed suicide.

Castro, Fidel (**1927-**), political leader, was born in Oriente Province, Cuba, the son of a wealthy sugar planter. After graduation from the University of Havana, he practiced law, but also engaged in revolutionary activities against the Batista regime. On January 1, 1959 his revolutionary government came to power and he became premier. His foreign policy has favored Communist Russia and has been extremely hostile toward the United States.

Cather, Willa Sibert (**1876-1947**), American author, was born at Winchester, Va. She graduated at the University of Nebraska in 1895 and began literary work by serving on the staff of the Pittsburgh *Daily Leader*, 1897-1901. She was associate editor of *McClure's Magazine*, 1906-12. Turning to fiction, she excelled in delineation of prairie life and the recreation of earlier periods in historical novels. The list of her works includes *April Twilights*, *O Pioneers*, *The Bohemian Girl*, *Death Comes for the Archbishop*, *Not Under Forty*, and *One of Ours*, the last being a war novel which won the Pulitzer prize for 1922. She was elected in 1938 to the American Academy of Arts and Letters.

Catherine II, the Great (**1729-1796**), empress of Russia, was born at Stettin, Prussia. She was married in 1745 to the prince who, in 1762, ascended the Russian throne as Peter III. Threatened with repudiation by the emperor, she seized the reins of government and had Peter III put to death. She gave the country a strong administration and furthered the process of "westernization." During her reign, Russian territory was extended at the expense of the Turks, and she took a leading part in the three partitions of Poland. Her court was one of the most brilliant in Europe, due to her liberal patronage of art and literature. It was also the most immoral, her ministers being openly her lovers.

Catherine, Saint (**c. 1347-1380**), of Siena, Italian saint. She is said to have been favored with extraordinary revelations, and the wounds of Christ were believed to have been impressed upon her body. She attained influence in public life by her force of character, which was directed toward healing the schism that divided the Church in her

day. It was through her persuasion that Pope Gregory XI was induced to return his seat from Avignon to Rome in 1377. She wrote many devotional works, letters, and poems, which rank among the classics of the period.

Catherine de' Medici (*dä mä'dē-chē*) **(1519-1589)**, was born in Florence, Italy. She was a great-granddaughter of Lorenzo the Magnificent, niece of Pope Clement VII, and queen to Henry II of France. She acted as regent during the minority of her second son, Charles IX. Her policy was to play off the parties of the Catholic Guises and the Protestant Condés against each other. She entered into a plot with the Guises which led to the massacre of Saint Bartholomew. Three of her sons became kings of France.

Catherine of Aragon (1485-1536), queen of England, the daughter of Ferdinand of Aragon and Isabella of Castile. She married Arthur, Prince of Wales, and subsequently his brother, afterward Henry VIII. She was beautiful and virtuous, yet the king in 1527 sought a divorce on the ground that the marriage was uncanonical. After much temporizing on the part of the pope, the marriage was in 1533 pronounced invalid by Cranmer, archbishop of Canterbury, and his sentence was ratified by act of Parliament. Catherine spent her last years in Kimbolton castle.

Catiline (*kăt'ĭ-lĭn*), or **Lucius Sergius Catilina (c. 108 B. C.-62 B. C.)**, Roman politician. During his youth, he attached himself to the party of Sulla. He is known chiefly as the leader of a conspiracy against the republic which was discovered and crushed by Cicero while consul in 63 B. C. Catiline, a man of great bodily endurance and boldness of mind, was a senator who apparently chose to stake all on an overthrow of the republic and seizure of the reins of power. Unsuccessful in his candidacy for consul in 63 B. C., he allied himself with the discontented elements of the population and planned a *coup d'etat* involving murder of the elected consuls.

On discovery and frustration of the plot by Cicero, Catiline fled from Rome and took refuge with Manlius, who was in command of the conspirators' army in Etruria. In 62, the army of the senate encountered that of Catiline near Pistoia, and after a desperate battle, in which Catiline displayed extraordinary courage, he was defeated and slain.

Cato, Marcus Porcius (234 B. C.-149 B. C.), Roman statesman, surnamed the Elder to distinguish him from his later namesake, was born at Tusculum. Induced by Lucius Valerius Flaccus to remove to Rome when that city was in a transition epoch from severe frugality to the luxury and licentiousness of Grecian manners, Cato severely denounced the degeneracy of the philhellenic party and set for Rome a pattern of sterner character.

In 184 B. C., he was elected censor, and discharged so rigorously the duties of his office that the epithet *Censorius*, formerly applied to all persons in the same station, was made his permanent surname. He repaired the watercourses, paved the reservoirs, cleansed the drains, raised the rents paid by the publicans for the farming of the taxes, and diminished the contract prices paid by the state to those who undertook public works.

In 175 B. C., Cato was sent to Carthage to negotiate on the differences between the Carthaginians and the Numidian king, Masinissa; but, having been offended by the Carthaginians, he returned to Rome, where ever afterward he described Carthage as the most formidable rival of his country and concluded all his addresses in the senate—whatever the immediate subject might be—with the well-known words: "*Ceterum censeo Carthaginem esse delendam.*" ("For the rest, I vote that Carthage should be destroyed.")

Cato, Marcus Porcius (95 B. C.-46 B. C.), often called Cato the Younger, Roman statesman. He entered the army and, in 72, served with distinction in the campaign against Spartacus. From Macedonia, where he was military tribune in 67, he went to Pergamum, whence he brought the Stoic philosopher Athenodorus to Rome. In 63, as tribune, he delivered a famous speech on the Catiline conspiracy, in which he denounced Cæsar as an accomplice of that political desperado and determined the policy of the senate. Fearing the effects of unrestrained greatness, he steadily opposed Pompey, Cæsar, and Crassus. Upon the rupture between Cæsar and Pompey, Cato joined Cæsar's opponents and became governor of the Pompeians in Africa. When Cæsar finally defeated the Pompeian army under Scipio at Thapsus, Cato committed suicide.

Catt, Carrie Chapman (1859-1947), American suffrage leader and lecturer, was born at Ripon, Wis. She was educated at the State College of Iowa. In 1890–92, she was lecturer and organizer of the Iowa Woman Suffrage Association. In 1892, she began similar service for the National Woman Suffrage Association, of which she was president in 1900–04 and after 1915. She was a leader in the campaign that resulted in the adoption of the 19th amendment to the Federal Constitution.

Cattell (*kă-tĕl'*), **James McKeen (1860-1944)**, American educator and psychologist, was born in Easton, Pa.; was graduated from Lafayette College and the University of Leipzig; and studied also at Göttingen, Paris, Geneva, and Johns Hopkins University. He was the first professor of psychology in America, holding a chair at the University of Pennsylvania, 1888-91. He then taught at Columbia University until 1917, when he was dismissed for opposing compulsory military service. Thereafter he edited several scientific publications, including *Science*, the *Scientific Monthly*, and the *American Naturalist*.

Catton, Bruce (1899-), historian and editor, was born at Petoskey, Michigan and was educated at Oberlin College. For a time he was a news reporter but found his most congenial work in writing about the Civil War, as in such books as *Mr. Lincoln's Army* (1951), *The Glory Road* (1952), *A Stillness at Appomattox* (1953), a Pulitzer Prize winner, and *This Hallowed Ground* (1957). He is editor of *American Heritage*.

Catullus (*kă-tŭl'ŭs*), **Gaius Valerius (c. 87 B. C.-54 B. C.)**, Roman lyric poet, was born at Verona. He wrote over 100 poems, chiefly lyric and elegiac, which rank among the most original and imaginative in Latin literature. A large number of them record phases of his love for "Lesbia," which became the consuming passion of his life. He is intensely personal in his poetry and utterly without reserve. His poems breathe the deepest affection for his friends, with the most bitter invective for his enemies.

Cauchy (*kō'shē'*), **Augustin Louis, Baron (1789-1857)**, French mathematician and founder of the theory of functions, was born in Paris. His *Mémoire sur la théorie des ondes* helped to establish the undulatory theory of light. At Prague he published his *Mémoire sur la dispersion de la lumière*. He was professor of astronomy at Paris, 1848-52, but refused the oath of allegiance to Napoleon III and went into voluntary exile. His works, which have been collected and published in 27 volumes, occupy a leading place in mathematical science.

Cavalieri (*kä'vä-lyä'rē*), **Emilio del (c. 1550-1602)**, Italian composer, was born in Rome. In 1589, he was made inspector general of art and artists at the court of the Medici in Florence. In 1590, he wrote *Disperazione di Filene* and *Il satiro* and, in 1595, *Guioco della cieca*, which are among the very earliest operas. His chief work, *Rappresentazione di anima e di corpo*, performed in Rome in 1600, is regarded as the first oratorio. He developed the monodic style by supplying an accompaniment in figured bass and emphasized the melody, which he ornamented with trills. Died in Florence.

Cavalli (*kä-väl'lē*), **Francesco (c. 1602-1676)**, Italian composer, was born in Crema. His musical talent gained him the patronage of the podestà of Crema, whose support enabled him to study under Monteverde. In 1665, he was appointed organist in San Marco, Venice, and, in 1668, became *maestro di cappella*, holding this post until his death. While he wrote much Church music, he is most noted as a dramatic composer. He introduced solos and set numbers into his operatic compositions and was thus the forerunner of Scarlatti and the modern opera.

Cavell, Edith (1865-1915), English nurse, was born in Norfolkshire, the daughter of a clergyman. In 1907, she was appointed matron of a training school for nurses in Brussels which, in 1914, became a Red Cross hospital. In August 1915, under the German occupancy of the city, she was arrested, charged with facilitating the escape of Belgian and British men of military age. She admitted the charge and was sentenced to be shot. This precipitate execution of a Red Cross nurse was a powerful psychological factor in creating hostility to the German cause. In 1919, Edith Cavell's body was taken to England and was interred in Norwich cathedral after a service in Westminster Abbey.

Cavendish (*kăv'ĕn-dĭsh*), **Henry (1731-1810)**, English chemist and physicist, was born at Nice, France. His most important work included the discovery of the composition of water, the composition of nitric acid, and the determination of the mean density of the earth. Since the discovery of argon by Rayleigh and Ramsay, it has become evident that Cavendish in his studies on the composition of air had, at that early date, isolated argon without knowing it. He was a man of great wealth, lived in retirement, and devoted his entire life to scientific experiment.

Cavour (*kä'vōōr'*), **Count Camillo Benso di (1810-1861)**, Italian statesman, was born at Turin. He was educated for a military career, but, as liberal sympathies appeared likely to prove an insuperable barrier to his promotion, he retired and devoted himself to agriculture. While a resident in England, he made himself intimately acquainted with the political and industrial organization of the country. With Count Cesare Balbo, in 1847, he established a daily political journal, in which he advocated a representative system somewhat after the pattern of the English constitution.

On Cavour's suggestion, the King of Sardinia was petitioned for a constitution, which was granted in February 1848. Cavour became a member of the Chamber of Deputies and served successively as minister of agriculture and commerce, minister of marine, and minister of finance; in 1852, he was made premier. From this time, he directed Sardinian policy and devoted himself to securing the independence and unification of all Italy. He made an alliance with Napoleon III of France, but when war broke out between Sardinia and Austria, Napoleon deserted his ally and made peace in 1859. Cavour resigned in chagrin but was recalled the following year and, with the help of Garibaldi, enabled various Italian states to throw off the Austrian yoke. The first parliament of all Italy met at Turin a few months before Cavour's death.

Caxton, William (1422-1491), the founder of English printing, was born in the Weald of Kent. During a residence in Flanders he acquired the new typographic art and, on his return, set up a press in the almonry, Westminster, where, in 1477, he brought out the earliest known book printed in England, *Dictes and Sayings of the Philosophers.* He printed about a hundred works, many of which were translations made by himself. His notable pioneer work in the new art helped to fix the English speech and to prepare the way for the Elizabethan era.

Cazin (*kȧ'zăn'*), **Jean Charles (1841-1901),** French landscape painter and ceramic designer, was born at Samer. In 1868, he became director of the art school and curator of the museum at Tours. In 1871, he went to England, where he designed ceramics for the Fulham pottery. After his return to France, he devoted himself to landscape art, in which he excelled. His landscapes with religious sentiment include "Judith," "Tobit," and "Hagar and Ishmael," now in Luxembourg. Examples of his paintings are in the National Gallery, Berlin; the Metropolitan Museum, New York; and the Art Institute, Chicago.

Cecil, William. See *Burleigh, William Cecil, Baron.*

Cecil (*sĕs'il; sĭs'il*) **of Chelwood, Edgar Algernon Robert Cecil, Viscount (1864-1958),** English statesman, was educated at Oxford University. He was chosen chancellor of Birmingham University in 1918. In his public career, he opposed any abridgment of the powers of the Church; fought all socialist measures; favored woman suffrage; during World War I, served as minister of blockade; and later became one of the strongest supporters of the League of Nations, receiving in 1924, the first award of the Woodrow Wilson peace prize. He was awarded the Nobel peace prize for 1937. His writings include *A Great Experiment: an Autobiography.*

Celebrezze (*sĕl-ĕ-brez'ē*), **Anthony J. (1910-),** political leader, was born at Anzi, Italy, but grew up in Cleveland, Ohio. He attended John Carroll University and studied law at Ohio Northern University. After serving in the Ohio legislature he was elected mayor of Cleveland, 1953, and has been continually re-elected since then. In 1962 he was appointed by President Kennedy to succeed Abraham Ribicoff as secretary of Health, Education and Welfare.

Cellini (*chĕl-lē'nē*), **Benvenuto (1500-1571),** Italian goldsmith and sculptor, was born at Florence. He first became known as a chaser and goldworker. At an early period, having been banished from Florence in consequence of a duel, he went to Rome, where he was employed by many distinguished patrons of art. He was afterward allowed to return to Florence. Another affray compelled him to go to Rome, where he secured the favor of Clement VII. Later he accompanied Cardinal Ferrara to France and entered the service of Francis I. He executed many fine works in metal and marble, among them the celebrated bronze group of "Perseus with the Head of Medusa," now in the market place in Florence. His *Autobiography* furnishes one of the most valuable pictures of life in the period of the Renaissance.

Celsius (*sĕl'sĭ-ŭs*), **Anders (1701-1744),** Swedish astronomer, was born at Upsala. He studied in prominent observatories in Germany, Italy, and France; published papers on the aurora borealis; and advocated the adoption of the Gregorian calendar. In 1730, he became professor of astronomy at Upsala, where, in 1740, a splendid observatory was erected for him. In 1742, he constructed the scale of the centigrade thermometer, now in general use for scientific purposes.

Cerf, Bennett (1898-), publisher and lecturer, was born in New York and received his education in local schools and at Columbia University. He was vice president of Boni and Liveright, publishers, then founded the Modern Library and later Random House, of which he is president. His recreational activities include membership on the panel of the television program "What's My Line?" and the writing of a humor column for *This Week* magazine.

Cervantes (*sĕr-văn'tēz*) **Saavedra, Miguel de (1547-1616),** Spanish novelist, was baptized October 9, 1547, at Alcala de Henares, a town of New Castile. The exact date of his birth is not known. He sprang from noble, but not wealthy, parents and was sent to the University of Salamanca and afterward to Madrid. His attention was often diverted from his studies by a strong propensity for writing verse. Cervantes perused anything that attracted his attention and thus gained, besides much other information, an intimate knowledge of the Old Spanish literature.

Cervantes left Spain in 1569 to seek his fortune in Rome. Here he entered the service of Cardinal Giulio Acquaviva; the next year, he enlisted as a private for the relief of Cyprus. In 1571, in the battle of Lepanto, Cervantes received a wound that deprived him of the use of his left hand. Returning to Spain in 1575, he was captured by the Moors and was kept prisoner for five years in Algiers.

Literary Career. After these vain pursuits of fortune, Cervantes dedicated himself to literature. In 1584, he published *Galatea,* a pastoral novel. This same year, he married Dona Catalina de Palacios Salazar and settled in Madrid. He wrote several dramas, none of which was received favorably on the stage.

His *Moral Tales* were supposedly written in Seville, where he was employed for several years following 1588. Subsequently, he resided at intervals in La Mancha, the province which he rendered famous in his great work, *Don Quixote.*

In 1604-05, Cervantes lived with his family at Valladolid, where Philip III held court. In 1605, the first part of *Don Quixote* appeared at Madrid and ran through four editions in one year. For seven years after its appearance Cervantes published nothing. He maintained a studious retirement, yet gained two powerful friends, the Count de Lemos and the Archibishop of Toledo, whose patronage and money kept him from actual want though not from poverty.

In 1613, Cervantes published his *Moral Tales,* much esteemed for their purity of language and depicition of life and character. His *Journey to Parnassus* appeared in 1614. A spurious sequel to *Don Quixote* having been printed, Cervantes angrily repudiated it and published the second part of his masterpiece in 1615, which met with universal applause. His last work was *Persiles y Sigismunda.*

Don Quixote. Cervantes' most celebrated work, *Don Quixote de La Mancha,* is undoubtedly the best-known work in Spanish literature. Cervantes wrote it to extirpate by ridicule the mass of imitations of the older tales of chivalry. An unfailing source of amusement lies in the contrast between the lofty, single-minded knight, Don Quixote, and his simple, yet shrewd and earth-seeking squire, Sancho. Cervantes waged literary warfare against the false and improbable, and his genius championed the sublimity of nature and truth. Died, April 23, 1616, the day of Shakespeare's death. See *Don Quixote.*

Cesnola (*chĕs'nō-lä*), **Count Luigi Palma di (1832-1904),** archeologist, was born near Turin. He served with the Sardinians in the Crimean War; went to New York in 1860; and fought in the Civil War. Appointed American consul at Cyprus in 1865, he carried out a series of fruitful excavations there; in 1873, his splendid collection of statues, lamps, vases, and inscriptions was purchased by the Metropolitan Museum, New York, of which he became director in 1879. He wrote *Cyprus: Its Ancient Cities, Tombs, and Temples.*

Cèzanne (*sȧ'zȧn'*), **Paul (1839-1906),** French painter, was born at Aix. His early style followed the Italian masters but with a disturbing intensity of feeling to which his technique was not quite adequate. Examples from this period are "The Autopsy" and "The Judgment of Paris." His acquaintance in 1872-73 with the impressionist Pissaro led to a greater attention to color effects, but Cèzanne strove for a reality which he believed the impressionists missed. In 1879, he retired to Aix, where he worked until his death, largely forgotten by the world. Fame came posthumously and established him among the great modern French painters. His later canvases showed his earlier turbulent style, but with a surer technique.

Chadwick, George Whitefield (1854-1931), American composer was born in Lowell, Mass. He began musical study under Eugene Thayer and later, in Europe, was a pupil of Jadassohn, Reinecke, and Rheinberger. In 1897, he became director of the New England Conservatory of Music at Boston. He was elected to the American Academy of Arts and Letters in 1909.

Among American composers, Chadwick ranks second only to MacDowell, whom he surpasses in the treatment of the higher instrumental forms of music, although he is inferior in fertility of invention. His lyric drama, *Judith,* and the comic operas, *Tabasco* and *The Quiet Lodging,* are his most ambitious works for the stage. His musical compositions include also three symphonies; the overtures, *Rip Van Winkle, Thalia, The Miller's Daughter, Euterpe;*

and the choral works, *The Viking's Last Voyage*, *Lovely Rosabelle*, *Phœnix Expirans*, *The Lily-Nymph*.

Chagall, Marc (**1887-**), Russian painter, was born near Vitebsk, Russia. At the age of 20 he began to study painting at Leningrad, but, not caring for the style of art taught in the schools there, he soon became attached to Leon Bakst, the painter, who was engaged in designing settings and costumes for Diaghelev's ballet company. When Bakst went to Paris in 1910 with the ballet, he took Chagall with him. Chagall returned to Russia and started an art school at Vitebsk, but was forced to give it up. Returning to Paris in 1923, he became a French citizen, and remained there until compelled by the defeat of France in World War II to seek asylum in the United States, where he lived from 1941 to 1948. Although Chagall has been connected with art movements such as cubism and surrealism, he has throughout his career been largely independent of all schools, and has pursued his own individual way. In subject matter his work reflects his nostalgic interest in the Russian-Jewish life and folklore he knew in his youth. Well-known pictures by him in American museums include "The Village and I" (Museum of Modern Art, New York) and "The Rabbi of Vitebsk" (Art Institute, Chicago). Notable among his book illustrations are those for LaFontaine's *Fables* and Gogol's *Dead Souls*.

Chaliapin (*shä-lē-ä'pĭn*), **Theodore** (**1873-1938**), Russian operatic singer, was born at Kazan, Russia. Without previous training in music, he joined a comic opera company in 1890, and the natural quality of his voice immediately attracted attention. In 1894, he appeared in grand opera at Leningrad. His intense portrayal of national types in Russian operas made him a prime favorite among his countrymen and abroad. His repertoire included roles in *A Life for the Czar*, *Ivan the Terrible*, and *Faust*.

Chamberlain, (Arthur) Neville (**1869-1940**), English statesman, son of Joseph Chamberlain, was born at Birmingham. Educated at Rugby and Mason college, Birmingham, he entered public life in the city government of Birmingham, serving as mayor in 1915-16. He was director-general of national service in the following year, one of the most critical in World War I. After the war, he served in various Conservative governments, supervising a housing scheme, under which over 900,000 dwellings were erected. In the national government of 1931, he was made chancellor of the exchequer, in which capacity he exerted a major influence in English policies.

Becoming prime minister in 1937, Chamberlain went to great lengths to avoid war with Germany, his policy of "appeasement" reaching its climax with the abandonment of Czechoslovakia in the Munich agreement with Hitler in 1938. This policy failing, he led Great Britain into war against Germany in 1939. He failed, however, to appreciate the seriousness of the German threat, and, after Germany's conquest of Norway in 1940, he was replaced as prime minister by Winston Churchill.

Chamberlain, Joseph (**1836-1914**), British statesman was born in London; was educated in a private school and at University College, London; and joined the firm of Nettlefold, screw makers of Birmingham. He became a member of the town council and was three times mayor, 1873-76, in which capacity he made Birmingham conspicuous among British cities for its municipal improvements. In 1876, he entered Parliament and took his seat with the radicals. He was a member of the cabinet from 1880 until 1886, when his disapproval of Gladstone's Irish policy led to his resignation. He went to Washington to negotiate regarding the dispute between the United States and Canada on the fisheries question. In 1895, he took office as colonial secretary; was largely responsible for the British attitude preceding the Boer War; and advocated a system of preferential tariffs for British dominions. This policy, however, met defeat at the polls.

Chamberlain, (Joseph) Austen (**1863-1937**), English statesman, the son of Joseph Chamberlain, was born at Birmingham. Educated at Cambridge, Paris, and Berlin, he was elected to Parliament in 1892 as a Liberal Unionist and entered Lord Salisbury's cabinet in 1895. In 1900, he became financial secretary to the treasury, in which capacity he supported his father's unsuccessful efforts for the imposition of import tariffs with preferential rates for British dependencies. He became leader of the Unionist party in 1921 and, in 1924, entered Stanley Baldwin's cabinet as secretary of state for foreign affairs. The leading part which he took in negotiating the Locarno treaties in 1925 won for him the award of one-half the Nobel peace prize for that year.

Chamberlin, Thomas Crowder (**1843-1928**), American geologist and astronomer, was born at Mattoon, Ill. He was graduated at Beloit College in 1866 and later at the universities of Michigan and Wisconsin. He became professor of natural science at the State Normal School in Whitewater, Wis., 1869; professor of geology at Beloit College, 1873; president of the University of Wisconsin, 1887; and head of the department of geology at the University of Chicago from 1892 to 1919. He also conducted much special research in geology, being connected with the Carnegie Institution. With F. R. Moulton, he formulated the planetesimal theory which has succeeded the theory of Laplace as a working hypothesis in astronomy. See *Cosmogony*.

Chambers, William (**1800-1883**), Scottish publisher, was born at Peebles. In 1814, he was apprenticed to a bookseller in Edinburgh, and, in 1819, he started a business of bookselling for himself, afterward adding printing. Between 1825 and 1830, he wrote the *Book of Scotland* and, in conjunction with his brother Robert, a *Gazetteer of Scotland*. In 1832, he started *Chambers's Edinburgh Journal;* soon thereafter he united with Robert in founding the business of W. and R. Chambers, the best known of whose many publications are, besides the *Journal* and a large series of educational works, a *Miscellany*, *Papers for the People*, the *Cyclopædia of English Literature*, and *Chambers's Encyclopædia*.

Chaminade (*shä'mē'nàd'*), **Cécile Louise Stéphanie** (**1861-1944**), French composer, was born in Paris. She made her debut as a pianist at the age of 18, later studying under Le Couppey, Savard, and Godard. She composed a large number of songs and instrumental pieces which attained great popularity by reason of their melodiousness and charm. Her works became well known in the principal concert centers of France and England, and, in 1908, she made a successful tour in the United States. The list of her best-known instrumental pieces includes *La lisonjera*, *Pas des amphores*, *Pas des echarpes*, *Au matin*, *Callirhoe*, and *Les amazones*.

Chamisso (*shä'mĭ-sō*), **Adelbert von** (**1781-1838**), lyric poet and naturalist, was born in Champagne, France. He fled during the French Revolution to Germany, where he became a page to the Queen of Prussia in 1796. During 1804-06, he collaborated in the publication of the *Musen Almanach*. In 1806, he returned to France and led an unsettled life until 1812, when he began to study medicine in Berlin. In 1813, he wrote the novel *Peter Schlemihl*. During 1815-18, he accompanied, as naturalist, Kotzebue's Russian polar expedition, his *Journal* of which is ranked among the classics of travel. Subsequently he obtained a situation in the botanical garden of Berlin, and was made a member of the Academy of Sciences. His poems include some of the finest lyrics and ballads in German literature. See *Peter Schlemihl*.

Champlain (*shăm'plān'*), **Samuel de** (**1567-1635**), French naval officer and explorer, was born at Brouage. During the reign of Henry IV of France, he founded the first French settlements in America, at Quebec (1608) and Montreal (1611). He penetrated also to Lake Huron and Lake Champlain, supporting the Huron Indians against the Iroquois and their English allies. He was made governor of Quebec, which territory the English captured in 1629, taking him as a prisoner to England. Peace restored Quebec to France in 1632, and Champlain was again made governor. He wrote *Voyages and Travels in New France, Called Canada*.

Champollion (*shäN'pôl'yôN'*), **Jean François** (**1790-1832**), French Egyptologist, was born at Figeac, France. He was professor of history in the Lyceum of Grenoble and afterward professor of Egyptian antiquities in the College of France, Paris. We are indebted chiefly to Champollion for the discovery of the method of interpreting Egyptian hieroglyphics. Among his principal works are *Egypt under the Pharaohs*, *Monuments of Egypt*, and *Nubia*, and an *Egyptian Grammar*, edited by his elder brother, Jean Jacques Champollion, who was also a distinguished archeologist.

Channing, William Ellery (**1780-1842**), founder of American Unitarianism, was born in Newport, R. I.; was graduated from Harvard in 1798; and was ordained minister of the Federal Street church in Boston in 1803. During the earlier years of his ministry, he stood upon friendly terms with all orthodox churches. In 1819, however, he preached a sermon in which he advocated the Unitarian doctrine with so much zeal and ability that he was termed the "apostle of Unitarianism." This involved him in controversy despite his antipathy to everything one-sided and dogmatic, whether Unitarian or Trinitarian.

In 1821, he received the title of D. D. from Harvard University. He visited Europe in 1822 and made the acquaintance of several great authors, notably Wordsworth and Coleridge, both of whom were strongly impressed by his personality. His publications include *Evidences of Christianity*, *Address on War*, *Essays on National Literature*, and *Self Culture*. Both his writings and his public discourses were characterized by a vigorous eloquence and a lofty moral earnestness. He was elected to the American Hall of Fame in 1900.

Chaplin, Charles Spencer (1889-), motion picture actor, was born in London, Eng. Both his parents were actors. He entered a stage career at seven years of age, displaying a remarkable talent for humorous acrobatic acts. Coming to New York in 1911 with the Fred Karno Company, he was there engaged to play in motion picture productions. Through this medium, Chaplin shortly became a world-wide celebrity. In 1918, he formed his own company and produced *A Dog's Life*, *The Kid*, and other successful comedies. He joined later with Douglas Fairbanks, Mary Pickford, and D. W. Griffith to form the United Artists' Corporation. Under his direction and with him as chief actor were produced *The Gold Rush*, *Modern Times*, and *The Great Dictator*, which were widely acclaimed as masterpieces of motion-picture acting. In 1953, Chaplin, a British subject, while in Europe surrendered his permit to reenter the United States.

Chapman, Frank Michler (1864-1945), American ornithologist, was born in Englewood, N. J. From 1887, he was connected with the American Museum of Natural History, of which he became curator in 1908. He was the originator there of habitat bird groups. He conducted many expeditions in temperate and tropical countries. Among his many publications are *Handbook of Birds of Eastern North America*, *Bird Studies with a Camera*, *The Economic Value of Birds to the State*, and *Life in an Air Castle*.

Chapman, George (c. 1559-1634), English poet. He published a translation of the *Iliad* in English ballad measure: afterward translated the *Odyssey* and portions of Ovid, Terence, and Petrarch; and also wrote many plays. He was associated with Jonson, Marston, and others in writing the comedy of *Eastward Hoe!* for which they were imprisoned by King James I because of reflections on the Scotch.

Chapman, John (c. 1775-1847), usually known as "Johnny Appleseed," American frontiersman. He developed an apple tree nursery near Pittsburgh Landing, Pa., from which he gave or sold saplings or seed to families migrating westward. Beginning in 1806, he made canoe trips through Ohio, Indiana, and Illinois, for the purpose of planting in the wilderness apple orchards which he returned to care for, and assisted settlers in establishing orchards of their own. Of a religious and eccentric character, he was widely known to the pioneers, and legends soon gathered about his name. He saved Mansfield, Ohio, from an attack by the Indians in the War of 1812.

Charlemagne (*shär'lē-mān*) **(742-814)** is the French name of Charles the Great, king of the Franks and Roman emperor. He was the son of Pepin the Short and grandson of Charles Martel. His birthplace, according to different traditions, was either Aix la Chapelle or Ingelheim. In 768, he became joint ruler of the Franks with his brother Carolman, whose death three years later left him as sole king of Francia. Opening war against the Saxons in 772, Charles began a series of conflicts which was to last more than thirty years.

Conquests. Crossing the Alps, Charles completely subdued northern Italy as far as the Neapolitan duchy and was acknowledged as king of Lombardy in 774. At Easter of this same year, he visited Rome, where the pope conferred upon him the title, "Patrician of Rome." Charles endowed the Church with immense territorial possessions, which were later known as the States of the Church.

His next expedition took him into Spain. He was invited there by an offer of alliance with a Saracen emir, who had revolted from the caliph of Cordoba in 778. On the return of his army through the valley of Roncesvalles near Pamplona, the Gascons fell upon his rear guard and killed one of the Frankish leaders, named Roland, and many other nobles. This defeat was the historical basis of the poetic legend known in the middle ages as the *Ballad of Roland*. From 778 to 812, the Franks made six other expeditions into Spain, the main result of which was finally to deliver France from any further danger of Saracen invasion.

Other conquests awaited the king beyond his eastern frontiers. Charles defeated the Saxons under Wittekind in 780 and, in 788, carried his arms into Bohemia, Bavaria, and Hungary. The Frankish dominion now comprised the whole of France; all Germany and Austria except East Prussia, eastern Hungary, and Croatia; the northwest corner of Spain; and the entire peninsula of Italy save the kingdom of Naples. Such success called for formal consecration. On Christmas Day, 800, the king in great state attended Mass in Saint Peter's at Rome, where Pope Leo III, placing an imperial crown on his head, thrice hailed him as "Augustus, crowned by God, great and pacific emperor of the Romans." The Church became the spiritual guide of the revived Roman Empire of the West, and the Frankish king was the right hand of the Church.

Constructive Achievements. Great as a warrior, Charles was even greater as an administrator and civil ruler. He divided the whole empire systematically, placing each division under military, judicial, and civil authority. A real, but short, renascence of learning also took place in the Frankish kingdom. From this reign, the Church became a vast, independent power, co-ordinate in authority with the civil government.

Charles entertained a plan for the union of the newly revived Western Empire with the Eastern Empire through his marriage with the Byzantine empress, Irene. The plan failed, however, by reason of Irene's overthrow. Charles left his dominion to his only remaining son, Louis. Placing the imperial crown upon the altar, he ordered Louis to take it with his own hands, thereby giving him to understand that he wore it in his own right and under no authority but that of God.

Charles I (1600-1649), king of England, was proclaimed king on the death of his father, James I, in March 1625. A firm believer in the "divine right of kings," he attempted to rule independently of his subjects, taxing them without the consent of their representatives and thereby precipitated civil war in 1642 between Parliament and the king's supporters. Charles was eventually captured; brought to trial before a court constituted for the purpose; sentenced to death on a charge of treason; and, January 30, 1649, was beheaded. The boldness of this assault on the institution of monarchy created a profound sensation throughout Europe.

Charles II (1630-1685), king of England, son of Charles I, was at The Hague, Netherlands, when his father was beheaded. He assumed the royal title and was proclaimed king by the Scots. Marching into England, he was defeated by Cromwell at Worcester, 1651, and fled to France. By the policy of General Monk, after Cromwell's death, he was restored to his crown and kingdom in 1660, an event known as the Restoration. In 1662, he married Catherine of Braganza. Charles II was an easygoing man, and is known in history as the "merry monarch." His reign was an inglorious one for England, though it is distinguished by the passing of the Habeas Corpus act, one of the great bulwarks of English liberty next to the Magna Charta.

Charles V (1500-1558), emperor of Germany and king of Spain, was born at Ghent. From his father, Philip of Burgundy, he inherited the Netherlands and Franche Comte. In 1516, on the death of his grandfather Ferdinand, he succeeded, under the title of Charles I of Spain, to the crowns of Aragon and Castile with all their possessions in the New World and in Sicily and Naples. In 1519, on the death of his grandfather Maximilian, Charles was elected German emperor, and, the following year, he was crowned as Charles V of Germany.

Germany was in a state of unprecedented agitation concerning the doctrines proclaimed by Luther. Charles made it his aim to restore tranquility, and, with this end in view, he summoned, in 1521, the famous Diet of Worms, over which he presided in person. The conference, however, failed of its main purpose. In 1522, he reduced to subjection the towns of Castile, which had risen against him. He was likewise successful in his war against the Turks under Soliman the Magnificent and in a long struggle with France. In 1525, the French king, Francis I, became his prisoner at Pavia. The emperor's forces took Rome itself in 1527 and made prisoner Pope Clement VII, who had allied himself with France and with the principal Italian towns. In 1529 at Cambrai, peace was concluded with the pope and France, and, in 1530, Charles was crowned King of Lombardy and Emperor of the Romans.

A diet summoned at Augsburg in 1530 for the purpose of settling the religious controversy ended in failure. In 1535, Charles undertook a successful expedition from Spain against the pirate Barbarossa, then established at Tunis. Peace with France was patched up in 1538. Charles then hastened to supress a revolt in Ghent. In 1542, war about Milan was renewed with France, and, two years later, Francis I was forced to make the unfavorable peace of Crepy.

Though the Council of Trent, in 1545, seemingly made Catholic and Protestant union impossible, Charles still aimed at it. In the second diet of Augsburg, 1548, he proposed a common platform, which was rejected by both parties. The Lutherans rose in arms, and Charles narrowly escaped capture at Innsbruck in 1552. This same year, he made an unsuccessful venture to recover from Henry II of France the bishopric of Metz.

The emperor's principal aim in life had been hopelessly crossed. In 1554, he gave up the kingdom of Naples to his son Philip, and, the next year, he resigned to him the Netherlands. In 1556, Spain and the West Indies passed into the same hands; the imperial dignity was renounced; and the crown was sent to Charles's brother Ferdinand. Broken in health and with no worldly ambitions, Charles sought repose in the sequestered monastery of Saint

Yuste, near Plasencia in Estremadura, Portugal, where he died.

Charles VII (1403-1461), king of France. He was a son of Charles VI, on whose death in 1422 Henry VI of England was proclaimed king of France. Henry proceeded to assert his authority by force of arms and had almost succeeded when, in 1428, Joan of Arc came forward and inspired new ardor in the French armies, which she led in person against the English. A series of victories enabled her to have Charles crowned king of France at Reims in 1429. The English were gradually driven from France until, in 1453, Calais alone remained in their hands. Peace and order were restored, a regular army was organized, and commerce was encouraged. Charles VII was timid and irresolute in character and has been much censured for failing to save Joan of Arc from the hands of the English.

Charles IX (1550-1574), king of France, son of Henry II and Catherine de' Medici, succeeded his brother Francis II in 1560, under the regency of his mother. His reign was marked by almost uninterrupted civil war between the Huguenots led by the Condé and the Catholics headed by Guise. Barbarities and outrages were practiced by both sides, but all other atrocities were eclipsed by the massacre of Saint Bartholomew in 1572. This massacre of the Huguenots received the assent of Charles under the influence of his mother, who planned it for political reasons. Charles continued to be subject to her influence until his death.

Charles X Gustavus (1622-1660), king of Sweden, son of the Count Palatine, was born at Nykoping. He took part in the Thirty Years' War, and, on the abdication of his cousin Queen Christina, 1654, succeeded to the throne of a kingdom impoverished by her extravagance. He overran Poland in 1655; forced the Elector of Brandenburg to enter into an alliance with him; and crushed the forces of the Polish king in a terrible three days' battle at Warsaw, late in July 1656. His next war was with the Danes, when he crossed two arms of the sea on the ice and extorted the Treaty of Roeskilde, 1658, which gave to Sweden the southern parts of the Scandinavian peninsula, previously Danish. In 1659, he was driven from a new attack on Copenhagen by help of the Brandenburgers and the Dutch.

Charles XII (1682-1718), king of Sweden, son of Charles XI, ascended the throne at the age of 15. He had to cope with the combined power of Denmark, Russia, and Poland. He foiled the Danes at Copenhagen, the Russians at Narva, and Augustus II of Poland at Riga; but, being trapped in Russia and compelled to spend a winter there, he was, in July 1709, attacked and defeated by Peter the Great at Poltava, so that he had to take refuge with the Turks at Bender. Here he was again attacked, captured, and conveyed to Demotica, but, escaping, he succeeded in effecting a precarious return to Sweden. Making peace with the czar, he commenced an attack on Norway, but was killed by a musket-shot at the siege of Frederikshald.

Charles XIV John (1763-1844), king of Sweden and Norway, and known before his election to the throne as Jean Baptiste Jules Bernadotte, was born at Pau, France, the son of a French lawyer. In 1780, he joined the French army; fought in the Revolutionary wars with distinction; became general in 1794 and minister of war in 1798. In 1800, he suppressed an uprising of the Chouans, commanding the army in La Vendée. In 1804, Napoleon made him one of the 18 marshals of France. For brilliant services at Austerlitz in 1805, he was made Prince of Pontecorvo, and, in 1809, he won new fame at Wagram.

Being chosen Crown Prince of Sweden by the Swedish diet in 1810, he accepted, going immediately to Stockholm and changing his name to Charles John. He became powerful and popular and soon joined the allies against Napoleon, contributing materially to his defeat at Leipzig in 1813. He compelled Denmark to give up Norway, which he annexed to Sweden. Upon the death of Charles XIII in 1818, he became king of Sweden and Norway. His reign was able, uniformly peaceful, and resulted in great progress and prosperity. He was the only one of Napoleon's generals to found a dynasty.

Charles Martel (c. 689-741), duke of Austrasia, was the natural son of Pepin d'Heristal and succeeded his father in the dukedom in 714. As mayor of the palace, he possessed a regal power, which he employed with little interference from the titular Frankish kings. His chief title to fame is a decisive victory which he won over the Saracens under their general, Abd-er-Rahman, whom he defeated with great slaughter between Tours and Poitiers in 732. It was in consequence of this victory, which saved northern Europe from the invading Moors, that he was called *Martel*, or "The Hammer." At his death, he divided his dominions between his sons, Carloman and Pepin. The latter became the first king of France of the Carlovingian race.

Charles the Bold (1433-1477), the last duke of Burgundy, succeeded his father Philip the Good in 1467. He conceived the ambition of restoring the kingdom of Burgundy. This involved the defeat of the king of France, his feudal superior, and the conquest of territories including Lorraine and part of Switzerland. Louis XI was compelled to sign a treaty by which he gave up part of his territory. Alsace and Lorraine were won, partly by the help of Charles's father-in-law, Edward IV of England. In Switzerland, however, Charles suffered three severe defeats, in the last of which he was slain. With his death terminated the long resistance of the great French vassal chiefs to the centralized power of the monarchy.

Charpentier (*shär'päN'tyā'*), **Gustave (1860-1956),** French composer, was born at Dieuze, Lorraine. He received his musical education at the Paris Conservatory, studying under Massenet and winning the *grand prix de Rome*, 1887. He composed songs, orchestral pieces, and a symphonic drama, *The Poet's Life*, which was produced in 1892. In 1898, he captivated musical Paris by the production of his opera *Louise*, of which he wrote both words and music. This distinctly modern work, characterized by a dramatic libretto and music of notable beauty and originality, won him high rank among the French "impressionists."

Chase, Salmon Portland (1808-1873), American jurist and statesman, was born in Cornish, N. H. After being graduated from Dartmouth in 1826, he taught in a boys' school at Washington, D. C. He was admitted to the bar in 1829; began practice in Ohio; and, in 1834, was appointed solicitor in Cincinnati for the bank of the United States. His defense of J. G. Birney in 1837 for harboring a fugitive slave brought him into prominence as an antislavery advocate.

In 1849, the Democrats and Free-Soilers elected him to the United States Senate, where he was a vigorous opponent of slavery extension. He joined Sumner and Seward in opposing the Kansas-Nebraska bill. In 1855, he was elected governor of Ohio by the Republicans. Chosen secretary of the treasury by President Lincoln at the outbreak of the Civil War, he conducted the finances of the government during this trying period with rare skill and success. In 1864, he was appointed chief justice of the United States Supreme Court and as such presided in 1868 over the impeachment trial of President Andrew Johnson.

Chase, Stuart (1888-), American social and economic writer, was born at Somersworth, N. H. Educated at the Massachusetts Institute of Technology and Harvard University, he entered an accounting firm and, from 1917 to 1922, was an investigator for the Federal Trade Commission. He won a name as an independent critic of the current economic system through his *Tragedy of Waste*, *The Nemesis of American Business*, and *A New Deal. Your Money's Worth*, written in co-operation with F. J. Schlink, challenges the prevailing advertising practices. In *Mexico —A Study of Two Americas*, he set forth a searching criticism of the conventional values of civilized life. He wrote also *Rich Land, Poor Land; The Tyranny of Words;* and *The New Western Front. The Proper Study of Mankind* appeared in 1948, *Roads to Agreement* (with M. Tyler) in 1951, and *Power of Words* in 1954.

Chase, William Merritt (1849-1916), American painter, was born at Franklin, Ind. He began art study in Indianapolis, continuing at New York and, under Wagner and Piloty, in Munich. He established a studio in New York, 1878, and rose to the foremost rank among American artists, painting figures, portraits, and still life with remarkable skill. Many examples of his work are found in the leading American art galleries. Among the best known are "A Broken Jug"; "Ready for a Ride"; "Alice," Art Institute, Chicago; and "Lady in Black," Metropolitan Museum, New York. He was elected to the American Academy of Arts and Letters in 1908.

Chateaubriand (*shà'tō'brē'äN'*), **François Auguste, Vicomte de (1768-1848),** French author and statesman, was born at Saint Malo in Brittany. He traveled in America, 1791-92, and, while still there, learned of the flight and arrest of Louis XVI. He immediately returned to France, but retired to England before the revolutionary tide. In 1800, he returned to Paris and wrote for the *Mercure de France*. In this journal, he first printed his tale of *Atala* with a preface lauding the first consul, Bonaparte. Its success was remarkable, but his *Génie de Christianisme* was even more successful. Bonaparte appointed Chateaubriand secretary to the embassy in Rome.

Chateaubriand was created a peer of France, 1815, was ambassador at London in 1822, and became minister of foreign affairs in 1823. His *René* and *Atala* marked the inception of the romantic movement in France and a new era in literary art. Died at Paris.

AMERICAN SINGERS

Helen Traubel
World Wide Photo

Lily Pons

Rise Stevens
World Wide Photo

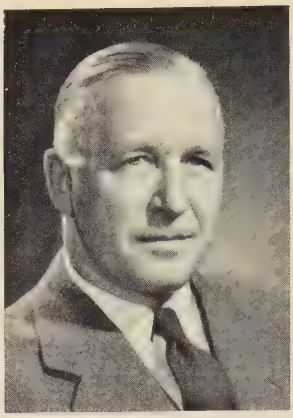
Marian Anderson

Mary Garden

Ernestine Schumann-Heink

Mahalia Jackson
World Wide Photo

Dr. Jack E. Froehlich, aeronautical engineer, is Vice President of the Alpha Corporation. Before becoming chief of a guided missile engineering division, he did research on jet propulsion.



A. Gordon Murphy, engineer for the St. Lawrence Seaway, formerly served as Port Manager at Montreal. He also directed studies for the National Harbours Board.

Formerly Port Director at Chicago, Martin W. Oettershagen is now engineer with the St. Lawrence Seaway Development Corporation at Massena, New York.

ARCHITECTS AND ENGINEERS

Right Wallace Kirkman Harrison, co-architect for Rockefeller Center, was director of planning for the United Nations.

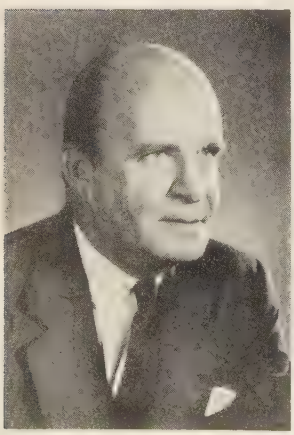
Wide World

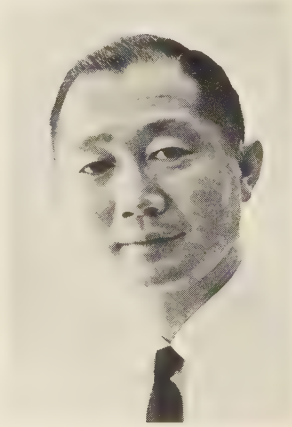
Lower right John E. Burchard, architectural engineer, is Dean of the School of Humanities and Social Studies at the Massachusetts Institute of Technology.

Fabian Bachrach

Below center With beauty and serenity his main goals in architecture, Minoru Yamasaki uses precast concrete to effect the play of light and shadow. In the Detroit area, the buildings of the American Concrete Institute and the Reynolds Metals Co. are but two of his many achievements.

Lower left Wide-ranging in variety of structures and international in scope, the work of Edward Durell Stone, architect, is perhaps best represented by the U.S. Embassy at New Delhi and the American Pavilion at the Brussels World's Fair.





Chatham, William Pitt, first earl of. See *Pitt, William.*

Chaucer (*chô'sẽr*), **Geoffrey** (**1328-1400**), early English poet, was born most probably about 1340, though the traditional date is 1328. He is believed to have studied at Cambridge and later at Oxford. While a student, he wrote *The Court of Love* and *The Book of Troilus and Cressida.* In 1359, he served under Edward III in his French campaign and was made prisoner. After his release and subsequent marriage, he entered public life. He was sent on an embassy to Genoa in 1372. On his return, he was appointed comptroller of the customs for wools, and, in the same year, the king granted him a pitcher of wine daily for life. In 1377, he proceeded to Flanders in the retinue of Sir Thomas Percy, afterward Earl of Worcester, and, for several years thereafter, he was employed in the public service.

Chaucer is the "father of English poetry" in the sense that he gave prestige to the language's use in narrative poems such as had previously been confined to Latin and French. The earlier ones are translations, but he improved on the originals and gradually emerged as an independent poet, the greatest in the English language before Shakespeare. His poems include *The Flower and the Leaf, The Romaunt of the Rose, The Canterbury Tales, The Book of the Duchess, The House of Fame,* and *The Legend of Good Women.* He died at London and was buried in Westminster Abbey. See *Canterbury Tales, The.*

Chávez (*chä'vâs*), **Carlos** (**1899-**), Mexican composer and conductor, was born at Mexico City. He began his musical studies in Mexico, and went to Berlin in 1921, but Germany disappointed him because it seemed to have nothing new to offer. The United States, on the other hand, proved musically stimulating and won his approbation. He returned to Mexico resolved to build up the musical life of his native land on the American model, but on a nationalistic foundation. He organized the Mexican Symphony Orchestra in 1928, and that same year became head of the Mexican National Conservatory of Music. He has been guest conductor of both the Boston Symphony Orchestra and the New York Philharmonic. Among his compositions are *Sinfonia India, Sinfonia Antigone,* and *H. P.* (Horse Power).

Chékov (*chĕ'kôf*), **Anton** (**1860-1904**), Russian novelist and dramatist, was born at Taganrog, southern Russia. He first worked as an assistant to his father, a former serf, who was a provision merchant. At 17, he wrote a tragedy in verse, and shortly after entered the University of Moscow to study medicine. At the same time, he began writing short stories, which soon became successful. His collections of *Humorous Stories* and *In Twilight,* published in 1887, and *Morose Folks* in 1890 attracted wide attention; his reputation increased so that he soon occupied, with "Gorky" and Andréiev, the foremost place among Russian writers of his day. Plotless, his stories emphasize what the author feels as the tragic inescapable isolation of the individual from understanding by others.

In 1887, Chékov was compelled by ill health to go south. He spent his remaining years in the Crimea, where he wrote five plays which have established him as a dramatist of the first rank. The list of his stories includes *Memoirs of a Stranger, Fires, Ward No. 6, A Tedious Story,* and *The Steppe.* Among his most important plays are *The Swan Song, A Proposal, Ivanoff, The Boor,* and *The Cherry Orchard.* See *Cherry Orchard, The.*

Cheops (*kē'ŏps*), or **Khufu,** was a king of Egypt of the fourth dynasty. He built the greatest of the pyramids, employing 100,000 men working in relays of three months. He reigned about 23 years, probably between 2900 and 2800 B. C.

Chesterfield, Philip Dormer Stanhope, Earl of (**1694-1773**), English politician, writer, and man of fashion, was educated at Cambridge. He represented Saint Germans, Cornwall, in the House of Commons, and in 1726 succeeded to the earldom. He was distinguished at the court of George II, and, in 1728, was sent as ambassador extraordinary to the Netherlands. In 1745, he was appointed lord lieutenant of Ireland, and afterward became secretary of state. He is now far more widely known by his letters of *Advice to His Son,* by virtue of which his name has become a synonym for worldly wisdom and courtliness.

Chesterton, Gilbert Keith (**1874-1936**), English journalist and author, was born at Campden Hill, Kensington. He was educated at Saint Paul's School and for a time studied art. He began his literary career by reviewing art books for the *Bookman.* Subsequently, he contributed to magazines and reviews in both England and America. By his attractive, piquant prose style and by the notable range and brilliancy of his fiction, essays, biography, and criticism, he soon firmly established himself in the front rank of English writers.

Among Chesterton's numerous works are *Twelve Types, Browning, Heretics, Dickens, The Man who was Thursday, Orthodoxy, Defendant, Magic, The Wisdom of Father Brown, Irish Impressions, The Superstition of Divorce, Evils of Eugenics,* and *What I Saw in America.*

Chevalier (*shē-vä-lyā'*), **Maurice** (**1888-**), French singer and actor, was born in Paris of working class parents. The death of his father compelled Maurice to earn his living while still a boy. He began singing in a suburban variety theater, and even performed on street corners in the city. After World War I, during which he was wounded and made a prisoner of war, he became the partner of Mistinguette, the revue star at the Folies Bergère. He soon became the most popular artist in the revues at the Casino de Paris. It was not until the introduction of sound films that he came to Hollywood. His broken English and his gay and suggestive songs have made him extremely popular with American and British stage and screen audiences. His autobiography, *The Man in the Straw Hat,* was published in 1950.

Chevreul (*shē-vrûl'*), **Michel Eugène** (**1786-1889**), French chemist, was born at Angers. He studied chemistry at the College de France in Paris. Later, he lectured at the Lycée Charlemagne, and held a technical post at the Gobelins. In 1826, he became a member of the Academy of Sciences, and, in 1830, was made professor at the museum of natural history. Among his discoveries were those of margarin, olein, and stearin. The results of his researches, especially his theory of saponification, led to the establishment of vast industries.

Chiang Kai-shek (*chē-äng'ki'shĕk'*), (**1886-**), Chinese political leader, was born in a village near Ningpo. He was orphaned in infancy. Through scholarships he was enabled to study at the national military academy in Paoting and the Tokyo Military Academy. The revolution of 1911 recalled him to China. Later he became a follower of Sun Yat Sen.

Chiang went to Russia in 1923 to study Soviet methods. Returning in 1924, he aided Sun Yat Sen in establishing, with Soviet help, a government at Hangkow based on a party dictatorship. Sun died in 1925. Chiang broke with his Soviet supporters in 1927 and set up a new government in Nanking, backed by Shanghai industrial interests. He opposed the Communist movement, and played a waiting, passive role against the aggressive tactics of Japan. Kidnapped in 1936 by a general restive under his policy, he returned to Nanking with his captor a captive. When Japan invaded China in 1937 he rallied his countrymen to resistance. He was obliged to remove the seat of government to Chungking. On the death of President Lin Sen, 1943, Chiang was chosen president. When Japan surrendered, Chiang returned the seat of government to Nanking. In May 1948 he became the first president under the new constitution but in 1949 he relinquished the office, which he resumed in 1950 on the island of Formosa (Taiwan), after the communists had gained control of China.

Madame Chiang Kai-shek, née Soong, was educated at Wellesley College and married General Chiang in 1927. She became conspicuous in educational and war relief work in China and in 1942 visited the United States to represent China's pressing need of assistance.

Childs, George William (**1829-1894**), American publisher and philanthropist, was born in Baltimore. He began mercantile life as a clerk in a bookstore in Philadelphia. In 1847, he established an independent business and in 1849, became partner in the publishing firm of Childs and Peterson. In 1864, he purchased the Philadelphia *Public Ledger,* which he developed into a journal of great influence. He devoted his wealth to beneficence, erecting a memorial window in Westminster Abbey to Cowper and George Herbert, a monument to Leigh Hunt at Kensal Green, and a fountain to Shakespeare at Stratford-on-Avon. He is said to have educated 800 boys and girls.

Chippendale, Thomas (**c. 1718-1779**), English cabinet maker, born at Otley in Yorkshire, England. In 1727 he began work in London, and in 1754 brought out his famous book of designs, *The Gentleman and Cabinet Maker's Director.* Working almost exclusively in dark mahogany, Chippendale produced furniture of outstanding design and craftsmanship in the style that bears his name. Although his style was frankly derivative, he made his adaptions so skillfully that the result was something new and original. His chief sources were the earlier eighteenth century Queen Anne and Georgian furniture, with borrowings from the French, Dutch, and Chinese. His influence in England and America has been great. (See *List of Illustrations—Furniture*).

Chirico (*kē'rē-kō*), **Giorgio di** (**1888-**), Greek-born Italian painter, studied in Germany, Italy, and France, and first exhibited at the Paris Salon in 1911. He has followed various styles of painting from surrealism to representational art, but is chiefly known for his earlier works of a nostalgic character, in which faceless figures appear against mysterious and enigmatical backgrounds. Horses have been a favorite subject with him. Chirico has also designed ballet settings and done some writing. His

pictures are to be found in the leading galleries of America and Europe.

Choate (*chōt*), **Joseph Hodges** (**1832-1917**), American lawyer and diplomat, was born in Salem, Mass. He was graduated from Harvard College, 1852, and from Harvard Law School, 1854. In 1855, he was admitted to the bar, and, in 1856, he began law practice in New York City. He was identified with many famous legal cases, and was one of the committee of seventy which, in 1871, broke up the Tweed Ring. From 1899 to 1905, he was the ambassador of the United States to England, and, in 1907, he sat as the first United States delegate to The Hague Peace Conference. He was noted as a public and after-dinner speaker. His writings include *Addresses on Abraham Lincoln, Admiral Farragut,* and *Rufus Choate.*

Choate, Rufus (**1799-1859**), American lawyer, statesman and orator, was born at Essex, Mass. After being graduated from Dartmouth College, he entered upon the study of law at Cambridge and in Washington. He practiced at Danvers, Salem, and Boston, successively, and, in 1841, was elected to the Senate, which he quitted in 1845. After the death of Daniel Webster, Choate became the recognized leader of the Massachusetts bar, and acquired a national reputation. His foresight led him to anticipate the Civil War, and to do more to conciliate the South than was by some considered wise. As an advocate and orator, he may be classed with the most distinguished masters of modern eloquence. He was elected to the American Hall of Fame in 1915.

Chopin (*shō'păn'*), **Frédéric François** (**1810-1849**), Polish pianist and composer, was born near Warsaw, of French-Polish parentage. He appeared in public with great success when only nine years old and was hailed as "the new Mozart." In 1830, he started upon a proposed world tour, proceeding through Germany to Paris where he was warmly encouraged by Cherubini and Liszt. Remaining in Paris, he met in 1836 the noted author, George Sand, with whom he lived for ten years.

Chopin composed almost exclusively for the piano. In the field of emotional music he has been justly styled "the poet of the piano." His waltzes, mazurkas, nocturnes, preludes, and other compositions are peculiar in melody, rhythm, and harmony, and possess great and enduring charm. He was a pianist of the first rank, and his playing, like his music, had a peculiarly captivating grace. After a trip to England in 1847, he fell ill and died of consumption in Paris. See *Music: The Romanticists.*

Chou En-lai (*jō'ĕn'lī'*) (**1898-**), Chinese Communist leader, was born at Huaian, Kiangsu Province, China, of a Mandarin family. He was educated in Japan, China, and France. As a student at Nankai University in 1919, he led a student revolt against the treatment accorded China by the Versailles Treaty and was imprisoned. The following year he went to France, where he was active in organizing the Communist Youth party. Returning to China in 1924, he became associated in a political capacity with Whampoa Military Academy, then under the presidency of Chiang Kai-shek, and in 1927 took part as a nationalist in the uprising at Shanghai. He became a Red army leader, fighting the forces of Chiang Kai-shek and later those of the Japanese invaders. On the establishment of the People's Republic of China in 1949, he was elected premier and foreign minister. In 1958 he resigned the second of these positions but remained premier.

Christian IV (**1577-1648**), king of Denmark and Norway, and Duke of Schleswig-Holstein, was born in Zealand, and was elected successor to the throne in 1588. He became king in 1593. Beginning in 1611, he carried on against Charles IX of Sweden and his successor, Gustavus Adolphus, a successful war, known as the Kalmarian War, which, in 1613, ended in an advantageous peace. As leader of the Protestants in the Thirty Years' War, Christian was not successful. His legislative and financial reforms, together with his love and patronage of the arts and sciences, gained the esteem of his people. He founded the present capital of Norway, long called Christiania after him.

Christian X, Carl Frederik Albert Alexander Wilhelm (**1870-1947**), king of Denmark, the son of Frederick VIII, was born at Charlottenlund. In 1898, he married Alexandrine, Duchess of Mecklenburg. Upon the death of his father in 1912, Christian X succeeded to the throne of Denmark. His country was occupied by Germany in 1940, but the king was permitted to retain his throne. He regained his authority with the German defeat.

Christie, Agatha (**?-**), English writer of detective stories, was born at Torquay, England. Since the publication of her first book *The Mysterious Affair at Styles,* in 1920, she has written more than fifty mystery stories, sometimes at the rate of two or three a year. The character of Hercule Poirot, a Belgian detective, who is featured in many of her novels, has proved highly popular. One of her best books, *The Murder of Roger Ackroyd* (1926), has been hailed as one of the outstanding detective stories of the present century. Other books by her include *Murder in the Calais Coach* (1934), *Death on the Nile* (1937), *And Then There Were None* (1940), *Sparkling Cyanide* (1945), and *Witness for the Prosecution* (1953). Some of her stories have been successfully dramatized for stage and screen. *Witness for the Prosecution* was a 1956 Broadway hit.

Christina (*krĭs-tē'-nă*) (**1626-1689**), queen of Sweden, was born at Stockholm. She succeeded her father, Gustavus Adolphus, in 1632. After her coronation in 1650, she fell under the influence of favorites, and ceased to interest herself in state affairs. She resigned the crown to her cousin, Charles Gustavus, in 1654, embraced Catholicism, and lived for some time at Paris. On the death of Charles Gustavus, in 1660, she vainly endeavored to regain the throne. Christina was one of the most accomplished women of her time, a remarkable linguist, and the friend and correspondent of many famous *literati* and scientists.

Christophe (*krēs'tŏf'*), **Henri** (**1767-1820**), Haitian ruler, was born a slave. A man of great strength and commanding stature, he assisted in a revolt against the French governor of the island, on whose death in 1806 Christophe was elected first president of the republic of Haiti. In 1811, Christophe declared himself king, as Henri I, and proceeded to build up an army, created a currency, and developed a substantial foreign trade. Blending an uncanny grasp of statecraft with methods of fantastic cruelty, he created a political state by main force. A palace at San Souci and a great mountain citadel at La Ferrière are monuments to his power. Overtaken by partial paralysis and threatened by revolts, he took his life, shooting himself with a silver bullet.

Christy, Howard Chandler (**1873-1952**), illustrator and writer, was born in Morgan County, Ohio. He studied art in New York and at the National Academy and also at the Art Students' League under W. M. Chase. He became an illustrator on New York periodicals. During the Spanish-American War, he went to Cuba with the "Rough Riders," and won wide notice by his letters and illustrations. He is known by his illustrations of authors, executed with marked facility and spirit, and by his picturesque types of society women.

Chrysler, Walter Percy (**1875-1940**), American motor car manufacturer, was born at Wamego, Kans. He was apprenticed to a mechanic in a Union Pacific machine shop at 17. Rising rapidly, he was superintendent of motive power for the Chicago and Great Western system at 33. By 1912, he had become manager of the Pittsburgh works of the American Locomotive Company.

As early as 1905, Chrysler purchased an automobile to study its mechanical construction. In 1916 he became president of the Buick Motor Car Company, later a division of General Motors. Following a difference with W. C. Durant, president of General Motors, he reorganized the Willys-Overland Company. A similar service for the Maxwell Motor Corporation led to the formation of the Chrysler Corporation in 1923. This organization forged rapidly ahead to the front rank. In 1928, it acquired the Dodge Bros. properties and became the third largest unit of the American motor car industry.

Chrysostom (*krĭs'ŏs-tŭm; krĭs-ŏs'tŭm*), **Saint John** (**c. 347-407**), one of the Greek fathers of the Church. From an early age, he devoted himself to a life of prayer and asceticism, and, in 398, was made bishop of Istanbul by the emperor Arcadius. As an orator and theologian, Chrysostom ranks among the most important doctors of the early Church. His zeal as a reformer made him many enemies, among them the Empress Eudoxia. He was summoned before a synod at Chalcedon, deposed and banished, but an insurrection of the people led to his immediate recall. He was soon afterward deposed again, and conveyed to the Taurus Mountains, whence he was ordered to proceed to Pityus, on the Euxine, but died on the journey.

Church, Frederick Edwin (**1826-1900**), American landscape painter of the Hudson River School, was born at Hartford, Conn. He was a pupil of Thomas Cole and first attracted notice by his scenes from the Catskill Mountains. Later, he traveled in South America, and painted "Heart of the Andes," "Morning on the Cordilleras," and "Cayambe." His "View of Niagara Falls from the Canadian Shore" is one of his best works.

Churchill, John. See *Marlborough, Duke of.*

Churchill, Winston (**1871-1947**), American novelist, was born at Saint Louis, Mo. He was graduated from the United States Naval Academy, 1894. After serving as an editor of the *Army and Navy Journal* of New York, 1894, and as managing editor of the *Cosmopolitan Magazine,* 1895, he devoted himself to the production of historical fiction. By careful, substantial work, he won high rank as a historical novelist and as a portrayer of contemporary life. His works include *Richard Carvel, The Crisis, The Crossing, The Inside of the Cup, A Far Country, The Dwelling Place of Light,* and *The Uncharted Way.*

Churchill, Sir Winston Leonard Spencer (1874-1965), English statesman and writer, was born at Blenheim Palace, Oxfordshire. He was educated at Harrow and at Sandhurst, entered the army in 1895, and fought with distinction in India, 1897, and in the Sudan, 1898. During 1899-1900, he acted as South African correspondent of the London *Morning Post*.

Elected to Parliament in 1900, he rapidly rose to prominence. He was first lord of the admiralty when World War I broke out, serving later as minister of munitions and secretary of state for war. In 1921, he was made secretary of state for the colonies and, in 1924, became chancellor of the exchequer and was largely responsible for the restoration of British currency to a gold basis in 1925.

His opposition to Chamberlain's policy of "appeasement" in 1938 led to his severance from the cabinet, but when war with Germany broke out in 1939 he was made first lord of the admiralty. In the next year, popular dissatisfaction with Chamberlain's half-hearted conduct of the war led to Churchill's elevation to the prime ministry. The choice was dictated partly by the fact that for years he had warned the government of the impending danger and partly by the fact that, in various crises in the past, he had shown striking decisiveness in action. With great energy he extricated his countrymen from threatened disaster and inspired them with a spirit of ultimate resistance in the face of their direst peril. When Russia and later the United States became allies against the common enemy, he led in welding Allied efforts into effective unity. With the defeat of his party in the elections of July 1945, he left office to lead the opposition. In April 1946, in a speech at Fulton, Missouri, he urged a spiritual union of Britain and the United States against the danger developing behind the "Iron Curtain" from Stettin to Trieste. In May 1948, at an unofficial assembly at the Hague, he advocated the federation of western Europe. His party winning the general election of 1951, Churchill again became prime minister. He was knighted in 1953 by Queen Elizabeth, and in 1954 was installed as a Knight Companion of the Order of the Garter. In 1955 he resigned as prime minister and was succeeded by Sir Anthony Eden. In 1953 he was awarded the Nobel prize in literature. His numerous writings include *The River War, My African Journey, Liberalism and the Social Problem, The World Crises, Marlborough, his Life and Times, The Second World War,* and *A History of the English Speaking Peoples.*

Ciano (*chä'nō*), **Galeazzo, Count (1903-1944),** Italian statesman, was born at Leghorn. He joined with Mussolini in the "march on Rome" in 1922. Under the Fascist regime, he entered the diplomatic service. In 1930, he married Mussolini's daughter, Edda. From 1933, he was head of the press bureau. He served as minister of foreign affairs from 1936 to 1943. Having participated in the overthrow of Mussolini in 1943, he was executed by Mussolini's later German-supported government.

Cibber (*sĭb'ĕr*), **Colley (1671-1757),** actor, manager, dramatist, and poet, was born in London. He was educated at Grantham. In 1690, he joined the Theatre Royal, where he remained, except for short intervals, during his whole theatrical career of 43 years. In 1696, his first comedy, *Love's Last Shift,* was produced; it established his fame as both dramatist and actor. Cibber also prepared the acting version of Shakespeare's *Richard III* now commonly used. He was made poet laureate in 1730.

Cicero, Marcus Tullius (106 B. C.-43 B. C.), Roman orator and politician, was born in Arpinum, Italy. He inherited a large estate from his father and, as a boy, went to Rome, where he studied law, oratory, Greek philosophy, and Greek literature. At the age of 17, he served a few years in the Social war under Sulla. After his return, he devoted several years to the further study of law and of oratory. At 26, he attained his first brilliant success in the law courts; but poor health sent him to travel for the next few years in Greece and Asia Minor.

Political Career. At the age of 30, Cicero entered public life in Rome and soon became quæstor of Sicily, where he obtained the information that enabled him, in 70 B. C., to impeach Verres, the corrupt governor of Sicily. This success gave him a high reputation, and, in 66 B. C., he became prætor.

In 63 B. C., at the age of 44, Cicero was elected consul, in which capacity he checkmated the dangerous conspiracy of Catiline, delivering in the senate his famous *Orations against Catiline* and having some of the conspirators executed. The vigor and courage with which he conducted himself at this crisis won for him, by popular acclamation, the title of "father of his country."

Cicero's fortune had now reached the culminating point. His archenemy, the demagogue Clodius, assailed him with the charge of acting contrary to the constitution by putting citizens to death without appeal to the people. Thus in 58 B. C. he was obliged to go into exile in Thessalonica, and his country seats were torn down. Pompey and Cæsar had suffered Cicero to undergo this humiliation for their own purposes; but the following year, wearied by the arrogance of Clodius, they let it be understood that the persecution should cease, and Cicero was recalled from exile.

Cicero returned to Rome; but he felt powerless in the presence of the leaders of factions, and henceforth he vacillated in his allegiance between Pompey and Cæsar. In 53 B. C., he attained a seat in the College of Augurs, and two years later, he was sent as proconsul to Cilicia, a post in which he conducted himself so meritoriously that he was received in triumph on his return to Rome.

When civil war was imminent between Cæsar and Pompey, Cicero first endeavored to reconcile the two rivals. This hope proving vain, he gave his allegiance to Pompey after a period of vacillation. Following the defeat of Pompey, however, at the battle of Pharsalus, he recommended himself to Cæsar.

The next few years Cicero devoted to literature and philosophy. He was divorced from Terentia, his first wife, and married the heiress Publia. His beloved daughter Tullia died. Upon the assassination of Cæsar in 44 B. C., Cicero hoped to regain political influence, and he opposed Antony in orations called *Philippics* from their analogy to the orations of Demosthenes against Philip of Macedon. His eloquence won him Antony's implacable animosity.

Writings. Cicero's works may be classed as political, philosophical, and personal. The political works comprise 56 speeches delivered in the forum and courts, among which are *For the Manilian Law, Against Catiline, Against Verres, For Milo,* and the *Philippics.* Cicero also produced several treatises on the subject of oratory, of which *On the Orator* is the most important. From his philosophical treatises we derive most of our knowledge of the Greek systems of thought and culture as they were diffused in the Roman world. His *Familiar Letters,* half of which are addressed to his lifelong friend Atticus, possess consummate literary style.

Character. Cicero was not a great nor a wise politician, but, throughout his whole career, he was a true patriot. His chief fault was his vanity. He presents to us the Latin language at the highest stage of its development, and he will ever stand pre-eminent as an example of the best moral and intellectual culture of the ancient world. He was slain by order of Antony. The hired assassin was a man whom Cicero, as a lawyer, had successfully defended.

Cimon (*sī'mŏn*) **(?-449 B. C.),** Athenian general, was the son of Miltiades, the conqueror at Marathon. With his patron Aristides, he was placed over the Athenian contingent to the allied fleet, which, under Pausanias, continued the war against Persia, 447 B. C. His greatest exploit was his encounter with a Persian fleet at the river Eurymedon, 466, when he destroyed or captured some 200 out of 350 ships, and defeated the land forces on the same day. He advocated a close alliance with Sparta; and, when the Helots revolted, he twice led an army to support the Spartans. But the second time, having lost the confidence of his allies, he was ignominiously dismissed. At Athens he was opposed by the democracy, headed by Pericles, who procured his ostracism. He was recalled about 454, and was instrumental in obtaining a five years' armistice with Sparta.

Cincinnatus (*sĭn'sĭ-nā'tŭs*), **Lucius Quinctius (c. 519 B. C.-c. 430 B. C.),** Roman consul. About 460, he was chosen consul, and two years later was made dictator. When the messengers from Rome arrived to tell him of his new dignity, they found him plowing on his small farm. After a dictatorship of 16 days he returned to his simple country life. When 80 years old, he was again made dictator and put down a threatened insurrection. By the later Romans, Cincinnatus came to be regarded as the model of old-fashioned virtue.

Clairaut (*klĕ'rō'*) **Alexis Claude (1713-1765),** French mathematician, was born in Paris. He displayed remarkable precocity, read works on infinitesimal analysis and conic sections at the age of 10, presented a memoir on curves to the French Academy in his 13th year, published a work on curves of double curvature at 16, and was elected to the Academy at 18. In astronomy he solved the celebrated problem of three bodies in the case of the sun, the earth, and the moon. He demonstrated the figure of the earth, proving the flattening toward the poles; explained the motion of the moon; and computed the return of Halley's comet. In mathematics he contributed valuable studies in curves and differential equations.

Clark, Alvan Graham (1832-1897), American optician and astronomer, was born at Fall River, Mass. He was the son of Alvan Clark (1808-87), maker of astronomical instruments, and was associated with his father in the manufacture of telescopes. The chief refracting telescopes of the early 20th century were products of their establishment. The great lenses for refracting telescopes made by Alvan Graham Clark include those of the Naval Observatory at Washington (26 inches in diameter), of the Nicholas Central Observatory at Pulkovo, Russia (30

inches in diameter), of the Lick Observatory, Mount Hamilton, California (36 inches in diameter), and of the Yerkes Observatory of the University of Chicago (40 inches in diameter). He was an active astronomical observer and made numerous discoveries of double stars.

Clark, Champ (1850-1921), American politician, was born in Anderson County, Kentucky. He was educated in Kentucky University, Bethany College, and at the Cincinnati Law School. During 1873-74, he was president of Marshall College. He worked as a hired hand on a farm, was clerk in a country store, was editor of a country newspaper, and became prosecuting attorney of Pike County, Missouri. In 1893, he was elected to Congress and, except for the term 1895-97, was re-elected continuously until 1921. He was chairman of the Democratic National Convention at Saint Louis in 1904. At the Democratic National Convention in 1912, he was a prominent candidate for the presidential nomination but was defeated on the 46th ballot by Woodrow Wilson. From 1911 to 1919, he was speaker of the House of Representatives.

Clark, Francis Edward (1851-1927), American clergyman, was born of New England parentage at Aylmer, Quebec. A graduate of Dartmouth College and Andover Theological Seminary, from 1876 to 1883 he was pastor of Williston Congregational church, Portland, Me. In 1881, he organized the Williston Young People's Society of Christian Endeavor. Most of his time thereafter was devoted to Christian Endeavor work, as president of the United Society and of the World's Christian Endeavor Union and as editor of the *Golden Rule*. His writings include *Our Vacations* and *The Holy Land of Asia Minor*. See *Christian Endeavor*.

Clark, George Rogers (1752-1818), American military leader, was born near Charlottesville, Va. Engaged as a surveyor, he bought land in Kentucky and settled there. In 1778, when the pressure of British and Indians threatened to drive the Americans from Kentucky, he secured authority from the state of Virginia to lead a counter attack. With 175 men and little equipment, he captured Kaskaskia, Cahokia, and Vincennes, accomplishing his ends by speed of movement and brilliant strategy and securing for the colonists Kentucky and the Northwest.

Clark, Mark Wayne (1896-), American general, was born at Madison Barracks, N. Y. A graduate of West Point in 1917, he served in World War I and was promoted through grades to brigadier-general in 1940, In October 1942, he was sent into North Africa to gain information and make contacts for the Allied invasion. For his success in this mission he was promoted to lieutenant-general. In 1943, he commanded the fifth United States army in the invasion of the Italian peninsula. After commanding the Allied forces in Italy, he was placed in command of the American Occupational forces in Austria. In 1952 he was appointed U. N. commander in Korea. Since 1953 he has been president of The Citadel Military Academy of South Carolina, at Charleston.

Clark or **Clarke, William (1770-1838),** American explorer, was born in Virginia. In 1804-06, in company with Meriwether Lewis, he conducted the famous exploring expedition sent out by Jefferson from Saint Louis to the mouth of the Columbia River and kept the log of the journey. He was governor of Missouri territory, 1813-21, and superintendent of Indian affairs at Saint Louis from 1822 to 1838.

Clarke, Charles Cowden (1787-1877), English writer and critic, was born at Enfield, Middlesex. He early developed a passion for the theater, and made frequent visits to London, where he formed the friendship of Leigh Hunt, Shelley, Hazlitt, and Charles and Mary Lamb. In 1820, he became a bookseller in London, and shortly after partner as music publisher with Alfred Novello, whose sister Mary Victoria he married in 1828. A year later, Mrs. Cowden Clarke began her famous *Concordance to Shakespeare's Plays*. In 1834, Clarke entered on a twenty years' course of public lectures on Shakespeare and other dramatists and poets which brought him much celebrity and profit.

Some of Clarke's lectures were published, including his *Shakespeare Characters* and *Molière Characters*. The joint productions by Clarke and his wife were the *Shakespeare Key*, *Cassell's Illustrated Shakespeare*, *Recollections of Writers*, full of reminiscences of Keats, Lamb, Dickens, and other literary friends. In 1856, Clarke and his wife removed to Nice and, in 1861, to Genoa, where Charles died in 1877 and his widow in 1898.

Clarke, James Freeman (1810-1888), American theologian and writer, was born at Hanover, N. H. He was graduated at Harvard in 1829 and at Cambridge Divinity School in 1833. He was pastor of a Unitarian Church, Louisville, Ky.; professor of natural theology at Harvard, 1867-71; and lecturer on ethnic religions, 1876-77. In 1841, he aided in founding the Church of the Disciples, Boston, of which he was pastor from 1841 to 1850 and from 1854 to 1888. Among his writings are *The Ten Great Religions*, *Events and Epochs in Religious History*, *Self-Culture*, *Manual of Unitarian Belief*, *Essentials and Nonessentials in Religion*, and *Anti-Slavery Days*.

Clarke, John Hessin (1857-1945), American jurist, was born at Lisbon, Ohio. He was educated at Western Reserve University where he was graduated in 1877 and received his master's degree in 1880. He was admitted to the bar in 1878 and practiced law in his native town, 1878-80. He practiced law in Youngstown, Ohio, from 1880 to 1897 and in Cleveland from 1897 to 1914, when he was made United States district judge. From 1916 to 1922, he was Associate Justice of the United States Supreme Court, his opinions being of a pronounced liberal trend. He resigned to devote his time to the furtherance of world peace.

Claude (*klōd*), **Georges (1870-1960),** French inventor and engineer, was born at Paris. He devised an improved method for producing liquid air and for obtaining its constituent gases in a pure form; also a modification of the Haber process for making synthetic ammonia, in which the requisite hydrogen is obtained from the distillation of coal. Best known of his inventions is the neon electric lamp, in which the illumination proceeds from the gas within a neon-filled tube instead of from a filament.

Claude (*klōd*) **Lorraine,** or **Claude Gelée (1600-1682),** early French landscape painter, was born at Chamagne in Lorraine. Left an orphan at the age of 12, he found a home with an elder brother, who was a carver in wood at Freiburg, and there showed some signs of pictorial genius. He afterward studied at Rome and at Naples. In return for his teaching, in the house of Agostino Tassi at Rome, he ground his master's colors and performed household duties. He made a tour of Italy, France, and Germany, suffering much through poverty; but, in 1627, he returned finally to Rome where he speedily made himself famous by paintings remarkable for their warm, rich coloring and brilliant light effects. He painted Italian landscapes with unsurpassed perfection and notable poetic feeling. He was the foremost painter of classic landscape in his century and one of the world's greatest landscape artists. Most of his paintings are in England. He died at Rome.

Claudius (*klô'dĭ-ŭs*), or **Tiberius Claudius Drusus Nero Germanicus (10 B. C.-54 A. D.),** Roman emperor, was born at Lugdunum. When Caligula was killed, 41 A. D., Claudius was made emperor by the soldiers. This was the first time that an emperor was chosen by the army.

The conquest of Britain was begun by Claudius. From his conquests in Germany he took the title of Germanicus. He built the harbor of Ostia and the Claudian aqueduct. He was poisoned by his wife Agrippina, who wanted the empire for her son Nero.

Clausius (*klou'zē-ŭs*), **Rudolf Julius Emanuel (1822-1888),** German physicist, was born at Koslin, Pomerania. He was educated at Berlin, and held professorships in physics at Zurich, Würzburg, and Bonn. In 1850. he stated the second law of thermodynamics, namely that "heat cannot of itself pass from a colder to a hotter body," and is regarded as one of the founders of thermodynamics. In his theory of electrolysis, now accepted, he assumed that the ions are not in complete union, but are in part free, and that the uncombined ions are brought by the action of the electric current to the anode and cathode. He was one of the most eminent mathematical physicists of his century and made many notable researches in electricity, heat, and molecular physics.

Clay, Henry (1777-1852), American statesman, was born in Hanover County, Va. He studied law and was admitted to the bar, 1797, thereafter taking up his residence in Lexington, Ky. In 1806, he was appointed senator and, in 1809, was again chosen to fill a vacancy. In 1811, he was sent to the House of Representatives, where he was immediately elected speaker. A strong advocate of nationalism, he denounced the claims put forth by England as to right of search. He was a strenuous supporter of the war with that country and in consequence was sent, in 1814, as one of the commissioners to sign the treaty of peace at Ghent. On his return he exerted all his talents in favor of the independence of South America, and labored hard to eradicate all European influence from America.

Clay, however, is best known as the author of the famous Missouri Compromise, and of the Compromise of 1850, known as Clay's "omnibus" measure. In 1824, he was an unsuccessful candidate for president, but was made secretary of state by J. Q. Adams, the successful candidate. In 1832, he ran against Jackson and was defeated. He was then returned to the United States Senate, in which he played a leading part for many years ensuing, especially in the tariff compromise of 1833 whereby a conflict with South Carolina was averted.

Clay was a candidate for president before the first Whig national convention in 1839, but Harrison was nominated and elected. Harrison's death and Tyler's course brought Clay forward as the choice of his party in 1844, when an

unsuccessful effort was made to elect him. Clay's name was once more presented to the Whig national convention of 1848, but Taylor was nominated over him and elected. In 1842, he resigned his seat in the Senate, but was persuaded to return to it after 1844, and bore a leading part in effecting the slavery compromise of 1850.

Though not successful as an aspirant to the presidency, he was a gallant party chief, an eloquent orator, a skillful legislator, wielding unsurpassed influence not only over his friends but even over his political antagonists. He was elected to the American Hall of Fame, 1900.

Clay, Lucius D. (**1897-**), United States army officer, was born in Marietta, Ga., and was graduated from the U. S. Military Academy in 1918. His assignment as commander of the U. S. forces in occupied Germany (1947-49) involved keeping order, feeding the population, and carrying out a program of de-Nazification, while maintaining correct relations with the Russians. General Clay's varied experiences and his conception of the problem are summarized in his book *Decision in Germany*. He retired in 1949, but in the crisis of 1961 he returned to Berlin as President Kennedy's personal representative.

Clayton, John Middleton (**1796-1856**), American statesman and diplomat, was born at Dagsboro, Del. He was graduated from Yale, 1815, and became a noted lawyer. He was United States senator, 1829-37, 1845-49, and 1851-56. During 1849-50, he was secretary of state under President Taylor and negotiated with the British government the historic Clayton-Bulwer Treaty.

Clemenceau (*klā'mäN' sō'*), **Georges** (**1841-1929**), French statesman, was born in Vendée. In 1865 he visited the United States as a journalist, returning to France in 1869 to practice medicine. He entered politics, supporting Gambetta, was a member of the Chamber of Deputies, 1876-93, as leader of the extreme left, and was elected senator in 1902. In 1880 he established a daily newspaper, *La Justice*, and became a political power, feared as the destroyer of ministries. He defended Dreyfus and published Zola's famous letter, *J'Accuse* (I Accuse). In 1906 he was chosen premier, resigning in 1909. During his ministry he firmly carried out the law separating Church and State.

Pledged from the days of the French defeat in 1870 to the ultimate restoration of Alsace-Lorraine, Clemenceau, during World War I, became one of the most vigorous patriotic leaders of France. At the critical period following the downfall of the Painlevé ministry, Clemenceau was again chosen premier (November 16, 1917) and, by unflagging energy, united the French nation for the supreme effort which, within a year, led to complete victory for the Allies. In 1919, Clemenceau was made leader of the French delegation to the Peace Conference at Versailles and was chosen to preside over its sessions.

Clemens, Samuel Langhorne (**1835-1910**), ("Mark Twain") American humorist and novelist, was born at Florida, Mo. He was educated in the common schools, Hannibal, Mo.; was apprenticed to a printer when about 12 years of age; and served for a time as a Mississippi pilot. He engaged in 1861 as private secretary to his brother when the latter was appointed territorial secretary of Nevada. In 1862, he became editor of the Virginia City (Nev.) *Enterprise*. Here he first displayed his powers as a writer of humor and sarcasm. He then alternated between mining and newspaper work until he began lecturing and writing books. In 1884, Clemens engaged in the publishing enterprise of C. L. Webster and Co., the failure of which some ten years later involved him in heavy losses. He paid much of the firm's indebtedness and restored his own fortune by proceeds of lectures and books. Few other novelists have so clearly pictured the irresponsible American boy as has Clemens in the escapades of Tom Sawyer and Huckleberry Finn. His rich humor lends a compelling charm to his books as it did to his lectures. His writings document a period of American history that has passed and introduce a healthy skepticism into the narrative of ages earlier than his. He lived abroad for many years and was greatly admired in England. He was one of the seven original members of the American Academy of Arts and Letters.

His works include *The Jumping Frog, The Innocents Abroad, The Gilded Age* (with C. D. Warner), *Roughing It, Adventures of Tom Sawyer, A Tramp Abroad, The Prince and the Pauper, Life on the Mississippi, Adventures of Huckleberry Finn, A Yankee at the Court of King Arthur, Pudd'nhead Wilson, Tom Sawyer Abroad, A Dog's Tale, Eve's Diary, A Horse's Tale, Christian Science*, and *Autobiography of Mark Twain*. He was elected to the American Hall of Fame in 1920. See *Literary Plots, Characters, and Allusions: Innocents Abroad; Prince and the Pauper, The; Pudd'nhead Wilson; Sellers, Colonel Mulberry; Tom Sawyer*.

Clement, Frank Goad (**1920-**), American lawyer and politician, was born at Dickson, Tenn., and was educated at Cumberland and Vanderbilt universities. Admitted to the Tennessee bar in 1941, he practiced law at Nashville and Dickson. He saw service with the Federal Bureau of Investigation from 1941 to 1943, and also served as 1st lieutenant in the U.S. army during World War II. He was elected governor of Tennessee in 1953, and in 1956 was the keynote speaker at the Democratic National Convention at Chicago. Clement is a Methodist lay preacher.

Clement of Alexandria (**c. 150 A. D.-c. 215**), or Titus Flavius Clemens, Greek theologian of the early Church, was educated under many teachers, and finally studied in a Christian school at Alexandria, where he entered the Church. About 190, he succeeded Pantænus as the head of the catechetical school, which became renowned on account of his own and Origen's teachings.

Clement was thoroughly versed in Greek philosophy, literature, and history and ranked high as a theologian, although overshadowed by Origen, his celebrated pupil. In his view Greek philosophy was a divinely inspired preparation for Christianity. His chief works are *Exhortation to the Greeks, The Instructor*, and *The Stromata*. He wrote also a tract entitled *Who is the Rich Man that Shall be Saved?* During the persecution, about 203, he left Alexandria, visiting Palestine and Asia Minor, but the place and the date of his death are unknown.

Cleon (**?-422 B. C.**), Athenian politician and advocate of democracy, son of Cleænetus, was by occupation a leather dealer. He first became known by his opposition to Pericles, causing the latter's conviction for misuse of public funds. In 427 B. C., he urged severe penalties against the revolting populace of Mytilene. In 425, he induced the Athenians to impose harsh terms upon Sparta, and, in co-operation with Demosthenes, he ended the siege of Sphacteria in 20 days. Although denounced as a demagogue by Aristophanes and Thucydides, he was for some years the leading man in Athens, able in public administration, and a zealous advocate of war with Sparta. While in charge of a campaign to recover for the Athenians the city of Amphipolis, he was defeated and slain.

Cleopatra (*klē'ô-pā'trȧ*) (**c. 69 B. C.-30 B. C.**), queen of Egypt, celebrated for her beauty, was the daughter of Ptolemy Auletes, by whose will she was left joint sovereign with her brother Ptolemy, 51 B. C. Expelled by the latter, she sought the assistance of Julius Cæsar, who restored her to the throne in conjunction with a younger brother. She afterward followed Cæsar to Rome, and, in 41 B. C., captivated Mark Antony, who rejected Octavia for her sake. A quarrel with Octavius ensued. The fleet of Antony and Cleopatra was defeated at the battle of Actium, and Cleopatra, followed by Antony, fled to Egypt, where they committed suicide.

Cleveland, (Stephen) Grover (**1837-1908**), 22d and 24th president of the United States, 1885-89 and 1893-97, was born in Caldwell, N. J. He received an academic education, and, in 1855, went to Buffalo, N. Y., where he became clerk in a law office. He was admitted to the bar in 1859, was assistant district attorney from 1863 to 1866, Sheriff of Erie County from 1870 to 1873, and, in 1881, was elected mayor of Buffalo. His veto of extravagant appropriations directed outside attention to him and led to his nomination and election as governor of New York in 1883.

In 1884, Cleveland was elected president of the United States, Democrat, over James G. Blaine, Republican. In 1888, he was again the Democratic nominee, but was defeated by Benjamin Harrison. He then returned to law practice, locating in New York City. In 1892, he was again elected president as a Democrat, defeating President Harrison. In 1896, the Democratic party having declared for the free coinage of silver, Cleveland withheld his support from the ticket and the platform. After his second retirement from the White House, he took up his residence at Princeton, N. J., where he died. He was elected to the American Hall of Fame in 1935.

Clews, Henry (**1836-1923**), banker, was born in Staffordshire, Eng. He was intended for the ministry, but he left school at 15 to enter mercantile life in New York, where his father had taken him for a visit. At the outbreak of the Civil War, he was invited by the secretary of the treasury to become agent to sell government bonds. He rose to prominence in finance and, in 1877, organized the firm of Henry Clews and Company, its members pledging themselves to take no speculative risk. He wrote *Twenty-eight Years in Wall Street* and *The Wall Street Point of View*.

Cliburn, Van (**1934-**), pianist, was born at Shreveport, La. He studied with his mother and later entered the Julliard School of Music, where he was an honor graduate. A concert tour of the United States following appearances with the New York Philharmonic and the Dallas Symphony orchestras introduced him to American audiences. In 1958 he gained international fame by winning first prize in the Tchaikovsky Piano Competition at Moscow.

Clinton, De Witt (**1769-1828**), American statesman, was born at Little Britain, N. Y. He graduated at Columbia College, and, after studying law, entered the lower house of the New York legislature in 1797, where he soon became

the leader of his party in the state. He was chosen United States senator in 1802, but left the Senate to become mayor of New York City. On the question of war with England, he competed for the presidency with Madison in 1812, receiving 89 electoral votes. He was elected governor of New York four times. His greatest service to the state was in urging the construction of the Erie Canal and pushing the measure assiduously until he saw that great enterprise completed and the canal open for traffic. He died at Albany, N. Y.

Clinton, George (**1739-1812**), American general and statesman, was born in Little Britain, N. Y. In the French and Indian war he served as lieutenant at the capture of Fort Frontenac, 1758. After the war he practiced law. During the struggle for independence, he sat in the Colonial Congress, and was made a brigadier general. He was the first governor of New York, serving, 1777-95, and again, 1801-04. Objecting to some of the provisions of the Federal Constitution, he did all in his power to prevent New York from adopting it. In 1805, he was chosen vice president of the United States and served continuously until his death.

Clinton, Sir Henry (**c. 1738-1795**), English general. He served as a general in the American Revolutionary War, fought at Bunker Hill and so distinguished himself at the battle of Long Island that shortly afterward he succeeded Sir William Howe as commander in chief of the English forces. He assisted in the capture of Charleston. After his return to England he was appointed governor of Limerick and later of Gibralter, where he died.

Clive (*klīv*), **Kitty** (**1711-1785**), British actress, the daughter of William Raftor, a Jacobite lawyer from Kilkenny, was born in London. She appeared at Drury Lane about 1728, and continued to play chiefly at that theater until 1769, when she quitted the stage. In 1732, she married George Clive, a barrister, but they soon parted. She was a friend of Garrick, Handel, Horace Walpole, and Dr. Johnson, the last remarking to Boswell that "in the sprightliness of humor he never had seen her equal." She died at Strawberry Hill.

Clive of Plassey, Robert Clive, Baron (**1725-1774**), English statesman and soldier, founder of the British Indian Empire, was born at Styche, in Shropshire. He went to India in 1744 as a writer under the East India Company, but three years later relinquished the civil for the military service, in which he greatly distinguished himself. In 1753, he visited England and, in 1755, returned to India with rank of lieutenant colonel. Scarcely had he arrived when the nabob of Bengal captured Calcutta, and threw some English prisoners into the memorable "black hole of Calcutta." At Plassey, in 1757, Clive avenged this deed by defeating the nabob's large army with a small force of expertly led troops. He was then made governor of Bengal, but two years afterward returned once more to England, when he was created Baron. In 1765, he went again to Bengal, as president, but finally returned to England in 1767. His last years were embittered by the attacks of his enemies. In a fit of gloom he committed suicide in London. See *Black Hole of Calcutta*.

Clovis I (*klō'vis*) (**c. 466-511**), king of the Salian Franks. He is regarded as the founder of the French monarchy. He succeeded his father, Childeric I, in 481. By defeating Syagrius at Soissons in 486, he made himself master of all the Roman possessions in the center of Gaul. After a victory over the Germans at Tolbiac near Cologne in 496, he made a vow to embrace christianity at the instance of his wife Clotilda. With 3000 Franks, he was baptized by Saint Remigius, Archibishop of Reims. He conquered Alaric II, king of the Visigoths, in 507 and gained most of the south provinces.

Clyde, Colin Campbell, Baron (**1792-1863**), British general, was born in Glasgow. His father was a cabinetmaker named Colin Macliver. In 1808, he entered the army as an ensign, taking, to please an uncle, the name of Campbell. He greatly distinguished himself in wars in the Spanish peninsula, the United States, China, India, and the Crimea. He reached the summit of his fame in 1857, when, as commander of the forces in India, he brilliantly relieved Lucknow, thoroughly subdued the Sepoy mutiny, and saved the English empire in India. In 1858, he was created Baron. He was buried in Westminster Abbey. See *Sepoy Mutiny*.

Cobb, Henry Ives (**1859-1931**), American architect, was born at Brookline, Mass. He was educated at the Massachusetts Institute of Technology and Harvard University, being graduated from the latter in 1880. In 1881, he removed to Chicago. He was architect for the Newberry Library, the University of Chicago, the Church of the Atonement, and many other prominent buildings in Chicago and other cities. He was one of the board of architects for the World's Columbian Exposition, 1893, and, from 1893 to 1903, was special architect for the United States government. Throughout the country he acquired a large general practice, his commissions including the Pennsylvania State Capital, the United States government buildings at Chicago; League Island, and Annapolis; the City Hall and Courthouse Building, Chicago; and the American University at Washington.

Cobb, Irvin Shrewsbury (**1876-1944**), American writer and correspondent, was born at Paducah, Ky. He was educated in public and private schools, and at an early age became a reporter and a contributor to comic weeklies. At 19 he edited the Paducah *Daily News*. After seven years of experience on New York papers, he was engaged in 1911 as staff contributor to the *Saturday Evening Post*.

Cobb was the author and collaborator of several plays and musical comedy skits, among them *Funabashi*, *Mr. Busybody*, and *Guilty as Charged*. His published books include *Back Home*, *Cobb's Anatomy*, *The Escape of Mr. Trimm*, and *Exit Laughing*, an autobiography.

Cobden, Richard (**1804-1865**), English statesman and economist, was born at Heyshott, Sussex. He was the son of a poor farmer, went to an inferior school in Yorkshire, and began life as a clerk. At 21 he became a commercial traveler, and at 24 set himself up at Manchester in the calico-print business, in which he was notably successful. By systematic self-education and travel he prepared himself for a larger field. His pamphlet, *England, Ireland and America*, published in 1835, revealed a new force in the political world. He was active in forming the Anti-Corn-Law league in 1839, and was elected to Parliament in 1841.

Cobden devoted his energies and sacrificed his fortune to secure the repeal of the Corn laws, which was effected in 1846. To him more than to any other one person was due the establishment of the policy of free trade by England, which continued for nearly a century.

Cochran, Charles Blake (**1872-1951**), British producer and impresario, was born in Sussex. His indifferent success as an entertainer, or comedian, was followed by more rewarding activity as a theatrical business agent, beginning with an assignment as secretary to Richard Mansfield. His various enterprises, not all of which had to do with the drama, included the promotion of boxing and wrestling matches and the management of Eleanora Duse, Chaliapin, Houdini, and Elizabeth Bergner. Among the stage or film plays for which he is best remembered are *The Better 'Ole*, *As You Were*, and, with Noel Coward, *Cavalcade*. His book, *Secrets of a Showman*, recalls many of his experiences, including some of the ups and downs that lend constant excitement to a theatrical manager's occupation.

Cockcroft, Sir John Douglas (**1897-**), British physicist, is Director of the Atomic Energy Research Establishment for the Ministry of Supply, a position he has held since 1946. He was educated at Oxford, with studies and research also at Sydney, Manchester, and Cambridge. Preceding his present assignment, he was Chief Superintendent of Air Defense Research, 1941–44.

Cocteau (*kôk'tō'*), **Jean** (**1891-1963**), French poet, novelist, dramatist, librettist, and motion picture director, was born at Maisons-Lafitte, France. He was an exponent of modernism in the arts and a leader of advanced groups. His output includes ballets such as *Le Boeuf sur le toit* (1920) and *Les Maries de la tour Eiffel* (1921), and plays like *La Machine infernale* (*The Infernal Machine;* 1934). One of his best-known novels is *Les Enfants terribles* (*Enfants Terrible*; 1931). In 1955, he was made a member of the French Academy.

Cody, William Frederick (**1846-1917**), American frontiersman, scout, and showman, known as "Buffalo Bill," was born in Scott County, Iowa. In 1851, his parents removed to Kansas, where his father was killed five years later in the border warfare. He found himself the head of the family at the age of ten. In 1860, he became a rider of the pony express. At the outbreak of the Civil War he served as government scout and guide and, in 1863, enlisted in the cavalry. At the end of the war he contracted with the Kansas Pacific railroad to supply buffalo meat to its laborers, whence he was named "Buffalo Bill."

He served in the army as a scout from 1868 to 1872, when he became a member of the Nebraska legislature. In 1876, he served in the Sioux War and, at the battle of Indian Creek, killed Chief Yellow Hand in personal combat. In 1883, he organized a noted "Wild West" show, which he took to Europe in 1887. In 1901, he established a school of rough riders on his lands in Wyoming. He wrote several books on frontier life including *The Adventures of Buffalo Bill* and *True Tales of the Plains*. He was the last notable frontier scout in American history.

Coffin, Henry Sloane (**1877-1954**), American clergyman, was born in New York City. After being graduated from Yale University, he studied in Edinburgh, Scotland, and Marburg, Germany. He was ordained a Presbyterian minister in 1900 and preached in New York until 1926, first at Bedford Park Church and, after 1905, at Madison Avenue Church. In 1926 he was made president of Union

Theological Seminary, in which position his influence was exerted for the liberal wing of religious thought with emphasis on the social aspects of Christianity. He retired in 1945. His publications include *Christian Convictions, A More Christian Industrial Order,* and *God's Turn.*

Cohan (*kō-hăn'*), **George Michael** (**1878-1942**), American comedian and playwright, was born at Providence, R. I. He first appeared on the stage at 9 years of age in *Daniel Boone,* and, at 12, appeared in *Peck's Bad Boy.* Later, with his family in an act called *The Four Cohans,* he became popular on the vaudeville stage. From 1899 to 1940 he wrote, produced, and acted in a large number of plays and musical comedies. His plays include *Forty-Five Minutes from Broadway* (1906) and *The Seven Keys to Baldpate* (1913). Among the many songs he has written are "Give My Regards to Broadway," "I'm a Yankee Doodle Dandy," "You're a Grand Old Flag," "Mary's a Grand Old Name," and "Over There." In 1941, he was awarded the Congressional Medal for his patriotic World War I song "Over There" and for "You're a Grand Old Flag."

Coke (*kōōk; kōk*), **Sir Edward** (**1552-1634**), English jurist and law writer, was born at Mileham, in Norfolk. He was educated at Norwich Grammar School and at Cambridge University. Admitted to the bar in 1578, he early acquired a high reputation. He became solicitor-general in 1592 and attorney general in 1594. In his prosecution of Essex, Raleigh, and others, he showed much harshness, but his loyalty gained him, in 1606, the chief justiceship of the common pleas. In this position and in that of chief justice of the king's bench, 1613, he opposed the claim of King James I to exercise prerogatives and was temporarily deposed in 1616. Entering Parliament in 1620, he there resisted the king's encroachments; was imprisoned in the Tower in 1622; and, in 1628, took the chief part in drawing up the petition of rights. The remainder of his life was spent in compiling his famous legal commentary, *Coke upon Littleton.*

Colbert (*kôl'bûr'*), **Jean Baptiste** (**1619-1683**), French statesman, was born at Reims, France. As minister of finance under Louis XIV, he devoted his efforts to financial and fiscal reforms, and to the encouragement of commerce and manufactures. To him the kingdom was indebted for the enlargement of its navy, for the acquisition of many of its foreign possessions, and for a large number of internal improvements. He reorganized the Royal Academy of Painting and Sculpture, and founded the Academy of Sciences and the Academy of Architecture. The gardens of the Tuileries, the Hôtel des Invalides, the façade of the Louvre, and several of the quays along the Seine were all the work of Colbert.

Cole, Rossetter Gleason (**1866-1952**), American musician and composer, was born at Clyde, Mich. He was graduated at the University of Michigan in 1888, and, after teaching languages in high schools, 1888-90, he studied composition and organ, 1890-92, in Berlin. He became musical director at Ripon College in 1892; was professor of music at Grinnell College, 1894-1901; acted as musical editor in Chicago, 1902-07; and was director of the School of Music, University of Wisconsin, 1907-09. From 1915 he taught at the Chicago Cosmopolitan School of Music. His published compositions include *The Passing of Summer* (a lyrical cantata), *Hiawatha's Wooing, King Robert of Sicily, a Fantaisie Symphonique* and a *Rhapsody* for the organ, and some 85 other compositions for chorus, piano, organ, and orchestra, including *Heroic Piece,* first performed in 1924 by the Chicago Symphony Orchestra.

Cole, Thomas (**1801-1848**), American landscape painter, was born at Bolton, England, and came to America in 1819. He studied in Philadelphia and New York; associated with Durand and Trumbull; traveled three years in Europe, but strongly preferred American scenery to that of the Old World. He was the founder of the Hudson River School of Painting, from which American landscape art has developed. Among his best-known allegorical works are "The Voyage of Life," "Course of Empire," and "Expulsion from Eden." His landscapes are mostly in private collections. Five of his paintings, however, are in the Metropolitan Museum, New York. Died at Catskill.

Cole, Timothy (**1852-1931**), American wood engraver, was born at London, England, and came to the United States, 1857. He studied in New York under Bond and Chandler, and, in 1875, entered the employment of the *Century Magazine,* then called *Scribner's.* In 1883, he went to Europe to engrave the old masters. He finished the Italian series in 1892, the Dutch and Flemish series in 1896, the English series in 1900, the Spanish series in 1907, and the French series in 1910. Later, he began to engrave a series of old masters in American public and private galleries.

Regarded as the foremost modern wood engraver, Cole was notably effective in his use of the white line, in his appreciation of light and shade, and in reproducing the personality and atmosphere of his subject. His writings include *Notes to Old Italian Masters, Monograph on the Lives of Dutch Masters,* and *Notes to English Masters.* In 1913, he was elected member of the American Academy of Arts and Letters.

Coleridge, Samuel Taylor (**1772-1834**), British poet, critic, and philosopher, was born in Devonshire. He was sent to Christ's Hospital School and subsequently studied at Cambridge, where he obtained the prize for the best Greek ode. He was the founder of modern Shakespearean study; introduced German literature and Kant's philosophy into England; and won enduring fame as a poet by a small volume of verse. His *Christabel, The Rime of the Ancient Mariner,* and *Kubla Khan* rank among the finest poems in English. Like De Quincey, he fell short of the highest attainments of his genius through long enslavement to opium. Among his other works are *Sibylline Leaves, Biographia Literaria, Remorse,* and *Aids to Reflection.* He died in London. See *Ancient Mariner, The.*

Coleridge-Taylor, Samuel (**1875-1912**), English composer, was born in London. He was of African descent through his father, a native of Sierra Leone. His mother was an English woman, and he received his education under English influence. He entered the Royal Academy at 15 and made a distinguished record, winning the composition scholarship in 1893. After studying three years with Villiers-Stanford, he turned his attention entirely to musical composition. His principal works are symphonies, ballads, and waltzes for the orchestra; the operetta, *Dream-Lovers;* choral pieces with orchestra, including *Hiawatha's Wedding, The Atonement, Endymion's Dream,* and *A Tale of Old Japan;* chamber music, piano pieces, and many songs. He died at London.

Colet (*kŏl'ĕt*), **John** (**c. 1467-1519**), English theologian and educator, was born probably in London. He was educated at Oxford, and traveled in Paris and Italy, where he made the acquaintance of Budæus and Erasmus. Upon his return to England, he lectured on the various books of the New Testament until 1505, when he was made dean of Saint Paul's in London. In 1509, he devoted a part of a large inheritance to the establishment of Saint Paul's School in London where William Lily was first head master. By his liberal opinion and his frankness in denouncing corruption in the Church, he was influential in paving the way for the Reformation.

Coligny (*kō'lēn'yē'*), **Gaspard de** (**1517-1572**), French admiral and general, was born at Châtillon sur Loing. Introduced at court, he served under Francis I in Italy. Under Henry II he was made an infantry colonel and, in 1552, admiral of France. On the death of Henry II, Coligny became a Protestant and a friend of the Prince of Condé. Coligny went to court and was apparently well received by Charles IX, but the enmity of the Guises was stirred up against him, and an attempt was made to assassinate him. This attempt at individual murder was but a preliminary step to the general massacre of the Huguenots, which took place soon afterward, and in which Coligny perished.

Collier (*kŏl'yĕr*), **Jeremy** (**1650-1726**), English clergyman and controversialist, was born in Cambridgeshire. He was educated at Caius College, Cambridge, afterward becoming rector of Ampton, near Bury Saint Edmunds, and lecturer at Gray's Inn. His reply to Burnet's defense of King William, 1688, cost him some months in Newgate prison. He next waged warfare on the crown with incisive pamphlets and, in 1692, was arrested on suspicion of being a partisan of the Stuarts. In 1698, he published his *Short View of the Immorality and Profaneness of the English Stage,* which led to 10 years of controversy with leading dramatists. Collier continued to preach and, 1713, was consecrated bishop. He died in London.

Collier, John (**1884-**), social reformer, was born at Atlanta, Ga. Educated at Columbia University and *College de France,* he entered social service work in New York, interesting himself particularly in the welfare of immigrants. In 1923 he became secretary of the American Indian Defense Association. He was commissioner of Indian affairs from 1933 to 1945.

Collins, Leroy (**1909-**), political leader, was born at Tallahassee, Fla. He studied at Rollins College and Cumberland University and was admitted to the bar in Florida, Arkansas, and Tennessee. During World War II he served in the United States navy. He was a member of the Florida state legislature and, in 1955, was elected governor. As a member of the Democratic party, he was active in national politics. In 1960 he was made president of the National Association of Broadcasters. He resigned in 1964 to accept appointment by President Johnson as director of Community Relations Service under the Civil Rights law.

Collins, Michael (**1890-1922**), Irish patriot and military officer, was born at Woodfield, Clonakilty, Ireland. He was educated in the local schools, and, at 15, entered the civil service as a clerk. In the Easter rebellion of 1916, he was a member of the party that seized the general post office in Dublin. He was made prisoner and, after his

release some months later, became one of the most active workers for Irish freedom. In 1918, he was imprisoned for a time in Sligo jail for sedition. While still a refugee, he was elected to the Dail Eireann, and later became finance minister. He was an active advocate of the Sinn Fein cause and took a prominent part in the party councils. After the ratification of the treaty with Great Britain, Collins was made commander in chief of the forces of the Irish Free State. While repelling an attack by a party of irregulars, he was killed near Bandon.

Collins, William Wilkie (1824-1889), English novelist, was born in London. He was educated at a private school. Early in life he adopted the profession of the law, became a student at Lincoln's Inn, and was called to the bar. He soon inclined to literature and a meeting with Dickens, in 1851, decided his career. In the creation of baffling mystery, Collins had no superior in his time. His first novel was called *Antonina, or the Fall of Rome.* This was followed by *Basil, Hide and Seek, After Dark, The Dead Secret, The Fallen Leaves, Heart and Science, The Legacy of Cain, Blind Love,* and *The Moonstone.*

Colonna (*kô-lôn'nä*), **Vittoria (1490-1547),** Italian poetess, daughter of Fabrizio Colonna, grand constable of Naples, was born at Marino. When four years old she was betrothed to a boy of the same age, Ferrante d'Avalos son of the Marchioness Pescara. At 17 they were married. After her husband's death in the battle of Pavia, 1525, she found her chief consolation in the cultivation of her poetical genius. She formed a Platonic friendship with Michelangelo, who addressed many of his sonnets to her. Cardinal Bembo, Lugi Alamanni, and Baldassare Castiglione were among her literary friends. Tender melancholy and spiritual exaltation characterize her poems. Died in Rome.

Colt, Samuel (1814-1862), American inventor, was born in Hartford, Conn., He early conceived the idea of revolving firearms, and, in 1835, took out a patent for the weapon since known as "Colt's revolver ." He established a company for the working out of his patent and built at Hartford one of the most extensive armories in the world.

Colum (*kŏl'ŭm*), **Padraic (1881-),** Irish-American poet and dramatist, was born at Longford, Ireland. As editor of the *Dublin Review,* he was a leader in the revival of Irish literature. He assisted in founding the Irish National Theater. In 1914, he removed to New York where he continued to write and lecture. His works comprise, besides plays and poems, books for children, collections of folk stories, and essays. They include *The Children of Odin, The Golden Fleece, The Fountain of Youth, Poems,* and *The Story of Lowry Maen.*

Columbus, Christopher (1451-1506), navigator and discoverer, was born in Italy, the son of a weaver. His birthplace is usually given as Genoa, but an important recently discovered document states that he was born at Milan. In 1474, he made a voyage to Chios, and, in 1476, to England. On the latter voyage, his ship was attacked by pirates and he was compelled to take refuge for a while in Lisbon. He settled there the following year, and, in 1479, he married the daughter of Perestrello, a distinguished Italian navigator in the Portuguese service. The charts and memoranda of his father-in-law were placed in the hands of Columbus, who was inspired by them to devote his life to geographical discovery.

Preparations for Great Voyage. Letters exist purporting to be a correspondence between Columbus and Toscanelli in 1481 on the feasibility of a western passage to Asia. In 1482, Columbus is believed to have made several voyages to the coast of Guinea, and he claimed to have measured the length of a degree at the equator. This claim implies that Columbus was familiar with the view of the Greek geographer Ptolemy that the earth was a sphere.

Columbus saw important authority and illimitable wealth as the reward of his proposed western passage to Asia; but all earthly gains were subordinated to the anticipated triumphs of the Cross among new and vast populations. He first vainly applied for financial aid to Genoa and then to John II of Portugal he proposed unsuccessfully his daring scheme of reaching India by the western ocean. In 1485, in the south of Spain, Columbus carried his project to the dukes of Medina Sidonia and Medina Celi. But his only direct gain was a recommendation to Queen Isabella of Castile, who, with her husband, Ferdinand of Aragon, was then occupied in campaigns against the Moors. They half-heartedly entertained the schemes of Columbus, 1487-90. At length, in the summer of 1490, he pressed with such earnestness for a distinct reply to his application that a conference was held, which reported unfavorably on his scheme of discovery.

Through Juan Perez de Marchena, a former confessor of the queen, Columbus ultimately succeeded in convincing Martin Alonzo Pinzon, the head of a family of navigators at Palos. More interviews with Isabella followed, and, at last, on April 17, 1492, she and Ferdinand signed the so-called capitulations, by which Columbus was authorized to search for and take possession of certain islands. Three vessels were made ready: the *Pinta* and *Niña,* commanded by the brothers Pinzon, and the *Santa Maria* under Columbus himself. They sailed August 3, 1492.

Discovery of America. After the ships had passed beyond the Canary Islands, lamentations and great fear broke out amid the crew. The admiral, however, courageously suppressed all mutiny. At last, they picked up riverweeds and a branch of thorn with red berries. Joy and hope ran high, for they knew land must be near. On Friday, October 12, 1492, they landed on an island of the Bahamas, where Columbus solemnly planted the Cross; called it San Salvador; and took possession of it in the name of Spain. To his dying day, Columbus believed that he had reached the confines of India, and, for this reason, the aborigines of the New World have ever since been called Indians.

Later Voyages. Henceforth the biography of Columbus is unimportant, when compared with the grand and primal fact of the discovery itself. Intrigue and mortifications saddened his triumph, and he was continually harassed by disputes and greed among the colonists who accompanied his later expeditions.

Having returned to Palos from his first voyage on March 15, 1493, he sailed again in September from Cadiz with 17 ships. He discovered Jamaica and the Caribbee Islands, but calumnies at home forced him to return in 1496. A third voyage, undertaken in 1498, led to his discovering Trinidad and touching for the first time the American continent near the mouth of Orinoco River. Intrigues of his enemies in Spain, however, especially of Fonseca, Bishop of Palencia, resulted in the arrest of Columbus in 1500, when he was brought back to Spain in chains. He was released, but found it impossible to secure the honors originally promised him by his royal patrons. Betrayed, impoverished, and broken in health, Columbus still planned a fourth expedition. Setting out in 1502, he discovered Cape Honduras and Puerto Bello. On November 7, 1504, he again reached Spain.

Weary arbitrations and disheartening months followed. Columbus died at Valladolid, May 20, 1506, and, to make amends somewhat for his injustice, Ferdinand gave him a pompous funeral. He was first buried at Valladolid; then, for a time, his body rested in a monastery near Seville. After some years the body was removed to Santa Domingo, Haiti; thence later to Havana, Cuba.

Columella, Lucius Junius Moderatus, Roman writer on agriculture, was born at Cadiz in Spain and flourished about the middle of the 1st century A. D. For some time he resided in Syria, but lived chiefly at Rome, and died, most probably, at Tarentum. His work, *De Re Rustica,* in twelve books, treats of arable and pasture land, culture of vines and olives, and the respective duties of masters and servants.

Comenius (*kô-mā'nê-ŭs; kô-mē'nĭ-ŭs*), or **Komensky, John Amos (1592-1670),** educational reformer, was born in Moravia. His parents belonged to the Moravian brethren. He studied at Herborn and later at Heidelberg. He became a minister of the Moravian sect at Fulnek, but lost all his property in 1621, when that town was taken by the invading Spaniards. Settling at Lissa in Poland, he worked out a new theory of education based on the view that words and objects must go together.

In 1641, Comenius was invited to England by Parliament to assist in reforming the system of public instruction; but, owing to the outbreak of the civil war, he went instead to Sweden, 1642. He returned to Lissa in 1648 and, in 1650, went to Sarospatak, Hungary. Here he composed his *Orbis Sensualium Pictus,* the first picture book successfully adapted to the teaching of children. By his early formulation and practical adaptation of educational principles, though but little known for two centuries, Comenius ranks as a leading figure in the history of education. He died at Amsterdam. See *History of Educational Reformers.*

Commager, Henry Steele (1902-), American historian and educator, was born at Pittsburgh, Pa., and was educated at the University of Chicago and at foreign universities. From 1931 to 1938 he was professor of history at New York University, and since 1939 has been professor of American history at Columbia University. In 1947-48 he was Pitt professor of American history at Cambridge University, England. He has written and edited numerous historical works, including *The American Mind* (1950), *America's Robert E. Lee* (1951), and *Europe and America Since 1492* (1954).

Comnena, Anna. See *Anna Comnena.*

Compton, Arthur Holly (1892-1962), American physicist, was born at Wooster, Ohio. After being graduated from Wooster College in 1913, he continued his studies at Princeton and Cambridge universities. He was professor of

physics at Washington University, 1920-23, and, from 1923 to 1945, at the University of Chicago. In 1945 he became chancellor of Washington University. His principal work is in the X-ray field. Among other things he showed that, when X-rays are scattered by a material object, the scattered rays have a longer wave length than the incident rays. This is the so-called Compton effect, for which he received one-half the Nobel prize for physics in 1927. He supervised the development of the first atomic chain reaction and the first quantity production of plutonium. He wrote *The Human Meaning of Science* (1940) and contributed to *Man's Destiny in Eternity* (1949).

Compton, Karl Taylor (1887-1954), American physicist, educator, and administrator, was born at Wooster, Ohio. Educated at Wooster College and Princeton University, he taught physics at Princeton University until 1930, becoming chairman of the physics department in 1929. From 1930 he served as president of the Massachusetts Institute of Technology. In 1940 he became chairman of the National Defense Research Committee, in which capacity he directed development of inventions for prosecution of the war against the Axis nations. His scientific work includes studies on the effect of crystals on X-ray photography.

Comstock (*kŭm'stŏk*), **Anna Botsford (1854-1930),** naturalist and wood engraver, was born at Otto, N. Y. She was graduated at Cornell University in 1878 and studied art at Cooper Union, New York. In 1878, she married John Henry Comstock, the entomologist. She exhibited wood engravings at the World's Columbian Exposition at Chicago in 1893, at the Paris Exposition of 1900, and at the Pan-American Exposition in Buffalo in 1901. Her writings include *Ways of the Six-Footed, The Pet Book,* and *Bird, Animal, Tree, and Plant Notebooks.*

Comte, (*kônt*), **Auguste (1798-1857),** French philosopher, founder of the "positive philosophy," was born at Montpellier, France. He studied at Paris, and attracted the attention of his associates by the boldness and the novelty of his speculations, maintaining that political and social phenomena may be grouped under scientific laws. He was thus the founder of sociology. He published several philosophical works of which the most important was his *Cours de philosophie positive,* in which he aimed to found not only a new philosophy but also a new religion, the good of humanity taking the place of a supreme being.

Conant, James Bryant (1893-), American educator, was born in Dorchester, Mass. He was graduated from Harvard, 1913, and received his Ph.D. degree in 1916. In 1916-17, he was instructor in chemistry at Harvard. During World War I he served with the Bureau of Chemistry and Bureau of Mines at Washington, contributing valuable information on the production of war gas. He was professor of organic chemistry at Harvard, 1919–33. In 1933, he was elected president of Harvard. For his work regarding chlorophyll, the green coloring substance in plants, he was awarded a medal by Columbia University and the American Chemical Society. In 1953 he was appointed U. S. high commissioner for Germany, and from 1955 to 1957 was ambassador to Germany. Since then he has made a comprehensive study of education in the United States. His findings have been summarized in a book entitled *The American High School Today.*

Condé (*kôn'dā'*), **Louis I de Bourbon, Prince de (1530-1569),** younger brother of Antoine of Bourbon, king of Navarre. During the wars between Henry II and Spain, he distinguished himself at the siege of Metz, the battle of Saint-Quentin, and the capture of Calais from the English. On the accession of Francis II in 1559, Condé, like his brother, joined the Huguenots, took part in an unsuccessful conspiracy of Amboise against the Guises, and escaped execution only by the death of the king.

As a result of concessions made to the Huguenots by the regent, Catherine de' Medici, Condé became governor of Picardy. After the massacre of Huguenots at Vassy, 1562, Condé and Coligny took up arms against the Guise faction, but they were defeated at Dreux the same year and Condé was taken prisoner. In the second Huguenot war, 1567-69, Conde had coins struck with the inscription "Louis XIII, first Christian king of France," but at Jarnac he was defeated, taken prisoner, and shot.

Condillac (*kôn'dē'yak'*), **Etienne Bonnot de (1715-1780),** French philosopher, the founder of sensationalism, was born of a noble family at Grenoble. In youth he numbered among his friends Rousseau, Diderot, and Duclos. Many of his works were composed for his pupil the Duke of Parma, grandson of Louis XV. He was chosen a member of the French Academy of Sciences in 1768. He based all knowledge on the senses and denied the existence of innate ideas. Among his works were *Essai sur l'origine des connaissances humaines, Traité des systèmes, Traité des sensations, La logique,* and *Longue des calculs.*

Confucius (*kŏn-fū'shĭ-ŭs*) **(551 B. C.-478 B. C.)** is the Latinized name of the religionist and sage, Kung-fu-tse, whose influence has held uninterrupted sway over the Chinese people for almost 2500 years. He was born, according to tradition, in the village of Tsou, state of Lu, now in the province of Shantung, China. At the age of 19, Confucius had married and held an office as district inspector of agriculture. His honesty in tax collections was credited with contributing greatly toward the prosperity of his district.

Early Life. When he was 22, his mother died. Confucius then resigned his office and lived in retirement for three years, mourning his loss. This act of filial piety made a strong impression upon his fellow citizens, and it was later used as the historical prop in restoration of ancient funeral rites in honor of the dead. This conduct by Confucius affords a key to his influence, which rested upon idealization of the past in terms of social virtues calculated to preserve society. To spread his doctrines, he began, in his 30th year, to establish schools as he had opportunity and to educate disciples.

Labors. About 501 B. C., Confucius was appointed governor of the State of Lu. The next year, he became minister of works; the next, minister of crime. He applied in public office reforms based on his conceptions of civic virtues. As a result of antagonisms created by his reforms however, he was finally compelled to retire from office and to seek refuge in the province of Wei. He proffered his services as a reformer there and elsewhere, but met with refusal in each case. Finally, when he was in extreme poverty, he was recalled to Lu. He was well received, but did not re-enter political life.

In his last years, Confucius is said to have completed a collection of the ancient writings. His work consisted in gathering together the documents that make up the *Shu King, "Canon of History,"* and writing an introductory commentary on it. The direct teachings of Confucius are to be found principally in the *Analects,* compiled after his death by his immediate disciples.

Doctrines. It is often said that Confucianism is a system of morality without religion, because it s ia system of political and social life built upon a very slight foundation of philosophy. Its distinctive feature, however, is its emphasis on ceremonies, most of which were of a distinctly religious character. In all that Confucius did or thought, the useful and practical, in a broad sense, formed the sole object of his labor and consideration. His precepts included the following typical admonition: First, let every man govern himself according to the sacred maxims; then his family according to the same; and, finally, let him render to the emperor, who is the father of his people, such filial obedience as he demands of his own children, and worship him with the same veneration that he pays to his own ancestors.

Schools arose throughout the empire where the maxims of his philosophy were taught, and his influence was perpetuated from generation to generation.

Congreve (*kŏng'grēv*), **William (1670-1729),** English dramatist, was born at Bardsey. He entered as a student at the Middle Temple, but abandoned the law for literature. His first piece was a romance entitled *Incognita, or Love and Duty Reconciled.* In 1693, he wrote his first comedy, *The Old Bachelor* This established his reputation as a playwright. His comedies, which brought him much money and fame, are intricate in plot, but the characters play their parts brilliantly and the dialogue abounds in sparkling wit. His writings include *Love for Love, The Double Dealer, The Mourning Bride, The Way of the World,* and poems.

Conkling (*kŏngk'lĭng*), **Roscoe (1829-1888),** American politician, was born at Albany, N. Y. In 1846, he removed to Utica, N. Y., where he became district attorney, and was mayor in 1858. In the latter year he was elected to Congress and, in 1867, became a member of the United States Senate. He took a prominent part in the practical business of both houses, served on important committees, and was instrumental in the passing of many useful legislative measures. After the war he took an active part in the reconstruction of the Southern states, and advocated the resumption of specie payments. He opposed President Johnson's policy, and was a zealous champion of Grant's administration. In 1881, he resigned his Senate seat in protest over Garfield's control of patronage in New York State. Later, failing in a campaign for re-election, he retired to private life. See *Stalwarts.*

Connaught, Arthur William Patrick Albert, Duke of (1850-1942), third son of Queen Victoria. He was educated at Woolwich; entered the army, 1868; became captain, 1871, major, 1875, colonel and major general, 1880; accompanied the expedition to Egypt, 1882; became lieutenant general, 1889, and general, 1893. He commanded the Bombay army in India, 1886-90; the southern district of England, 1890-93; and that of Aldershot, 1893-98. In 1900, he succeeded Lord Roberts in command of the forces in Ireland, became inspector general in 1904,

and was commander in chief of Mediterranean, 1907-09. He was created Duke of Connaught and Strathearn and Earl of Sussex in 1874; married Princess Louise of Prussia, 1879. From 1911 to 1916, he was governor general of Canada.

Connelly, Marc (1890-), American playwright, whose full name is Marcus Cook Connelly, was born at McKeesport, Pa. He began as a newspaperman and a contributor to magazines, but soon turned to writing for the theater, collaborating with George S. Kaufman in such plays as *The Deep Tangled Wildwood* (1913), *Dulcy* (1921), *Merton of the Movies* (1922), *To the Ladies* (1923), and *Beggar on Horseback* (1924). He was co-author with Frank Ball Elser of *The Farmer Takes a Wife* (1934). Among the plays he has written single-handed are *The Wisdom Tooth* (1926) and *The Mole on Lincoln's Cheek* (1941). He is probably best known for his *Green Pastures* (1930), founded on Roark Bradford's *Old Man Adam an' His Chillun.*

"Connor, Ralph." See *Gordon, Charles William.*

Conrad, Joseph (1857-1924), English novelist, was born in Poland. He is known by his first two names—his family name was Korzeniowski. His father was a Polish revolutionist, and, upon his death, Conrad, then 13 years of age, made his way to Marseilles, entered the French merchant marine and advanced to the rank of captain. Somewhat later, he became mate on an English ship. Although he did not learn English until comparatively advanced in life, he acquired a stirring descriptive style which has won him increasing reputation as a master of English.

Conrad's novels vividly depict seafaring life in the Orient and faithfully reflect the effects of Eastern influences on Western character. Among his writings are *The Children of the Sea, An Outcast of the Islands, Tales of Unrest, Typhoon, The Mirror of the Sea, Nostromo, Chance, The Secret Agent, Under Western Eyes, The Shadow Line, Rescue, The Arrow of Gold,* and *The Rover.* See *English Literature.*

Constable (*kŭn'stă-b'l*), **John (1776-1837)**, landscape painter, was born in East Bergholt, Suffolk, England. He studied at the Royal Academy, began with portraits and historical subjects, but finally specialized in landscape. By reason of his truthful portrayal of nature, he became the father of modern landscape art, profoundly influencing all subsequent painting in England. The National Gallery, London, has his best pictures— "The Cornfield," "The Valley Farm," and "The Hay Wain." Other good examples of his art include "Hamstead Heath,"in the Louvre; and "The Bridge on the Stour" and "The White Horse," in the Metropolitan Museum, New York.

Constantine I (*kŏn'stăn-tĭn*) **(c. 274 A. D.-337 A. D.)**, called the Great, was born in Naissus, now Nish, Yugoslavia, the son of Constantius Chlorus by Helena. On the death of his father at York, in Britain, 306, where he had accompanied him, Constantine was proclaimed emperor by the troops. This title being challenged by Maximian, his father-in-law, and by Maxentius, his brother-in-law, he took up arms against first the one and then the other and defeated them. During these campaigns Constantine is said to have seen a cross in the sky with the words, in Greek, "By this sign, conquer."

Under this sign, known as the labarum, which he adopted as his standard, Constantine marched to Rome, where he was acknowledged emperor by the senate in 312, and, in 313, the edict of Milan was issued granting toleration to the Christians. He then proceeded to extend his dominion over the East and transferred the seat of his empire to Byzantium, which was thereafter called Constantinople, i. e., Constantine's city. Constantine was baptized in 337 as a Christian, having three years before proclaimed Christianity the state religion.

Constantine I (1868-1923), king of Greece, was born in Athens. He was the eldest son of King George I and Olga, niece of Czar Nicholas I. He was educated at the universities of Berlin and Leipzig, and, in 1889, married Princess Sophia, sister of Emperor William II of Germany. He was commander in chief of the Greek forces in the unsuccessful war with Turkey, 1897, and was compelled by the criticism of the military league to leave Greece in 1909. In the Balkan war, 1912-13, he led the Greek armies in Macedonia against the Turks with such success that he was acclaimed a national hero. Upon the assassination of his father in 1913, he became king.

In 1917, in response to the demands of France, Great Britain, and Russia, Constantine abdicated in favor of his second son, Alexander. On the death of Alexander and the defeat of the Venizelos party at the polls in 1920, Constantine returned to Athens as king in defiance of the Allied powers. In 1921, he took command of the Greek army in a disastrous war against the Turks in Asia Minor. In 1922, he abdicated in favor of his son George.

Constantine XIII, Palæologus (1394-1453), the last Byzantine emperor. His father and his brother had been emperors before him, and he did not come to the throne until he was 54 years old, 1448. At that time the Turks had conquered almost all of the Byzantine Empire, and but little was left besides Istanbul and a few other cities The Turkish sultan, Mohammed II, determined to take Istanbul also and laid siege to it with a great army. Constantine, who had fewer than 10,000 soldiers, resisted bravely for a time, but finally, May 29, 1453, the Turks battered down part of the walls and rushed in. The emperor and his little band of defenders were all slain.

Conwell, Russell Herman (1843-1925), American educator and clergyman, was born at Worthington, Mass. He was educated at Wilbraham Academy and Albany Law School; served in the Union army, 1862-65; and practiced law in Minneapolis, 1865-67. In 1867, he went abroad and served as foreign correspondent for several American newspapers. On his return, he practiced law in Boston for some years, and, in 1879, was ordained to the Baptist ministry. In 1888, he founded Temple University, Philadelphia, and became its first president. He was widely known as a lyceum lecturer, his earnings amounting to about $11,000,000, nearly all of which he devoted to the education of deserving young people. His publications include *Woman and the Law, Acres of Diamonds, Lives of the Presidents,* and *The Romantic Rise of the Temple University.*

Cook, Frederick Albert (1865-1940), American physician and explorer, was born at Hortonville, near Callicoon, N. Y. He received his medical degree from the University of the City of New York in 1890. Fascinated by books of exploration at a time when the arctic was the chosen field of many men of science and adventure, Cook served as surgeon and anthropologist of Robert E. Peary's first North Greenland expedition in 1891-92. In 1893 and 1894 he was the leader of two expeditions to Greenland in quest of scientific data. From 1897 to 1899 he was with the Belgian antarctic expedition. In 1901 he served on the Peary relief ship *Erik.* Between explorations, Dr. Cook practiced medicine in Brooklyn, N. Y.

He was leader of two exploring expeditions to Mount McKinley, Alaska, in 1903 and 1906, and in September 1906 announced his conquest of the peak. In the summer of the following year he sailed for the arctic with the North Pole as his geographical objective. For the sled journey he chose a game route that enabled him to make the dash across the Arctic Sea with the minimum of men, equipment, food, and dogs. On his return in 1909, he announced that he had reached the pole with two Eskimos on April 21, 1908. Five days later, Peary announced his attainment of the pole on April 6, 1909. A bitter controversy followed between the two explorers and their supporters as to which man had been first, and, though Peary is generally recognized as the discoverer, many persons believe that Dr. Cook was the first to reach the North Pole.

Cook, Captain James (1728-1779), English navigator, was born in Marton, Yorkshire. He made three principal voyages, in the course of which he made many important discoveries, particularly in Australia, New Zealand, and the antarctic region. These were described in his *Three Voyages Round the World.* In 1778, he discovered the Sandwich (Hawaiian) Islands, and explored the west coast of North America to Bering Strait. He returned to Hawaii, where he met his death at the hands of hostile natives early in 1779. Many honors were paid to his memory, including the erection of an obelisk on Kealakekua Bay at the place where he was slain.

Cooke, Sir William Fothergill (1806-1879), British electrician, was born at Ealing, England; was educated at Durham and Edinburgh; served in the Indian army from 1826 to 1831; and, after studying medicine at Paris and Heidelberg, took up telegraphy. In 1837, he entered into a partnership with Professor Wheatstone, which resulted in notable advances in electrical engineering and telegraphy. In 1838, he built the first English telegraph line. In 1845, Wheatstone and Cooke patented the single needle apparatus. In 1846, Cooke formed a company, which paid £120,000 for the partners' earlier patents. In 1867, Cooke and Wheatstone received the Albert gold medal. Cooke was knighted in 1869.

Coolidge, Calvin (1872-1933), 30th president of the United States, was born at Plymouth, Vt., of early New England ancestry. He was graduated from Amherst College, 1895, and was admitted to the bar, 1897. He was elected to the Massachusetts House of Representatives, 1907-08, was mayor of Northampton, 1910-11, member of the state senate, 1912-15, and lieutenant governor, 1916-18. Elected governor of Massachusetts in 1919, he attracted nation-wide notice by his firm stand for law and order during the Boston police strike and was overwhelmingly re-elected for 1920. He was elected vice president on the Republican ticket in 1920 along with Warren G. Harding as president. On the death of President Harding, August 2, 1923, Coolidge became president. He was re-elected in 1924.

His administration was one of marked governmental economy, which, together with general prosperity, permitted a drastic reduction of income taxes. A soldier bonus act was passed over his veto; immigration was severely restricted; Allied debts to the United States were funded; and the Senate, at presidential request, voted, with reservations, for adherence to the World Court. The Paris Pact, or multilateral treaty renouncing war as an instrument of national policy, was negotiated and ratified during his administration. He had a reputation for taciturnity and sparing use of words. On the expiration of his term in 1929, he retired to private life.

Coolidge, Charles Allerton (1858-1936), American architect, was born in Boston. After being graduated from Harvard University in 1881, he studied architecture at the Massachusetts Institute of Technology. Among the many noted structures and groups of buildings designed by him are Leland Stanford University; the South Station and the new Harvard Medical School, Boston; the Public Library and Art Museum, Chicago; the Law School and Commons, University of Chicago; and the new buildings for the Rockefeller Institute, New York.

Coolidge, William David (1873-), American physical chemist, was born at Hudson, Mass. After being graduated from the Massachusetts Institute of Technology and the University of Leipzig, he taught in the former institution from 1901 to 1905. He then joined the research staff of the General Electric Company at Schenectady, N. Y., and became director in 1932.

Among the valuable products of his research were the invention and application of ductile tungsten for electric lamps and the development of powerful X-ray tubes which emit rays, known as Coolidge rays, having physiological effects unexampled in the case of any rays previously known.

Cooper, Anthony Ashley. See *Shaftesbury, Earl of.*

Cooper, Sir Astley Paston (1768-1841), English surgeon, was born in Norfolk; studied under Henry Cline, surgeon to Saint Thomas's Hospital, London, and was appointed demonstrator of anatomy there, 1789. In 1793, he was appointed professor of anatomy at Sturgeon's Hall and, in 1800, surgeon to Guy's Hospital. In 1813, he received the professorship of comparative anatomy in the College of Surgeons. He was the earliest to attempt the tying of the carotid artery, a bold experiment at the time. A colossal statue to his memory stands in Saint Paul's Cathedral, London.

Cooper, Hugh Lincoln (1865-1937), American hydraulic engineer, was born at Sheldon, Houston County, Minn. On leaving high school in 1883, he went to work for a bridge construction company and rose to be chief engineer. In 1891, he devoted his efforts to problems of dam construction for the development of electric power. Among the most famous of the dams constructed by him are the Keokuk Dam in Iowa, the Wilson Dam at Muscle Shoals, and the Dnieprostroy Dam in Russia.

Cooper, James Fenimore (1789-1851), American novelist, was born in Burlington, N. J. When very young, he was taken to Cooperstown, Otsego County, N. Y., where he lived in the frontier wilds until he went to sea. In 1811, after six years' experience in naval life, he settled in Westchester County, N. Y., where he began to write.

In 1820 appeared his first work, *Precaution,* which was followed in 1821 by *The Spy,* a tale which secured for him a place in the first rank of novelists; then appeared his almost unequaled sea stories,—*The Red Rover, Pilot,* and *Waterwitch,*—and his famous "Leatherstocking series" of Indian life and adventure, including the *Pioneers, Last of the Mohicans, Pathfinder, Deerslayer,* and *Prairie.*

Cooper's works exhibit a rare power of narrative and entitle him to rank as one of the greatest literary geniuses of America. He was practically the first writer to extend the domain of fiction over the sea, the primeval forest, and the prairie. He was elected to the American Hall of Fame in 1900.

Cooper, Peter (1791-1883), American inventor, manufacturer, and philanthropist, was born in New York City. His early life was laborious. His first invention was an improvement in a machine for shearing cloth. In 1828, he erected ironworks in Baltimore, and here constructed after his own designs the first locomotive engine ever made in this country. He took a great interest in the first telegraph, in state canals, and many mercantile enterprises, from which he amassed considerable wealth.

One of the most noteworthy of his achievements was the founding of an institution for the instruction of working people—the Cooper Union, New York, whose cornerstone he laid in 1854. It was made a center for free instruction in art, science, mathematics, and engineering, offering also popular lectures on general topics and a widely used library service. In 1876, the Independent party nominated him for president of the United States. He was elected to the American Hall of Fame, 1910.

Cope, Edward Drinker (1840-1897), American zoologist and paleontologist, was born at Philadelphia. He was educated privately, studied at the University of Pennsylvania and at the Smithsonian Institution, and devoted a year to research in the great museums of Europe. From 1864 to 1867, he was professor of natural sciences at Harvard College. He made immense collections of fossils, especially of extinct vertebrates, and did important work in herpetology and ichthyology, establishing the basis of the modern classification of North American reptiles, amphibians, and fishes. His publications include *Origin of Genera, Origin of the Fittest,* and *Primary Factors of Organic Evolution.* He was editor of the *American Naturalist* from 1878 until his death.

Copernicus (*kō-pûr'nĭ-kŭs*), or **Koppernigk, Nicolas (1473-1543),** mathematician and the founder of modern astronomy, was born at Thorn, Poland. He was instructed in the Latin and Greek languages at home. In 1491, he entered the University of Krakow, where later he received the diploma of doctor in arts and medicine. His early taste for mathematical studies, especially astronomy, was furthered by an acquaintance with the works of the astronomer John Müller, known as Regiomontanus.

The years 1496 to 1500 Copernicus spent in Bologna as pupil, assistant, and companion of the professor of astronomy, Domenico Maria Novarra.

Career. In 1500, Copernicus was appointed to a professorship of mathematics in Rome. The following year, he continued his studies at Padua, and, in 1503, he was made doctor of canon law by the university at Ferrara. Returning to Poland in 1505, Copernicus entered into holy orders and was enrolled by his uncle, the bishop of Ermeland, as a canon of his chapter. This chapter became the center of violent political struggles, and, in the ensuing years, Copernicus frequently interrupted his speculative inquiries to serve the interests of the bishopric.

At least as early as 1507, Copernicus began to meditate on the ideas which led him to the theory of the solar system propounded in his book, *De Revolutionibus Orbium Coelestium,* "*The Revolutions of the Celestial Spheres.*" This work seems to have been practically completed about 1530, but various political and religious considerations delayed its publication until 1543. Upon it rests the fame of Copernicus, though he wrote also a noteworthy treatise on trigonometry and several other minor works.

Copernican System of Astronomy. Before Copernicus, it was generally believed, in accordance with the Ptolemaic theory, that the earth occupies the center of the universe; that the changes of day and night are produced by a rapid revolution of the heavens; that the sequence of seasons and the apparent motions of the planetary bodies are caused by the revolution of the sun and planets in orbits of various complexity, subject to the common daily motion of all from east to west. The Copernican system represents the sun to be at rest in the center of the solar system, and the earth and planets to move around it in elliptical orbits.

The most brilliant and valuable part of *The Revolutions of the Celestial Spheres* is that in which are explained the variations of the seasons, the precession of the equinoxes, and the stations and retrogradations of the planets. As a whole, the explanations given by Copernicus are right as to the general nature of the causes of the phenomena. But Copernicus had neither mathematical nor mechanical knowledge sufficient to enable him to explain more than the mean motions of the solar system. To account for irregularities, he introduced a system of epicycles, not yet having discarded the false notion, current in his time, that all motions must be compounded of circular ones. Yet, despite such inadequacies, Copernicus laid the foundation upon which Kepler, Galileo, Newton, and other men of genius could build the structure of modern astronomical science.

Copland, Aaron (1900-), American composer, was born in Brooklyn, N.Y. Private instruction in music, which began at an early age, was followed by study in France, where he came under the influence of Nadia Boulanger, a teacher of harmony. In New York, Hollywood, and elsewhere, he has become known for highly original creative work, particularly in ballet and music for the theater. He has also composed several symphonies and has won recognition as a critic and interpreter of music. His writings include *What to Listen For in Music* and *Our New Music.*

Copley (*kŏp'lĭ*), **John Singleton (1737-1815),** American portrait and historical painter, was born at Boston, Mass. In painting, he was practically self-taught. At the age of 17, he ranked as a prominent artist and soon became the recognized portrait painter of Boston. At Benjamin West's invitation, he went in 1774 to London, where he painted the king and the queen and other notable personages. After studying in Italy, he became celebrated in England for his popular historical paintings "The Death of Lord Chatham," "The Death of Major Pierson," and the "Siege of

Gibraltar." His portraits typically represent the New England society of his time, and he ranks as one of the chief painters of the period. Among his noted portraits are those of Paul Revere, John Hancock, Samuel Adams, and John Quincy Adams. He died at London.

Corbett, Harvey Wiley (1873-1954), American architect, was born in San Francisco. After being graduated from the University of California, he studied architecture in Paris at the Ecole des Beaux Arts and began practice in the office of Cass Gilbert in New York. Firms in which he was a partner designed, among many other buildings, the Bush Terminal building in New York, Bush House in London, the Masonic National Memorial at Alexandria, Va., and, with two other firms, Rockefeller Center, New York. Corbett was one of the first to work out an aesthetically satisfactory treatment of the skyscraper. A grasp of the relation of architecture to social purposes characterizes his work, the forward-looking nature of which led to his selection, in 1933, as chairman of the architectural commission of the Century of Progress Exposition in Chicago.

Corbin, Margaret (1751-1800), American heroine, was born in Franklin Co., Pa. She married John Corbin in 1772 and accompanied him when he enlisted to fight in the Revolutionary War. In an attack on Fort Washington, N. Y., her husband was killed while firing a cannon. She took his place and fired the cannon until wounded. She was the first woman to receive a pension from the government. Her remains were removed in 1916 from Highland Falls, N. Y., to West Point, where a monument was erected to her memory.

Corday d'Armont (*kôr'dĕ' dàr'môN'*), **Marie Anne Charlotte (1768-1793),** generally known as Charlotte Corday, French heroine, was born of a noble family at Saint Saturnin, Normandy. She sympathized with the ideas of the French Revolution, but was horrified at its excesses. She visited Paris in July 1793 with the purpose, it is said, of assassinating Marat or Robespierre. Obtaining an interview with the former while in his bath, she stabbed him with a knife. She was immediately apprehended and was executed four days afterward. Her beauty added to the interest which her sanguinary heroism inspired.

Corelli (*kô-rĕl'ĭ*), **Marie (1864-1924),** English novelist was born of Italian and Scotch parentage. She was adopted in infancy by Charles Mackay, the song writer and *littérateur,* and spent her childhood in England. She was afterward sent to France and educated in a convent, where she received, with other instruction, excellent musical training. Her first book, *A Romance of Two Worlds,* was an instant success, and from that time she devoted herself entirely to literature. She never, however, abandoned her love of music. Her fiction, which is romantic, melodramatic, and sensational, nevertheless displays a genuine gift of story-telling and is widely popular. Her books include *Thelma, Soul of Lilith, The Sorrows of Satan, The Murder of Delicia, A Study in Supremacy, God's Good Man, The Devil's Motor,* and *The Secret Power.*

Corliss, George Henry (1817-1888), American inventor and manufacturer, was born at Easton, N. Y. He received an academic education and, in 1844, removed to Providence, R. I. There, after patenting several devices which he has invented for the improvement of steam engines, he organized a company in 1856 and established engine works. His inventions for securing uniformity of motion revolutionized the construction of stationary steam engines. A single colossal engine built by him furnished the power which moved all of the machinery in the Centennial Exposition at Philadelphia in 1876. This famous "Corliss engine" was later transferred to Pullman, Ill., where it furnished motive power for the Pullman Car Company's works. Corliss died at Providence.

Corneille (*kôr'nā'y'*), **Pierre (1606-1684),** French dramatist and creator of French tragedy, was born at Rouen. He studied for the legal profession. A love affair, in which he became the rival of a friend, first prompted him to write verses, and *Mélite,* the comedy founded on this incident, was performed with success in 1629. It was quickly followed by other dramatic pieces. In 1635 appeared his *Médée,* a declamatory drama written in imitation of Seneca.

Cardinal Richelieu for a time numbered Corneille among poets whom he hired to write plays from dictated plots, but Corneille soon lost his favor by altering a plot. He then returned to his native place, where M. Chalon, once secretary to Marie de' Medici, suggested that he should turn his attention to tragedy. The result was *The Cid,* 1636, which was received with enthusiastic applause. In 1639, he composed *Horace* and *Cinna,* which were followed by *Polyeucte,* a tragedy of Christian martyrdom. Soon afterward appeared *La Mort de Pompée* and *Le Menteur,* the latter a comedy, the only one he wrote worthy of his great genius. Corneille closely followed the three unities—time, place, and action—declared by Aristotle to be requisites of effective tragedies. See *Cid, The.*

Cornelia, Roman matron of the 2d century B. C., was celebrated as the most admired type of early Roman womanhood. She was the daughter of Scipio Africanus and the wife of Tiberius Sempronius Gracchus, who left her, at his death, a widow with 12 children. She was still in the prime of life, but she refused many offers of marriage, including one from King Ptolemy of Egypt, and devoted herself to the training and education of her children. These included the democratic leaders Tiberius and Gaius. A lady, after displaying her jewels, asked to see those of Cornelia, who, producing her sons Tiberius and Gaius, said, "These are mine." She devoted her last years to the study of Greek literature and to the society of men of letters in Misenum.

Cornelius (*kôr-nā'lē-ŏŏs*), **Peter von (1783-1867),** German historical painter, founder of the Munich School, was born at Düsseldorf. His first work of importance was his series of illustrations of Goethe's *Faust.* In 1811, he went to Rome, where he gained a wide reputation by two cartoons, "Joseph's Interpretation of the Dream" and "Joseph's Recognition of his Brethren," in which he notably revived fresco painting. He was then called to Berlin and became the head of the Düsseldorf academy. His paintings, which are colossal and executed in the cartoon style, emphasize design rather than color.

Cornell, Ezra (1807-1871), American capitalist and philanthropist, was born at Westchester Landing, N. Y. He began life as a mechanic and miller at Ithaca, but spent most of his active years in the extension of the telegraph service throughout the northern and western states. He was a delegate to the first Republican national convention in 1856; president of the New York State Agricultural Society, 1862; member of the assembly, 1862-63; and state senator, 1864-67. In 1865, he founded Cornell University at Ithaca, intending it to be "an institution where any person can find instruction in any study." He endowed it with $500,000 and subsequently devoted an additional $500,000 to the purpose.

Cornell, Katharine (1898-), American actress, was born of American parents in Berlin, Germany. She made her debut in New York in 1917 with the Washington Square players and appeared in *Little Women* in London, 1920. Her ability in intense characterizations was revealed in Shaw's *Candida,* Arlen's *Green Hat,* and the highly successful *Barretts of Wimpole Street,* in which her portrayal of the invalid, Mrs. Browning, created a sensation. Other plays in which she starred include *Casanova, Saint Joan,* and *No Time for Comedy.* In 1921 she married Guthrie McClintic who died in 1961.

Cornwallis, Charles, Marquis (1738-1805), English statesman and general, was born at London. He entered the British army in 1756, the House of Commons in 1760, and the House of Lords in 1763. He was promoted major general, and, in 1776, he joined Sir William Howe in command of the British forces during the American Revolution. He defeated General Gates at Camden in 1780; won the battle of Guilford Courthouse, 1781; and surrendered to Washington at Yorktown, October 19, 1781. He was afterward governor general and commander in chief in India, where he greatly distinguished himself by his victories over Tippoo Sahib; still later, in 1798, he was lord lieutenant of Ireland. In 1805, he was appointed governor general of India a second time.

Corot (*kô'rô'*), **Jean Baptiste Camille (1796-1875),** French painter, was born in Paris. He began to exhibit in 1827. His early pictures were in the classic manner but in 1843 he abandoned this style and developed a delicate romantic style, not inaccurately called "painted music," which won him fame throughout the world. He has been styled the lyric poet among the eminent painters of the Barbizon-Fontainebleau group, among whom were Rousseau, Millet, Dupré, and Diaz. In the Louvre are about 80 of his pictures, including the well-known "Dance of the Nymphs," "Paysage," and "Souvenir of Castelgandolfo." Excellent examples are found in many American art galleries. See *List of Illustrations: Landscape, by Corot.*

Correggio (*kôr-rĕd'jō*), **Antonio Allegri (1494-1534),** Italian painter, was born at Correggio, a small town near Modena from which the painter received his name. He was the first among the moderns who displayed that grace, general beauty, and softness of effect and that combined excellence of design, color, taste, and expression in which he is still unsurpassed.

Almost before he had seen the great masters, he became a master in a style all his own. He is ranked with Michelangelo, Leonardo da Vinci, Raphael, and Titian among the five most eminent painters of Italy. His "Holy Night" (Dresden Museum) is classed among the world's twelve greatest pictures. Both his sacred and his mythological subjects are treated with joyousness. Their effects depend in considerable degree on the soft interplay of light and shadow. Other noted works are "The Marriage of Saint Catherine," Louvre; "La Danaë,"

Borghese Gallery; "Holy Family"; "Ecce Homo"; and many frescoes at Parma.

Cortés (*kôr-tās'*), or **Cortez** (*kôr'tĕz*), **Hernando** (**1485-1547**), Spanish adventurer, was born in Medellin, Estremadura. He was first intended for the law, but, a passion for arms carrying him to the military profession, he went early in the 16th century with Velásquez to Cuba and subsequently obtained the command of an expedition sent against Mexico.

With 700 men under his command, he landed at San Juan de Ulloa and founded the town of Vera Cruz in 1519. He then burned his ships so that his followers might have no hope but in victory. He advanced to Mexico, where he was at first received with friendly demonstrations but, on his seizure of Montezuma, the Mexican king, a struggle ensued, in which many thousands of lives were lost. He eventually succeeded in putting down all opposition and in overrunning Mexico. In 1536, he discovered Lower California. For his conquests in Mexico, he was rewarded with the title of Marquis and with a grant of land. See *Noche Triste*.

Cortissoz (*kôr-tē'sōs*), **Royal** (**1869-1948**), American art critic, was born in New York City. He had a common school education and entered the office of the architects McKim, Mead, and White. While there, he began to write for the press criticisms of art, music, drama, and books. These led to his appointment as art critic on the New York *Commercial Advertiser* and, in 1891, on the New York *Tribune*. He also lectured widely before universities and museums. His thorough knowledge of art and keen discrimination gave him a foremost place among art critics of the day. His published works include *Augustus St. Gaudens, Art and Common Sense*, and *An Introduction to the Mellon Collection*. He was elected to the American Academy of Arts and Letters in 1924.

Cosgrave, William Thomas (**1880-**), Irish statesman, was born in Dublin. He was educated at a Christian Brothers School and, in 1918, was elected a member of the Irish Parliament or the Dail Eireann. He became a member of the provisional government in 1922 and, the same year, was elected president of the executive council of the Irish Free State, guiding its fortunes until defeated at the polls in 1932. Thereafter he led the opposition party.

Costain, Thomas Bertram (**1885-**), American editor and author, was born at Brantford, Ontario, Canada. From 1908 to 1910 he was editor of the Guelph (Ontario) *Daily Mercury*, and from 1910 to 1920 editor of *MacLean's Magazine* (Toronto). Coming to the United States in 1920, he became associate editor of *The Saturday Evening Post* continuing in that position until 1934. In 1939 he joined the editorial staff of the book publishing house of Doubleday, and soon after began writing historical novels, among them *For My Great Folly* (1942), *Joshua* (with Rogers MacVeagh, 1943), *Ride With Me* (1943), *The Black Rose* (1945), *The Moneyman* (1947), *The Silver Chalice* (1952), *The White and Gold* (1954), *The Tontine* (1955), and the most widely discussed of his novels, *Below the Salt* (1957). A naturalized citizen, Costain has devoted all his time to writing since 1945.

Costello, John Aloysius (**1891-**), Irish statesman, was born at Dublin, Ireland, where he was educated at University College. Called to the bar in 1914, he first gained public notice by his defense of the Irish patriots following the Easter rebellion of 1916. On the establishment of the Irish Free State, he served as assistant to the attorney general from 1922 to 1926, and then as attorney general from 1926 to 1932. He was for years a member of the Dail Eireann as representative of various Dublin constituencies. Costello was prime minister of the coalition government opposed to De Valera's party from 1948 to 1951. In 1949, he became the first prime minister of the Irish Republic which was proclaimed that year. In 1954, on the defeat of De Valera's party in the elections, he again became prime minister. He was President Eisenhower's guest in Washington in 1956, the first head of his country to visit the United States. During his stay he signed an agreement for U.S.-Irish co-operation on peaceful uses of atomic energy.

Coues (*kouz*), **Elliott** (**1842-1899**), American ornithologist, was born at Portsmouth, N. H.; was graduated from Columbian (George Washington) University, 1861; and became a surgeon of the United States army in 1863. He studied the flora and fauna at various posts where he was located until 1880, when he resigned to devote himself exclusively to natural science. He became a prominent writer on ornithology and a leading authority on American birds. His chief works include *Field Ornithology* and *Dictionary of North American Birds*.

Coulomb (*kōō'lôn'*), **Charles Augustin** (**1736-1806**), French physicist, was born at Angouleme. He experimented on friction and invented the torsion balance for measuring the force of magnetic and electric attraction. He was elected to the French Academy in 1781. The unit of electric quantity was named the coulomb in his honor.

Coulter (*kōl'tẽr*), **John Merle** (**1851-1928**), American botanist, was born at Ningpo, China; was graduated from Hanover College, Indiana, 1870; and subsequently studied at Harvard. He was botanist of the United States Geological Survey in the Rocky Mountains in 1872-73 and later taught at Hanover College and Wabash College, and was president successively of the University of Indiana and Lake Forest University. From 1896 to 1925, he was head of the department of botany in the University of Chicago and then became adviser to the Boyce Thompson Institute of Plant Research, Yonkers, N. Y., which he helped to found. Among his works are *Manual of Rocky Mountain Botany, Plant Relations*, and *Plant Genetics*.

Courbet (*kōōr'bĕ'*), **Gustave** (**1819-1877**), French painter and founder of the modern realistic school of painting, was born at Ornans. In 1839, he was sent by his father to study law in Paris, but the bent of his nature was toward art. In 1841, he took up landscape work, painting in the forest of Fontainebleau. In 1844, he began to exhibit at the salon, and his works created a great sensation in 1850. His hunting scenes and animal subjects are especially vigorous and spirited. In 1871, he joined the commune. He was implicated in the destruction of the Vendôme column, for which act he was sentenced to six months' imprisonment and a fine for its restoration, his pictures being sold in 1877 to raise funds for that purpose. On his release, he retired to Switzerland, where he died.

Courtois (*kōōr'twä'*), **Bernard** (**1777-1838**), French chemist, was born at Dijon. He became Fourcroy's assistant in the Polytechnic School in Paris. With Séguin, he discovered the alkaloids of opium. In 1811, while investigating the products of mother liquors prepared by leaching the ashes of burnt seaweed, he discovered the element iodine. He did not communicate his discovery to other scientists until late in 1813. Within a month after Courtois had made his communication to the institute, Gay-Lussac published an account of the properties of the new element, which he named iodine on account of its violet color. Notwithstanding his discovery, Courtois was ignored and forgotten until the Academy of Sciences, in 1832, awarded him a prize of 6000 francs in appreciation of his important discovery. He died at Paris.

Cousin (*kōō'zăN'*), **Victor** (**1792-1867**), French philosophical writer and educator, was born in Paris. After a literary and educational career extending over many years, he was made, in 1830, a member of the Council of Public Instruction in France. In 1832, he was chosen a peer of France and, in 1840, became minister of public instruction. In this capacity he reorganized the system of primary education. In higher education he exercised an important influence in discarding the dogmatic teaching of philosophy for a more historical approach. His position in the history of thought is that of an eclectic rather than an analyst. He published a translation of *Plato*, and a *Course of the History of Philosophy*, his largest original work.

Cousins, Norman (**1912-**), editor, author, and lecturer, was born at Union, New Jersey. He was graduated from Teachers College, Columbia University, and began his journalistic career as educational writer for the *New York Post*. He was literary editor, then managing editor of *Current History* magazine. Since 1942 he has been editor of *The Saturday Review of Literature*. During World War II he was chairman of the editorial board of the Office of War Information. He has been U. S. Government lecturer in India, Pakistan, and Ceylon. His books include *Modern Man Is Obsolete* (1945), *Talks with Nehru* (1951), and *Who Speaks for Man?* (1952).

Coverdale (*kŭv'ẽr-dāl*), **Miles** (**1488-1568**), translator of the Bible into English, was born in Yorkshire. He was a monk of Norwich, but early devoted himself to the promotion of the Reformation. In 1551, he was appointed Bishop of Exeter, but was ejected and imprisoned on the accession of Mary in 1553. In the subsequent reign of Elizabeth until within two years of his death, he was rector of the Church of Saint Magnus in the city of London. In 1535, he published his first translation of the Bible, which was the earliest complete Bible printed in the English language.

Coward, Noel (**1899-**), English dramatist and actor, was born at Teddington. He made his first appearance on the stage in 1910. His first successful plays were sparkling comedies. They include *The Vortex*, *Easy Virtue*, *Hay Fever*, and *Private Lives*, which depended for their effect largely on short, comic speeches and amusing passages of mutual abuse. In 1930, he produced a tragic play, *Cavalcade*, which won him an enviable reputation in both England and America as a dramatist and actor of rare ability. Among his numerous works are *Present Laughter* and *This Happy Breed*, both published in 1947, *Peace in Our Time* (1948), *Relative Values* (1952), *and the* autobiographical *Future Indefinite* (1954).

Cowles, Gardner (**1903-**), publisher, was born at Algona, Ia. and was educated at Philips Exeter Academy

and Harvard University. His career in journalism began with work on the *Des Moines Register*, on which he advanced from city editor to publisher. As president of Cowles Magazines, Inc. he founded several successful publications, best-known of which is *Look* magazine.

Cowley, Abraham (1618-1667), English poet and essayist, was born in London. He wrote excellent verses at 10 years of age. From Westminster School he proceeded in 1637 to Trinity College, Cambridge, and there wrote, among many other pieces, a large portion of his epic, the *Davideis*, the hero of which was King David. From 1644 to 1656 he was an exile to France with the queen of Charles I. His poetry abounds in metaphysical subleties and niceties of expression, which were very popular in his time. Among his longer poems his elegies are the most worthy, and some of his most natural verses are found scattered through his essays, which are graceful and beautiful. He died at Chertsey, and was buried in Westminster Abbey.

Cowley, Malcolm (1898-), American writer, critic, translator, and editor, was born at Belsano, Pa. After he was graduated from Yale in 1920, he lived for a number of years in Paris, where he was a free lance writer and translator. Returning to the United States, he served as associate editor of *The New Republic* from 1929 to 1944. In 1934, his autobiographical *Exiles Return* was published (revised edition 1952). Among the books he has edited are *The Portable Hemingway, The Portable Faulkner, The Portable Hawthorne, The Complete Whitman,* and *The Stories of F. Scott Fitzgerald.* His translations include works by Paul Valéry, Maurice Barrès, and André Gide.

Cowper (*kōō'pēr; kou'pēr*), **William (1731-1800),** English poet, was born in Hertfordshire. He was admitted to the bar in 1754, but did not practice. He passed many years at Olney, Buckinghamshire, in the society of Mrs. Unwin, Lady Austen, and the Rev. John Newton, engaged in religious exercises and charities. Lady Austen turned his attention to poetry, and, after contributing extensively to the *Olney Hymns*, he published in 1782 his first volume, which was tolerably well received. The ballad of *John Gilpin* gave him wide renown. His longest original poem, *The Task*, 1785, also gained general popularity. He next translated *Homer* into English blank verse and undertook a new edition of Milton with translations of the Latin and Italian poems. In 1799, he wrote his last poem, *The Castaway*. Besides possessing great gifts as a poet, Cowper was one of the most charming of letter writers, his epistles ranking among the finest in the English language. See *Gilpin, John.*

Cox, James Middleton (1870-1957), congressman and governor, was born at Jacksonburg, Ohio; grew up on a farm; and received a public school and high school education. In early life he taught country school and worked in a printing office. Later be became a newspaper reporter and rose to the position of editor on the staff of the *Cincinnati Enquirer*. In 1898, he bought the *Dayton Daily News* and, in 1903, he purchased the *Springfield Press-Republic*, forming the News League of Ohio and making a record as a successful newspaper man. He was a member of Congress, 1909-13, and governor of Ohio for three terms, 1913-21. He was Democratic candidate for the presidency in 1920.

Cox, Kenyon (1856-1919), American mural and figure painter, was born in Warren, Ohio; studied in Cincinnati and Philadelphia, and later in Paris under Carolus-Duran and Gérôme, 1877-82. His works consist principally of portraits, figure pieces, and mural decorations. Among his mural paintings, which rank with the greatest in America, are "Art and Science" in the Library of Congress, Washington; "The Progress of Civilization" in the Capitol, Des Moines, Ia.; and "Venice" at Bowdoin College, Me. His finest pictures include "Hope and Memory," "The Hunting Nymph," "October Afternoon," "A Vision of Moonrise," and "A Book of Pictures." His "Harp Player" and portrait of Saint-Gaudens are in the Metropolitan Museum, New York. He wrote, among other books, *Mixed Beasts, Old Masters and New, Painters and Sculptors, Artist and Public,* and *Concerning Painting.* He was elected to the American Academy of Arts and Letters in 1908.

Cox, Louise Howland King (1865-1945), American painter, was born in San Francisco. She was a pupil at the New York Academy and studied at the Art Students' League under Kenyon Cox, whom she married in 1892. Her graceful decorative work is similar in style to that of her husband. Her mural painting of "The Fates" and the decorative canvases, "The Annunciation," "Psyche," and "Pomona," are noteworthy examples of her art in this field. She excels in her paintings of children. her charming naturalism in portraying them is well shown in "Lucile," "The Wonder Book," "Goldilocks," "My Children" and "Mrs. Homer Saint-Gaudens and Child."

Cox, Palmer (1840-1924), author and artist, was born in Granby, Quebec, Canada; was graduated from Granby Academy; lived in San Francisco, 1863-75, contributing to *Golden Era* and *Alta California;* and, in 1875, removed to New York. His specialty was the execution of original pictures illustrating his own juvenile books of humorous fancy, of which the most characteristic are his widely known *Brownies.* Among his other books are *Squibs of California, Hans von Pelter's Trip to Gotham, How Columbus Found America, That Stanley,* and *Queer People with Paws and Claws.*

Cozzens, James Gould (1903-), American novelist, was born in Chicago, Ill. His literary talent developed early; he appeared in *The Atlantic Monthly* magazine when he was sixteen, and had his first novel *Confusion,* published when he was nineteen and a sophomore at Harvard. Over the years, Cozzens has maintained a steady production of rewarding, expertly-written novels. His first success was *S. S. San Pedro,* in 1931. *The Just and the Unjust,* published in 1942, was remarkable for its insight into the legal profession. Cozzens won the Pulitzer prize in 1948 with *Guard of Honor,* a big, richly colorful story of practically every level of life on a Florida air force base during World War II. His controversial novel, *By Love Possessed,* appeared in 1957. Universally praised for its craftsmanship and condemned by some for its realism, this book has attracted much attention.

Crabbe (*krăb*), **George (1754-1832),** English poet, was born at Aldeburgh. He was a surgeon, but abandoned his profession for literary pursuits and went to London in 1780. Edmund Burke secured a publisher for his poem *The Library* in 1781 and advised him to take Holy Orders. He was ordained in 1782 and became chaplain to the Duke of Rutland at Belvoir Castle. He published *The Village* in 1783 and, in 1807, *The Parish Register.* These, his best works, were followed by *The Borough, Tales in Verse,* and *Tales of the Hall.* His poetry portrays realistically the lives of the destitute. His last days were spent as rector of Trowbridge, Wiltshire.

Craig, Edward Gordon (1872-), English stage designer, son of the actress Ellen Terry. He began his career as an actor in 1889 under the direction of Sir Henry Irving, but soon specialized in stage design introducing settings which emphasized simplicity and massive effects. He founded a school of theatrical art in Florence in 1913. Later his settings were used by the Reinhardt Theatre in Berlin and the Moscow Art Theatre. He has been influential chiefly through his writings, which include *On the Art of the Theatre, Books and Theatres,* and *Ellen Terry and Her Secret Self.*

Craigie (*krāg'ĭ*), **Mrs. Pearl Mary Teresa.** See *Hobbes, John Oliver.*

Cranach (*krä'näk*), **Lucas, the Elder (1472-1553),** German painter, was born near Bamberg, Germany. Besides following other lucrative trades, he acted as court painter to Frederick the Wise, elector of Saxony, and to his two successors. In 1520, he bought an apothecary's business at Wittenberg, where he was also a bookseller and paper maker, became councilor and chamberlain, and was twice chosen burgomaster of the town. He was an intimate friend of Luther and Melanchthon, whose portraits he several times painted. He has been styled the painter of the Reformation. His best works are his portraits and madonnas, some of which rank among the noblest in German art. Other well-known works are "Christ Blessing the Children," "Repose in Egypt," "Samson and Delilah," "Marriage of Saint Catharine," and "Fountain of Youth."

Cranch (*kränch*), **Christopher Pearse (1813-1892),** American painter and poet, was born at Alexandria, Va. He studied in France and Italy, 1846-63; returned to New York; and became a member of the National Academy in 1864. He was also a graceful writer in prose and verse, and published a book of *Poems, The Bird and the Bell, Ariel and Caliban,* and prose tales for children, which he illustrated. His best pictures are "October Afternoon," "Venice," and "Venetian Fishing Boats." Died at Cambridge, Mass.

Crane, Walter (1845-1915), English illustrator, was born at Liverpool. He was educated privately and, although influenced by Rossetti, Holman Hunt, and Millais, was in the main self-taught. In his painting, his style reveals his study of the Florentine masters, particularly Botticelli. He was pre-eminently an illustrator and is considered the leader of the romantic movement in decorative art in England. His drawings, chiefly in outline, are distinguished by imagination, humor, and notable mastery of method. Among the finest are: "The Baby's Opera," "Pan Pipes," "Echoes from Hellas," "Queen Summer," and illustrations for Shakespeare's works.

Cranmer, Thomas (1489-1556), archbishop of Canterbury, was born in Nottinghamshire, and was educated at Cambridge University. He obtained the favor of Henry VIII by furthering his divorce from Catherine of Aragon and was appointed Archbishop of Canterbury in 1533. He

favored the reformed doctrines during the reign of Henry VIII and in that of Edward VI. Under his guidance, Protestantism was thoroughly established and the *Book of Common Prayer* was compiled and issued, 1549. He was committed to the Tower on the accession of Mary; condemned at Oxford for heresy in 1554; and, after two years' imprisonment, was burned there in 1556, openly rejecting the recantations of Protestantism which he had been induced to sign.

Crassus, Marcus Licinius (c. 115 B. C.-53 B. C.), Roman general and statesman. He was the wealthiest citizen of Rome in his day, having made much of his wealth by purchasing houses when burning and then extinguishing the flames with the help of a body of slaves trained for the purpose. The buildings were then repaired and sold at a huge profit.

During his consulate, he gave to the people a feast which was spread on 10,000 tables, and he distributed a three months' supply of grain. In 60 B. C., Cæsar, Pompey, and Crassus formed the First Triumvirate. In 55 B. C., as consul with Pompey, Crassus received Syria to govern and made preparations for war against the Parthians; after being defeated, he was beguiled into a conference with the Parthian general Surenas and was slain at the appointed place of meeting.

Crawford, Francis Marion (1854-1909), American novelist, son of Thomas Crawford, the sculptor, was born at Bagni di Lucca, Italy, and was educated in the United States, Italy, England, and Germany. In 1879, he edited *The Indian Herald* at Allahabad, India. From 1881 to 1883, he was in America, and subsequently he resided at Sorrento, Italy.

Crawford published over forty novels, including *An American Politician, Zoroaster, Saracinesca, With the Immortals, Love in Idleness,* and *The Heart of Rome.* He wrote also a play, *Francesca da Rimini,* and several historical romances, including *Ave Roma Immortalis* and *The Rulers of the South.* His *Saracinesca* series is of the romantic type, ingenious in plot, with characters and scenes charmingly portrayed in the style of an experienced and discerning man of the world. He was a member of the American Academy of Arts and Letters.

Crawford, Thomas (1814-1857), American sculptor, was born at New York. He early manifested a taste for art and, in 1835, repaired to Rome, where he entered the studio of Thorvaldsen. His principal works are a bronze bust of Beethoven, executed for the Boston Music Hall; the colossal equestrian statue of Washington at the Capitol, Richmond; the marble and bronze statuary for the Capitol, Washington. Among his works in American art collections are "The Indian," belonging to the New York Historical Society; "Orpheus" and "Adam and Eve after the Expulsion," in the Boston Museum; "Josiah Quincy," a bust in the Boston Atheneum; and "The Dancer," "Dying Indian Maiden," and "Flora," at the Metropolitan Museum. Died in London.

Creasy, Sir (*krē'sĭ*), **Edward Shepherd (1812-1878),** English historian, was born at Bexley, Kent. From Eton he passed to King's College, Cambridge, and, in 1834, was elected a fellow there. Admitted to the bar in 1837, he served as a judge for some years and, in 1840, was appointed professor of history at London University. In 1860, he was knighted and appointed chief justice of Ceylon, a post which he held for ten years. He is the author of *The Fifteen Decisive Battles of the World, Invasions of England, History of the Ottoman Turks, Imperial and Colonial Constitutions,* and a novel entitled *Old Love and the New.* He died at London.

Cremazie, Octave (1827-1879), French Canadian poet, was born at Quebec. Financial involvements, arising from an unsuccessful bookselling enterprise, led him, in 1862, to seek refuge in France under an assumed name. His poems, written in French and inspired by intense religious and patriotic sentiment, were first published in complete form in 1882, three years after his death in Havre, France. He is known as "the father of French Canadian poetry."

Cremer (*krē'mĕr*), **Sir William Randal (1838-1908),** English advocate of international peace, was born at Fareham. From 1860 to 1870, he was a prominent figure in English trade unions. He was elected to the House of Commons as a Liberal in 1885 and was repeatedly re-elected until 1906. For 37 years he was secretary of the International Arbitration League. In 1903 he was awarded the Nobel Peace prize, which he gave to the league as an endowment. He was knighted in 1907.

Crile (*krīl*), **George Washington (1864-1943),** American surgeon, was born at Chili, Ohio. He was graduated from Western Reserve University and, after European study, taught surgery there until 1924, when he became surgeon and later director of research for the Cleveland Clinic. Crile's contribution to surgery related to the reduction or elimination of surgical shock and the relation of cells and electric currents to the phenomena of life. His publications include: *Surgical Shock, The Phenomena of Life,* and *Intelligence, Power and Personality.*

Cripps, Sir (Richard) Stafford (1889-1952), English politician. Educated at Winchester College and University College, London, he was called to the bar in 1913. Closely associated with the Fabian socialist group, he joined the Labor party. He was elected a member of Parliament for East Bristol in 1931. He was solicitor-general in Macdonald's Labor ministry, 1930-31, but went into opposition with the formation of the national government of Macdonald and Baldwin. In 1940, he was sent as ambassador to Russia, but was recalled in 1941 to serve in the reorganized Churchill cabinet as lord privy seal and leader of the House of Commons. He conducted an unsuccessful mission to India in 1942, and was minister for airplane production, 1942-45. In the Attlee Labor ministry he was made president of the board of trade. In 1947 he became chancellor of the exchequer.

Crispi (*krēs'pē*), **Francesco (1819-1901),** Italian statesman, was born at Ribera, Sicily. After the revolutionary movement of 1848 he was obliged to take refuge in France. He organized the successful movement of 1859-60 and reentered Sicily with Garibaldi. He became eventually premier, advocating the Triple Alliance of Germany, Austria, and Italy; in 1896 the Abyssinian disaster compelled him to resign; and in 1898 he withdrew from politics. He ranks as a much maligned but constructive statesman. He died in Naples.

Croce (*krō'chā*), **Benedetto (1866-1952),** Italian philosopher, was born at Pescasseroli, Aquila, and was educated at Naples and Rome. He began in 1902 an exposition of what he called the philosophy of the spirit. A basic concept is the identity of concrete philosophy and history. Through his periodical, *La Critica,* he deeply influenced Italian literature. He was made a senator in 1910 and after Mussolini's fall took a prominent part in the reconstruction of the government. Among his many works are: *Esthetics; History, Its Theory and Practice; Goethe; Europe in the XIX Century;* and his *Autobiography.*

Crockett, David (1786-1836), American pioneer and politician, was born in Tennessee. He was noted chiefly for his adventures and eccentric habits. He was a member of Congress from 1827 to 1831 and from 1833 to 1835. He joined the Texans in their revolt against Mexico; was taken prisoner at Fort Alamo in 1836; and, with the five other survivors of the battle, was massacred by order of Santa Anna. *A Narrative of the Life of David Crockett,* an autobiography probably authorized or dictated by him, was published in 1834.

Crœsus (*krē'sŭs*), last king of Lydia, lived in the 6th century B. C. He was celebrated for his wealth, his name becoming a synonym for a man possessing extraordinary riches. It is said that Solon, visiting him, replied to his questions that no man could be considered happy until his death. Crœsus was later defeated by Cyrus, King of Iran, and condemned to be burned. Amid the flames he thrice called the name of Solon. Cyrus, hearing and wondering, ordered the flames to be extinguished, and, on learning the cause of Crœsus' exclamation, spared his life and retained him as one of his counsellors.

Crofts, Ernest (1847-1911), English painter, keeper of the Royal Academy, was born in Yorkshire. He studied art in London and later at Düsseldorf, where he lived many years. His historical paintings range over a wide period and deal mainly with military subjects. The chief ones include "Napoleon at Ligny," "On the Morning of the Battle of Waterloo," "Oliver Cromwell at Marston Moor," "George II at Dettingen," "Wallenstein," "Marlborough after Ramillies," "Napoleon Leaving Moscow," and "Execution of Charles I."

Croker, Richard (1843-1922), politician, was born at Black Rock, Ireland; was brought to the United States when two years old; and was educated in the public schools of New York. He rose to great prominence in the politics of New York City, where he stoutly opposed the Tweed Ring and was long recognized as leader of the Tammany forces. He retired from politics in 1902 and, soon after, removed to Ireland, where he devoted much time to the turf. He was a Derby winner in 1907.

Crome, John (1768-1821), English landscape painter, was born at Norwich. He founded the so-called Norwich school of painting, a cardinal principle of which was fidelity to nature. His art is characterized by realism, and his landscapes contain a true appreciation of light and air. His works include "Willow," "Coast Scene near Yarmouth," and "Fishmarket at Boulogne."

Cromer (*krō'mĕr*), **Evelyn Baring, first Earl (1841-1917),** British statesman and diplomat, was born at Cromer Hall, Norfolk. He was educated at the Ordnance School, Carshalton, and at the Royal Military Academy, Woolwich. After serving with distinction in the royal artillery, he became private secretary to the Earl of Northbrook;

governor general of India, 1872; commissioner of the Egyptian public debt, 1877; controller general of Egypt, 1879; and finance minister of India in 1880. From 1883 to 1907, he was agent and consul general in Egypt. In this capacity he was virtually British viceroy and, by reason of his constructive administration, was called the "maker of modern Egypt." After his return to England in 1907, he became active in Parliament. His writings include *Staff College Essays, Paraphrase and Translations from the Greek, The War Game, Modern Egypt,* and *Ancient and Modern Imperialism.*

Crompton, Samuel (**1753-1827**), English inventor, was born near Bolton, England. For five years, he devoted all his spare time and money, including his earnings from playing the violin at Bolton Theater, to work upon improving the spinning jenny. The outcome was the spinning mule, which would spin yarns fine enough to make muslin. He sold the invention under an unfortunate arrangement, from which he realized a total of only about £60. The spinning mule was of revolutionary importance but the only substantial recognition to the inventor was a grant of £5000 from the House of Commons in 1812. He died in comparative poverty.

Cromwell, Oliver (**1599-1658**), lord protector of England, Ireland, and Scotland, was born at Huntingdon, England. Educated at the Huntingdon Grammar School, he entered Sidney Sussex College, Cambridge, in 1616. He later went to London to study law. In 1620, he married Elizabeth Bourchier and embraced Puritanism in its most uncompromising form.

Parliamentary Career. In 1628, Cromwell sat for Huntingdon in the stormy third Parliament of Charles I, and, in 1640, when 41 years of age, he was sent to Parliament for the town of Cambridge. As a member of the so-called Long Parliament, which met in that year, Cromwell warmly supported all measures that tended to disarm royalty and to invest Parliament with the supreme power. When the hopes of reconciliation between the king and Parliament failed through the perfidy or vacillation of the former, Cromwell was among the first to offer of his substance to defend the state. Ranking as captain of a troop of cavalry in 1642, he exhibited astonishing military genius. He was promoted to the rank of lieutenant general.

Military Campaigns. Cromwell served at Winceby, October 11, 1643; at Marston Moor, July 2, 1644; and in the second battle of Newbury, October 27, 1644. When, by a self-denying ordinance, the army had been rid of its grandees, it was remodeled, and the war was pushed forward with new vigor. In the capacity of lieutenant general, Cromwell commanded the right wing of the Parliamentary army at Naseby, June 14, 1645. Everywhere the royal cause was failing, and Charles himself was given up to the Parliamentary commissioners in 1646.

With characteristic sagacity, Cromwell perceived that the advantage would lie with that party which held possession of the king's person, and he had Charles removed from the commissioners into the hands of the army, June 1647. At this time, the country was in a critical situation. The Welsh had risen in insurrection; a Scotch army was bearing down from the north; and Rupert was threatening a descent from the Netherlands. There was extensive royalism also in Ireland. Prompt measures alone could prevent anarchy, and Cromwell was not afraid to employ them.

In 1648, the Scotch were utterly defeated at Preston Moor. Then came the execution of Charles I on January 30, 1649, and Parliament established the Commonwealth. The abolition of the House of Lords followed speedily, and Cromwell became a powerful member in the new council of state. In August 1649, he quelled the rebellion in Ireland and established unexampled prosperity in that country. Affairs in Scotland now claimed his attention. Charles II was declared king in the north of Scotland and, on September 3, 1650, Cromwell routed the Scotch army at Dunbar. A year later to the day, September 3, 1651, he defeated Charles II at Worcester. This battle, which ended the civil war, placed Cromwell at the head of public affairs in England.

Protectorate. In April 1653 came the dissolution of Parliament. Cromwell now convened a parliament, which consisted wholly of Puritans and Dissenters, numbering 154 persons. It assembled July 4, 1653, and immediately invested Cromwell with the supreme power under the title of lord protector. When Parliament met again, its two houses fell into a disagreement which compelled Cromwell to dissolve it. His power thenceforth rested upon the army, though it was his constant desire to revert to constitutional government.

His protectorate was a continual struggle between Royalist plots and Republican resistance, yet Cromwell was able to maintain a strong policy, home and foreign. He united Scotland and Ireland to England, giving to each representation in Parliament. He upheld toleration and curbed the persecuting tendencies of the time. He saved the universities from the fanatics, put capable men at their head, and encouraged letters. Under Cromwell, the Commonwealth became the head and protectress of Protestant Europe. He made peace with the Netherlands and, in the interest of religious liberty and commerce, allied himself with France against Spain. By the hand of Blake, he chastised the pirate states of Barbary. His boast, that he would make the name of Englishman as fully respected as that of Roman, had been fulfilled. He died at Whitehall.

Cromwell, Thomas (**c. 1485-1540**), earl of Essex, English statesman. He was in the service of Woolsey for several years before the cardinal's downfall in 1529 and remained his steady friend in adversity. His superior talents commended him to Henry VIII, who appointed him his secretary and his spokesman in the House of Commons. He thus became the leader of the English Reformation, although his motive was strengthening the royal power. In 1535, he was made visitor general of all the country's monasteries, religious houses, and universities, and, in 1536, he became lord privy seal, baron, and ecclesiastical vice regent. Later, having lost the king's favor, he was beheaded.

Cronkite, Walter (**1916-**), radio and television expositor, was born at St. Joseph, Mo. He was employed as a news writer and editor by Scripps Howard and by the United Press, being stationed chiefly at Kansas City, Houston, Dallas, and El Paso. He served as war correspondent 1942-1945 and took a leading part in reporting the Nürnberg war trials. More recently, he has become well known as a news commentator and interviewer for CBS and as expositor for many special television programs.

Cronstedt (*krŏn'stĕt*), **Axel Frederic, Baron** (**1702-1765**), Swedish scientist, was born at Stropsta Nykoping. He was councilor of mines and member of the Academy of Sciences at Stockholm. In 1751, he discovered nickel, isolating the metal in impure form from niccolite. His results were verified by Bergman in 1775. With Wöhler's invention, 50 years later, of a method for extracting the metal in commercial quantities, the foundation was laid for the present day nickel industry with its innumerable applications in the arts. In 1758, he published an important work on mineralogy, making chemical composition the basis of classification. He was the first to draw a clear distinction between minerals and rocks.

Crookes (*krŏŏks*), **Sir William** (**1832-1919**), British chemist and physicist, was born in London; was educated at the Royal College of Chemistry; and became professor of chemistry in the training college, Chester, in 1855. He discovered the element thallium; repulsion resulting from radiation; radiant matter; radiant matter spectroscopy; and new elements in gadolinite. In 1865, he worked out the sodium amalgamation process for separating gold and silver from their ores. By inventing improvements in the Sprengel air pump, he was enabled to make the famous high vacuum tubes known as "Crookes tubes," used in the production of the Roentgen or X-rays. This discovery also made the incandescent electric light commercially practicable. Crookes also devised the radiometer, the otheoscope, and the spinthariscope. In 1907, with Eduard Buchner, Crookes received the Nobel prize for chemical researches.

Crosby, (Bing) Harry Lillis (**1904-**), singer and motion picture actor, was born in Tacoma, Wash. After attending Gonzaga University at Spokane, he became a vaudeville performer, but was soon singing with Paul Whiteman's orchestra and other dance bands. Since 1931 he has been enormously successful on the radio and in motion pictures and his records have been best sellers. He popularized, among other songs, *White Christmas,* and achieved fame in his picture *Going My Way,* which won him the 1944 ("Oscar") award of the Academy of Motion Picture Arts and Sciences.

Crosby (*krŏz'bĭ*), **Fanny** (Mrs. Frances Jane Van Alstyne) (**1820-1915**) blind writer of popular hymns, was born at Southeast, N. Y. When 6 weeks old, she lost her eyesight during an illness. At 15, she entered an institution for the blind, New York, and taught there, 1847-58. Among the best-known hymns written by her are "Safe in the Arms of Jesus," "Jesus Keep Me Near the Cross," "Pass Me Not, O Gentle Savior," "Jesus is Calling," "I am Thine, O Lord," and "Jesus the Water of Life Will Give." Among her songs are "There's Music in the Air" and "Hazel Dell." She wrote, among other works, *The Blind Girl* and *A Wreath of Columbia's Flowers.*

Cross, Wilbur Lucius (**1862-1948**), American writer and scholar, was born at Mansfield, Conn. A graduate of Yale University, he joined the faculty there in 1894 as instructor in English and, from 1916 to 1930, was dean of the graduate school. He edited many books and wrote various works on the history of the English novel and also *An Outline of Biography.* In 1926, he was elected to the American Academy of Arts and Letters. From 1931 to 1939 he was governor of Connecticut. In 1943 he published his autobiography, *Connecticut Yankee.*

Crothers, Rachael (1878-1958), American dramatist and theatrical manager, was born at Bloomington, Ill. After being graduated from the Illinois State Normal School, she taught school and began writing plays, directing their production herself. They were typically social comedies with sparkling dialogue written from a woman's point of view. The more successful include *Mother Carey's Chickens, As Husbands Go, When Ladies Meet,* and *Susan and God.*

Crouse, Russel (1893-), American playwright and librettist, was born at Findlay, Ohio. He began writing as a newspaper reporter in the Middle West and in New York City. In the 1930's, he was author or co-author of librettos for several well-known musical comedies, including *The Gang's All Here* and *Red, Hot and Blue.* With Howard Lindsay, he prepared a stage version of *Life with Father,* and wrote *State of the Union* and *Call Me Madam.* He is also author of *Mr. Currier and Mr. Ives, It Seems Like Yesterday, Murder Won't Out,* and *The American Keepsake.*

Cruikshank (*krōōk'shăngk*), **George (1792-1878),** English artist and caricaturist, was born in London. The works illustrated by him include, among hundreds of others, Grimm's *Fairy Tales, Peter Schlemihl,* Dickens's *Oliver Twist* and *Sketches by Boz,* and Ainsworth's *Jack Sheppard.* Like Hogarth, he was a moralist as well as an artist, and he used his art to dramatize the downward career of the drunkard. His last important work, done in oil, is the "Worship of Bacchus."

Cui (*kü-ē'*), **César Antonovitch (1835-1918),** Russian composer and military engineer, was born at Vilna. He received his early education at Vilna, where his father, a survivor of Napoleon's army of invasion, was an instructor in French. He studied music for a brief period and then took up engineering at Leningrad, later becoming a professor in the Military Academy and attaining the rank of lieutenant general. He was the instructor of many noted military leaders and wrote valuable textbooks on fortification. He continued musical study with Balakirev and became a champion of the new Russian nationalistic school. He composed the operas *The Prisoner of the Caucasus, William Ratcliff, Angelo, The Saracen, The Captain's Daughter,* and *Le Filibustier;* also symphonies, orchestral and piano pieces, choruses, and songs.

Culbertson, Ely (1891-1955), American author, authority on bridge, worker for international peace, was born in Rumania. He was educated at Geneva and Paris. Best known as an expert and final authority on bridge, he devoted much effort to crusading for better understanding between nations. He was founder and president of "The World Federation, Inc." and the author of *Total Peace, The World Federation Plan,* and *Must We Fight Russia?* Within the special field of bridge playing, he was well known for such books as *Culbertson's Hoyle, Contract Bridge Complete, Culbertson Point-Count Bidding,* and *Culbertson's Self-Teacher.*

Culligan, Matthew J. (1918-), business leader, was born in New York City and was educated at All Hallows Institute and Columbia University. Returning from service with a combat Infantry unit in World War II, he was employed by the Hearst magazines. His career has brought him varied assignments in research, marketing, and public relations. He has been particularly active in the field of communications, including radio and TV as well as magazine publishing. In July 1962, he became associated with the Curtis Publishing Company.

Cummings, Edward Estlin (1894-1962), American author and painter whose typographical affectations render his name "e e cummings," was born in Cambridge, Mass. He earned a B.A. and M.A. at Harvard, where his father taught English.

Cummings' first and most lasting literary fame came as a result of his experiences in the American Ambulance Corps in World War I. Erroneously suspected to be a spy, he was thrown into a French jail and kept there, incommunicado, for several months. The book he wrote about his experiences, *The Enormous Room,* brought him immediate recognition. He studied art in Paris after World War I, and devoted much of his time to painting. In addition to a collection of poems, he published a book whose title, in characteristic lower-case letters, is *six non lectures.*

Cunard (*kŭ-närd'*), **Sir Samuel (1787-1865),** civil engineer and founder of the Cunard steamship line, was born at Halifax, Nova Scotia; succeeded early as a merchant and shipowner, and removed to England in 1838; joined with George Burns, Glasgow, and David M'Iver, Liverpool, in founding, 1839, the Royal Mail Steam Packet Company; and obtained a contract for the mail service between Liverpool and Halifax, Boston, and Quebec. The first passage, 1840, was made by the *Britannia* in 14 days, 8 hours. Iron steamers were introduced in 1855, and paddle wheels gave way entirely to the screw after 1862. Cunard was created a baronet in 1859. Died at London.

Cunningham of Hyndhope, Andrew Browne Cunningham, Viscount (1883-1963), British naval officer. He entered the Royal Navy in 1898, and served in World War I at Gallipoli. Most of his subsequent service was in the Mediterranean. On the outbreak of World War II, he was placed in command of the British Mediterranean fleet, which played a key role in the defense of Malta and the defeat of Rommel's army in Egypt. He commanded the Allied fleet in Eisenhower's invasion of Africa, Sicily, and Italy. He was made admiral in 1941 and created a baronet in 1942. In 1943 he was made admiral of the fleet and was appointed first sea lord of the admiralty and chief of the naval general staff. His brother, Sir Alan Cunningham (1887–), was the last high commissioner and commander in chief for Palestine, 1945-48.

Curie, Eve (1904-), French writer and lecturer, was born in Paris, the daughter of two famous scientists, Madame and Pierre Curie. Overshadowed at first by the world-wide reputation of her mother, she has become famous in her own right as an author and a patriotic interpreter of France in defeat and reconstruction. In her girlhood she received a complete general education but, unlike her mother and her sister Irene, Eve showed no special interest in science. As a concert pianist, music critic (under a pen name), and translator, she gained some local recognition, but the writing of *Madame Curie,* a biography of her mother, gave her an international reputation. Translated into English by Vincent Sheehan, it was a 1937 choice of the Literary Guild and won for its author the Clement Cleveland Medal awarded for distinction in the fight against cancer.

Curie (*kü'rē'*), **Madame (1867-1934),** nee Marie Sklodowska, Polish-French chemist and physicist, was born at Warsaw, Poland, where her father was professor of physics. She studied physical sciences at Warsaw and at the Sorbonne with Pierre Curie, whom she married in 1895.

In 1898, she discovered the element polonium and, with her husband, the element radium. In the investigations on radioactivity and radioactive substances which made her husband and herself renowned throughout the scientific world, she performed a fully equal share. She carried out with monumental patience the innumerable fractional crystallizations which at last yielded a minute quantity of pure radium salt and was thereby enabled to determine the exact atomic weight of radium. In 1903, with her husband and A. H. Becquerel, she was awarded the Nobel prize for physics. In 1906, she was appointed to the position at the Sorbonne made vacant by the death of her husband. In 1911, she was honored with the full Nobel prize in chemistry, the first woman scientist to win it and the only person at that time who had shared in two Nobel prizes. See *Radioactivity, Radium.*

Curie, Pierre (1859-1906), French chemist, was born in Paris. He was educated at the Sorbonne. In 1895, he became professor of physics at the Ecole Municipale, where, in 1896, he and his wife began a series of investigations upon the Becquerel rays which resulted in the discovery of polonium and radium. In 1901, they jointly received the La Case prize and, in 1903, the Davy medal. In 1903, they were awarded, with Becquerel, the Nobel prize for physics. In 1904, Curie was appointed professor of physics in the Sorbonne and, in 1905, was made member of the Institute of France. He was killed in a street accident.

Curran (*kŭr'ăn*), **John Philpot (1750-1817),** Irish legal and parliamentary orator, was born at Newmarket, Ireland. He was educated at Trinity College, Dublin. In 1773, he went to London and studied law at the Middle Temple. Two years later he was admitted to the Irish bar, where his humorous, flowery, and sarcastic speech secured him immediate success, which his attractive social qualities did much to extend. About 1782, he obtained a seat in the Irish Parliament, where he supported Catholic emancipation but was opposed to Anglo-Irish unification. His fearless defense of Robert Emmet led to his examination before the privy council in 1803. Fox appointed him to the privy council in 1806, from which he retired in 1813.

Currie, General Sir Arthur William G. (1875-1933), Canadian military leader and educational administrator, was born at Napperton, Ont.; was educated at Strathroy Collegiate Institute; and taught school in British Columbia. He volunteered for service on the outbreak of World War I and was made commander of an infantry brigade. Currie was promoted to the rank of brigadier general in 1915 and, in 1917, became commander of all the Canadian forces in France. The more decisive battles in which he took part were those in 1918 at Amiens, Arras, and Cambrai. In 1920, he resigned from the army and became principal of McGill University.

Currier, Nathaniel (1813-1888), American lithographer and print publisher, was born at Roxbury, Mass. In 1835, he founded the business of producing and selling prints of contemporary scenes. He took into partnership J. Merritt Ives, an artist, 15 years later and thereafter their

prints always carried the signature "Currier & Ives." Currier retired in 1880, but his son William carried on the business until the end of the century.

Curtice, Harlow H. (**1893-1962**), former president of the General Motors Corporation, and one of the world's foremost industrialists, was born in Eaton Rapids, Mich. His first connection with General Motors was with the AC Spark Plug Division. In 1933, Curtice became president and general manager of the Buick Division, and in 1953 he became president of the giant General Motors Corporation, whose profits in that year alone exceeded half a billion dollars. Curtice took control at a crucial time; his firm's Chevrolet was competing strenuously with Ford for domination of the low-priced motor car market. The results were record production, and the raising of sales efforts to a high pitch. Throughout these hectic times Harlow Curtice, as an unofficial spokesman for the industry, repeatedly maintained his faith in the ability of the American economy to absorb an ever-larger number of automobiles.

Curtin, John (**1885-1945**), Australian statesman. He was a member of the Commonwealth house of representatives from 1928 and from 1934 was head of the Labor party, the parliamentary opposition. In October 1941 he became prime minister of Australia, taking also the portfolio of minister of defense. He organized the Australian defense against Japan in cooperation with General MacArthur, and withdrew the Australian army from the European theater to use in reconquering islands in the Southwest Pacific.

Curtis, Charles (**1860-1936**), American politician, was born at N. Topeka, Kansas, of Kaw Indian blood on his mother's side. His early upbringing was with the Kaw Indian tribe. Having studied law, he began practicing at Topeka in 1881. He was elected to Congress in 1892, serving in the House until 1907, when he entered the Senate. With one brief interruption in 1912-14, he continued as senator until 1928, being Republican leader of the Senate from 1924. In 1928, he was nominated to the vice presidency as the running mate of Herbert Hoover and was elected for the term 1928-32.

Curtis, Cyrus Herman Kotschmar (**1850-1933**), American publisher, was born in Portland, Me. He received his education in the public schools and removed to Philadelphia, where he became publisher of the *Tribune* and the *Farmer*. Later he established the *Ladies' Home Journal*, which, under his management, became one of the most successful periodicals in the United States. The Curtis Publishing Company, of which he became head, undertook the publication of the *Country Gentleman* and the *Saturday Evening Post*, the latter established in 1728 by Benjamin Franklin. Under the management of Curtis, the *Saturday Evening Post* attained a larger circulation than any other American periodical of the time. In 1913, he purchased, with John Gribbel, the Philadelphia *Public Ledger* and, in 1923, he acquired the New York *Evening Post*.

Curtis, George William (**1824-1892**), American journalist, essayist, and critic, was born at Providence, R. I. After four years in Europe and the Orient, he joined the staff of the New York *Tribune* and became one of the editors of *Putnam's Monthly* in 1852. He began the "Editor's Easy Chair" papers in *Harper's Monthly* in 1853 and became editor of *Harper's Weekly* on its establishment in 1857. He possessed an attractive, graceful style, and was a polished lecturer and orator. He was anti-slavery and favored woman suffrage. Among his numerous writings are *Lotus Eating*, *Potiphar Papers*, *Prue and I*, and *Trumps*.

Curtiss, Glenn Hammond (**1878-1930**), American aviator was born at Hammondsport, N. Y. He became interested in mechanics, and, in 1906, at Ormond Beach, Fla., in a special motorcycle of his own construction, he covered a mile in 26⅖ seconds. In 1907, he took up aeronautic experiment. In 1908, he won the *Scientific American* cup in airplane competition at Hammondsport, N. Y.; in 1909, the international cup in the airplane competition at Reims, France; in 1910, the New York *World's* $10,000 prize in a flight from Albany to New York in a biplane of his own design. In 1911, he invented and demonstrated the hydro-airplane and, in 1912, he invented the flying boat. In 1914, he built the *America*, designed for transatlantic flight; also the Navy-Curtiss machine, which was the first to fly across the Atlantic Ocean. He became actively engaged in the commercial side of aviation and, in 1915, established extensive works for making airplanes. With the exception of the Wright brothers, no one else accomplished so much for aviation in America. See *Airplane*.

Curtius (*kōōr'tsē-ōōs*), **Ernst** (**1814-1896**), German archeologist, was born at Lübeck. He studied at Bonn, Göttingen, and Berlin; visited Athens in 1837; and later accompanied Otfried Müller in his travels through Greece. In 1844-50, he was tutor to the Crown Prince Frederick of Prussia, afterward Emperor Frederick III. In 1856, he became professor at Göttingen, whence he was called in 1863 to the University of Berlin. He was one of the most distinguished scholars of his day and a writer and teacher of great force and influence. Among his works are *Klassische Studien*, *Peloponnesos*, *Olympia*, *Ephesos*, *Altertum und Gegenwart*, *Griechische Geschichte*, and *Die Ausgrabungen zu Olympia*.

Curzon (*kûr'zŏn*) **of Kedleston, George Nathaniel Curzon, Baron** (**1859-1925**), English statesman and author, was born in Kedleston. He was graduated from Balliol College, Oxford. In 1885, he was assistant private secretary to the Marquis of Salisbury and entered Parliament the next year as a Conservative. He became secretary of foreign affairs in 1895 and was made governor general of India in 1899, introducing numerous reforms in taxation and administration. He resigned in 1905 as a result of a disagreement with Lord Kitchener. As chancellor of Oxford University, in 1908, he revised the university's constitution. The same year, he was made a peer and became a member of the House of Lords, of which he was leader from 1916 to 1924. He advocated universal military service and opposed woman suffrage. During World War I, he was president of the British Air Board, and he served as secretary of foreign affairs, 1919-24. His publications include *Russia in Central Asia*, *Problems of the Far East*, and *Tales of Travel*.

Cushing, Harvey Williams (**1869-1939**), American surgeon, was born at Cleveland, Ohio. After being graduated from Yale University and Harvard Medical School and studying also at Johns Hopkins and European hospitals, he taught at Johns Hopkins University until 1911, then became professor of surgery at Harvard University. He developed the method of performing surgical operations with local anesthesia. He discovered the functions and disorders of the pituitary body and became known also for his operations on the nervous system and brain tumors. His *Life of Sir William Osler* in 1925 received a Pulitzer prize award.

Cushing, Richard Cardinal (**1895-**), clergyman, was born in Boston and was educated at Boston College and St. John's Seminary. He was ordained priest in the Roman Catholic Church in 1921 and was pastor in the Archdiocese of Boston 1921–39. Later he was auxiliary bishop and then Archbishop of Boston. In 1947 he became Episcopal director of the National Catholic Welfare Conference, youth division. In 1958 he was named Cardinal by Pope John XXIII.

Cushman (*kōōsh'măn*), **Charlotte Saunders** (**1816-1876**), American actress, was born at Boston, Mass. She appeared first in opera in 1835 and later in the same year as Lady Macbeth, which she afterward made one of her most celebrated roles. Among her many parts, both tragic and comic, which included Bianca, Rosalind, Goneril, Nancy Sikes, Lady Teazle, and Cardinal Wolsey, her Meg Merrilies was of unusual distinction. In 1844, after a tour in America with Macready, she made a successful trip to England, which she revisited many times. In 1856, she went to Rome. Throughout her distinguished career she was esteemed not only as a great artist but as a noble woman. She retired from the stage in 1875. She was elected to the American Hall of Fame, 1915.

Custer, George Armstrong (**1839-1876**), American soldier, was born at New Rumley, Ohio. He was graduated from West Point in 1861 and served with distinction through the Civil War. As a cavalry commander in the West, he several times defeated the hostile Indians; but, on June 25, 1876, he attacked, on the Little Big Horn, Mont., a force of Sioux who outnumbered him ten to one, and he and five companies of cavalry were surrounded and killed to the last man. As a brilliant, daring, cavalry officer, Custer had few equals, but, in the Little Big Horn engagement, he undoubtedly permitted his impetuosity to master his judgment. His wife, Elizabeth Bacon Custer, accompanied him in many campaigns and became well known as the author of *Boots and Saddles*, *Tenting on the Plains*, and *Following the Guidon*.

Cuvier (*kü'vyā'*), **Georges Chrétien Léopold Frédéric Dagobert** (**1769-1832**), French naturalist and the founder of comparative anatomy, was born at Mompelgard, now Montbeliard, France. In 1784, he was admitted to the Academy in Stuttgart, where he distinguished himself for great receptivity and brilliancy of mind.

At the age of 19, Cuvier became tutor to the only son of Count d'Héricy in Normandy. Here Cuvier became intimate with the Abbé Tessier, a noted authority on agriculture, who had fled from Paris during the Revolution to a small town near the residence of the Count. Under the stimulation of Tessier, Cuvier devoted himself assiduously to the study of natural phenomena.

In 1795, Cuvier was invited to Paris as a member of the commission of arts, newly organized by the Revolutionary government. At the Jardin des Plantes, he soon became professor of natural history and assistant super-

intendent of the botanical gardens. There he continued his studies on the structure of animals and, in 1798, produced his *Elementary View of the Natural History of Animals*. Other investigations made at this time enabled him subsequently to write the important *Researches on Fossil Bones*.

Cuvier was made a member of the National Institute of France in 1796, and, four years later, he was appointed professor of the philosophy of natural history in the College de France. He continued, however, to act as professor at the Jardin des Plantes. Napoleon soon detected Cuvier's administrative skill and made him one of six inspectors to establish public schools in the principal towns of France. Cuvier opened the lycees of Marseilles, Nice, and Bordeaux and organized the universities of Piedmont, Genoa, Tuscany, and Rome. His labors extended also into the Netherlands and the Hanseatic towns.

In 1814, Cuvier was appointed councilor of state, and, the following year, he became chancellor of the University of Paris. In 1817, he published *The Animal Kingdom* and, in 1818, was elected a member of the French Academy.

Through Cuvier's careful and laborious observation of the analogies of internal structure, the whole animal kingdom was brought into systematic arrangement. To him is due the conversion of natural history into a science of exact and severe induction. He originated the classification that is the basis of modern zoology. He is accredited also with the foundation of the new science of paleontology.

Cyrus the Great (**c. 600 B. C. -529 B. C.**), commonly called Cyrus the Elder, founder of the Persian empire. Much of a legendary character attaches to his birth and early youth. According to Herodotus, he was the son of Cambyses, a Persian noble, and of Mandane, daughter of Astyages, the Medo-Persian king. His birth was a source of alarm to his grandfather, Astyages, who had previously had a dream the interpretation of which portended that the offspring of Mandane would one day be the ruler of all Asia. He therefore contrived to get the infant into his own hands and gave it to Harpagus, his chief servant, with orders to put it to death. Harpagus promised to do so, but intrusted it secretly to the care of a herdsman, who brought it up together with his own children. The young Cyrus quickly distinguished himself among his companions.

Meanwhile the tyranny of Astyages had made him hateful to his subjects, and, by the help of the crafty Harpagus, Cyrus formed a party among the Medes favorable to his designs. Putting himself at the head of his Persian troops, Cyrus advanced into Media and overthrew the forces of Astyages, 550 or 549 B. C. After consolidating his dominions, Cyrus proceeded to conquer the surrounding nations. The kingdom of Lydia first yielded, 546 B. C., and its king, the famous Crœsus, fell into his hands. Ultimately, the whole of Asia Minor was subdued.

Cyrus's crowning triumph, however, was his capture of the city of Babylon, the metropolis of Assyria, 538 B. C. The city is said to have fallen without fighting. Through the instrumentality of Cyrus, the Jews were delivered from their captivity and were allowed to return to Palestine. While attacking the Massagetæ, a tribe dwelling to the northwest of the Caspian, Cyrus was defeated and slain.

Cyrus the Younger (**c. 424 B. C.-401 B. C.**), son of Darius and governor of the western provinces of Asia Minor. After unsuccessfully plotting against his elder brother, Artaxerxes, he raised a large army, including about 13,000 Greek soldiers, and marched against him. Cyrus was slain in the moment of victory at Cunaxa, 401 B. C. The victory was due mainly to Cyrus's Greek force, which, after being treacherously deprived of its generals and reduced in number to about 10,000, was led back to Greece by Xenophon.

Czerny (*chĕr'nê*), **Karl** (**1791-1857**), Austrian pianist and composer, was born in Vienna. He received his first musical instruction from his father. He was a favorite pupil of Beethoven and studied also under Clementi. At an early age, he won great fame both as a pianist and as a teacher, numbering among his pupils Liszt, Thalberg, and Kullak. He was a prolific composer and his instructive works, such as *The School of Velocity*, *Daily Studies*, *The School of Virtuosity*, and *The School of Fingering*, are of permanent value. At his death, his fortune was left largely to the Vienna Conservatory.

Daguerre (*dà'gâr'*), **Louis Jacques Mandé**, (**1789-1851**), French inventor, was born at Cormeilles. He discovered the daguerreotype process of photography, by which the portrait was fixed on a plate of copper thinly coated with silver, by the successive action of the vapors of iodine, bromine, and mercury; in this invention he was associate with M. Niépce. He was also celebrated as a dioramic painter; was named by the French government as an officer of the Legion of Honor; and was granted a pension of 6000 francs. Died near Paris.

Daingerfield, Elliott (**1859-1932**), American religious and landscape painter, was born at Harpers Ferry, Va.; studied drawing and painting at the Art Student's League, New York. He first exhibited at the National Academy of Design, 1880; studied in Europe, 1897; and later became professor of painting in the school of design, Philadelphia. Among his religious subjects are the paintings in the Church of Saint Mary the Virgin, New York, a "Madonna and Child" and "The Story of the Madonna." His landscapes include "Slumbering Fog," in the Metropolitan Museum, New York; "The Midnight Moon," Brooklyn Museum; and "Pearls of the Morning."

Daladier (*dà'là-dyā'*), **Edouard** (**1884-**), French statesman, was born at Carpentras, Vaucluse, France. Educated at Lyons, he taught school until World War I, in which he served, rising to the rank of captain. He was elected a deputy in 1919 as a radical socialist. His first cabinet position was the ministry of war in 1925. Becoming leader of his party in 1927, he held various cabinet posts and headed two short-lived governments prior to 1938. In that year, as prime minister, he participated in the "appeasement" conference with Hitler at Munich. He led France, as an ally of Great Britain, into war against Germany in 1939. His government fell in early 1940. After the defeat of France he was arrested by the Vichy government. Released at the end of the war, he was elected a member of the National Assembly.

Dalberg-Acton, Sir John Emerich Edward. See *Acton, Baron.*

D'Albert. See *Albert, Eugen Francis Charles d'.*

D'Alembert. See *Alembert, Jean le Rond d'.*

Dali (*dà'lê*), **Salvador** (**1904-**), Spanish artist, was born in Catalonia. His paintings, depicting Freudian dream symbols with brilliant draftsmanship and imagination, express "Surrealism" more exactly than any other art form. These works, along with his personal showmanship, have made him world-famous, and have made "Daliesque" a well-known adjective.

Salvador Dali studied at the Madrid Academy of Fine Arts, where his experiments were too extreme for the faculty. He exhibited first at Barcelona in 1925, and became a sensation. He went to Paris, where he became a friend of the artists Picasso and Miro, and began his consummate interest in Freudian psychology. Dali has lived mainly in the United States since 1940. His most famous paintings are "The Persistence of Memory," which shows melted watches in an eerie beach setting, and a portrait of his wife. He has designed memorable ballet scenery and costumes. His remarkable versatility has also reached into advertising and jewelry designing.

Dallin, Cyrus Edwin (**1861-1944**), American sculptor, was born at Springville, Utah. In his early years, he was closely associated with Indian life, in the portrayal of which he has excelled all other American plastic artists. He studied under Truman Bartlett in Boston and under Chapu in Paris. His "Signal for Peace," now in Lincoln Park, Chicago, was inspired by a visit of Buffalo Bill's wild west show to Paris. "The Medicine Man," in Fairmount Park, Philadelphia, is ranked among the most notable efforts of American sculptural art. Among his other works are a statue of Sir Isaac Newton in the Congressional Library, "Don Quixote," "Peace or War," "The Appeal to the Great Spirit," and "The Spirit of Life."

Dalou (*dà'loo'*), **Jules** (**1838-1902**), French sculptor, was born in Paris. He studied sculpture under Carpeaux and Duret and, in 1867, exhibited examples of his work at the French Salon. During the troublous period of the Commune, 1871, he took refuge in England. Through his appointment as instructor in the National Art Training School at South Kensington, he rapidly won a high reputation and took a leading part in the revival of English sculpture. While in England, he executed "Maternity," "The Reader," and "Woman Telling Her Beads."

After Dalou's return to France in 1879, he produced a long series of notable sculptural works, including the "Triumph of Silenus," in the Luxembourg, and "The States General," in the Chamber of Deputies, Paris. His most elaborate achievement, "The Triumph of the Republic," erected after 20 years' work, was executed for the City of Paris. For his later work Dalou chose subjects chiefly among peasants and artisans.

Dalton (*dôl'tŭn*), **John** (**1766-1844**), British chemist and physicist, was born near Cockermouth. He taught mathematics and physics in Manchester; made his first appearance as an author in 1793 in a volume of his observations and essays; and, in 1808, published *A New System of Chemical Philosophy*. In this work he set forth for the first time the main features of the atomic theory, which revolutionized the science of chemistry and led to many of the most valuable developments in physical science. He set forth also the law of the expansive force of steam and other gases, which is known as Dalton's Law, or the law of partial pressures. See *Atom.*

Daly, John Charles, Jr. (**1914-**), radio correspondent and news analyst, was born at Johannesburg, South Africa, and came to the United States in 1923. After attending Boston College, he joined the Columbia Broadcasting Company as a reporter and news commentator. He was White House correspondent and special events reporter from 1937 to 1941, and during and after World War II acted as correspondent for CBS in Europe, Africa, and South America. In 1949 he joined the American Broadcasting Company in the same capacity, and has since become vice president of that organization in charge of public affairs and sports. Daly is well known, not only for his news broadcasts, but also for his work as a moderator of television programs on various networks of which perhaps the most popular is "What's My Line?"

Dam (*dăm*), **Henrik** (**1895-**), Danish-American biochemist, was born at Copenhagen, Denmark. He taught at the University of Copenhagen from 1920, becoming professor of biochemistry in 1929. Leaving Denmark when Germany conquered it in 1940, he was made professor *in absentia* at the Copenhagen Polytechnic Institute in 1941. In 1942 he became senior research associate at the University of Rochester's School of Medicine, where he continued researches, previously begun, which led to his discovery of Vitamin K, a substance which controls the clotting of blood. In 1943, he received half the Nobel prize in medicine for this discovery.

Damien de Veuster (*dä'myăN' dĕ vû'stâr'*), **Joseph** (**1840-1889**), better known as "Father Damien," Roman Catholic missionary, was born near Louvain, Belgium. Sent on a mission to Honolulu and learning of the neglected state of the lepers, he volunteered to cast his lot with theirs. He long worked single-handed, but was ultimately joined by other priests. In 1885, the malady appeared in him, yet he continued unabated his heroic labors until near his death. In 1936 his remains were sent to Belgium.

Damrosch (*dăm'rŏsh*), **Leopold** (**1832-1885**), composer and conductor, was born in Posen, Prussia. In 1854, he gave up medicine to study music. In 1855, he appeared as a concert violinist in Magdeburg. He became director in Posen and in Breslau. In 1871, he came to New York as director of the Arion Society, where, in 1873, he founded the Oratorio Society and, in 1877, the Symphony Society. In 1884, he successfully established German opera at the Metropolitan Opera House, producing *Fidelio*, *Tannhäuser*, *Lohengrin*, *Die Walküre*, and other works. His musical compositions comprise works for the violin, an overture, several cantatas, and songs. He died at New York.

Damrosch, Walter Johannes (**1862-1950**), American musician, son of Leopold Damrosch, was born in Breslau, Prussia. He began to study the piano under his father before coming to the United States in 1871. He continued his musical education in New York and, in 1885, succeeded his father as conductor of the Oratorio and Symphony societies. In 1894, he organized the Damrosch Opera Company, devoted chiefly to the production of Wagner opera, which appeared under his direction in many cities of the United States. Through his efforts in 1903, the New York Symphony Society was reorganized as a permanently established orchestra, and he was its director until 1927. The next year he became music counsellor for the National Broadcasting System. In 1932 he was elected to the American Academy of Arts and Letters. His musical compositions include three operas, *The Scarlet Letter*, *Cyrano de Bergerac*, and *The Man Without a Country; Manila Te Deum*, a sonata for violin and piano; and a number of songs. He re-formed the bands of the American expeditionary force in World War I. He wrote *My Musical Life*.

Dana (*dă'nà*), **Charles Anderson** (**1819-1897**), American journalist, was born at Hinsdale, N. H. From 1849 to 1862, he was managing editor of the New York *Tribune* and, from 1863 to the close of the Civil War, was assistant secretary of war. In 1868, he became part owner and editor in chief of the New York *Sun*, and for the remainder of his life continued the successful management of that paper in the interests of the Democratic party. By his brilliant intellect, incisive style, and thorough knowledge of the art of newspaper making, he became one of the foremost journalists of his time. Together with George Ripley he planned and edited the *American Cyclopædia*.

Dana, James Dwight (**1813-1895**), American geologist and educator, was born at Utica, N. Y., and was graduated from Yale, 1833. From 1838 to 1842, he was a member of the Wilkes exploring expedition, sent out by the United States government. His collections, chiefly from little-known parts of the Pacific Ocean, were so extensive that he devoted almost 13 years to their study and described nearly 900 new species of marine life. In recognition of his important service to science, he was made professor of natural history at Yale and occupied the chair with distinction from 1855 to 1890.

Dana possessed a vivid scientific imagination and remarkable keenness of perception and analysis. His discussions of continents, mountain building, and volcanoes establish his position among the most eminent scientists of the 19th century. He was an inspiring instructor and the author of numerous scientific works, including *A System of Mineralogy*, *Manual of Geology*, *Corals and Coral Islands*, and *The Geological Story Briefly Told*.

Dana, Richard Henry (**1815-1882**), American lawyer and author, was born at Cambridge, Mass. He entered Harvard College in 1832, but suspended his studies in 1834 on account of the weakness of his eyes. He then shipped as a common sailor on a Pacific voyage, a record of which is given in his narrative *Two Years Before the Mast*, a book of sailor life which has become a classic. He was graduated at Harvard, 1837; studied law and was admitted to the bar in 1840; in 1861, was United States attorney for Massachusetts; and, in 1867-68, was counsel for the United States government in the proceedings against Jefferson Davis. He published *The Seaman's Friend* and *To Cuba and Back* and edited Wheaton's *International Law*.

Daniel, Price (**1910-**), political leader, was born at Dayton, Texas. He was educated at Baylor University and practiced law at Liberty, Texas. He became active in politics, both as a member of the state legislature and as attorney general. After serving for three years as U.S. senator, he was elected governor of Texas in 1956.

Daniels, Josephus (**1862-1948**), editor and political leader, was born at Washington, N.C., where he became editor of *The Advocate* in 1880. He subsequently became editor of the Raleigh *State Chronicle*. From 1893 to 1895 he was chief clerk in the department of the Interior at Washington. In 1912 he managed the publicity for Woodrow Wilson's campaign for the presidency. He was appointed secretary of the navy by President Wilson, in which capacity he advocated a large navy; provided training in various trades for enlisted men; and abolished the sale of intoxicating liquors within the navy. In 1921 he resumed his editorial activities but he was recalled to public service (1933-1941) as ambassador to Mexico.

Dannecker (*dän'ĕk-ĕr*), **Johann Heinrich von** (**1758-1841**), German sculptor, was born near Stuttgart; was educated by the Duke of Württemberg, who had become his patron; and was made professor of sculpture in the Academy at Stuttgart. His earlier subjects were from Greek mythology, and his later ones were religious, the principal of the latter being a colossal "Christ." He executed many fine busts of contemporaries, such as those of Schiller, Lavater, and Gluck. "Ariadne on the Panther" is his best-known work. He was one of the most eminent sculptors of the classic school. His work, which reveals a continual struggle between the classic and the naturalistic style, stands between that of Canova and that of Thorvaldsen.

D'Annunzio. See *Annunzio, Gabriele d'*.

Dante (*dän'tê*; It., *dän'tā*) **Alighieri** (**1265-1321**), Italian poet, was born in Florence, Italy. His father was a lawyer, whose family was of honorable though not of noble descent. Of Dante's youth little is known. The first fact of importance is the extraordinary affection he conceived, when only nine years of age, for Beatrice Portinari. He is said to have studied at Bologna, Padua, and Paris; Boccaccio described him as skilled in painting and music. About 1297, some years after the death of Beatrice, Dante married Gemma Donati, a lady of noble family.

Political Career. All Italy was then divided between the Guelphs and the Ghibellines. Florence was also distracted by dissensions between the Whites, the party of the ennobled rich led by the Cerchi family, and the Blacks, the conservative nobility supported by the proletariat and led by the Donati family.

Dante appears to have taken an active part in public affairs. In Italian politics, he sided with the Guelphs, and, as a citizen of Florence, he was one of the Whites. When quite young, he fought against the Ghibellines at Campaldino in 1289 and also in the wars against the Pisans in 1290. In that year, the Whites came into power in Florence. The fame of Dante's studies and his reputation for inviolable firmness and honesty raised him, in the prime of life, to the highest dignities of the republic. In 1300, he was elected one of the priors of Florence, and, probably in that year, he began the *Divine Comedy*.

His political honors were short-lived. That same year, the party of the Whites was overthrown, and Dante was banished. He found himself forced to wander for several years, afflicted by poverty. In 1306, he was at Padua; in 1307, at Casentino; in 1309, at Paris; in 1313, at Pisa. When, some time later, he was offered permission to return to his beloved Florence, he refused in a magnificent letter that is still extant. The last of his wanderings, apparently, led him to the house of Guido Novello da

Polenta in Ravenna. Through the influence of Guido, Dante was sent as ambassador to the republic of Venice in 1321. Failing to obtain an audience, he returned to Ravenna, where he spent the few remaining months of his life.

WORKS. The dates and sequence of Dante's various works are matters of conjecture. Doubtless, the *New Life* is the earliest. It is an account of his love for Beatrice, written after her death. This exquisite little book is the outpouring of the incense of Dante's soul in gratitude to God for the joy of loving. Its prose is a finished model of language and style.

The *Banquet*, which takes the form of a commentary on some short poems of the author, is one of Dante's most important works. *On Monarchy*, in Latin, expounds his theory of the divinely intended government of the world by a universal emperor acting in harmony with a universal pope.

By far the most celebrated of Dante's works is the *Divine Comedy*, in which he gives a description of hell, purgatory, and heaven. It is expressed in the sublimest and most exquisite poetry. This poem may be said to have made the Italian language, which before was so rude and unformed that Dante himself, hesitating to employ it on such a theme, is said to have begun his poem in Latin. Probably no work in the world, except the Bible, has given rise to so vast a literature. The poem, as a whole, is a complete personification of the intense religious spirit of the middle ages, and it fully justifies the title "the Christian Homer," which posterity has bestowed upon its author. See *Divine Comedy*.

Danton (*dän'tôn'*), **Georges Jacques** (**1759-1794**), French Revolutionist, was born at Arcis sur Aube, France. He was one of the most prominent figures in the first French Revolution and one of its most famous orators. As a member of the National Convention, he used all his influence to hasten the execution of Louis XVI; subsequently, as the president of the committee of public safety, he united with the other Revolutionary leaders to establish the revolutionary tribunal under whose authority persons believed to be opposed to the Revolution were disposed of. He quarreled, however, with Robespierre, by whom he was supplanted; and, by that very tribunal which he himself had established, he was condemned and guillotined.

Darius I (*da-rī'ŭs*) (**558 B. C.-486 B. C.**), became king of Persia (Iran) in 521 B. C. He captured Babylon after a siege of 20 months and conquered Thrace, but an expedition which he led against the Scythians failed. He sent two armies to Greece to avenge the destruction of Sardis by the Athenians, the first of which was repulsed by the Thracians and the second by the Athenians at Marathon in 490. He died while organizing a third expedition. He was a ruler of marked caution, skill, and energy.

Darius III, Codomannus (**?-330 B. C.**), the last ruler of the Persian empire, 336-30 B. C. Shortly after ascending the throne, he had to resist the advance of the Greeks under Alexander. His satraps were defeated at the river Granicus in 334, and Darius, having collected an immense army, was himself defeated at Issus, 333, where his mother, wife, sister, and other members of his family were made captive. At the battle of Arbela, 331, the Persian army was completely routed. Darius fled to Ecbatana, where he collected a new force. Alexander pursued him there, but, before being overtaken, Darius was assassinated.

Darling, Grace Horsley (**1815-1842**), English heroine. With the assistance of her father, who was keeper of the Longstone lighthouse on one of the Farne Islands, she rescued nine of the survivors of the wreck of the steamer *Forfarshire*, September 7, 1838.

Darrow, Clarence (**1857-1938**), American lawyer and lecturer, was born at Kinsman, Ohio, and was admitted to the bar in 1878. In his earlier years he rose to prominence in litigation against monopolistic corporations and in defense of labor leaders. Later, he defended many famous murder cases with extraordinary skill. He was convinced that crime is basically a social disease, and requires cure rather than punishment. A bitter foe of organized Christianity, he attained to wide celebrity as a lecturer on evolution, a mechanistic view of life, and related topics.

Darrow, Whitney, Jr. (**1909-**), cartoonist, was born at Princeton, New Jersey and was graduated from Princeton University. Appearing first in *Collier's* and *The Saturday Evening Post*, his cartoons have been a regular feature of *The New Yorker* for twenty-five years.

Dart, Raymond (**1893-**), educator and anthropologist, was born in Australia. Before completing his medical studies he served as demonstrator of anatomy at St. Andrew's College, Sydney, and, in 1918-19, was a captain in the Australian army medical corps. In 1928 he became professor of anatomy at the University of Witswatersrand, Johannesburg, South Africa. He has made extensive studies of fossil man and is president of the anthropological section Pan-African Congress. As a result of his discoveries of ape-man remains in South Africa he has been credited with adding an important new chapter to the story of evolution.

Darwin, Charles Robert (**1809-1882**), English naturalist and biologist, was born at Shrewsbury, England. His father was a physician and wished his son to adopt that profession. Accordingly, Darwin, at the age of 16, entered the University of Edinburgh; but repugnance to the practice of medicine sent him, in 1828, to Christ's College, Cambridge, with the expectation of preparing for the ministry. There he became acquainted with Henslow, the professor of botany, who did much to mold Darwin's dominant qualities and to shape his career.

CAREER. His zeal and proficiency in every department of natural science won Darwin the opportunity of traveling with Captain Fitzroy on the surveying voyage of the *Beagle*. After receiving his bachelor's degree, he sailed in December 1831 and did not return until October 1836. During this long voyage to the southern islands and South America, Darwin obtained an intimate knowledge of the fauna, flora, and geology of many climes. His contributions to geology, made in his subsequent reports to the government, showed his unlimited patience and careful habits in reaching conclusions through personal observation.

In 1839, Darwin married his cousin, Emma Wedgwood. In the same year, he published *Journal of Researches* and was made a member of the Royal Society. In 1842, he settled at Down, Kent, where he carried on experiments in greenhouse, garden, and paddock. Here he collected a library and wrote his books. Possessed of an ample private fortune, he had no need to undertake any teaching work or to expend his energy in gaining a livelihood. Darwin's impaired health in his later years limited his work.

SCIENTIFIC ACHIEVEMENTS. As early as 1834, while seeking to formulate an explanation of diversity in animals having the same ancestry, Darwin conceived that "by patiently accumulating and reflecting on all sorts of facts that could possibly have any bearing on the matter, some light might be thrown on the origin of species." This became the chief object of his investigations. In 1859, he published *On the Origin of Species by Means of Natural Selection*. The work created a profound sensation both in the scientific and in the nonscientific world.

Upon the specific doctrine laid down in *The Origin of Species*—particularly that of "natural selection," or the "survival of the fittest"—has been founded what is commonly known as "Darwinism." The popular conception that Darwinism is simply the theory of evolution applied to the origin of man is far from correct. Its novelty lies, not in the conception of evolution, but in an exposition of a probable cause of evolution so clear and cogent as to remove the theory from the sphere of philosophical speculation to that of practical life.

Darwin continued to work unremittingly on a great series of supplementary treatises. *The Fertilization of Orchids* appeared in 1862, *The Variation of Plants and Animals under Domestication* in 1868, and *The Descent of Man* in 1871. The last named work, hardly less famous than *The Origin of Species*, derives the human race from a hairy quadrumanous animal belonging to the great anthropoid group and related to the progenitors of the orangutan, chimpanzee, and gorilla. In it Darwin also developed his theory of sexual selection.

In addition to these and other volumes, his *Emotion in Man and Animals* was published in 1872, *Movement in Plants* in 1880, and *The Formation of Vegetable Mould* in 1881. He wrote many papers, besides, on minor phases of the great scientific issues of the day. To the end of his life he continued his painstaking and elaborate researches into the facts of nature. He died at Down and was buried in Westminster Abbey. See *Biology, History of*.

Darwin, Erasmus (**1731-1802**), English poet and physician, was born in Elton, Nottinghamshire. He studied at Cambridge, obtained a degree in medicine at Edinburgh, and settled at Lichfield as a physician. He was a man of great and varied talent, and, although some of his opinions were deemed extravagantly eccentric at the time, his ideas have been appreciated and utilized by later writers. His *Botanic Garden* was admired as a fine specimen of polished verse, and his *Zoonomia, or The Laws of Organic Life*, though discredited at the time, anticipated some of the tenets of the modern theory of evolution. He died at Derby. His third son, Robert Waring Darwin, an eminent physician, was the father of the famous Charles Robert Darwin.

Daubigny (*dō'bēn'yē'*), **Charles François** (**1817-1878**), French landscape painter, the youngest of the five great landscape artists of the Barbizon school, was born in Paris. He first studied art under his father and with an uncle; entered the studio of Delaroche in 1840; and thereafter exhibited almost annually at the salon. From the first, he was a landscape painter and became noted for his pictures of river scenery, fields, orchards, and the coasts of the English Channel. He chose subdued light effects, which he

executed with a fine sense of color values and of harmony. Among his best-known paintings are "Lock of the Optevoz," "Springtime," and "The Vintage," in the Louvre; also "Pool of Gylien," "The Harvest," "Beach at Villerville," "The Sheepfold," "Banks of the Oise," "Moonrise," and "Apple Orchard." Examples of his work are found in leading American galleries. Died in Paris.

Daudet (*dō'dĕ'*), **Alphonse** (**1840-1897**), French novelist and humorist, was born at Nimes, France; was educated at the Lyon Lycée; and, when only 17, settled in Paris. In the charming extravaganzas *Tartarin de Tarascon, Tartarin sur les Alpes,* and *Port Tarascon,* he good-naturedly caricatured his fellow southerners of the Provence. He described the sufferings of his early life in *Le petit chose* and in *Jack.* His *Lettres de mon moulin* and *Contes du lundi* contain prose sketches which rank among the greatest French classics. Daudet is noted for his charming, polished style, marked originality, and fine sense of humor. His characters are real and typical, and, like Dickens, whom he has been charged with imitating, he possessed the gift of laughter and tears. Among his other works are *Fromont jeune et Risler aîné, Le nabob, Les rois en exil, Sapho, La Belle Nivernaise, Trente ans de Paris,* and *Souvenirs d'un homme de lettres.* Died in Paris.

Davenport, Homer Calvin (**1867-1912**), American cartoonist, was born in Silverton, Ore. In his early life, he was at different times jockey, railroad fireman, and clown in a circus. In 1892, he was employed on the San Francisco *Examiner;* was taken to New York by W. R. Hearst, 1895, and placed on the New York *Journal;* originated the Mark Hanna $-mark suit of clothes and the giant figure of the trusts in 1899. While sometimes crude in draftsmanship, his cartoons are noted for vigor, directness, and stern satire. His "Uncle Sam" ranks among the best ever produced. He was the author of *Davenport's Cartoons; The Bell of Silverton, and Other Short Stories of Oregon;* and *The Diary of a Country Boy.*

Davey, John (**1846-1923**), American tree surgeon, was born in Somersetshire, England, and was largely self-educated. He learned floriculture and landscape architecture in Torquay, England, 1866-72. In 1873, he came to the United States, first settling at Warren, Ohio, whence, in 1881, he moved to Kent, Ohio, which became his permanent place of residence. In 1890, he introduced tree surgery, and, in 1908, organized the Davey Institute of Tree Surgery and also the Davey Tree Expert Company, of which he was president. Among his writings are *The Tree Doctor, A New Era in Tree Growing,* and *Primer on Trees and Birds.*

David (*dȧ'vĕd'*), **Félicien César** (**1810-1876**), French composer, was born at Cadenet. He was a chorister and later chapelmaster in the Cathedral at Aix, and, at the age of 20, entered the Paris Conservatory. He became a member of the sect of Saint Simonists and later spent two years in Turkey, Egypt, and Syria. In 1844, his symphonic ode *The Desert* scored a notable success, followed in 1851 by an opera, *The Pearl of Brazil,* and in 1867 by *Herculaneum.* He became known as the "musical orientalist," and his use of oriental melodies inaugurated a new movement in French music. He greatly influenced Bizet, Massenet, and Delibes.

David, Jacques Louis (**1748-1825**), French historical and portrait painter, founder of the modern French classical school, was born at Paris; studied at Paris and Rome; and, during the Revolution, was artistic superintendent of grand national fêtes and solemnities. In 1804 Napoleon appointed him his first painter. His art is cold and severe but grand and noble. His paintings excel in composition and draftsmanship. Among them are: "Napoleon Crossing the Alps" and other historic portraits of Napoleon, "Rape of the Sabines," "Death of Socrates," "Leonidas at Thermopylæ," and a portrait of Madame Récamier. He died at Brussels. See *Paintings.*

David, Pierre Jean (**1789-1856**), French sculptor, known also as David d'Angers, was born at Angers, France. In spite of the opposition of his father, a wood carver, he resolved to become an artist. Tramping to Paris in 1808, he placed himself under Jacques Louis David, the painter. In 1811, his *rilievo* of the "Death of Epaminondas" gained the *grand prix,* and David proceeded to Rome, where he became intimate with Canova. In 1816, he returned to France. A statue of the great Condé established his reputation. While trained in the classical school, he portrayed nature with freedom and truth, excelling in portrait sculpture, in which he was the first to insist upon contemporary costume. Among his works are busts of Washington and Lafayette, a statue of Jefferson, and the tomb of Marco Bozzaris, at Missolonghi, Greece.

Da Vinci, Leonardo. See *Vinci, Leonardo da.*

Davis, Bette (Ruth Elizabeth) (**1908-**), actress, was born at Lowell, Mass., and was educated at Cushing Academy, Ashburnham. She began work in motion pictures in 1931, and appeared in *Of Human Bondage, Dangerous, Jezebel, Elizabeth and Essex,* and other pictures. She received the award of the Moving Picture Academy of Arts and Sciences as the best actress of the year in 1935 and 1938.

Davis, Elmer (Holmes) (**1890-1958**), American writer, was born at Aurora, Ind. He attended Franklin College, and held a Rhodes scholarship at Oxford. From 1914 to 1924 he was on the staff of the *New York Times.* In 1939 he became news analyst with the Columbia Broadcasting System and gained a high reputation for soundness and accuracy. In June 1942 he was appointed head of the Office of War Information, with authority over the dissemination of official news and propaganda and held this position through the war. His writings include *Morals for Moderns, Show Window, Not to Mention the War,* and *But We Were Born Free.*

Davis, Jefferson (**1808-1889**), American statesman and soldier, was born in Kentucky; was graduated from West Point, 1828; and later represented the state of Mississippi in the House and Senate. Leaving Congress he acquired distinction in the Mexican War. When Pierce was elected president in 1853, Davis was appointed secretary of war. At this period, he exercised a powerful influence in the administration—ruling, in fact, the president as well as the greater number of the members of the cabinet.

When Buchanan became president, Davis left the cabinet, but was returned to the Senate by the legislature of Mississippi, which office he retained until the secession of his state. In February, 1861, Davis was chosen president of the Confederate states for one year and, in 1862, was re-elected for six years. The manner in which the new constitution was drawn up by Davis, his military skill, administrative capacity, and unwearied activity fully justified the choice; his disinterestedness endeared him to the South. After the fall of Richmond, in 1865, he was captured when endeavoring to escape and was imprisoned in Fort Monroe for two years. He was released on bail in 1867 and was finally set at liberty by the general amnesty of 1868. He published *The Rise and Fall of the Confederate Government,* 1881.

Davis, or **Davys, John** (**c. 1550-1605**), English navigator, was born at Sandridge, near Dartmouth. During 1585-87, he undertook three arctic voyages in search of a northwest passage to Asia. In the last voyage, he sailed as far as 73° N.; explored the coasts of Baffin Bay and Greenland; and discovered Davis Strait. He next made a voyage to the South Seas and discovered the Falkland Islands in 1592. After his return, he published *The Seaman's Secrets* and *The World's Hydrographical Description.* He invented the Davis quadrant, long used by navigators. With Baffin and Hudson, he ranks as one of the greatest early arctic explorers. While serving as pilot of an English ship, he was killed by Japanese pirates off Bintang, near Sumatra.

Davis, Rebecca Harding (**1831-1910**), American novelist, was born at Washington, Pa. In 1863, she married L. Clarke Davis, a Philadelphia journalist. Her sons, Richard Harding Davis and Charles Belmont Davis, achieved literary success while she was still an active writer. She was the earliest American author to introduce the labor question into fiction. Her numerous writings embrace novels, short stories, and sketches, including *Life in the Iron Mills, A Law unto Herself, Dr. Warrick's Daughters, Bits of Gossip,* and *Silhouettes of American Life.*

Davis, Richard Harding (**1864-1916**), American novelist and journalist, son of Rebecca Harding Davis, was born in Philadelphia. He was graduated from Lehigh University; subsequently studied at Johns Hopkins; and began his journalistic career on Philadelphia papers. He served as war correspondent in the Turko-Greek, Spanish-American, South African, Russo-Japanese, and World I wars. His novels and stories, which abound in incident and adventure, are fresh and animated in style. His works of fiction and travel include *Soldiers of Fortune, Three Gringos in Venezuela, Cuba in War Time, Exiles, The King's Jackal, The West From a Car Window, In the Fog, The Bar Sinister, With the Allies,* and *Somewhere in France.* He wrote also the following plays: *Taming of Helen, The Dictator, Blackmail,* and *Zone Police.* He died from a disease brought on by the hardships he suffered in the retreat from Serbia when with the British and French armies there.

Davisson, Clinton Joseph (**1881-1958**), American physicist, was born at Bloomington, Ill. After being graduated from the University of Chicago and Princeton University, he taught physics at the Carnegie Institute of Technology for six years, beginning in 1911, and then joined the technical staff of the Bell Telephone laboratories. Among his many discoveries is the diffraction of electrons by crystals, for which reason chiefly he was awarded half the Nobel prize for physics in 1937. This discovery created a new tool for investigation of atoms.

Davitt (*dăv'ĭt*), **Michael** (**1846-1906**), Irish journalist and political leader, was born at Straid, Ireland. The family emigrated to Haslingden in Lancashire, England, 1851. In

1857, the boy lost his right arm through a machinery accident. He joined the Fenian movement, and was sentenced in 1870, to 15 years' penal servitude. He was released in 1877, and began an anti-landlord crusade, which culminated in the Irish Land League, 1879. In 1881-82, Davitt was again imprisoned. His *Leaves From a Prison Diary* was published in 1885. He was elected to Parliament in 1892, where he favored a more extreme Irish policy than that supported by Parnell. See *Land League*.

Davout (*dȧ'vōō'*), **Louis Nicolas** (**1770-1823**), French marshal, was born at Annoux, France; was educated with Bonaparte at the Military School of Brienne. As general, he accompanied Bonaparte to the East, and was chiefly instrumental in winning the victory at Abukir. Created a marshal of France in 1804, he acted a brilliant part at Australitz, Auerstadt, Eckmuhl, Wagram, and in the Russian campaign of 1812. After Waterloo, Davout received command of the remnant of the French army. At the Second Restoration, he was deprived of his titles which were restored in 1817. He was made a peer of France in 1819.

Davy, Sir Humphry (**1778-1829**), English chemist, was born at Penzance, in Cornwall. He was educated at various local schools and, in 1798, was made laboratory assistant in Beddoes Institution at Bristol. Two papers in 1801 on nitrous oxide, which he had discovered the previous year, led to his appointment as lecturer at the Royal Institution, London, and, in 1802, he was made professor. His Bakerian lecture in 1806 entitled *On Some Chemical Agencies of Electricity* advanced the view that chemical affinity is the mutual electrical attraction of the ultimate particles of matter, a viewpoint which marked a turning point in the development of the science.

Davy's electrolytical experiments enabled him to decompose potash and to secure the pure metal potassium in 1808. In 1809, he obtained the metal sodium and alloys of calcium, strontium, and barium, and proved that hydrochloric acid is a compound of hydrogen and chlorine. In 1815, he invented the miner's safety lamp, one of the most valuable gifts of science to humanity. He was knighted in 1812, made a baronet in 1818, and elected president of the Royal Society in 1820. His chief works are *Elements of Chemical Philosophy* and *Elements of Agricultural Chemistry*.

Dawes (*dôz*), **Charles Gates** (**1865-1951**), American financier, soldier, statesman, and diplomat, was born at Marietta, Ohio. He was educated at Marietta College and the Cincinnati Law School. He was comptroller of the currency from 1897 to 1901, thereafter becoming president of a trust company founded by himself. In 1918, he was made a brigadier general and chairman of the general purchasing board for the American army in France, later serving on the liquidation commission of the Allies.

In 1923, an international committee under his chairmanship drew up the so-called Dawes plan for solving the economic problems connected with German reparations, an accomplishment that brought him one-half the Nobel peace prize in 1925. He was elected vice president of the United States in 1924. In 1929 he was appointed ambassador to Great Britain. When President Hoover organized the Reconstruction Finance Corporation in 1932, Dawes was chosen to head it, but he resigned the same year to conserve his threatened banking interests in Chicago.

Dawson, Sir John William (**1820-1899**), Canadian geologist and naturalist, was born at Pictou, Nova Scotia; studied at Edinburgh; and afterward devoted himself to the natural history and geology of Nova Scotia and New Brunswick. He was appointed superintendent of education in Nova Scotia, 1850; from 1855 to 1893, he was professor of natural history and vice chancellor of McGill University, Montreal. He was knighted in 1884. He was an authority on Canadian geology and one of the ablest opponents of the Darwinian theory of the origin of life forms. Among his works are *Archaia, Story of the Earth and Man, Dawn of Life, Origin of the World,* and *Relics of Primeval Life*. Died at Montreal.

Day, Edmund Ezra (**1883-1951**), American economist and educator, was born at Manchester, N. H. After being graduated from Dartmouth College and Harvard University, he taught economics at Dartmouth, 1907-10, and at Harvard from 1910 to 1923, when he was made professor of economics at the University of Michigan. From 1927 to 1937, he was associated with foundations supported by Rockefeller funds, directing the flow of financial assistance for research in social sciences. In 1937, he was made president of Cornell University.

Day, J. Edward (**1914- **), government official, was born at Jacksonville, Ill. He studied at the University of Chicago and the Harvard Law School. He was legal and legislative assistant to Adlai Stevenson during the latter's term as governor of Illinois. In 1961 Day was appointed postmaster-general by President Kennedy, but resigned in 1963 to re-enter law practice.

Deák (*dā'ȧk*), **Ferencz** (**1803-1876**), Hungarian statesman, was born at Sojtor, Zala, Hungary; practiced as an advocate; entered the national diet in 1832; and played the part of a moderate in the revolution of 1848. He did more than anyone else to establish, in 1867, the Austro-Hungarian empire and is regarded as one of the ablest European statesmen of his century. As an orator, he won distinction by the sheer force of his logic.

Deakin (*dē'kĭn*), **Alfred** (**1856-1919**), Australian statesman and orator, was born in Melbourne, Australia; was graduated from Melbourne University; and practiced law. He was elected to the parliament of Victoria in 1879. He took a leading part in the organization of the Commonwealth of Australia and became its first attorney general in 1901. In 1903, he became premier and continued to hold that office, with two interruptions, until 1910, when he led the opposition party. He favored a protectionist policy and the development of a navy. For many years, he was a reconciling influence between the Conservatives and the Labor party. His published writings include *Temple and Tomb* and a number of works on irrigation.

Debs (*dĕbz*), **Eugene Victor** (**1855-1926**), socialist, writer, lecturer, and labor organizer, was born in Terre Haute, Ind.; received a common school education; and, after some years spent as a workman and a clerk became a member of the Indiana legislature, 1885. In 1893 he organized and headed the American Railway Union, which, in the Pullman strike of 1894, ordered the trainmen not to move Pullman cars. A federal court injunction, one of the first issued in a labor case, forbade such interference, and Debs received a prison sentence for violating the injunction. He was nominated as the candidate of the Social Democratic party for president in 1900 and as the Socialist party's presidential candidate in succeeding presidential elections. In 1918 he protested against numerous arrests of pacifists and was himself arrested for sedition, being sentenced to 10 years' imprisonment. He was pardoned in 1921 and resumed his activities in behalf of the Socialist party.

Debussy (*dĕ-bü'sē'*), **Claude Achille** (**1862-1918**), French composer, was born at Saint Germain. At the age of 11 years, he entered the Paris Conservatory. In 1884, he won the *grand prix de Rome* with his cantata *L'Enfant prodigue*. This was followed by a symphonic suite, *Printemps*, which was pronounced unduly modern. His next compositions were *La Demoiselle élue*, for female voices and the orchestra; *Petite Suite*, for the piano; and *Suite Bergamesque*. In 1902, his symphonic poem *L'Après-midi d'un faune* elicited much discussion but enhanced his reputation. This was followed in the same year by his first dramatic work, *Pelléas et Mélisande*, which gave him unquestioned leadership of the new French school. It came to be recognized as one of the most important musico-dramatic works since the death of Wagner.

Debussy's later important works include three symphonic sketches entitled *La Mer;* the ballets *Jeux* and *Crimen Amoris; Chimène; Histoire de Tristan; Le diable au Beffroi;* and *La chute de la maison Usher*. He also composed a number of piano pieces and songs. He excels in refined, fascinating instrumentation and, by using the higher overtones and the whole-tone scale, has achieved many new musical effects. In particular he evoked new effects from the piano, exerting an influence in that respect unmatched since Chopin.

Decamps (*dĕ-kȧN'*), **Alexandre Gabriel** (**1803-1860**), French painter, was born at Paris and studied in a desultory manner under Pujol, David, and Ingres. In 1827-28, he journeyed in Italy and the Levant. He excelled in genre and landscape pictures, in which he introduced Oriental subjects saturated in sunlight and rich, warm color. With Delacroix, he laid the foundation of orientalism in French art. His "Defeat of the Cimbri" had a great success. Other well-known works from his brush are "Cafe in Asia," "Street of a Roman Village," and "The Monkey Connoisseurs." Many fine examples of his paintings are in the Louvre, Paris; in the Wallace collection, London; and in the Metropolitan Museum, New York.

De Candolle (*dĕ kȧN'dôl'*), **Augustin Pyrame** (**1778-1841**), Swiss botanist, was born at Geneva and studied in Geneva and Paris. He first lectured on botany at the Collège de France in 1804. His *Flore Française* appeared in 1805. He traversed France and Italy in 1806-12, investigating their botany and agriculture and, in 1807, was appointed to a chair at Montpellier. In 1816, he retired to Geneva, where a professorship of botany was founded for him. His chief work, which has been of great value to the botanists of the world, was his monumental *Prodromus Systematis Regni Vegetabilis*, of which he was able to complete only 7 volumes. To these his son Alphonse de Candolle added the remaining 14 volumes.

Decatur (*dē-kā'tŭr*), **Stephen (1779-1820),** United States naval officer, was born at Sinnepuxent, Md. and entered the navy in 1798. In 1804, he led a small party which burned, in the harbor of Tripoli, the American frigate *Philadelphia* after its capture by the Tripolitans. For this exploit, which Admiral Nelson pronounced "the most daring of the age," he was raised to the rank of captain. Having taken command of the frigate *United States*, he captured the British frigate *Macedonian*, 1812. In 1815, he captured two Algerine vessels of war and compelled the Dey of Algiers to sue for peace. He was killed in a duel by Commodore James Barron.

Decker, Sarah Platt (?-1912), American woman suffragist and social reformer, spent her early years in Holyoke, Mass.; later removed to Denver, Colo., where she first came into prominence as president of the Women's Club of that city. In 1898, she was elected first vice president of the General Federation of Women's Clubs. She took an active interest in civic affairs, doing effective work for five years as president of the Colorado State Board of Charities and Corrections. She also became a member of the State Civil Service Commission, the first woman to hold an office of this character.

Defoe (*dē-fō'*), **Daniel (c. 1660-1731),** English novelist and political writer, was born in London. In 1685, he took part in the rebellion of the duke of Monmouth, but luckily escaped being punished on its suppression. After this, he engaged in trade, but a series of misfortunes finally led him to forsake it. About 1697, he became a prolific writer of pamphlets on political and religious subjects. In 1701, he published a satirical poem, *The True-born Englishman*, which was written in vindication of King William. In 1703, he was pilloried and imprisoned on account of statements in his pamphlet, *The Shortest Way With Dissenters*. In 1704, he established a newspaper, *The Review*, and also acted as a secret agent for Lord Oxford. In 1719 appeared *Robinson Crusoe*, the most popular of all his works, which has become one of the world's classics of fiction. Defoe, in rapid succession, produced other notable works of fiction, including *Moll Flanders*, *Journal of the Plague Year*, *Adventures of Rozana*, and the *Memoirs of a Cavalier*.

De Forest, Lee (1873-1961), American inventor, was born at Council Bluffs, Iowa. He was graduated from Yale University in 1899 and, devoting his attention to wireless telegraphy, became one of the pioneers of its scientific and industrial development in America. Among his many inventions is the so-called audion, by means of which the long-distance telephone and radio broadcasting became possible. He invented also a system of sound recordings on films making practicable motion pictures with sound. He made the first radio news broadcast in 1916. By reason of his basic inventions and his early installations of radio stations, he is sometimes referred to as the "father of radio."

Degas (*dĕ-gä'*), **Hilaire Germain Edgar (1834-1917),** French painter, was born in Paris. Famous for his warmly colorful paintings, he was destined by his father to be a lawyer, but gave this up for art. His long career spanned the births and the passings of many schools and art techniques, but Degas retained the basic impressionism that he helped to create with Manet, Monet, and Renoir, and used it with brilliant success. Critics appreciate Degas for his striking, yet basically delicate, color, and for the moods that his paintings evoke. His famous paintings of ballet dancers and of Parisian theater scenes are said to represent perfectly the mood of the era in which he lived. His work influenced Toulouse-Lautrec, Paul Gauguin, and Pablo Picasso.

De Gasperi (*dĕ gäs-pĕ'rē*), **Alcide (1881-1954),** Italian statesman, was born in Trent (then part of Austria) and was educated at the University of Vienna. He served in the Austrian parliament and later in the Italian. In 1926 he was sentenced to four years' imprisonment for anti-Fascist activities. He worked with the underground during the German occupation. In 1944 he was appointed minister without portfolio in the first Italian cabinet after the fall of Rome, and later became foreign minister. As prime minister from December 1945 until July 1953, he not only rebuilt Italy but restored it as an essential part of Europe.

De Gaulle, Charles (1890-), French soldier, was graduated from the St. Cyr Military College in 1914. In World War I he was wounded, captured, and escaped. He became an expert on tank warfare and spent twenty years vainly endeavoring to impress on leaders of the French army the importance of mechanization in warfare. Finally, in May 1940, he was elevated to the rank of general in time to see France conquered by the methods he had advocated for French use. DeGaulle escaped to England and organized the resistance of the "Free French." The Vichy government condemned him to death *in absentia*, but DeGaulle's influence with his countrymen brought him to the leadership of the provisional government. The first constituent assembly chose him interim president, but he resigned, January 1946. He opposed both the constitutions put forward for the Fourth Republic, believing they left the executive too weak. He remained in the background till the great crisis of 1958, when he was swept back into power by popular demand. His constitution for a Fifth Republic was adopted, and he became president with almost dictatorial powers.

DeGaulle's timely assumption of leadership ended the most critical *impasse* in a long series of crises that had plagued the Fourth Republic throughout its troubled existence. He tried earnestly to end the rebellion in Algeria, but despite his great popularity and influence, his efforts to bring about a settlement were frustrated by extremists among rebels and French Colonials. He aspired to a larger share of control in NATO and, against much opposition, he sought to make France one of the nuclear powers. Economic conditions have improved during his administration, but Algeria has achieved independence. DeGaulle has emphasized close relations with West Germany.

De Kalb. See *Kalb, Johann, Baron de.*

De Koven (*dē kō'vĕn*), **Henry Louis Reginald (1861-1920),** American light opera and song composer, was born in Middletown, Conn.; graduated at Saint John's College, Oxford, England, 1879; and studied music in Stuttgart, Florence, Paris, and Vienna. Upon returning from Europe in 1882, he located in Chicago and subsequently in New York. In 1902, he founded the Washington Symphony Orchestra, which he conducted until 1904, thereafter serving as musical critic for the New York *World* and other publications. His opera *Robin Hood* was notably successful, and several of his songs, including "Oh, Promise Me," have become widely known. Among his operas are *The Begum*, *Don Quixote*, *The Fencing Master*, *The Mandarin*, *Papa's Wife*, *The Golden Butterfly*, *The Beauty Spot*, and *The Canterbury Pilgrims*.

De Kruif (*dē krīf'*), **Paul (1890-),** American bacteriologist and writer, was born at Zeeland, Mich. Graduating from the University of Michigan, he taught there until 1917 and after serving in World War I as sanitary expert, he was on the staff of the Rockefeller Institute from 1920 to 1922. In 1925 he collaborated with Sinclair Lewis on *Arrowsmith* and thereafter worked as reporter for the Curtis Publishing Company. In a series of very readable books, he dramatized the struggle of science against disease. His works include *Microbe Hunters*, *Men Against Death*, *Why Keep Them Alive*, and *The Fight for Life*.

Delacroix (*dĕ-lä'krwä'*), **Ferdinand Victor Eugène (1798-1863),** French painter, chief of the romantic school, was born near Paris. At the age of 18, he entered the studio of Pierre Guerin. In 1822, his first work, "Dante and Virgil," attracted much attention; his second picture, "Massacre of Chios," won him fame. He subsequently painted many Moroccan canvases with novel effects of light and costumes. He also decorated many public buildings and churches. As a colorist, he ranks with the foremost masters of all times, being frequently compared to Rubens, whose style notably influenced him. Among his best pictures are "Milton and his Daughters," "The Barricade," "Algerian Women," "Jewish Wedding in Morocco," "The Bark of Don Juan," and "The Abduction of Rebecca."

Delambre (*dĕ-läN'br'*), **Jean Baptiste Joseph (1749-1822),** French astronomer, was born at Amiens; he studied under Delille and Lalande. After the discovery of the planet Uranus by Herschel in 1781, he computed tables of its motion, which obtained the annual prize of the Academy of Sciences. He later constructed new solar tables and, at a still later period, tables of the motions of Jupiter and Saturn. He was appointed by the French government, in 1792, to measure the arc of the meridian between Dunkirk and Barcelona. This task was completed in 1799, and the results appeared in his *Basis of the Decimal Metric System*. In 1807, he was appointed to the chair of astronomy at the Collège de France. Died at Paris.

Deland (*dē-länd'*), **Margaretta Wade (1857-1945),** nee Campbell, American novelist, was born at Allegheny, Pa.; was educated at private schools in New Rochelle, N. Y.: and married, 1880, Lorin F. Deland, Boston. While she is most widely known for her stories of "Old Chester," which are grouped around a village character, Dr. Lavendar, she produced also novels and verse which established her position among the foremost American woman writers. Among her works are *The Old Garden and Other Verses*, *The Iron Woman*, *The Voice*, *The Hands of Esau*, *The Rising Tide*, *The Vehement Flame*, and *Old Chester Days*.

Delano, William Adams (1874-1960), American architect, was born in New York City. After being graduated from Yale University and the Ecole des Beaux Arts in Paris, he joined the firm of Delano and Aldrich in 1903. This firm designed many well-known public structures, including the new Post Office and Japanese Embassy buildings in Washington, D. C. He was elected in 1937 to the

American Academy of Arts and Letters. As a member of the planning commission for parks and buildings in Washington, D. C., from 1929, he took a prominent part in the great program of improvement extending over the next decade. He directed design for the New York World's Fair of 1939-40.

De la Ramée. See *Ramée, Louise de la.*

De la Rive (*dĕ lȧ rēv'*), **Auguste Arthur** (**1801-1873**), Swiss physicist, was born at Geneva. He was made professor of natural philosophy at the Academy of Geneva at the age of 22. He devoted himself for a time to investigations on the specific heat of gases and on the temperature of the earth as disclosed by operations in artesian wells. He then turned his attention entirely to electricity, making original discoveries in connection with magnetism, electrodynamics, the properties of the voltaic arc, and the passage of electricity through rarefied air and gases. He presented a new theory of the aurora borealis and discovered a method of electrogilding for which he was awarded the *grand prix* by the French Academy of Sciences.

Delaroche (*dĕ-lȧ'rôsh'*), **Hippolyte** (commonly called Paul). (**1797-1856**), French historical painter, was born at Paris and studied under Watelet and Gros. Many of his subjects are drawn from English and French history, and they are usually of a somber character. They include "The Children of Edward IV in the Tower," "The Death of Lady Jane Grey," "The Death of Queen Elizabeth," "Joan of Arc," "Napoleon at Saint Bernard," "Strafford Going to the Scaffold," and "Napoleon at Fontainebleau." His most important work is the hemicycle depicting great artists of all ages which covers the semicircular wall of the hall in the Ecole des Beaux-Arts, Paris. He sought to combine the strong points of the classic and romantic schools, uniting the excellent line of the one with the fine color of the other.

De Mille, Cecil B. (**1881-1959**), theatrical producer for motion pictures and the radio, was born in Mass., the son of a producer who collaborated with David Belasco. After a few years' experience as actor and play broker, he went to California and formed a partnership with Jesse L. Lasky to produce films. From modest beginnings he went on to organize his own "Pictures Corporation" and, later, to direct plays for Metro-Goldwyn-Mayer and Paramount. He has been particularly successful with Biblical and historical plays using a large cast and presented with sensational scenic effects.

Democritus (*dĕ-mŏk'rĭ-tŭs*) (**c. 470 B. C.-?**), Greek philosopher, called "the laughing philosopher," was born at Abdera, in Thrace. He lived seven years in Egypt and traveled widely in the East. Showing, throughout his long life, a tireless zeal for knowledge, he collected numerous works of earlier philosophers and developed a system of his own, known as the atomic system. He taught that matter consisted of innumerable atoms, which, by their different motions and arrangements, produced the varied phenomena known collectively as nature. Even consciousness and the gods were explained as the result of the concourse of atoms. Only a few fragments of his works are extant. The date of his death is unknown.

De Morgan, William Frend (**1839-1917**), English novelist, was born in London. He was educated at University College, London, and studied art in the School of the Royal Academy. From about 1864 to 1871, he worked on stained glass and then, for a period of 30 years, he devoted himself to pottery, making numerous experiments in glazes and luster. He also invented a bicycle and a smoke-consuming grate, and illustrated fairy tales. In his 66th year, he wrote the long novel *Joseph Vance*, which won immediate success on its appearance in 1906, and others followed with increasing popularity. He excels in naturalness of dialogue, in picturing groups of people, and in his sketches of children. His novels include *Alice-for-Short, It Never Can Happen Again, An Affair of Dishonor, A Likely Story,* and *When Ghost Meets Ghost.*

Demosthenes (*dĕ-mŏs'thē-nēz*) (**c. 384 B.C.-322 B. C.**), Greek orator, was born at Pæania, Attica. His father, a cutler and cabinetmaker, died when the boy was seven years old, leaving him well off. His property was squandered, however, by his guardians, whom Demosthenes, on attaining his majority, prosecuted in the law courts at Athens. Encouraged by the success of this lawsuit, he ventured to speak before the Athenian assembly, but his feeble voice and ungraceful gestures excited general ridicule. Determined to succeed, he subjected himself to the most rigorous training in voice culture and rhetoric. He again appeared in public in 355 B. C., this time with such success that he was generally acknowledged to be an orator second to none in the city of Athens. The remainder of his life was devoted to the task of rousing the Athenians to combat the power of Macedon, then ominously threatening the liberties of the free cities in Greece.

Demosthenes strove in vain to inspire his countrymen with the ardor and energy of former days. His crowning triumph came when he confronted the ambassadors of Philip of Macedon at Thebes and, by his patriotic eloquence, prevailed upon the Thebans to join the Athenians in striking a last blow for the liberties of Greece. The allied cities were defeated in 338 B. C. at Chæronea, and Demosthenes' chief hope was thus extinguished.

After the accession of Alexander as king of Macedon in 336 B. C., Demosthenes still continued his efforts in behalf of Athenian independence. In 324, however, his enemies had him convicted of accepting a bribe from Alexander's agent. He was imprisoned, but escaped to Ægina. When Alexander died in 323 B. C., Demosthenes returned and succeeded in persuading the Greeks to revolt. The insurrection was quickly suppressed, and the conquerors demanded the surrender of Demosthenes. The orator made his escape, however, to the island of Calauria.

The name of Demosthenes is a synonym for eloquence. He possessed a gift of keen satire, a vivacious humor, and a majesty of style that entitle him to rank among the foremost orators of the world. His courage, his disinterested patriotism, and his services as a statesman distinguish him as one of the noblest men of antiquity. The story of his declaiming by the sea with pebbles in his mouth in order to overcome an impediment of speech has passed into tradition as the classic example of persistent and energetic application to self-improvement.

The orations upon which chiefly rests Demosthenes' fame as a statesman are the three *Philippics,* three *Olynthiacs, On the Peace, On the Embassy, On the Affairs of the Chersonese,* and *On the Crown.* The last is a defense of his career and by many is considered his masterpiece. Died on the island of Calauria, where he is believed to have taken poison in order to avoid falling into the hands of the Macedonians. See *Philippic.*

Depew, Chauncey Mitchell (**1834-1928**), American lawyer, railroad executive, legislator, and orator, was born at Peekskill, N. Y.; was graduated from Yale College in 1856; studied law; and was admitted to the bar in 1858. He began his career as a railroad official and attorney for the New York and Harlem railroad and subsequently was prominently connected with various other railroads, becoming, in 1898, chairman of the consolidated board of directors of the New York Central system. In 1888, he was candidate for the presidential nomination in the Republican national convention. He was elected to the United States Senate in 1899 and was re-elected in 1905. He won an international reputation as an orator; was a famous after-dinner speaker; and delivered many addresses of public importance, including the oration at the unveiling of the Statue of Liberty in New York harbor. He is the author of *My Memories of Eighty Years.*

De Quincey, Thomas (**1785-1859**), English essayist, was born in Manchester, England. He was educated at Bath, where, at 15, he read and spoke Greek fluently, and afterward at Winkfield and the Manchester Grammar School, from which he ran away, subsequently encountering the adventures and privations which he described, in 1821, in the *Confessions of an English Opium Eater.* In 1803, he entered Oxford, which he left after five years' study without taking the final examinations for a degree. He soon after became acquainted with Coleridge and Wordsworth; took a cottage at Grasmere; and became a member of the famous "lake school." He subsequently resided in London and Edinburgh. While at Oxford he acquired the habit of taking opium by using it to cure an attack of neuralgia but finally shook it off after years of misery.

De Quincey's literary works fall into two classes,—critical articles and autobiographical sketches, nearly all contributed to magazines. These reveal profound scholarship and remarkable keenness of intellect, and are written in a brilliant, luminous style which, at its best, is unsurpassed in English prose. He made the famous distinction between "the literature of knowledge and the literature of power," the former to *teach,* the latter to *move,* maintaining that the literature of power is "triumphant for ever as long as the language exists in which it speaks." Besides the *Confessions,* the following works may be mentioned: *Literary Reminiscences, Autobiography Sketches, Murder Considered as One of the Fine Arts, Suspiria de Profundis, Joan of Arc,* and *The English Mail Coach.*

Derby (*dȧr'bĭ; dûr'bĭ*), **Edward George Geoffrey Smith Stanley, 14th Earl of** (**1799-1869**), British statesman, was born at Knowsley, Lancashire, 1799. He entered Parliament in 1820 and, in 1827-28, was undersecretary for the colonies. In the reform government of Lord Grey, he became, in 1830, chief secretary for Ireland and, in 1833, secretary of state for the colonies. In 1841, he was made colonial secretary in Peel's cabinet. In 1844, he was called to the House of Lords as Baron Stanley and assumed the leadership of the Conservative party in that body. He was prime minister three times for from one to two years, in 1852, 1858, and 1866.

He was a statesman of great ability; advocated free trade with the colonies, in which he assisted toward the abolition of slavery; and, with Disraeli, transformed the

Tories into the modern Conservative party. He was also a distinguished scholar, famous for his Latin speeches. In 1852, he became chancellor of Oxford University and, in 1864, published a translation of the *Iliad* in blank verse. He died at Knowsley.

Derzhavin (*dyĕr-zhä'vĕn*), **Gavril (1743-1816),** Russian lyric poet and statesman, was born at Kazan. He rose from the ranks as a common soldier to high offices in the state under the Empress Catherine II, and was made minister of justice by Alexander I. In 1803, he retired to private life and gave himself up to poetry. He is best known by his *Address to the Deity.* For sublimity of thought and expression, this ode has rarely been surpassed. He was the greatest and most highly original Russian poet before Pushkin and is most widely known as the "singer of Catherine."

Descartes (*dā'kärt'*), **René du Perrot (1596-1650),** French philosopher and founder of modern philosophy, was born at La Haye, near Tours, France. When about eight years of age, Descartes was sent to the Jesuit College at Le Flèche, where he devoted himself to physics, philosophy, mathematics, and poetry. Later, in Paris, he acquired the general education usually given to a youth of noble origin.

He was early influenced by a desire to see an entire reconstruction of all sciences. After two years of solitude and study, he entered the military profession. What philosophy failed to teach him, he hoped to learn through personal experience. He served as a soldier in the Netherlands in 1617 and later took part in the Thirty Years' War. In 1621, he returned to France to pass his time in meditation and the study of mathematics. In 1624–25, he made excursions into Switzerland and Italy and finally, in 1629, he settled in Amsterdam. In this retreat, he composed all his principal works. His *Discourse on Method* he published in 1637, *Speculations on Fundamental Philosophy* in 1641, and *Principles of Philosophy* in 1644.

Descartes devoted himself to mathematics, optics, meteorology, anatomy, chemistry, and mechanics, as well as to the reform of philosophy itself. He attracted many disciples and became involved in several learned controversies. In 1649, he went to Sweden as private tutor to Queen Christina.

Descartes departed from the prevailing custom of publishing all learned works in Latin. His own appeared in French, thereby being made accessible to a wider public. His *Discourse on Method,* a work intended to guide scientific investigation, rejects dogmatism and sets forth the value of doubt. His general views, however, owe much to scholasticism. He held that the only basis of absolute certainty was the consciousness of mental activity. This belief he expressed in the memorable sentence, "I think, therefore I am."

With the new criterion that "Whatever is clearly and distinctly thought, must be true," he passed to the study of material and spiritual phenomena. His doctrine gave rise to the system called occasionalism. His intellectual vigor left its marks on many departments of knowledge, and his method ruled universally until his physical theories and metaphysical conclusions were brought into disfavor by Newton's results in physics and by Locke's philosophy of sensationalism. His application of algebra to geometry, which is the basis of analytical geometry, has been pronounced the most important mathematical invention of the 17th century. He died at Stockholm.

Desmoulins (*dā'mōō'lăN'*), **Camille Benoit (1760-1794),** French Revolutionist, was born at Guise, France. A speech delivered by him in 1789, telling the populace of Paris that the popular Necker had been dismissed by Louis XVI, touched off the French Revolution. Two days later the Bastille was stormed. As the Revolution proceeded, he inclined with Danton to a policy of clemency and was sent with him to the scaffold by Robespierre, a one-time schoolmate of Desmoulins.

De Soto. See *Soto, Hernando de.*

De Staël. See *Staël, Madame de.*

D'Estaing. See *Estaing, Charles Hector, Count d'.*

D'Estournelles de Constant. See *Estournelles de Constant, Paul Henri Benjamin Baron d'.*

Detaille (*dĕ-tä'y'*), **Jean Baptiste Edouard (1848-1912),** French military painter, was born at Paris. He was a pupil of Meissonier; his pictures, chiefly of soldiers and battle scenes, have gained him much fame. Among them are "A Reconnaissance," "Salute to the Wounded," "Victims to Duty," "Evening at Rezonville," "The Conquerors," "Bonaparte in Egypt," "The Retreat," and "The Soldier's Dream." His "Passing Regiment" is owned by the Corcoran Gallery, Washington, and his "Defense of Champigny," called by the artist his best work, is in the Metropolitan Museum, New York. He served in the Franco-Prussian War, during which he made many sketches for his pictures. His work is finished and accurate like Meissonier's but broader in style and with better atmospheric effects.

De Tocqueville. See *Tocqueville, de.*

De Valera (*dĕv-ĭ-lĕ'rà*), **Eamon (1882-),** Irish Republican leader, was born in New York City, the son of a Spanish father and an Irish mother. His childhood was spent in Ireland, where he was educated, specializing in languages and mathematics. He taught in several Catholic colleges of Dublin prior to 1916, when he took part in the so-called Easter rebellion. He was captured and was condemned to death by the British government, but, being released the following year, became the most popular leader in the campaign for an independent Irish republic. He was rearrested in 1918, but escaped to the United States in 1919.

Although De Valera conducted the negotiations leading to the treaty by which the Irish Free State was established in 1922, he refused to assent to the terms. He led a rebellion, which was suppressed in 1923. In 1932, he was elected president of the Irish Free State and proceeded to abolish the oath of allegiance to the king as well as repudiating certain financial agreements with Great Britain. Under his leadership a new constitution was adopted in 1937. He was prime minister from 1937 to 1948. In 1938, he was president of the League of Nations Assembly. In World War II he clung to neutrality.

De Vigny. See *Vigny, Comte de.*

De Vinne (*dĕ vĭn'ē*), **Theodore Low (1828-1914),** American printer and writer on the printer's art, was born at Stamford, Conn.; learned the printer's trade; and was an employee, later a partner, of Francis Hart, New York. After the latter's death, the firm, in 1883, became Theodore L. De Vinne and Company. He began to print the *Saint Nicholas Magazine* when it was established in 1873, and the *Century Magazine* when it was founded in 1874. He organized the National Typothetae Society and became its president in 1896.

De Vinne made notable improvements in American typography; his publications ranked as the best examples of American presswork; and his firm achieved an international reputation. He wrote *Invention of Printing, Historic Types,* and *Book Composition.*

Devonshire, Victor Christian William Cavendish, Duke of (1868-1938), was educated at Eton and at Trinity College, Cambridge, and sat in Parliament from 1891 to 1908, when he succeeded his uncle as 9th duke of Devonshire. After holding various distinguished offices in England, he was, in 1916, appointed governor general of Canada. Returning to England in 1921, he served as secretary of state for the colonies from 1922 to 1924.

De Voto, Bernard Augustine (1897-1955), American writer, was born at Ogden, Utah, educated at Harvard, and served in World War I. He taught English at Northwestern University and at Harvard, 1929-36. He conducted the *Editor's Easy Chair* in Harper's Magazine, 1935-55. He wrote extensively on Mark Twain; his other works include several volumes of essays, *The Year of Decision: 1846,* and *Across the Wide Missouri.*

De Vries (*dĕ vrēs*), **Hugo (1848-1935),** Dutch botanist was born at Haarlem. He was educated at Leiden, Heidelberg, and Würzburg. In 1871, he became lecturer, and later professor of botany, at the University of Amsterdam. His most notable work was done in connection with researches on the theory of mutations as a method of evolution. These contain the most satisfactory explanation of organic evolution advanced since Darwin proposed the theory of natural selection. To De Vries also belongs the credit of discovering, and revealing to the scientific world, the importance of the unnoticed publications of Mendel which now constitute the basis of modern genetics. He also changed the method of studying evolution from observation to experimental work. Among his publications the following are widely known: *Intracellular Pangenesis Die Mutationstheorie,* and *Plant Breeding.* See *Mendel's Law.*

Dewar (*dū'ĕr*), **Sir James (1842-1923),** British scientist, was born at Kincardine, Scotland, and was educated at Dollar Academy and Edinburgh University. In 1875, he was made professor of experimental philosophy at Cambridge University and, two years later, became professor of chemistry at the Royal Institution, London. With Sir Frederick Abel he invented cordite. He was the first to liquefy and solidify hydrogen and oxygen gases. By evaporating hydrogen under reduced pressure he obtained the lowest temperature then reached, —170° F. He also introduced the thermos bottle. He was knighted in 1904.

De Wet (*dĕ vĕt'*), **Christian Rudolf (1854-1922),** Boer general. He acquired fame in the Transvaal War of 1880–81; and, in the South African War, 1899–1902, he was of all the Boer commanders the most audacious, the swiftest in movement, and the most fertile in expedients. After the submission, he went to Europe as a commissioner to raise money for the distressed Boer families. In 1907, he became member of the new parliament of the Orange River colony and also minister of agriculture; in 1912, he was appointed to the South African council of defense. In World War I

he rebelled against British rule, but was defeated. He wrote *Three Years' War*, a work on the South African War.

Dewey, George (1837-1917), American admiral, was born in Montpelier, Vt. He was graduated from the United States Naval Academy in 1858 and began active service on the Mediterranean station. He took part in Farragut's naval operations leading up to the capture of New Orleans in 1862. In the succeeding years, he held various commands and was promoted to the rank of commodore in 1896.

In 1898, on the outbreak of the Spanish-American War, Dewey was made commander of the Asiatic station. He destroyed the Spanish fleet in Manila Bay without any loss on his part. For this action, Congress immediately appointed him rear admiral. He subsequently co-operated in the capture of Manila. On his return to the United States, he was made "admiral of the navy," the only man who ever held that title, Farragut and Porter having been admirals but not admirals of the navy. His remains were transported to the National Cathedral, Washington, D. C., in 1925.

Dewey, John (1859-1952), American philosopher and educator, was born in Burlington, Vt. He was educated at the University of Vermont and Johns Hopkins University. He was professor of philosophy at the University of Minnesota in 1888–89 and at the University of Michigan, 1889–94. He then became professor of philosophy at the University of Chicago, where he was also director of the School of Education, 1902–04. He held the chair of philosophy in Columbia University, 1904–30, resigning to devote himself to the cause of liberalism in politics.

With William James, Dewey ranked as one of the two foremost American leaders of the pragmatic movement in modern philosophy. He equated truth with success of an idea or belief framed to accomplish a purpose; intelligence with flexibility of mind which can readjust past experience to novel situations; the chief virtue with growth in adaptation to, and influencing of, one's environment. His publications include *Significance of the Problem of Knowledge*, *How We Think*, *Influence of Darwin on Philosophy*, *Interest and Effort in Education*, *The Quest for Certainty*, *Logic: The Theory of Inquiry*, and *Culture and Freedom*. See *Educational Reformers*.

Dewey, Melvil (1851-1931), American librarian and educator, was born at Adams Center, N. Y. He was graduated in 1874 from Amherst College, where he was acting librarian until 1876. In that year, he published *Decimal Classification and Relative Index*, in later editions called the *Decimal Classification*, which sets forth the system now adopted throughout the world as the standard for classifying books in libraries. He also established the *Library Journal* in the same year and was active in founding the American Library Association, serving twice as president and for 14 years as secretary. In 1883, he was made librarian at Columbia College. In 1887, he established a school of library economy, which was transferred to Albany in 1890 and, reorganized as the State Library School, remained under his directorship until 1906. From 1889 to 1900, he was secretary of the University of the State of New York and, from 1888 to 1906, was director of the New York State Library.

Dewey, Thomas Edmund (1902-), American lawyer and politician, was born at Owosso, Mich. After being graduated from the University of Michigan and Columbia University, he practiced law in New York from 1926 to 1931, when he was made assistant United States attorney. His shrewd vigor in prosecution led to his selection for a number of special assignments, the most important of which was his appointment in 1935 as prosecutor for New York in a campaign against organized crime. His success in securing the conviction of leaders in an elaborate and widely ramified crime ring won him a national reputation. In 1938 he was defeated for the governorship of New York but was elected in 1942 and re-elected in 1946 and 1950. He did not run in 1954. In 1944, and again in 1948, he received the Republican nomination for the presidency, but was defeated.

De Witt (*dē vĭt'*), **Jan (1625-1672),** Dutch statesman, was born at Dort, Netherlands. He became the leader of the oligarchical states-rights party against the party of federal power and democracy led by the House of Orange. William II of Orange having died, De Witt succeeded in having himself elected grand pensionary of the province of Holland in 1653, in which position he led the entire country until shortly before his death.

Finding his country engaged in a disastrous war against Cromwell, De Witt made peace in 1654 and succeeded in extending Dutch commercial supremacy in the Indies. A secret article of the treaty barred the House of Orange from state offices. De Witt's position was threatened, however, by the restoration in England of the Stuarts, who favored the House of Orange. Despite victories over the British in 1665–67 and conclusion of an alliance with England and Sweden in 1668 to keep Louis XIV out of the Netherlands, the people turned to William III, of Orange, as leader when Louis XIV invaded the country in 1672. De Witt was slain by a mob.

Diamond, David (1915-), was born at Rochester, New York. He studied at the Cleveland Institute of Music (1928–30) and the Eastman School of Music at Rochester (1930–34). He has used many musical forms for his works. His compositions include symphonies, concertos, string quartets, preludes and fugues, chamber music, sonatas, and chorals. He has received many prizes and awards and his music has been played by notable orchestras in this country and abroad.

Diaz (*dē'ăs*), **Armando (1861-1928),** Italian general. Following the disastrous battle of Caporetto, October 24, 1917, in which all the fruits of earlier campaigns were lost, Diaz succeeded Cadorna as commander in chief of the Italian armies. In nine days, June 15–23, 1918, Diaz decisively repulsed a great Austrian offensive designed to crush the Italian armies, driving the Austrians back across the Piave and inflicting enormous losses. After four months' preparation, Diaz began, October 24, a tremendous offensive against the Austrian lines in Italy. A series of increasing successes resulted, at the end of 10 days, in the total collapse and rout of the Austrian forces. When Austria, on November 4, accepted terms of truce, the Italian armies under Diaz had captured 300,000 prisoners, 5000 guns, and military booty valued at about a billion dollars. This victory by Diaz ranks as one of the most overwhelming in military history. He was made Duke of Victory in 1921; served as minister of war, 1922–24; and received the title of marshal in 1924.

Diaz (*dē'ăs*), or **Dias, Bartholomew (?-1500),** Portuguese navigator, flourished in the 15th century. His residence at the court of John II of Portugal brought him into contact with many scientific men, and, in 1487, the king gave him the command of three vessels to follow up the discoveries already made on the west coast of Africa. Driven by a violent storm, he sailed round the southern extremity of Africa and the Cape of Good Hope, without immediately realizing the fact, and discovered Algoa Bay. The discontent of his crew compelled him to return, and he arrived in Lisbon, December 1488. He joined the expedition of Cabral, the discoverer of Brazil. In May 1500, he was lost in a storm off the great cape that he had discovered.

Diaz (*dē'ăs*), **Porfirio (1830-1915),** Mexican statesman, was born at Oaxaca. He studied law; was an officer in the war between Mexico and the United States; and, in 1863, was military governor of the state of Vera Cruz and the Mexican commander in the war with France. He was captured and sent to France, but escaped and was in command of the army which overthrew Maximilian in 1867, thus ending the war with France. In 1876, he rebelled and overthrew the president Lerdo de Tejada and was himself made president in the same year. In 1884, he was re-elected president and served continuously until May 1911. Mexico prospered greatly under his administration, and his achievements entitle him to a high place among the world's statesmen. Opposition to his rule culminated in a successful revolution led by Francisco Madero. He then resigned and went to Europe.

Diaz de la Peña (*dē'ăz' dē là pĕn'yä'*), **Narcisse Virgile** called **Diaz (1808-1876),** French landscape painter of the Barbizon School, was born at Bordeaux, of Spanish parentage. Left an orphan at 10, he was educated by a Protestant pastor at Bellevue, near Paris. A poisonous insect bite received while wandering in the woods necessitated the amputation of one of his legs. At 15, he was apprenticed to a porcelain painter, and, in 1831, he began to exhibit in the salon. In 1841, he formed a friendship with Rousseau, who taught him how to paint trees in the forest of Fontainebleau. He then devoted himself chiefly to landscape painting, winning both fame and fortune. He equipped a magnificent studio in Paris and was noted for his hospitality.

While his personality was less powerful than that of Dupre, Rousseau, or Corot, he was a painter of exquisite taste in both design and coloring. Many of his pictures are found in the Metropolitan Museum, New York; in the Art Institute, Chicago; and in other American collections. Among his best pictures are "The Fairy with Pearls," "Sunset in the Forest," "The Storm," and "The Forest at Fontainebleau," He died at Mentone.

Diaz Ordaz, Gustavo (1911-), political leader, was born at Puebla, Mexico. He practiced law in that locality and served for a time as judge. Having become a member of the Senate in 1946, he formed a close friendship with a fellow senator, Adolfo Lopez Mateos, in whose administration as president he held the Ministry of Government. As candidate of the Institutional Revolutionary Party, Diaz Ordaz was elected president to succeed Mateos in 1964.

Dick, George Frederick (1881-), American pathologist, was born at Fort Wayne, Ind. After being graduated from Rush Medical College, Chicago, in 1905, he practiced medicine in Chicago. With his wife, Gladys R.

Henry, whom he married in 1914, he isolated the germ which causes scarlet fever and devised the skin test, known as the Dick test, for determining whether individuals are susceptible to the disease. He was made professor of medicine in the University of Chicago in 1933.

Dickens, Charles (1812-1870), English novelist and humorist, was born at Portsmouth, England. He was first a parliamentary reporter and soon became distinguished for his uncommon ability. After a literary apprenticeship on the *True Sun*, he attached himself to the staff of the London *Chronicle*. In this newspaper, he gave the first evidence of his talents in the lively essays entitled *Sketches by Boz*, published in 1836. This was followed by the immortal *Pickwick Papers*, *Oliver Twist*, and *Old Curiosity Shop*. After a visit to the United States, he published, in 1842, his *American Notes*, followed by *Martin Chuzzlewit*, the greatest of his humorous works since the *Pickwick Papers*.

In his later novels Dickens's humor, except in some rich creations such as Mr. Micawber, was no longer so apparent, while, on the other hand, his wit and pathos increased. *Dombey and Son* was below the standard of his other works, but for this he made amends in *David Copperfield*, which is considered by many his greatest work. *Bleak House*, *Hard Times*, *Little Dorrit*, *Tale of Two Cities*, *Great Expectations*, *Our Mutual Friend*, and other equally celebrated novels followed.

His unparalleled popularity was due to the directness of his appeal to simple and common emotions and to his gift for caricature. Besides arousing a sentiment that made for many reforms in prisons, workhouses, and schools, he wrote the finest Christmas stories in the language, and, by his appreciation of the dignity and the worth of homely virtues, gave the common people in all English-speaking lands a new pride in themselves. In 1867, he again visited the United States, gave numerous readings, and met with a brilliant reception. His last novel, *The Mystery of Edwin Drood*, was left unfinished. He was buried in Westminster Abbey. See *Literary Plots, Characters, and Allusions* under the titles of his principal works.

Dickinson, Emily (1830-1886), American poet, was born at Amherst, Mass. She attended South Hadley Female Seminary and Amherst Academy between her 16th and 20th years. On a visit to Philadelphia in 1854, she experienced an unhappy love affair, of which the details are unknown. But, in a spirit of self-abnegation, she renounced her love and immured herself in the family home for the rest of her life. Here she wrote over 1000 poems, many of them ranking among the most poignant love lyrics ever written. Only three or four of her poems were published during her lifetime, and a few more in 1892, six years after her death. She was virtually unknown by the reading public until 1924, when most of her poems and her letters became generally accessible.

Diderot (*dēd'rō'*), **Denis (1713-1784),** French encyclopedist and philosophical writer, was born at Langres, France. He was joint editor with D'Alembert of the *Encyclopédie*, published in 28 volumes, 1751–72. Besides revising all the articles, Diderot wrote the departments of history, ancient philosophy, and mechanical arts. While not primarily written in the interests of any school of ethics or philosophy, it became a most influential organ of intellectual freedom.

Diderot also wrote dramas, novels, and art criticisms on the annual exhibitions at the salon. Toward the end of his life he determined to sell his library to provide a dowry for his daughter. The Empress Catherine of Russia, having been informed of his intention, bought the library, on condition that he himself should be librarian.

Diefenbaker, John G. (1895-), Canadian lawyer and political leader, was born in Grey County, Ontario, the son of a school teacher farmer. He was educated at the University of Saskatchewan, where he made a special study of political science. After being invalided home from service in World War I, he studied law and established a practice in Saskatchewan. He entered politics as a Conservative, but for several years has been a leading member of the Progressive Conservative party. In 1957 he became prime minister, succeeding Louis St. Laurent, but, not having a parliamentary majority, he asked Governor-General Massey to call an election, which was set for March 31, 1958. At this time Diefenbaker and his Progressive Conservative program received an overwhelming vote of support. At an election in April 1963, however, his party was defeated and he was succeeded as prime minister by Lester Pearson.

Diesel, Rudolf (1853-1913), inventor of the Diesel engine, was born in Paris of German descent. On the outbreak of the Franco-Prussian War in 1871, his parents took him to London. Later he attended school in Germany and studied engineering at the University in Munich. In 1892 he patented the internal combustion engine which bears his name. Adolphus Busch, the St. Louis brewer, backed him financially and had the first Diesel engine built in the United States. After Diesel's success, he disappeared one night from the ship on which he was crossing the English Channel, and his death, whether accidental, homicidal, or suicidal, has never been explained. See *Diesel Engine*.

Dietrich, Marlene (1904-), actress, born in Berlin, Germany. She began as a violinist, but turned to acting, appearing in Berlin and Vienna. She was for four years with Max Reinhardt's School of the Theater. In 1924 she married Rudolf Sieber. Her first notable motion picture was *The Blue Angel*. Since coming to the United States in 1930, she has starred in many Hollywood films. She became an American citizen in 1937.

Dillon, Douglas (1909-), financier, was born at Geneva, Switzerland, and was educated at Groton and Harvard. A member of the New York Stock Exchange and a director of Dillon, Read & Co., he became under-secretary of state for economic affairs in 1958. President Kennedy appointed him secretary of the treasury in 1961.

Dillon, John (1851-1927), Irish politician and leader, was educated at the Catholic University of Dublin. He early identified himself with the Parnellite movement and, in 1880, was elected to the British Parliament for County Tipperary, where, with a brief interruption in 1883–85, he sat for over 35 years. In Parliament, he distinguished himself by the violence of his language. Between 1891 and 1896, he opposed Parnell's leadership and, in the latter year, succeeded Justin McCarthy as head of the Irish Nationalist party. With the rise of the Sinn Fein party in Ireland, Dillon's leadership appeared too moderate and he was defeated at the polls in 1918.

Diocletian (*dī'ō-klē'shăn*), or **Valerius Diocletianus. (245 A.D.-313),** Roman emperor, was born in Dalmatia and reigned from 284 to 305. He entered the army and held important commands under the emperors Probus and Aurelian. After the death of Numerianus, he was chosen emperor by the troops at Chalcedon. With his reign began a new form of administration. He appointed Maximian as his companion in authority under the title Augustus and, soon after, he appointed Constantine and Galerius as subordinate rulers, each with the title of Cæsar. Each of the four rulers had a different capital and governed a different region. His reign is memorable for the persecution of Christians and for the substitution of highly centralized authority for local autonomy. In the year 305, Diocletian resigned as emperor and moved to Salona, in Dalmatia.

Diogenes (*dī-ŏj'ê-nēz*) **(c. 412 B. C.-323 B. C.),** Greek philosopher of the school of cynics, was born at Sinope, Asia Minor. Becoming a citizen of Athens, he made himself conspicuous by his abnegation of all social laws and customs, lived upon alms, and took up his abode in a tub. His life was a protest against the conventions. Of his cynicism many well-known anecdotes are related. Died at Corinth.

Dionysius (*dī'ô-nĭsh'ĭ-ŭs*), **the Elder (c. 431 B. C.-367 B.C.),** tyrant of Syracuse, in Sicily. When Sicily was invaded by the Carthaginians, he became a general in the service of Syracuse, which was then a republic. In the year 405, he made himself tyrant of Syracuse. He engaged in many military expeditions and was one of the most distinguished rulers of his time. He wrote poems and tragedies, and, at one time, gained a prize at Athens for the tragedy *Ransom of Hector*. He died at Syracuse.

Dioscorides (*dī'ŏs-kŏr'ĭ-dēz*), **Pedanius,** Greek physician, was born in Anazarbus, Cilicia, and flourished in the 1st century A. D. As physician to the Roman armies, he traveled through many countries and gathered a vast mass of information concerning plants which he embodied in his great work entitled *De Materia Medica*, in five books. This work described all of the medical substances then known, together with their properties. For 1500 years, this work was an undisputed authority in botany and materia medica and is still highly regarded by the Turks and the Moors.

Dirksen, Everett McKinley (1896-), political leader, was born at Pekin, Ill. and studied at the University of Minnesota. After service with the A.E.F. in World War I, he engaged in business for a time, then entered politics. In the 73rd to 80th Congresses, he was a member of the House of Representatives. In 1950 he was elected U.S. senator from Illinois, and in 1961 he became minority (Republican) leader of the Senate.

Disney, Walt (er E.) (1901-), American cartoonist, was born at Chicago, Ill. After a high school education, he enlisted and served in ambulance work in France during World War I. Returning, he secured a job in Kansas City as a commercial artist, but soon began adapting the cartoon to motion pictures, producing animated cartoons. From 1923 to 1926, he produced a series known as the *Alice Comedies*, in which the pictures combined a live girl with animated cartoons. He created the

characters of *Oswald the Rabbit, Donald Duck, Mickey Mouse*, and many other cartoon personalities that became popular among movie goers of all ages. Under his direction numerous favorite nursery stories, fairy tales, and even historical legends were presented effectively in cartoon motion picture form. Stories such as *Snow White, The Three Little Pigs, Alice in Wonderland*, and *Robin Hood* lent themselves readily to the new medium which he had developed. Recent successes have been his true-life nature studies in color and motion, such as *The Living Desert* and *The Vanishing Prairie*. Near Anaheim, California, he has built a colossal permanent exhibit called "Disneyland," which serves either as a base for television productions or as a museum of art and history, to be visited by tourists.

Disraeli (*dĭz-rā'lĭ*), **Benjamin (1804-1881),** Earl of Beaconsfield, English statesman and novelist, was born in London, of Jewish parentage. He entered the House of Commons in 1837 and remained a member until his elevation to the House of Lords in 1878. He made himself famous by his brilliant attacks upon Sir Robert Peel. He became the leader of the old Tory, or protectionist, party on the death of Lord George Bentinck in 1848. As chancellor of the exchequer, he was chiefly instrumental in carrying the Reform act of 1867. The following year, he became premier. Defeated at the polls the same year, his party again came into power in 1874. His administration was notable for its vigorous foreign policy. He acquired control of the Suez Canal and made Queen Victoria Empress of India. He retired from leadership in 1876 and was created Earl.

Disraeli was an orator and debater of unusual skill and his statesmanship was of a high order. In his domestic policy, while a Tory in theory, he was a Liberal in practice. His many novels, chiefly political, are remarkable for their brilliancy and for their epigrammatic style.

Ditmars, Raymond Lee (1876-1942), American naturalist, was born at Newark, N. J. Having been graduated from the Barnard Military Academy, he worked as assistant curator in the American Museum of Natural History, New York, 1891-96 and was court reporter on the New York *Times* in 1898-99. In the latter year he became curator of reptiles for the New York Zoological Park, and from that time the study of reptiles became his specialty, although he was made curator of mammals in 1910 and of insects in 1941. Among the fruits of his studies and expeditions are a number of books popularizing the lore of snakes, insects, and other animals. They include *Forest of Adventure, The Book of Living Reptiles, The Making of a Scientist*, and *The Book of Insect Oddities*.

Dixon, Thomas (1864-1946), American lecturer, novelist, and playwright, was born in Shelby, N. C.; graduated from Wake Forest College, N. C., and from Greensboro Law School; and was admitted to the bar in 1886. After studying a year at Johns Hopkins University, he was elected to the North Carolina legislature in 1885, but resigned the next year to enter the Baptist ministry. He occupied important pastorates in Raleigh, Boston, and New York, and became a popular lyceum lecturer. Among his books are *The Leopard's Spots, The One Woman, The Clansman, The Traitor, The Foolish Virgin, The Sun Virgin*, and *The Flaming Sword*. In 1915, his novel, *The Clansman*, was made the basis of the highly successful motion picture play *The Birth of a Nation*.

Dobie, J. Frank (1888-1964), educator and writer, was born in Live Oak county, Tex. and was educated at Southwestern University (Georgetown, Tex.) and Columbia. Although busily occupied as professor of English, chiefly at the University of Texas, he had done much research and writing, dealing with the history and folklore of the Southwest. His writings include *Tales of the Mustangs, The Flavor of Texas, Apache Gold and Yaqui Silver, The Longhorns, The Voice of the Coyote, A Texan in England*, and *I'll Tell You a Tale*.

Dodds, Harold W. (1889-), educator, was born in Utica, Pa., and received his education at Grove City College, Princeton, and the University of Pennsylvania. Because of his special interest in economics and political science, he has been both a teacher of these subjects and a member of government commissions in which his knowledge could be utilized. From 1933 to 1957 he was president of Princeton University. He was president of the Association of American Universities, 1952-54 and chairman of the Personnel Task Force of the Committee on Organization of the Executive Branch of the Government, 1954-55. Besides many articles and reports, he has published a book, *Out of This Nettle, Danger*.

Dodge, Mary Elizabeth Mapes (1838-1905), American editor, poet, and juvenile writer, was born in New York. She married William Dodge, after whose death she devoted herself to literature. From 1873, she ably edited the juvenile periodical *Saint Nicholas*. She also wrote several volumes of juvenile verse and prose, of which the more noteworthy include *Hans Brinker, or The Silver Skates; Theophilus and Others; The Land of Pluck;* and *The Golden Gate*.

Dodgson, Charles Lutwidge. See *Carroll, Lewis*.

Dolbear (*dōl'bēr*), **Amos Emerson (1837-1910),** American educator and inventor, was born at Norwich, Conn.; was graduated from Ohio Wesleyan University, 1866; and became professor of physics at Tufts College, 1874. He made valuable investigations and inventions in connection with the writing telegraph, the electric gyroscope, the magneto-telephone, wireless telegraphy, and the application of electric waves to photography. In 1873, he discovered the convertibility of sound into electricity, a discovery basic to the entire fabric of modern communication systems.

Dollond (*dŏl'ŭnd*), **John (1706-1761),** English optician, inventor of the achromatic object glass for telescopes, was born in London. He was a silk weaver of Spitalsfield, London, but studied science and, with his son, established a manufactory of optical instruments. After many years of experiment and research, he succeeded in constructing lenses where a concave lens of flint glass was fitted to a convex lens of crown glass, with the result that images were formed without any colored border. This was the greatest improvement made in the telescopic lenses.

Domenichino (*dō-mā'nē-kē'nō*), or **Domenico Zampiere (1581-1641),** Italian painter of the eclectic school, with Guido Reni the greatest of the pupils of the Carracci, was born at Bologna. His masterpiece is the "Communion of Saint Jerome," now honored with a place opposite Raphael's "Transfiguration" in the Vatican and considered one of the great pictures of the world. Other noted works painted by him are "Diana and Nymphs" and "Cumæan Sibyl," Borghese Gallery, Rome; "Guardian Angel," Naples Gallery; "Saint John," Hermitage Gallery, Leningrad; and the "Four Evangelists," in the cupola of Sant' Andrea della Valle, Rome.

Dominic (*dŏm'ĭ-nĭk*), **Saint (c.1170-1221),** founder of the order of monks called Dominicans, was born at Calaroga, Old Castile, Spain. He studied at the University of Palencia and, about 1195, became canon of the cathedral at Osma. In 1204, he went to Languedoc, France, and preached with much vehemence against the Albigenses. As a result of this crusade, he founded the order of the Dominicans, which was confirmed by papal decree in 1216 and was placed in charge of the Inquisition. He was a self-denying man, tireless and earnest in his efforts for the faith. He died in Bologna and, in 1234, was canonized by Gregory IX.

Donatello (*dŏn'ä-tĕl'lō*), properly **Donato de Betto Bardi (c. 1386-1466),** one of the revivers of sculpture in Italy, was born in Florence. An associate of Ghiberti and Brunelleschi, he became the most important sculptor of the early Renaissance. He was a realist who broke away from classic models and is considered the founder of modern sculpture. He did not hesitate to delineate character even at the sacrifice of beauty and excelled in portraying dramatic action. His immense influence on the sculpture of the Renaissance reached its culmination in the art of Michelangelo. Among his very numerous works are the statue "Saint George," in the National Museum, Florence; the statues "Saint Peter," "Saint Mark," "John the Baptist," and "David"; and the fine rilievos "Worshipping Angels," "Burial of Christ," "The Ascension," and the "Annunciation." He died in Florence.

Donizetti (*dō'nē-dzĕt'tē*), **Gaetano (1797-1848),** Italian operatic composer, was born at Bergamo, Lombardy, and studied at Bologna. In 1835, he settled in Paris and wrote for the French stage. He devoted himself chiefly to dramatic music and produced over 60 operas. His *Lucia di Lammermoor, Daughter of the Regiment, Lucrezia Borgia*, and *La Favorita* are well known and possess a melodic quality of the first order

Donnay (*dô'nā'*), **Maurice Charles (1859-1945),** French dramatist, was born in Paris. His first play, *Lysistrata*, produced in 1892, was adapted from Aristophanes. He produced about 20 dramas, all essentially Parisian in tone and treatment. The list includes *Family Hotel, The Emancipated Woman, A Prince's Education, The Clearing, The See-saw, The Other Danger, Birds of Passage*, and *The Man Hunt*.

Donovan, William J. (1883-1959), American soldier and lawyer, was a much-decorated member of the "Fighting 69th" New York regiment during World War I, having been wounded in action three times. He was destined to play a more daring and more important role in World War II, as director of the Office of Strategic Services, an organization whose cloak-and-dagger exploits surpassed any adventures described in romantic fiction. After the War he returned to his native city, Buffalo, to resume his law practice. When the National Security Medal was conferred upon him by President Eisenhower in 1957, he became the first man to receive all four of the Distinguished Service medals awarded by the U.S. government.

"Dooley, Mr." See *Dunne, Finley Peter*.

Doolittle, James H. (1896-), American aviator and air force commander, was born in Alameda, Cal., and spent part of his boyhood in Alaska. His first flying was done in World War I, in which he won a commission as second lieutenant in the signal reserve corps, aviation section. He continued in the air service, broadening his training by stunt flying, by studies in engineering, and by test flying.

From 1930 to 1940 he was manager of the aviation department for the Shell Oil Company. In 1931 he was awarded the Bendix trophy for a coast-to-coast flight at an average of 225 miles an hour. In World War II his various assignments culminated on April 18, 1942, in his leadership of a bombing raid on Tokyo from an undisclosed base mysteriously referred to by President Roosevelt as "Shangri-La." Promoted to the rank of general, he then went to Europe to organize the 18th Air Force. After the war he returned to the Shell Oil Company as vice president and director.

Dora d'Istria (*dō'rä dēs'trē-ä*). See *Ghika, Helena.*

Doré (*dō'rā'*), **Paul Gustave (1833-1883)**, French painter and illustrator, was born at Strasbourg and was educated at a Parisian Lycée. He became known by his illustrations of *Rabelais* and *Don Quixote* and, for some years was a constant contributor to the *Journal pour Rire*. At the time of the Crimean War, he produced "Alma" and "Inkermann"; in 1861, he published the first of his popular illustrations to Dante's *Divine Comedy*. These were followed by illustrations to the Bible, *Paradise Lost*, *The Ancient Mariner*, and *The Idylls of the King*. These works secured for him a greater reputation in England than was accorded to him in his native country. He afterward devoted himself to the production of large pictures on religious and historical subjects, such as "Christ's Entry into Jerusalem," "Francesca da Rimini," and "The Neophyte,"

Dorr, Thomas Wilson (1805-1854), American politician, was born at Providence, R. I., and was graduated from Harvard, 1823. He was the leader of a party, 1840–41, whose object was to extend the right of suffrage in Rhode Island. The charter granted by King Charles had arbitrarily fixed the legislative representation of the parts of the state. With the growth of population, the more populous parts had fewer representatives than the less populous.

Under Dorr's leadership, a new constitution was drawn up, submitted to the electors, and declared to have been carried. In April 1842, an election for state officers was held under this constitution, and Dorr was chosen governor. His attempts to assume power were resisted by the regular state government, although there was no actual fighting. Dorr was arrested, tried for treason, and sentenced to imprisonment for life, June 1844. In 1845, he was released and later was restored to civil and political rights. The abuses which he had opposed were soon rectified in large part.

Dos Passos (*dŏs păs'ŏs*), **John Roderigo (1896-)**, American novelist, was born at Chicago, Ill. After graduation from Harvard University he served in World War I in ambulance work. His *Three Soldiers*, grounded on his war experiences, revealed him as an observer almost photographic in his objectivity. His later books, including *Manhattan Transfer*, *42d Parallel*, *1919*, and *U. S. A.*, exhibit a motion picture technique of transferring the reader swiftly from scene to scene in an effort to present a bird's-eye view of American society before and after World War I. "Flash backs" reveal in swift narrative the lives of significant or typical persons. Always pervasive in the background is a note of social protest. His later works include *District of Columbia* (1952), *The Head and Heart of Thomas Jefferson* (1954), *The Theme Is Freedom* (1956), and *The Men Who Made the Nation* (1957).

Dostoiévsky (*dŏs'tô-yĕv'skē*), **Fiódor Mikháylovitch (1821-1881)**, Russian novelist, was born at Moscow. His *Poor Folk* had not long appeared when he was imprisoned in 1849, for association with liberal groups. A bogus sentence of death was carried through just short of the final volley, when the actual sentence of exile to Siberia was read. The experience greatly aggravated a tendency to epilepsy. In 1855 he was permitted to return and, in 1861–62, published *Memoirs of a Dead House*, describing his life in prison. His masterpiece, *Crime and Punishment*, is one of the most powerful realistic works of modern fiction. His characters, many of them demoniacal but convincing, rank among the most unforgettable in literature. His writings evince passionate sympathy for the humiliated and an intense interest in morbid psychology. Practically all his novels have been translated into English. They include *Injury and Insult*, *The Idiot*, *The Friend of the Family*, *The Gambler*, *The Permanent Husband*, *Uncle's Dream*, and *The Brothers Karamazov*.

Dou, Dow, or **Douw, Gerard (1613-1675)**, Dutch genre painter, was born at Leiden. He studied under Rembrandt in 1628–31 and at first occupied himself mainly with portraiture, but soon turned to genre. Dou excelled in small pictures, representing scenes or subjects from Dutch peasant life, soft and harmonious in color, with picturesque light effects, carefully drawn with great exactness of detail. He ranks high among the Dutch masters of painting. His numerous works, represented in all the great European collections, include his own portrait; that of his wife; "The Poulterer's Shop," in the National Gallery, London; and his celebrated "Woman Sick of the Dropsy," in the Louvre.

Dougherty, Dennis J. (1865-1951), American prelate, was born in Girardville, Pa. He was ordained as a priest of the Roman Catholic Church in 1890; became bishop of Nueva Segovia, P. I., in 1903; was transferred to Buffalo, N. Y., in 1915; and, in 1918, was appointed archbishop of Philadelphia. In 1921, he was created cardinal priest.

Doughty, Charles Montagu (1843-1926), English writer and traveler, was born in Suffolk, Eng. He was educated at the Portsmouth Naval School and Cambridge University. His *Arabia Deserta*, written after a period of travel in the Near East, is one of the most graphic books of travel in the English language. Its author was presented with a medal by the Royal Geographical Society. His other works include *The Dawn in Britain*, *Adam Cast Forth*, and *Mansoul, or the Riddle of the World*.

Douglas, Stephen Arnold (1813-1861), American statesman, styled the "little giant," was born at Brandon, Vt. His early youth was one of poverty; but he managed to spend three years at the Canandaigua Academy, having the study of law in view. In 1833, he settled in Jacksonville, where he entered the practice of law. He was soon chosen state's attorney; was elected to the legislature; and, in 1840, became secretary of state for Illinois. He was judge of the Illinois Supreme Court, 1841 to 1843, when he resigned and was elected to Congress as a Democrat.

Douglas was at once recognized as one of the ablest men of his party. He denied the right of the Federal government to legislate on slavery in the territories; favored the Mexican War and the annexation of Texas; opposed the Wilmot Proviso; and defended the compromise measure of 1850. In 1854, he introduced the Kansas-Nebraska bill, which created civil war in Kansas.

In 1858, he was a candidate for the United States Senate and held a series of notable debates with Abraham Lincoln, his opponent. He won the senatorship, but was forced by Lincoln to make statements which doomed his presidential ambitions to defeat. In 1860, the Democratic party split into two divisions, one of which nominated Douglas for president and the other John C. Breckinridge. Douglas was strongly opposed to secession and, after the outbreak of the Civil War following Lincoln's inauguration, staunchly supported the Union cause. Died at Chicago.

Douglas, William Orville (1898-), American administrator and jurist, was born at Maine, Minn. Educated at Whitman College, in Washington state, and at Columbia University, he lectured in law at the latter university and, after 1927, at Yale University. Specializing in the law of bankruptcy and finance, he undertook studies for the Securities and Exchange Commission, of which he was appointed chairman in 1936. His vigorous and fearless conduct in enforcing federal laws in this labyrinthine field recommended him for nomination by President Roosevelt to the Supreme Court of the United States, in which he was confirmed in 1940. His decisions marked him as one of the more liberal justices on the bench.

Douglass, Frederick (1817-1895), American orator, a mulatto slave, was born at Tuckahoe, near Easton, Md. In 1838, he escaped from a Baltimore shipyard to the Northern states and changed his name from Lloyd or Bailey to Douglass. He lectured on slavery with great success during 1845–47 in Great Britain, where £150 was collected to buy his freedom. In 1847, he established *The North Star*, afterward called *Frederick Douglass's Paper*, a weekly Abolition newspaper, at Rochester, N. Y. In 1855, he rewrote his earlier autobiography, which was published later as *The Life and Times of Frederick Douglass*. After the outbreak of the Civil War, he was one of the earliest to propose the use of Negro troops by the United States. He served in various offices under the government, 1871–91. He died at Washington. A bronze statue of Douglass stands in a public square of Rochester, N. Y.

Doumergue (*dōō'mĕrg'*), **Gaston (1863-1937)**, French statesman, was born at Aigues Vives, France. He was educated at Nimes and Paris, qualifying for a legal career. After practicing at Nimes from 1885 to 1890, he served as colonial magistrate in Indo-China and in Algeria. Returning to France, he was elected in 1893 as a Radical-Socialist to the Chamber of Deputies, of which he was secretary in 1905–06. After holding various other ministerial posts, he was prime minister in 1913–14; minister for the colonies, 1914–17; president of the Senate, 1923–24; and from 1924 to 1931, was president of the French republic. He was again made prime minister in 1934.

Dowie, John Alexander (1847-1907), religious leader, was born in Edinburgh, Scotland, and studied in the University there. His family removed to Sydney, Australia, in 1860, and he entered the ministry of the Congregational Church in South Australia. He went into evangelistic work in 1878 and later began faith healing. He came to the United States in 1888 and, in 1896, organized a group of converts, who, in 1901, settled 42 miles north of Chicago at a place given by Dowie the name Zion City. In 1906, Dowie was suspended from the Church by his followers, who charged him with tyranny, misuse of investments, and polygamy.

Doyle, Sir Arthur Conan (1859-1930), British novelist and physician, was born at Edinburgh and was educated at Stonyhurst and Edinburgh University. From 1882 until 1890, he was a practicing physician, in the meantime writing short stories. He also traveled in the arctic regions and in western Africa. In 1887, he wrote *A Study in Scarlet*, in which he created the famous detective Sherlock Holmes, who also appears in *The Sign of the Four*, *The Hound of the Baskervilles*, and many other detective stories. In imaginative invention, fascinating mystery. and power to create an atmosphere of horror, these tales rival those of Poe.

In 1888, he published *Micah Clarke*, his first successful historical novel, which was followed by *The White Company*, *The Refugees*, *The Great Shadow*, *Rodney Stone*, *The Adventures of Gerard*, and *Sir Nigel*. Among his volumes of short stories are *Round the Red Lamp*, *The Stark Munro Letters*, and *The Green Flag and Other Stories*.

During the Boer War, Doyle served as head physician in a field hospital in South Africa. Upon his return, he wrote a military history, *The Great Boer War*, and a defense of British policy, entitled *The Cause and Conduct of the War*, which was translated into many languages. For his services during this period, he was knighted in 1902. His later works include *The Crime of the Congo*, *The Poison Belt*, *History of the British Campaign in France and Flanders*, and *The Wanderings of a Spiritualist*. In 1920, he began lecturing in support of the belief that it is possible to communicate with the spirits of those who have died. See *Sherlock Holmes*.

Draco, Athenian lawgiver, lived in the last half of the 7th century B. C. He set a certain limit to the tyranny of the powerful citizens by committing the laws to writing and establishing the ephetæ, or court of appeal, 621 B. C. His code, which prescribed death for nearly all offenses, appeared harsh to later ages, but was probably a mere codification of contemporary usage. The laws, written "not in ink but in blood," were repealed by Solon, with the exception of the law on homicide. It is said that Draco was smothered to death in the theater by the hats and cloaks showered on him as a popular mark of honor for reducing the laws to writing.

Drake, Edwin L. (1819-1880), American oil producer. In August 1859, he sank, at Titusville, Pa., the first oil well in America. He died in 1880 and was buried in Woodlawn Cemetery, Titusville, where he is commemorated by a monument erected in 1902 and further adorned in 1923 by a statue, "The Driller."

Drake, Sir Francis (c.1545-1596), English admiral and navigator, was born of obscure parentage at Tavistock, England; he first commanded at sea under Sir John Hawkins, his relative. From 1570 to 1572, he commanded three expeditions to the West Indies and the Spanish Main, in the last of which he gained large booty. He next fought with such bravery in Ireland under Essex that he was introduced to Queen Elizabeth. With five small vessels, he sailed, in 1577, to attack the Spaniards in the South Seas. In this expedition, he ravaged the Spanish settlements, coasted the North American shore as far as Puget Sound, and took possession of the country under the name of New Albion. He then returned home by the Moluccas and the cape, after a voyage of nearly three years, the first Englishman to circumnavigate the globe.

Elizabeth dined on board his ship at Deptford, and knighted him in 1580. In 1585–86, he successfully attacked the Spaniards in the West Indies; in 1587, destroyed many ships at Cadiz; and, in 1588, as vice admiral, participated in the destruction of the Spanish armada. He died off Porto Bello.

Draper, John William (1811-1882), chemist, physiologist, and author, was born in England. He was educated at London University and the University of Pennsylvania. For many years he was president of the New York Medical College. He was a noted investigator in spectrum analysis and in photography. His improvements on Daguerre's crude methods made photography of the human countenance possible. He took his first photograph in 1839. His numerous works include *Human Physiology, Statical and Dynamical; History of the American Civil War; Textbook on Chemistry;* and *History of the Intellectual Development of Europe.*

Dreiser (*drī'sĕr*), **Theodore (1871-1945),** editor and author, was born at Terre Haute, Ind. He was educated in the public schools and at Indiana University. From 1892 to 1894 he worked for Chicago and St. Louis newspapers. He then engaged in editorial work for several magazines, including *Smith's*, *The Broadway Magazine*, and the *Butterick* publications.

His first novel, *Sister Carrie*, was suppressed because of its realistic treatment of prostitution. *The Financier* and *The Titan* are studies of ruthless industrial magnates. *An American Tragedy* reveals Dreiser's characteristic qualities—deep sympathy but strict objectivity. He wrote also *Tragic America*, *Book about Myself*, and *Dawn*.

Drew, John (1853-1927), American comedian, was born in Philadelphia, Pa., of a family of distinguished actors. He made his first theatrical appearance at Philadelphia, 1873, under his mother's management, in *Cool as a Cucumber;* joined Augustin Daly's company, 1875, as Bob Ruggles in *The Big Bonanza;* joined Edwin Booth, 1876, in Shakespearean plays; supported Fanny Davenport, 1877–78; and played in *Diplomacy*, 1878–79. Other plays in which he appeared include *The Masked Ball*, *The Butterflies*, *His House in Order*, *My Wife*, *The Scrap of Paper*, and *The Prodigal Husband*. He excelled in portraying society characters of a half-serious, half-ironical type.

Dreyfus (*drā'fŭs'*), **Alfred (c.1859-1935),** French army officer, the son of a rich Jewish manufacturer, was born at Mülhausen in Alsace. He was an artillery captain, attached to the general army staff, when, in 1894, on a charge of delivering to a foreign government documents connected with the national defense, he was court-martialed, degraded, and transported to Devil's Island, French Guiana.

The efforts of his wife and friends to prove him an innocent victim of malice, injustice, and forgery plunged France into a chaos of militarism and anti-Semitism. Early in 1898, the novelist Emile Zola came to his defense with his famous *J'Accuse* (*I Accuse*), and soon afterward an officer in the war department confessed the forgery of documents incriminating Dreyfus. In 1899, President Loubet pardoned Dreyfus and, in 1903, he was restored to his former rank and promoted major by vote of the legislature—an outcome which was regarded as a triumph over anti-Semitism and militarism in France.

Drinkwater, John (1882-1937), poet and dramatist, was born in England. For twelve years, he was employed by various assurance companies. Turning his activities toward the drama, he became a founder and manager of the Pilgrim Players and of the Birmingham Repertory Theater. Among the best known of his numerous plays are *Pawns*, *Loyalties*, *Abraham Lincoln*, *Robert E. Lee*, and *Bird-in-Hand*, a comedy. Numerous poems from his pen were published in periodical literature, principally in England. He published also *The Muse in Council*, a collection of essays.

Drummond, Henry (1851-1897), Scottish clergyman and author. He became famous by the publication of *Natural Law in the Spiritual World*, a book which had an enormous sale. This was succeeded by *Tropical Africa*—a book of travel—and by a series of booklets commencing with *The Greatest Thing in the World*, intended to expound and commend the first principles of the Christian faith.

Drummond, William Henry (1854-1907), poet, was born in Ireland, but came to Canada at an early age. Obtaining a medical education at McGill University and at Bishop's College, Lennoxville, Quebec, he established a practice in a French Canadian community. He was especially successful in portraying the French habitant. Among his best-known works are *The Habitant and Other French-Canadian Poems* and *The Voyageur and Other Poems.*

Drusus (*drōō'sŭs*), **Nero Claudius (38 B. C.-9 B. C.),** commonly called Drusus Senior, was stepson of the Emperor Augustus and younger brother of the Emperor Tiberius. He began his public career in 19 B. C., distinguishing himself by the defeat of the Rhætians and other Alpine tribes. In 13 B. C., he was sent into Gaul, then in revolt, and, after crushing the rebels there, he pushed across the Rhine in pursuit of their German allies. In this campaign, he subdued the Sicambri and Frisii and forced his way to the North Sea, being the first Roman general who had done so. From this time, he made it the business of his life to establish the Roman supremacy in Germany, partly by conquest and partly by the execution of great military works. A fall from his horse cut short his brilliant career.

Dryden, Hugh L. (1898-), physicist, was born at Pocomoke City, Md. After graduation from Johns Hopkins University, he continued his studies there, receiving the Ph.D. degree in 1919. Work with the U.S. Bureau of Standards led him to specialization in aerodynamics. As deputy administrator for the National Aeronautics and Space Administration, he has had an active part in various space exploration projects.

Dryden, John (1631-1700), English dramatist, poet, and critic, was born in Aldwinkle, Northamptonshire. After

being graduated from Cambridge, he entered upon a literary career and succeeded Sir William Davenant as poet laureate in 1870. His *Essay on Dramatic Poesy* established his reputation as a critic. Dryden, by his dramas and political satires, especially his *Absalom and Achitophel*, occupies a high place among English poets. He also made numerous translations from the classics, especially Virgil, Juvenal, and Ovid. His finest poem, *Alexander's Feast*, was written in 1697. By his new uses of the heroic couplet in poetry, his direct prose style, and his development of literary criticism, he became the foremost writer of the Restoration and exercised a great influence on 18th century English literature.

Du Barry (*dü bà'rē'*), **Marie Jeanne Bécu, Countess** (**1746-1793**), favorite of Louis XV of France, was born at Vaucouleurs, the natural child of a tax collector. She was educated in a Paris convent. As Mademoiselle Lange, she assisted Count Jean du Barry in entertaining guests who came to his house for gambling. In 1769, she won the notice of Louis XV, who kept her as his mistress, though formally marrying her to Count Guillaume du Barry, brother of her former protector. Her influence henceforth reigned supreme until the death of Louis in 1774, when she was dismissed from court. She was tried before the revolutionary tribunal for having wasted the treasures of the state and for having worn mourning for the late king, and was guillotined

Du Bois, William Edward Burghardt (**1868-1963**), American Negro writer, was born at Great Barrington, Mass. Educated at Fisk, Harvard, and Berlin universities, he was professor of economics at Atlanta University from 1896 to 1910. In the latter year he resigned to edit and direct the *Crisis* and other publications for the advancement of colored people. He returned to the university as professor of sociology, 1933–1944. Among his best known books are *The Suppression of the Slave Trade, The Philadelphia Negro, John Brown, Quest of the Silver Fleece, The Negro, The Dark Princess*, and *Dusk of Dawn*.

Dudevant (*düd'văN'*), **Aurore.** See *Sand, George.*

Dufay (*dōō'fà'*), **Guillaume** (**c. 1400-1474**), Flemish composer, was born probably at Chimay. He was a singer in the papal chapel, 1428–37, and lived in Paris from 1442 to 1449. He was the leading master of the earliest Flemish school of composers and developed four-part writing to such a degree that his work is regarded as the foundation of all choral writing. He died at Cambrai.

Duffy, Francis P. (**1871-1932**), clergyman and army chaplain was born in the province of Ontario, Canada. Graduating from St.Michael's College, Toronto, he went to New York as a teacher in St. Francis Xavier's College. In 1896, he was ordained a priest in the Catholic Church. Two years later he became first lieutenant and chaplain of the 69th infantry regiment of the national guard. In the Spanish-American War, in hostilities on the Mexican border in 1913, and in World War I, he won an unusual degree of respect and popularity as chaplain among the soldiers, and was decorated for valor by the American and French army commands. After the armistice in 1918, Father Duffy returned to Holy Cross Church, Times Square, New York, and became widely known both within and outside Church circles. A statue in his honor was erected at Times Square shortly after his death.

Du Gard, Roger Martin. See *Martin du Gard, Roger.*

Du Guesclin (*dü gĕ'klăN'*), **Bertrand** (**1320-1380**), French general. He gained his first reputation as a soldier in 1338 at a tournament in celebration of the marriage of Charles de Blois with Jeanne de Penthievre. He unseated all the famous competitors.

Becoming a soldier of fortune under Charles, he gained great distinction at the siege of Vannes in 1342 He was knighted and, in 1354, went with the lords of Brittany to England in order to secure the release of his captive master. He took service under the French king and, after several brilliant actions, was made Marshal of Normandy and Count of Longueville. In 1370, he was made constable of France and, for ten years, was active and successful in driving the English from the south and west of France. In 1373, he seized and held most of the strongholds in the Duchy of Brittany.

Dulles, John Foster (**1888-1959**), American lawyer and diplomat, was born at Washington, D. C., the son of Allen M. Dulles, professor of theology, and the grandson of John W. Foster, who was secretary of state under President Benjamin Harrison. Mr. Dulles was senior partner in a New York firm of corporation lawyers but gave much of his time to international diplomacy. He was a member of the U. S. delegation to the San Francisco Conference on World Organization in 1945, and later a member of the delegation to the general assembly of the United Nations. In 1949 he was appointed interim U. S. senator from New York, and in 1950 became adviser to the State Department. He was made special representative of President Truman with the rank of ambassador to negotiate the Japanese peace treaty in 1951. In 1953 he was appointed secretary of state in President Eisenhower's cabinet. Through a series of alliances he built up a strong deterrent force against Communist expansion. Despite illness he retained his position until shortly before his death. He is the author of *War, Peace, and Change* and *War or Peace* (1950).

Dumas (*dü'mà'*), **Alexandre, the Elder** (**1802-1870**), French novelist and dramatist, was born in Villers Cotterets, son of General Dumas, a Creole. After his father's death in 1806, he led for a time a desultory life until, driven by poverty, he went to Paris to seek his fortune. He early made his mark in literature and became perhaps the most prolific and widely read story-teller in the world. His capacity for production was prodigious, and in addition he employed assistants to write portions of books under his direction. In all, he was responsible for nearly 300 closely printed volumes, including a series of historic romances, or "Chronicles of France," comprising nearly 100 volumes.

Dumas reached the climax of his fame in *Monte Cristo* in 1844 and in *The Three Musketeers*, which followed soon after. His creative faculty was greater than his artistic genius, although he found many admirers among cultured readers. Besides producing novels, he was a forceful writer of romantic drama, and, by his *Antony* in 1831, he introduced the modern social play. He was unhappy in his marriage, and he squandered his enormous earnings in reckless extravagance. His last years he spent at Dieppe, broken in health and impaired in intellect, ministered to by his son and his daughter. See *Three Musketeers, The.*

Dumas, Alexandre, the Younger (**1824-1895**), French dramatist, was born in Paris. He was an illegitimate son of the preceding, and, like him, became a distinguished novelist and dramatist. After a neglected and bitterly unhappy childhood, he became the companion and literary associate of his brilliant but Bohemian father, whose bankruptcy in 1848 left the son penniless, facing a debt of 50,000 francs. He then renounced his unfortunate associations; vividly described the world in which he had been living in a celebrated novel, *La dame aux camélias;* and devoted himself industriously to authorship. He won both fame and fortune.

By dramatizing *La dame aux camélias* in 1852, he popularized the realistic study of social problems which has profoundly modified all subsequent drama. He created the so-called problem play, of which he wrote a notable series beginning with *Le demi-monde* in 1853 and including *Le fils, naturel, La question d'argent, La femme de Claude, Monsieur Alphonse, Une visite de noces*, and *L'Etrangere.*

As a moralist, Dumas took himself very seriously, and his dramas with their incisive prefaces are frank and forceful social sermons. As a dramatist, he possessed great gifts, and, with Augier and Sardou, whom he excelled in purposefulness and vigor, he dominated the French drama during the latter half of the 19th century. In 1874, he was elected to the French Academy. He died near Paris.

Dumas, Jean Baptiste André (**1800-1884**), French chemist, was born at Alais. He was apprenticed to an apothecary in Geneva, and engaged in some scientific investigations that attracted the attention of De Candolle and Prévost. In 1821, he went to Paris, where he became professor of chemistry in the Athenæum, afterward at the Sorbonne, and was made a member of the Academy of Sciences. He determined the atomic weights of about 30 elements. This with his researches on sulphuric ether and the law of substitutions in organic compounds attracted the attention of all Europe. In 1848, he was a member of the Legislative Assembly and, in 1849–51, held the portfolio of agriculture and commerce. After the *coup d'etat*, he was made a member of the Senate. He died at Cannes.

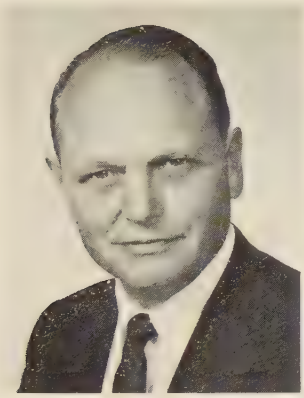
Du Maurier, (*dü mô'rĭ-ā*), **Daphne** (**1907-**), English writer, was born at London, and was educated at Paris. She is a daughter of Sir Gerald Du Maurier, British actor-manager, and a granddaughter of George Du Maurier, English artist and novelist. She began writing short stories and articles when she was twenty-one, and her first novel, *The Loving Spirit*, appeared in 1931. Among her other novels are *Jamaica Inn* (1936), *Rebecca* (1938), *Frenchman's Creek* (1941), *Hungry Hill* (1943), *The King's General* (1946), *The Parasites* (1950), *My Cousin Rachel* (1952), *Kiss Me Again, Stranger* (1953), *Mary Anne* (1954), and *Scapegoat* (1957). Her non-fiction works include a biography of her father, *Gerald, a Portrait* (1934) and *The Dumauriers* (1937). In 1932, she married Lieutenant General Sir Frederick A. M. Browning.

Du Maurier, George Louis Palmella Busson (**1834-1896**), British artist and novelist, was born in Paris and was educated in London, Belgium, and the Netherlands. For many years, he was a valuable art contributor to *Punch*, at the same time illustrating many other books and magazines. His mode of satirizing the extravagances of the so-called æsthetic school and other society foibles procured for him a high reputation. In 1892, he published the novel *Peter Ibbetson*, followed in 1894 by *Trilby*, which was a great success and was

LEADERS IN INDUSTRY

Byron Jay began work as a clerk for the Great Atlantic & Pacific Tea Co. in 1927. In 1964 he was elected president of its chain of almost 4500 stores.

Fabian Bachrach



Famed as a pilot among pilots, Harold E. Gray joined Pan American World Airways, Inc. in 1929 and has been an officer of the company since 1949. In 1964 he was named president.

Pan American World Airways

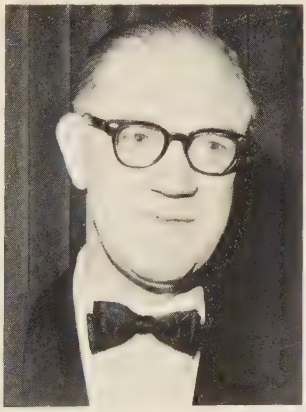
A specialist in marketing management, Fred J. Borch in 1963 became president of the General Electric Co., largest electrical equipment manufacturer in the U.S.

David Rockefeller, president of the Chase Manhattan Bank since 1961, did postgraduate work in economics at Harvard, London School of Economics, and University of Chicago where he received his Ph.D. in 1940.

Jan Jachniewicz

A graduate of the University of Cincinnati, William K. Divers has been president of the Savings and Loan Foundation, Inc. since 1954.

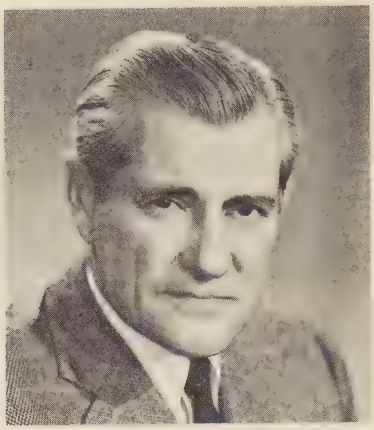
Chase Ltd.



Chairman of the board of directors of the United States Steel Corp., Industrialist Roger M. Blough received the "Man in Management" award in 1964.

Wide World Photo

Frederic G. Donner, chairman of the board of General Motors Corp., was appointed in 1964 to serve on the board of directors of Communications Satellite Corp. (COMSAT) which operates a network of space satellites for relaying communications to all parts of the world.



Eric Sevareid

CBS

Lowell Thomas

CBS

FAMILIAR NEWS ANALYSTS

Pauline Frederick reports news from the U.N. for NBC.

NBC

Chester Huntley

David Brinkley

NBC

William H. Lawrence

ABC

Walter Cronkite

CBS

dramatized in both England and America. In 1897, *The Martian* was published posthumously. See *Little Billee.*

Dumouriez (*dü'mōō'ryā'*), **Charles François** (**1739-1823**), French general, was born at Cambrai; entered the army in 1757; and served in Germany during the Seven Years' War. In 1791, he became lieutenant general in the army of the north, commanded by Marshal Luckner. A winter campaign in Belgium followed, and, in 1792, he overthrew the Austrians at Jemappes. The campaign of 1793 aimed at the complete conquest of the Netherlands, but at Neerwinden he sustained a severe defeat from the Austrians under Coburg, with whom he entered into a plot to restore the monarchy. Reports of his meditated treason reached the government at Paris and an order of arrest was issued against him, but he escaped across the border. A reward of 300,000 francs was set upon his head, but, after wandering through many countries of Europe, he finally settled in England, where he died an exile.

Dunant (*dü'näN'*), **Jean Henri** (**1828-1910**), Swiss philanthropist, was born in Geneva. While visiting the scene of the battle of Solferino, he determined to found a society for aiding wounded soldiers. The result was the establishment of the Red Cross Society. He wrote *Un souvenir de Solferino* in 1862 and lectured, advocating relief in war. These efforts led to the Geneva convention in 1864 and, after the co-operation of ten governments had been secured, the International Red Cross Society was officially established. In 1901, he shared the first Nobel peace prize with Frederic Passy. Dunant devoted his entire fortune to the establishment and support of various charities.

Dunbar, Paul Laurence (**1872-1906**), American poet of the African race, was born at Dayton, Ohio. After being graduated from the Dayton High School in 1891, he worked as an elevator boy, mechanic, and journalist. In 1897, he was employed on the staff of the Congressional Library, resigning in 1898 to give his attention entirely to literary work. His earliest volume of poems appeared under the title of *Oak and Ivy;* but his poetical genius was first introduced to American readers by W. D. Howells, who contributed an introduction to his *Lyrics of Lowly Life*, published in 1896.

Dunbar's dialect poems of the soil, exemplified their best in "When Malindy Sings," form a distinctive contribution to American literature and fairly entitle their author to leadership as the poet of his race in America. Besides the foregoing, the volumes of verse entitled *Majors and Minors, Poems of the Cabin and Field, Lyrics of the Hearth Side, Li'l Gal,* and *Lyrics of Sunshine and Shadow* were collected in his *Complete Poetical Works,* published in 1913.

Duncan, Isadora (**1878-1927**), American dancer, was born in San Francisco, Cal. Reared in poverty and untaught, she improvised dances from early childhood. Her first stage appearance was as a fairy in *A Midsummer Night's Dream* at Daly's Theater, New York, in 1895. With her sister and brother she went on a cattle boat to Europe and sought recognition for a new type of dancing. Her art discarded the conventionalized dances of the day and returned for inspiration to ancient Greek dances as depicted in art and to the rhythmic motions of wind and wave and the flight of birds and bees. After a period of extreme privation, success came to her in European capitals, and she opened a school of classical dancing in 1904 near Berlin and another in Paris in 1914. She left a lasting influence upon the art.

Her visits to America were fraught with mixed success and criticism, admirers being attracted by her genius as a dancer and detractors being repelled by the unconventionality of her character, which became more erratic after the accidental drowning of her two children in Paris in 1913. She espoused the cause of the Russian Revolution and opened a school in Moscow on Lenin's invitation in 1921. Her last years, spent in France and Germany, were darkened by poverty. She was killed in an automobile accident.

Dunne, Finley Peter (**1867-1936**), American humorist, was born in Chicago, and, after a public school education there, entered newspaper life as a reporter in 1885. He served on various Chicago papers and first attracted attention by sketches in which he passed humorous comment upon topics of the day in the crisp Irish brogue of one Martin Dooley, a publican of the great Chicago thoroughfare, Archey Road. His *Mr. Dooley in Peace and War* was widely read in America and England and placed him high in the rank of American humorists. His works include also *Mr. Dooley in the Hearts of his Countrymen, Mr. Dooley's Philosophy,* and *Mr. Dooley Says.*

Dunsany (*dŭn-sā'nĭ*), **Edward John, Baron** (**1878-1957**), Irish author, was born at London. He was educated at Eton and Sandhurst; took part in the South African War; and was wounded in World War I. His fantastic tales of gods and men are written in simple but colorful language. They include *The Gods of Pegana, Tales of Wonder,* and *The Curse of the Wise Woman.* Among the dramas of his authorship are *The Glittering Gate, A Night at an Inn, The Laughter of the Gods, The Prince of Stamboul,* and *Golden Dragon City.* Later works are *The Man Who Ate the Phoenix* (1949), *The Last Revolution* (1951), and *The Sword of Welleran* (1954).

Duns Scotus (*dŭnz skō'tŭs*), **John** (**c. 1265-1308**), Franciscan monk and divine, one of the greatest thinkers of the Middle Ages. He appears to have been educated at Oxford, where, in 1301, he became professor of theology. He afterward removed to Paris and then to Cologne. Duns Scotus, as one of the most eminent of the Franciscans, was a chief opponent of the teachings of the Dominicans, the two parties representing at that time two different schools of theology. He was also a chief advocate of realism as opposed to nominalism. For his defense of the doctrine of the Immaculate Conception, since declared a dogma of the Roman Catholic Church, he was styled *"doctor subtilis."* His writings comprise many volumes.

Dunstable, John (**c. 1370-1453**), English composer, was born probably at Dunstable, Bedfordshire. A three-part song, *O Rosa Bella,* was his only known surviving work until about 1900, when several of his compositions were discovered in the libraries of Oxford, London, Bologna, and Modena. The most important discovery was that by Haberl, of six volumes of manuscript in the Cathedral Library at Trent, which included masses, motets, and natiphons; also French and Italian songs with instrumental accompaniments. These reveal a high development of musical art in England during the early part of the 15th century. Dunstable was buried at Saint Stephen's in London.

Dunstan (*dŭn'stăn*), **Saint** (**c. 925-988**), English prelate, was born at Glastonbury. Under several kings, he wielded great influence. He was made Archbishop of Canterbury in 959 by Edgar. On Edgar's death, he raised Edward to the throne, but, on the accession of Ethelred, his power was broken. Dunstan built up the power of the Church; introduced the Benedictines into England; and manifested sagacity and farsightedness in matters of state.

Du Pont, (Thomas) Coleman (**1863-1930**), American manufacturer, was born at Louisville, Ky. Educated as an engineer at the Massachusetts Institute of Technology, he engaged in coal mining, steel manufacturing, street railway operation, and the manufacture of explosives, serving as president of the E. I. du Pont de Nemours Powder Company, 1902–15, during which time the company's annual income increased from 10 million to 200 million dollars. Du Pont purchased a controlling interest in the Equitable Life Insurance Company, erecting the Equitable Building, New York City, and operated a chain of famous hotels. He was made, 1921, a senator from Delaware, to which state he had donated a 4-million dollar highway constructed at his own expense. Ill health led to his resignation in 1928.

His cousin, Pierre Samuel du Pont (1870–1928), became, in 1915, the executive head of the Du Pont Company, which expanded its activities to the manufacture of other products, including rayon, ammonia, varnishes, paints, celluloid, dyes, and industrial alcohol. This company was the controlling interest in the re-organization of the General Motors Corporation, 1920, a merger of about 60 automobile companies. He donated over $4,500,000 for the building of public schools in Delaware.

Dupré (*dü'prā'*), **Jules** (**1812-1889**), French painter, was born at Nantes. He studied in Paris and formed a fast friendship with Rousseau who greatly influenced his style of painting. He became one of the foremost landscape painters of the Barbizon School and excelled in portraying the terrible and the tragic aspects of nature. His "Old Oak," "Hay Wagon," "Summer," and "Midday" are in the Metropolitan Museum, New York.

Durand, Asher Brown (**1796-1886**), American painter and engraver, was born at South Orange, N. J. Early in life he became an apprentice of the engraver Maverick, with whom he later formed a partnership. His engravings of Trumbull's "Declaration of Independence" and of Vanderlyn's "Ariadne" brought him wide reputation. After 1841, he painted landscapes chiefly and, with Thomas Cole, founded the American School of Landscape Painting.

Durant, Will(iam) James (**1885-**), American writer, was born at North Adams, Mass. Educated at St. Peter's College, Jersey City, and Columbia University, he taught Latin and French for some years and, in 1914, became director of Labor Temple School, New York, serving until 1927. In the previous year, he had published *The Story of Philosophy,* which made its author widely known. Sections of his monumental work, *The Story of Civilization,* which have already appeared include *Cæsar and Christ* (1944), *The Age of Faith* (1950), and *The Renaissance* (1953).

Duranty, Walter (**c. 1887-1957**), newspaper correspondent, was born in England. After being graduated

from Cambridge University in 1907, he led a roving existence traveling, writing, and teaching, until 1914. Then as Paris correspondent of the New York *Times*, he reported World War I. Having lost a foot in a railroad accident in France, he received a pension, which made him financially independent. Duranty was then sent to Russia, and for more than 13 years he sent to the New York *Times* bulletins on the evolution of the world's first Socialist government. The impartiality and grasp of these reports brought him an international reputation. Of books from his pen, *I Write as I Please* attained wide popularity.

Dürer (*dü'rĕr*), **Albrecht** (**1471-1528**), German artist, was born at Nüremberg. He was apprenticed to a painter in his native town and, some years later, began designing on wood and engraving on copper. In 1505, he went to Venice, where he formed a friendship with Bellini. Titian and Raphael greatly admired his work. He executed a number of commissions for the emperor Maximilian I and was appointed court painter by Charles V.

Dürer was the most important and the most representative artist that his country has produced. He possessed creative imagination, marked originality, and endless capacity for minute details. He was not only the most prominent engraver of his time but one of the world's greatest engravers. The invention of etching and of printing woodcuts in two colors is also ascribed to him.

Besides portraits, his works include "Crucifixion," Dresden Gallery; "Four Pillars of the Church," Munich, said to be the first Protestant picture; "Burial of the Savior" and "Nativity," also at Munich; "Adoration of the Trinity," Belvidere Gallery, Vienna; "Adoration of the Magi," Uffizi Gallery, Florence; and "Adam and Eve," Gallery at Madrid.

Duse (*dōō'zā*), **Eleonora** (**1859-1924**), Italian actress, was born in Vigevano. She appeared about 1880 on the Italian, chiefly the Roman, stage as leading lady in the plays of Dumas and Sardou, but afterward played parts of greater depth. She earned high praise by her combined force and gracefulness. In 1892, she appeared at Vienna and Berlin and, later, in New York and England. While acting chiefly in tragedies, her versatility enabled her to please in the lighter vein of Dumas's *Francillon* and as the hostess in Goldoni's *Locandiera*. Her later successes included D'Annunzio's *Francesca da Rimini*. She died at Pittsburgh, Pa., her remains being sent to Italy for burial.

Duveneck (*dū'vĕn-ĕk*), **Frank** (**1848-1919**), American painter and sculptor, was born at Covington, Ky. He studied at Munich, where he lived over ten years and formed a school of influential artists. After 1881 he spent much of his time in Florence, Italy, although he was also director of the McMicken Art School in Cincinnati, Ohio. His style at first was marked by great brilliancy and dash, but later became quiet in color. Representative of his better known works are "A Circassian" and "The Professor." The Cincinnati Museum contains the largest collection of his paintings in America.

Dvořák (*dvôr'zhäk*), **Antonin** (**1841-1904**), Bohemian composer, was born at Mühlhausen, Czechoslovakia. His *Stabat Mater*, first produced in London in 1883, won for him the ear of all Europe. His most ambitious work is orchestral and choral—a cantata, *The Spectre's Bride*, an oratorio, *Saint Ludmilla*, and several operas, also much chamber music and many sacred compositions. His piano music includes the well-known *Humoresque*. In 1892–95, he was director of the National Conservatory at New York, where he wrote his beautiful *New World Symphony*. He subsequently lived at Prague, where he died.

Dwight, Theodore William (**1822-1892**), American jurist, was born at Catskill, N. Y.; was graduated from Hamilton College, 1840; and studied at Yale Law School. In 1846, he was elected Maynard professor of law in Hamilton College, and there he established a law school. In 1858, he was chosen professor of municipal law in Columbia College and founded its School of Law, of which he served as warden until 1891. His important publications include *Trial by Impeachment* and, with E. C. Wines, *Prisons and Reformatories in the United States*.

Dwight, Timothy (**1752-1817**), American educator and theologian, was born at Northampton, Mass., and was graduated from Yale, 1769. He became an army chaplain during the Revolutionary War and was minister of Greenfield Hill, Conn., 1783, where he also successfully conducted an academy. In 1795, he was elected president of Yale College, which position he held until his death. His principal works are his *Theology Explained and Defended; The Conquest of Canaan*, an ambitious epic poem; and *Travels in New England and New York*.

Eads (*ēdz*), **James Buchanan** (**1820-1887**), American engineer, was born at Lawrenceburg, Ind. He constructed the steel arch bridge over the Mississippi River at Saint Louis, completed in 1874; developed and carried out a plan of deepening the Mississippi by means of jetties; and was engaged, at the time of his death, in planning a ship railway over the Isthmus of Tehuantepec. He was elected to the American Hall of Fame in 1920.

Earhart, Amelia. See *Putnam, Amelia Earhart*.

Early, Jubal Anderson (**1816-1894**), American soldier and lawyer, was born in Franklin County, Va. He practiced law in Virginia and saw service in the Seminole and Mexican wars. At the opening of the Civil War, he was appointed a colonel in the Confederate army. Proving his ability as a military officer at Bull Run and Williamsburg, he was promoted to the rank of major general and held important commands at Fredericksburg and Gettysburg. In 1864, operating against Sheridan, he was defeated near Winchester and at Fishers Hill, Va., and, in 1865, was routed by General Custer at Waynesboro. He subsequently practiced law in Richmond and published *A Memoir of the Last Year of the War for Independence in the Confederate States*. He died at Lynchburg, Va.

Eastlake, Sir Charles Lock (**1793-1865**), English painter, was born at Plymouth. From 1809, he studied in the Royal Academy Schools and in Paris. When the *Bellerophon* put into Plymouth with the captive Napoleon on board, Eastlake took rapid sketches from a shore boat and produced a full-length portrait of Napoleon. From 1817 to 1830, he lived in Rome, executing pictures of banditti and various other subjects. In 1839 appeared "Christ Blessing Little Children," now in the National Gallery, London. He was knighted in 1850 and, in 1855, was appointed director of the National Gallery. He died at Pisa.

Eastman, George (**1854-1932**), American inventor, was born in Waterville, N. Y., and was educated in Rochester, N. Y. He carried on experiments in photography, perfecting a process for making dry plates, and, in 1880, began to manufacture dry plates on a small scale. He invented the kodak and entered extensively into its manufacture, becoming head of the Eastman Kodak Company, Rochester, N. Y. He donated and bequeathed to the University of Rochester over $54 million, including over 6 million to the School of Music. His benefactions to the Massachusetts Institute of Technology totaled over $19 million. He endowed dental clinics in many European cities. Afflicted with an incurable disease, he shot himself. See *Photography*.

Eastman, Joseph Bartlett (**1882-1944**), American administrator, was born at Katonah, N. Y. Educated at Amherst College, he became an expert on the relation between transportation services and governmental bodies. He was secretary of the Public Franchise League, Boston, 1906–13; acted as counsel for employee groups in wage arbitration cases involving street railways; and served on the Massachusetts Public Service Commission, 1914–19. On the advice of Justice Brandeis, Eastman was appointed to the Interstate Commerce Commission in 1919. His expert knowledge made him a leader in this body and led to his selection to serve in the advisory post of Federal Coordinator of Transportation in 1933–36, after which time he returned to the Commission.

Eaton, Timothy (**1835-1907**), Canadian merchant was born at Clogher, Ireland. He emigrated to Canada in 1857 and opened a store at Kirkton, Ont., later at Saint Marys, Ont., and finally in Toronto. The last venture proved eminently successful and his business developed into the largest department store and mail order house in Canada, with branches at Winnipeg, Montreal, and elsewhere.

Ebert (*ā'bĕrt*), **Friedrich** (**1871-1925**), first president of the German Republic, was born at Heidelberg. For some years, he was a saddler by trade. Becoming an editor of a Socialist paper, he rose rapidly to a position as head of the Socialist party in Germany. In 1919, he was elected president of the German Republic, in which capacity he exerted his influence for a general policy of moderation.

Ebner-Eschenbach (*āb'nĕr-ĕsh'ĕn-bäĸ*), **Marie, Baroness von** (**1830-1916**), Austrian novelist and poet, was born in Moravia. Her fame rests on her prose fiction, which was begun in *Erzählungen* in 1875 and was continued in *Lotti die Uhrmacherin*, *Alte Schule*, *Agave*, and *Die arme Kleine*. She wrote also a popular collection of *Aphorismen* and *Parabeln, Märchen und Gedichte*. She possessed remarkable power of description, keen humor, and polished precision of style.

Eccles, Marriner Stoddard (**1890-**), banker, was born at Logan, Utah. After graduation from Brigham Young College, he spent two years traveling, then entered the investment business. He became a member of the Federal Reserve Board in 1934 and served as chairman of the Board from 1936 to 1948.

Echegaray (*ā'chā-gä-rī'*), **José** (**1832-1916**), Spanish dramatist, was born in Madrid. He was educated in Madrid, and, after a brief experience as an engineer, he was appointed professor of mathematics in Madrid. Becoming interested in politics, he took an active part in the revolution of 1868 and served as minister of education and finance for seven years. Upon the restoration of the monarchy, he withdrew from politics and won a reputation in literature.

His first success was with the drama *At the Hilt of the Sword*, which was followed by a long series of tragedies, comedies, and thesis plays. In Spain, he is ranked as the greatest dramatist since Lope de Vega and Calderón, and he occupies a high position among the modern dramatists of the world. In 1904, he shared with Frédéric Mistral the Nobel prize for literature. See *Great Galeoto*.

Eckert, John P., Jr. (**1919-**), engineer, was born at Philadelphia. He was educated at the William Penn Charter School and the University of Pennsylvania. As an electrical engineer he designed radar range systems. In collaboration with Dr. John W. Mauchly he invented the electronic numerical integrator and calculator known as ENIAC and the automatic computers BINAC and UNIVAC. Since 1946 he has been engaged in applications and further development of electronic computers. See *Mauchly, John W.*

Eckener, Hugo (**1868-1954**), German airship designer and navigator, was born at Flensburg. He took up the study of the construction and navigation of Zeppelins in 1908, and was instructor in their use during World War I. He conducted the *Los Angeles* from Germany to the United States in 1923 and delivered it to the American government. In 1928, as commander of the *Graf Zeppelin*, he was the first to circumnavigate the globe by airship.

Eddington, Sir Arthur Stanley (**1882-1944**), English astronomer, was born at Kendal, Eng. After being graduated from Cambridge University, he was made chief assistant at the Greenwich Observatory in 1906 and in 1913, accepted a professorship at Cambridge, becoming director of the Observatory there in the following year. His studies on the internal temperature of stars and his application of the theory of relativity to astronomy made him a leader in the field. Both scientific generalization and lucidity of expression characterized his works, among which were: *Space, Time and Gravitation* and *The Expanding Universe*.

Eddy, Mary Baker (**1821-1910**), nee Mary Baker, founder of Christian Science, was born in Bow, N. H. In 1866 she announced her discovery of Christian Science, following experiences in connection with what she described as a miraculous recovery from an accident pronounced fatal by a physician. She embodied the principles of Christian Science in *Science and Health, with Key to the Scriptures*, which was published in 1875. This and later works outline the possibility of healing through the understanding that Spirit alone is real and that matter and disease are subjective states and delusions.

Hitherto connected with the Congregational Church, Mrs. Eddy, with her followers, founded in 1879 the Church of Christ, Scientist, in Boston, which was reorganized and named the First Church of Christ, Scientist. It is also known as the Mother Church. All churches and societies subsequently founded are considered branches. In 1908, at the age of 87, Mrs. Eddy founded *The Christian Science Monitor*, international daily newspaper. Besides *Science and Health*, her writings include the *Church Manual, Miscellaneous Writings, Retrospection and Introspection, Unity of Good, No and Yes*, and *Rudimental Divine Science*.

Edel, Joseph Leon (**1907-**), critic and biographer, was born at Pittsburgh, Pa., but spent his youth in Canada. He was educated at McGill University and the University of Paris. Studies of Henry James, including a dissertation (*Henry üames Les Annees Dramatiques*), reflected an early interest that culminated recently in a classic series of critical-biographical works on James: *The Untried Years* (1844-1870); *The Conquest of London* (1870-1881); *The Middle Years* (1882-1895); and a fourth and final volume on which he is working.

Eden, Sir (Robert) Anthony (**1897-**), English diplomat. After finishing his schooling at Eton and Oxford University, he served in the British army in France, 1915–19, and, in 1923, was elected to the House of Commons as a Conservative. As secretary to Austen Chamberlain, he was made familiar with foreign affairs and in 1935 became secretary of state for foreign affairs. It was due largely to his efforts that the League of Nations in 1935 imposed economic sanctions on Italy for her aggression against Ethiopia. In 1938, he resigned from the cabinet in protest over British acquiescence in Germany's extension of power over Austria. On the outbreak of war with Germany in 1939, he was made colonial secretary. Following the resignation of Sir Winston Churchill in 1955, Sir Anthony succeeded him as prime minister. He resigned in January, 1957, owing to the failure of his Suez Canal policy and his own ill health. He was made Lord Avon in 1961. See *Suez Canal Crisis*.

Edinburgh, Philip Mountbatten, Duke of (**1921-**), husband of Elizabeth II of Great Britain whom he married November 20, 1947, was born in Corfu. He is the son of Prince Andrew and Princess Alice of Greece, a grandson of George I of Greece, great-grandson of Christian IX of Denmark, and great-great grandson of Queen Victoria. He was educated in France, Scotland, and England, and during World War II served in the Royal Navy. On becoming a naturalized British subject in 1947, he adopted his mother's family name of Mountbatten. He was created a Duke with the title His Royal Highness in 1947. In addition to continuing his service with the Navy, he has aided the Queen in her ceremonial and political tasks in Great Britain and in diplomatic visits to foreign countries and to states of the British Commonwealth. In 1957 Queen Elizabeth raised him to the rank of Prince.

Edison, Thomas Alva (**1847-1931**), American inventor and manufacturer, was born at Milan, Ohio, whence his family removed to Port Huron, Michigan, in 1854. He was employed on the Grand Trunk railway when 12 years of age, first as newsboy and later as telegraph operator.

Edison's first important invention was a device by which a telegraphic message could be transmitted automatically from one wire to another without the presence of an operator. It was followed shortly by others, including a vote recorder. The lack of demand for such an instrument led him afterward to investigate the need of any invention before reducing it to a practicable form. His subsequent success placed him at the head of those who apply scientific truths to practical ends.

In 1869, Edison came to New York City. He obtained patents for a device making possible quadruplex telegraphy, by which four messages could be transmitted on a wire at the same time. He established a laboratory at Newark, N. J., removing in 1886 to Orange, N. J. The long list of his inventions includes the carbon telephone transmitter, the megaphone, the phonograph, the incandescent lamp with a carbon filament, and improvements in the cinematograph. During World War I, he built and operated several chemical plants for the government. He was elected to the American Hall of Fame in 1960.

Edmund, or **Eadmund** (**c.981-1016**), known also as Ironside, king of the English. He was the son of Ethelred "the Unready," and was chosen king by the Londoners on his father's death, 1016, while Canute was elected at Southampton by the witan. Edmund hastily levied an army in the West, defeated Canute twice, raised the siege of London, and again routed the Danes. Levying a fresh army, he defeated them at Oxford—his last victory. At Assandun in Essex, after a desperate fight, he was routed. By a compromise with Canute, the latter retained Mercia and Northumbria; Edmund received all the south and the headship, the survivor to succeed to the whole. A few weeks later Edmund died.

Edward or **Eadward** (**c.1004-1066**), "the Confessor," king of the English, son of Ethelred "the Unready," and Emma, daughter of Richard "the fearless," Duke of Normandy. He was brought up at the Norman court and, after his accession in 1042, showed a preference for Norman customs and ideas. In 1052, Godwine, who had been outlawed, rose in rebellion, and, during the rest of the reign, all real power was in the hands of the house of Godwine. Edward codified the legal usages of the Anglo-Saxons.

Edward I (**1239-1307**), king of England, succeeded his father, Henry III, in 1272. Imbued with high notions of feudal sovereignty, he sought to establish his supremacy throughout the island of Britain. His expeditions against Llewelyn, Prince of Wales, 1282, and against the latter's brother David, 1283, resulted in the reduction of the principality, the government of which he settled by the statute of Wales, 1284. He made a partially successful attempt to conquer Scotland. A man of strictly legal but somewhat narrow mind, Edward secured order and good government. In his reign, Parliament met regularly for the first time, and to it was conceded the right of levying taxes. Although jealous of his royal prerogatives and cruel to the Jews, he was, on the whole, one of the most able and enlightened rulers of his age.

Edward II (**1284-1327**), king of England from 1307 to 1327, son of Edward I, was born at Carnarvon. In 1301, he was created Prince of Wales, being the first heir apparent to the English throne who bore that title. In 1308, he went to France to conclude a marriage with Isabella, daughter of Philip "the Fair," leaving the dissolute Piers de Gaveston in charge at home. The nobles rose against the latter and hanged him in 1312. Two years later, Edward invaded Scotland with an immense army, but was defeated at Bannockburn on June 24, 1314, by Robert Bruce.

The rest of his reign was a succession of disputes with the nobles and with Charles IV of France. Finally his queen and the nobles revolted against him successfully in 1327, and Edward was murdered in Berkeley Castle.

Edward III (**1312-1377**), king of England, eldest son of Edward II and Isabella of France. He was proclaimed king, 1327, during his father's captivity, and soon after marched with a large army against the invading Scots, but concluded an inglorious campaign by a treaty in which the entire independence of Scotland was recognized. The war was subsequently renewed by Edward, who several times invaded Scotland.

As the son of Isabella, daughter of Philip "the Fair," Edward claimed the crown of France against Philip of Valois. His subsequent invasion of France began the Hundred Years' War. Edward defeated a French fleet off Sluis, defeated Philip at Crecy, and captured Calais. King David of Scotland took advantage of Edward's French campaigns to invade England, but was defeated and captured. Edward then proceeded to ravage Scotland, and his son the Black Prince defeated and captured King John of France in 1356 at Poitiers. Edward's resources were exhausted, however, and he concluded peace with Scotland and France, restoring nearly all his conquests.

Edward IV (c. 1442-1483), king of England, was born in Rouen, the son of Richard, Duke of York. After the death of his father in 1460, Edward became the head of the Yorkist party, then struggling with the Lancastrians in the civil conflict known as the Wars of the Roses. He was declared king by his party in 1461.

Edward won a victory over the Lancastrian king, Henry VI, at Towton, but, in 1470, he was compelled to flee to the Netherlands. Returning with foreign aid, he won the decisive victories of Barnet and Tewkesbury in 1471, and, on Henry's death a few months later, Edward's rule was generally acknowledged.

The remaining years of Edward's reign were comparatively peaceful. Printing and silk manufactures were introduced into England. The king was debonair and popular, yet he steadily pursued the policy of strengthening the royal power, thereby preparing the way for the absolute monarchy of the Tudors.

Edward VII (1841-1910), king of Great Britain and Ireland, eldest son of Queen Victoria, was born at Buckingham Palace. He studied at Edinburgh and subsequently at Oxford and Cambridge. In 1860, he visited the United States and Canada; in 1862, traveled with Dean Stanley in the East; in 1863, married Princess Alexandra, eldest daughter of Christian IX of Denmark. He constantly manifested a lively interest in exhibitions, charitable institutions, the housing of the poor, and agriculture. He assisted in promoting the Royal College of Music, and the Imperial Institute was founded at his suggestion. On January 22, 1901, he succeeded his mother as Edward VII. By visits to continental capitals, the king did much to allay international animosities and promote peace and good will, especially between Britain and France.

Edward VIII (1894-), ex-king of Great Britain, the only English monarch to abdicate voluntarily, was born at White Lodge, Richmond, England. He was baptized as Edward Albert Christian George Andrew Patrick David. As heir to the throne, he was designated Prince of Wales. His university course at Oxford was interrupted by World War I, in which he played an active part on the staffs of various divisions of the army. Thereafter he traveled widely on good-will tours throughout the world, winning popularity everywhere by his democratic affability.

On the death of his father, George V, he was made king of Great Britain, January 20, 1936. When it became known that he intended to marry Mrs. Wallis Simpson, American born wife of Ernest A. Simpson, from whom she had secured a preliminary decree of divorce, the cabinet indicated determined opposition. Edward accordingly abdicated on December 10, Parliament consenting and creating him Duke of Windsor. Many informed observers regarded the abdication as a means of avoiding a possible crisis due to Edward's alleged insistence on a more active role as king than the constitution countenanced. He served as liaison officer between the British and French armies in 1939–40, but was removed after the disastrous battle of Flanders in 1940 and late was appointed Governor of the Bahama Islands. He is the author of *A King's Story: The Memoirs of the Duke of Windsor* (1951) and *Crown and People* (1953), an essay on coronations and on the monarchy as a British institution.

Edward, the Black Prince (1330-1376), eldest son of Edward III, was created Prince of Wales in 1343. In 1346, though only a boy, he fought at Crecy, and is said to have won from his black armor his popular title. In 1355–56, he undertook two expeditions in France, the second signalized by the great victory of Poitiers. In 1361, he married his cousin, Joan, the "fair maid of Kent," who bore him two sons, Edward and the future Richard II; in 1362, his father created him Prince of Aquitaine; and, in 1363, he departed to take possession of his principality. In 1367, he espoused the cause of Pedro the Cruel and, at Navarrete, won a great victory, taking Du Guesclin prisoner; in 1370, he sacked Limoges.

Edwards, Jonathan (1703-1758), American preacher and theologian, was born at East Windsor, Conn. He was graduated from Yale in 1720 and was tutor there, 1724–26. He accepted an invitation to a church at Northampton, Mass., and was ordained in 1727. Here he labored with intense zeal for more than 23 years, at the end of which period he was dismissed by his congregation because of his insistence that no unconverted persons should be allowed to approach the Lord's table.

Edwards was a powerful and impressive preacher; somber, and even gloomy in his religious opinions and sentiments; but earnest, unaffected, and nobly conscientious. While residing at Stockbridge, in that state, he composed his famous treatises on the *Freedom of the Will* and *Original Sin*. The former is the most famous American book on theology. In 1757, he became president of Princeton College, but died in the following year. He was elected to the American Hall of Fame, 1900.

Eggleston (*ĕg'lz-tŭn*), **Edward (1837-1902),** American author, was born at Vevay, Ind. He became a Methodist preacher in 1856 and subsequently edited for various periods the New York *Independent* and *Hearth and Home*. In 1879, he retired from the ministry and devoted himself entirely to literature. Among his best-known books are *The Hoosier Schoolmaster*, *The Circuit Rider*, *Pocahontas and Powhatan*, *History of United States*, and *The Transit of Civilization*. Died at Lake George, N. Y. See *Shocky*

Ehrlich (*ĕr'lĭĸ*), **Paul (1854-1915),** German physician, was born in Strehlen, Silesia. He was educated at Breslau, Strasbourg, Freiburg, and Leipzig, graduating in medicine in 1878. In 1885, he became assistant in the University Clinic, at Berlin and, in 1890, was appointed professor in the university. In 1896, he was made director of the Royal Institute for Experimental Therapeutics at Frankfort.

Ehrlich's greatest achievement was the discovery of salvarsan and neo-salvarsan, arsenic compounds of marked efficacy in the treatment of syphilis. In 1908, he received the Nobel prize for medicine with Elie Mechnikov.

Eiffel (*ī'fĕl*), **Alexandre Gustave (1832-1923),** French engineer, was born at Dijon, and early gained a reputation for bridge construction. He constructed the iron bridge over the Garonne at Bordeaux in 1858, and was one of the first to utilize air caissons. The bridge over the Douro at Oporto, the great viaduct of Garabit in Cantal, and that over the Tardes near Montlucon were designed by him. In the huge framework erected by him for Bartholdi's Statue of Liberty may be seen the germ of the iron Eiffel Tower, 984 feet high, which he erected in 1887–89 on the Champ de Mars in Paris at a cost of $1,000,000. In 1893, he was condemned to a fine and imprisonment for breach of trust in connection with the Panama Canal works, but sentence was later annulled.

Einhard (*īn'härt*), or **Eginhard** (*ā'gĭn-härt*) **(770-840),** Frankish scholar and biographer of Charlemagne, was born at Maingau in east Franconia. He was sent to the court of Charlemagne, where he became a pupil of Alcuin and a favorite of the emperor. Louis, successor of Charlemagne, continued his father's favor. Einhard's *Vita Caroli Magni* is the greatest biographical work of the Middle Ages.

Einstein (*īn'stīn*), **Albert (1879-1955),** physicist, was born in Germany, of Jewish parentage. At the age of 16 he went to Switzerland and became a naturalized citizen. He early displayed a genius for mathematics and, after graduating at the University of Zurich, became a professor of theoretical physics there. In 1914, he was called to Berlin and was made director of the Kaiser Wilhelm Academy for Research. He accepted in 1932 the chair in mathematics at the Institute for Advanced Study at Princeton, N. J. In 1933, he severed his German connections in protest against the Nazi persecution of Jews and later became an American citizen.

Einstein propounded in 1905 the so-called theory of relativity, which he generalized in 1915. This theory is regarded as the most important contribution to physics since the discoveries of Isaac Newton. In 1921, he received the Nobel prize in physics. In 1929 he announced a theory unifying mathematically the gravitational and magneto-electric forces. See *Relativity*.

Eiseley, Loren C. (1907-), anthropologist, was born at Lincoln, Nebraska. Early interest in nature study led him to concentrate upon anthropology at the University of Nebraska and later at the University of Pennsylvania, where he is now teaching. His essays are interesting both for scientific content and for literary style. His principal books are *The Immense Journey* and *Darwin's Century*.

Eisenhower, Dwight David (1890-), American general and 34th president of the United States, was born at Denison, Texas. After being graduated from West Point in 1915, he served in the tank corps in World War I and afterwards continued his studies at army schools. As lieutenant-general with headquarters in London he planned and commanded the invasion of Africa in November 1942. After the reconquest of French Africa and the invasion of Sicily and Italy, he was recalled to London. There he organized and later directed the invasion and reconquest of France in 1944, a sea-air-land operation whose scope was unprecedented in military history. He was made general of the army in December 1944. He was chief of staff of the United States army, 1945–47, when he resigned to accept

the presidency of Columbia University. In 1950, he was appointed supreme commander of Western European allied forces, a post which he finally resigned in 1952 to become Republican candidate for the presidency. Elected by an unprecedented popular vote, he was inaugurated president in January 1953. In line with his declared policy of peace with firmness, he arranged for a truce in Korea while making a defensive alliance with the Chinese Nationalist government on Formosa. In December 1953 he placed his "Atoms for Peace" proposal before the United Nations Assembly. He appointed a special representative to negotiate with Soviet Russia and other countries, looking toward agreement on partial disarmament. He went one step further at the "Big Four" Conference in Geneva in the summer of 1955. Here he proposed to the governments of Britain, France, and Russia an "open sky" inspection of military installations as a safeguard against surprise attacks. He also advocated the unification of Germany. After recovering from a heart attack suffered in September 1955 he resumed his schedule of presidential duties the following winter. Again in 1956 he won the presidential election.

President Eisenhower's second term began with a series of problems on the home front, notably his differences with Congress over agricultural policy and defense appropriations. Then came a crisis over school integration and signs of an impending economic recession. Later these issues were overshadowed by local and international questions raised by the launching of Sputnik. Indications of Russian supremacy in ballistic missiles turned the country's attention to scientific education, research, missile production, and the streamlining of the defense department. After the death of John Foster Dulles in 1959, President Eisenhower became increasingly active in personal diplomacy, traveling extensively and holding numerous conferences. Upon the expiration of his term he moved, in January 1961, to his farm at Gettysburg, Pa., where he has been continuously occupied in writing and in holding conferences with political leaders.

Eisenhower, Milton S. (1899-), was born at Abilene, Kansas. Before becoming a college president, first at Kansas State College of Agriculture and Applied Science, then at Pennsylvania State College and, in 1956, at Johns Hopkins University, he spent several years in journalism and in different branches of the public service. Some of the posts he held were vice consul at Edinburgh, Scotland; director of information for the U. S. Department of Agriculture; editor of *The Yearbook of Agriculture* (1929–36), director of the War Relocation Authority; and co-ordinator of news and propaganda for the U. S. Office of War Information, with headquarters in Morocco. Milton is co-author of *The United States Department of Agriculture: Its Structure and Functions*.

Elgar (*ĕl'gär*), **Sir Edward William (1857-1934)**, English musician and composer, was born at Broadheath, near Worcester. He succeeded his father as organist at St. George's in 1885. His first works, *The Black Knight*, *Lux Christi*, and others, brought him wide recognition. His oratorio, *The Dream of Gerontius*, written for the Birmingham Festival of 1900, placed him in the front rank of contemporary English composers. He was knighted in 1904 and, from 1905 to 1908, was professor of music in the University of Birmingham. Among his later works are *The Apostles*, *The Kingdom*, *Froissart*, and *Falstaff*.

Elgin (*ĕl'gĭn*) **and Kincardine** (*kĭn-kär'dĭn*), **James Bruce, Earl of (1811-1863)**, was born in London. He succeeded his father, the seventh earl, who, in 1812, brought from Athens the Elgin Marbles. As governor of Jamaica, 1842–46, and as governor general of Canada, 1847–54, he displayed great administrative abilities. While on his way to China in 1857, as plenipotentiary, he heard at Singapore of the Indian mutiny, and diverted the Chinese expedition thither—thus delaying his own mission, which, after some military operations and diplomacy, issued in the Treaty of Tientsin in 1858. In 1861, he became governor general of India, where he died.

Eliot, Charles William (1834-1926), American educator, was born at Boston and was graduated from Harvard University in 1853. He taught mathematics and chemistry at Harvard and, in 1863, went to Europe to study chemistry and to investigate the educational institutions of that continent. In 1865, he was chosen professor of analytical chemistry in the Massachusetts Institute of Technology, which post he filled for a period of four years.

In 1869, Eliot succeeded Thomas Hill as president of Harvard, and continued at its head until 1909. During his administration, many notable changes in the government of the university occurred; its scope was broadened, and there was a great increase in the number of its professors and students. The elective system as now known to American education was devised and developed by him.

Eliot, George (1819-1880), is the pen name of Mary Ann Evans, English novelist, who was born at Arbury, in Warwickshire. She received an ordinary school education but later became very proficient in Latin, German, and the higher mathematics. She began her literary career by a translation of Strauss's *Life of Jesus*, and became, in 1851, an assistant editor of the *Westminster Review*. During this time she formed the acquaintance of George Henry Lewes, with whom she subsequently lived as wife, though unmarried, and who, it would seem, discovered her latent faculty for fictional work.

Her first work in fiction was *Scenes of Clerical Life*, contributed to *Blackwood's* in 1857. The stories proved a signal success, and encouraged the production of a series of novels, beginning in 1859 with *Adam Bede*, which was followed in 1860 by *The Mill on the Floss*, and in 1861 by *Silas Marner*, a tale which is perhaps the most perfect of any of this series. In 1863, *Romola* appeared; *Felix Holt* was published in 1866 and *Middlemarch* in 1872. Eliot's novels reveal a highly intellectual rationalist who nevertheless deeply appreciates the strength of religious convictions. This fact, combined with her sympathetic delineation of character, especially when drawing on her experience, brought her into the front rank of novelists of the day. Lewes died in 1878. In 1880, George Eliot married an old friend, John Cross. She died in the same year.

Eliot, John (1604-1690), the "Indian apostle," was born probably at Widford, Herts, England. He was graduated from Jesus College, Cambridge, in 1622. After his ordination in the Church of England he left the country for conscience' sake, and, in 1631 landed at Boston. Next year he settled at Roxbury, and, in 1646, began to preach in the native dialect to the Indians at Nonantum. Shortly afterward, he established his converts in regular settlements, and in England a corporation was founded in 1649 for propagating the gospel among the Indians of New England.

In 1674, the number of "praying Indians" was estimated at 4000, but the decay of the "praying towns" was rapid after King Philip's War in 1675, in which the converts suffered equal cruelties at the hands of their countrymen and of the English. Eliot assisted in preparing an English metrical version of the psalms, *The Bay Psalm-Book*, the first book printed in New England. His greatest work was the translation of the Bible into the Indian tongue. He died at Roxbury.

Eliot, Thomas Stearns (1888-1965), critic, poet, and dramatist, was born at St. Louis, Mo., but became a British subject in 1927. He received his education at Harvard, University of Paris, and Oxford. He was employed for some years as a bank clerk, but he was primarily a scholar and a writer. As poet, critic, editor of *The Criterion*, lecturer, and, later, successful dramatist, he exerted a strong influence on the literature and thinking of his time. In recognition of his outstanding position in contemporary letters, he was awarded the Nobel prize for literature in 1948. His verse play, *The Cocktail Party*, was a 1950 success on Broadway. Other works written by him include: *The Sacred Wood*, *The Use of Poetry and the Use of Criticism*, *The Rock*, *The Waste Land*, *The Idea of a Christian Society*, and *What is a Classic?*

Elizabeth I (1533-1603), queen of England from 1558 to 1603, was born at Greenwich palace. She was the daughter of Henry VIII and Anne Boleyn; she was scarcely three years of age when her mother was beheaded, and only 13 at the death of her father. As Princess Elizabeth, she had the advantage of the best teachers and masters, especially under the supervision of Catherine Parr, the last of Henry's queens.

Elizabeth was in her 26th year when she obtained the crown. Her first act was to release the imprisoned Protestants and to re-establish Protestantism. Next she concluded a peace with France and Scotland, entering into an undertaking with the Reformers in the latter country to protect them from the Catholics. In her own country, while zealously maintaining Protestantism and severe toward those of her subjects who adhered to the formerly established religion, she was not less severe toward the Puritans, who were the most Protestant of all the sects.

Very early in her reign Elizabeth was troubled by the pretensions of the friends of Mary Queen of Scots, who was now the next heir to the throne. As Mary was a zealous Catholic, the counselors of Elizabeth were anxious that she should marry in order to secure the Protestant succession. She finally refused to marry, though it is believed that she would have accepted her favorite, the Earl of Leicester, for a husband, if she had not been prevented by her counselors. In 1586, the Babington conspiracy was formed, the object of which was to re-establish the papacy and to set Mary Queen of Scots on the throne of England. It led, however, only to the execution of Mary after she had been imprisoned in England for 19 years.

In 1588, Elizabeth had to contend with a more formidable enemy in Philip II of Spain, who avowed his resolution to annihilate Protestantism, but his threatened invasion of the country was prevented by the defeat and destruction of the armada. At the close of her reign, which lasted for 45 years, England was stronger and greater than it had ever been before. To this reign belong the dis-

coveries of Hawkins, Drake, and Sir Walter Raleigh. Spenser, Shakespeare, and Bacon belong also to the Elizabethan age.

Elizabeth II (**1926-**), English queen, was born in London and christened Elizabeth Alexandra Mary. She was proclaimed queen February 8, 1952, following the death of her father, King George VI. She had become heiress presumptive to the throne when her uncle, Edward VIII, abdicated in 1936. Trained from childhood for her royal career, she served during World War II in the Auxiliary Territorial Service. At the age of 21, Elizabeth married Philip Mountbatten (formerly Prince Philip of Greece) on November 20, 1947. They were created the Duke and Duchess of Edinburgh. They have four children—H.R.H. Prince Charles Philip Arthur George, born November 14, 1948, heir apparent to the throne, H.R.H. Princess Anne Elizabeth Alice Louise, born August 19, 1950, H.R.H. Prince Andrew Albert Christian Edward, born February 19, 1960, and H.R.H. Prince Edward Antony Richard Louis, born March 10, 1964. Queen Elizabeth has traveled widely. She has visited both Canada and the United States. At the time of her father's death she was in Africa. Following her coronation, Elizabeth and Prince Philip made an extensive tour of British Commonwealth countries and paid an official visit to Norway. In 1956 they visited Nigeria. Of special significance was their participation in events in America in the autumn of 1957. At Ottawa the Queen opened the Canadian Parliament, and in the United States the couple attended the 350th Anniversary celebration of the settlement of Jamestown, Virginia.

Ellis, Henry Havelock (**1859-1939**), English scientist and literary scholar, was born in Croydon, Surrey. He was educated for a medical career. After teaching in Australia, 1875–79, he practiced medicine in England for a brief period and then devoted himself exclusively to literary and scientific work. His researches were concerned chiefly with sex, to which he brought a psychological and sociological approach. His scientific works include *The Criminal; Man and Woman, Sexual Inversion, The Evolution of Modesty, Sexual Selection in Men, Erotic Symbolism,* and *Sex in Relation to Society.*

Elman, Mischa (**1891-**), Russian violinist, was born at Talnoje. He displayed precocious musical talent, and, at the age of five, he was taken to Odessa, where he studied five years with Fidelmann. In 1902, Leopold Auer prevailed upon the czar to suspend, in his case, the rule barring Jewish pupils from the Imperial Conservatory at Leningrad. Here he continued studying for two years under Auer with great success. He made his first appearance in concerts in 1904, at the age of 13, and was immediately acclaimed a violinist of the first rank. He made his first visit to the United States in 1908 and thereafter made frequent concert tours with increasing popularity.

Elphinstone (*ĕl'fĭn-stŭn*), **Mountstuart** (**1779-1859**), British statesman and historian. He was educated at Edinburgh and Kensington, and entered the Bengal civil service in 1795. He served with distinction on Wellesley's staff, and was appointed resident at Nagpur in 1804. In 1808, he was sent as envoy to Sha Shuja at Kabul. As resident at Poona, 1811–19, he ended the Mahratta war of 1817 and organized the newly acquired territory. During his governorship of Bombay, 1819–27, he founded an improved system of administration and greatly advanced public education. He returned to England in 1829, and, declining the governor generalship of India, he lived in comparative retirement. His valuable *History of India* appeared in 1841.

Emanuel I (*ĕ-măn'û-ĕl*) (**1469-1521**), king of Portugal, called "the Great" or "the Fortunate," became king in 1495. His reign is known as the golden age of Portugal. He prepared the code of laws which bears his name, and made his court a center of chivalry, of art, and of science. Vasco da Gama's voyage round the Cape of Good Hope, Cabral's discovery of Brazil, and the expedition of Albuquerque and others that so widened Portuguese possessions were all authorized and encouraged by Emanuel.

Emerson, Ralph Waldo (**1803-1882**), American essayist, philosopher, and poet, was born at Boston, Massachusetts, the descendant of a long line of ministers. After attending the Boston Latin School and receiving his degree in arts at Harvard University in 1821, he taught for a short time in Boston. In 1823, he began to study for the ministry.

In 1829, he married Ellen Louisa Tucker and became minister of the Second Church of Boston, a Unitarian congregation. From this ministry he resigned for conscientious reasons in 1832. In December of that year, after the death of his wife, he sailed for Europe. There he made the acquaintance of many English men of letters and began his lifelong friendship with Carlyle.

Emerson returned to America in 1833 and, in the following year, took up his permanent residence at Concord, Mass. In 1835, he married Lydia Jackson. He led a quiet, meditative life, preparing the lectures that he delivered subsequently in Boston and the vicinity, writing essays, and preaching occasionally.

The year 1836 was signalized in his life by the publication of his tractate *Nature,* perhaps the most important of his works, and by those meetings of a few like-minded thinkers who became known as the transcendental school of philosophy. This year, also, he wrote "Concord Hymn." In 1837, he delivered an oration *The American Scholar,* which advocated that American thought should cut loose from its moorings in European culture. He pleaded for making the individual consciousness and the soul of each man the supreme judge in spiritual matters.

His first series of *Essays* appeared in 1841; the second, in 1844. These were received with great interest on both sides of the Atlantic. He assisted in founding *The Dial,* the journal of the transcendentalists. In 1846, a collection of his poems was published. His second journey to England, the next year, resulted in the publication of *English Traits* in 1856.

In 1850, he issued *Representative Men.* A decade later appeared *The Conduct of Life,* which contains a statement of his moral and ethical principles. *Society and Solitude* appeared in 1870. The ripest fruit of his culture was the paper *Sovereignty of Ethics,* published in 1878. His last years were spent in revising his unpublished manuscripts and in preparing a complete edition of his works.

Though he was not, in the technical sense of the word, a reformer, his habits and tastes being rather those of a scholar and a man of letters, every earnest movement for the welfare of humanity had his sympathy. His thought may be described as Puritanism in the process of fermentation and transformation into a semi-scientific system. He was the prophet of intellectual individualism. He was elected to the American Hall of Fame in 1900. See *Representative Men.*

Emin Pasha (*ā'mĕn pä-shä*) (**1840-1892**), is the adopted name of Eduard Schnitzer, who was born at Oppeln, Silesia. He studied medicine and, in 1864, went to Turkey, where he became a well-known physician. He learned to speak Turkish and Arabic and adopted Turkish habits and customs. He also adopted the name Emin, which means "faithful one." In 1876, he joined the Egyptian service and proceeded as chief physician to the Equatorial Province, of which he was made governor in 1878 by "Chinese" Gordon. Here, on the sudden uprising of the Mahdi, he was cut off from the outside world. After great privations, a rescue party from the west coast, led by H. M. Stanley, reached him early in 1888. He refused, however, to return to Egypt and remained only to be deposed by a revolt in 1889, after which he reluctantly abandoned his province. In 1890, he entered the German service and at once made his way again to central Africa. In 1892, at Kinena, in the region of Stanley Falls, he was killed by Arabs.

Emmet, Robert (**1778-1803**), Irish revolutionist, was born at Dublin, the son of a doctor. He resigned from Dublin University in 1798 in protest against political domination, and was henceforth an ardent partisan of Irish independence. His impulsive patriotism led him in 1803 to make an unsuccessful attack on Dublin Castle, but he escaped into Wicklow. He was captured and executed the same year. His fate is the subject of a poem by Moore.

Empedocles (*ĕm-pĕd'ô-klēz*) (**c. 493 B.C.-435 B. C.**), Greek philosopher, was born at Agrigentum in Sicily. He was poet, priest, physician, and philosopher, and followed Pythagoras in his teaching. In philosophy he was an eclectic and endeavored to combine the teachings of the Eleatic School with the doctrine of Heraclitus. He assumed four indestructible elements—earth, air, fire, and water—and two primal causes of all change—"friendship" and "strife," or the uniting and the dividing principle. He was the first to teach that the mind can know only what is akin to it. He is credited with performing various miracles, including the restoration of a girl to life. The exact date and the manner of his death are unknown. According to a tradition, he threw himself into the crater of Etna.

Encke (*ĕng'kē*), **Johann Franz** (**c.1791-1865**), German astronomer, was born at Hamburg. Entering the University of Göttingen in 1811, he devoted himself to the study of astronomy under Gauss. In 1816, he became assistant in the Observatory of Seeberg, near Gotha. In 1817, the Cotta astronomical prize was awarded to Encke for his determination of the orbit of the comet of 1680. This led him to solve the problem of the sun's distance from the earth, and his value of the solar parallax, giving a distance of about 95 million miles, was for a long time accepted as the most accurate known. He showed that the comet discovered by Pons in 1818 revolves around the sun in the remarkably short time of 3.3 years, being identical with those observed in 1786, 1795, and 1805. This comet has ever since been known by Encke's name. In 1825, he was made director of the Berlin Observatory.

Endicott (*ĕn'dĭ-kŏt*), or **Endecott, John** (**c. 1588-1665**), early American governor, was born at Dorchester, England.

In 1628, he led the first settlers to the region now known as Salem, Mass. He commanded an expedition against the Pequot Indians in 1636 and was governor or deputy governor of the Massachusetts Bay Colony with short interruptions from 1641 until his death. Apart from his bigotry and harshness toward the Quakers, his administration was just.

Ennius (*ĕn'ĭ-ŭs*), **Quintus** (**239 B. C.-c. 169 B. C.**), Roman poet, the father of Roman literature, was born at Rudiæ, Calabria. Cato "the Elder" took him to Rome where he taught Greek and Latin and gained the friendship of the leading Romans of his day. He was famous for his learning and his charming conversation. His writings were a poem on Roman history; plays for the theater, many of them adapted from the finest Greek plays; and short poems, a few of which remain. He died in Rome.

Epaminondas (*ĕ-păm'ĭ-nŏn'dăs*) (**c. 418 B. C.-362 B. C.**), Theban general and statesman, led a retired life until his 40th year. After the stratagem by which his fellow citizens expelled the Spartans in 379, he was sent to Sparta in 371 to negotiate peace, but refused to meet the terms demanded. When war was resumed, he received the command, and with 6000 men defeated a much larger Spartan force at Leuctra through the use of a new organization of the phalanx. The victory over Sparta gave him extraordinary prestige. In 370, with Pelopidas, he marched into the Peloponnesus and incited several of the allied tribes to desert Sparta.

On his return to Thebes, Epaminodas was accused of having retained the supreme power beyond the lawful time, but was acquitted after an able defense. In 368, war was renewed. After indecisive campaigns he advanced into Arcadia and near Mantinea finally broke the power of Sparta, but was mortally wounded.

Epée (*ā'pā'*), **Charles Michel, Abbé de l'** (**1712-1789**), a French priest, one of the founders of the modern system of instruction for the deaf and dumb, was born at Versailles, In 1765, he began to occupy himself with the education of two deaf and dumb girls. Meeting with success with his system of manual signs, he founded at his own expense, in 1770, an institution for the deaf and dumb which through his labors attained international fame.

Epictetus (*ĕp'ĭk-tē'tŭs*), Greek Stoic philosopher, who flourished in the 1st century A. D., was born at Hierapolis, Phrygia, and was originally a slave to Epaphroditus, one of Nero's freedmen. Having obtained his freedom, he gave himself up wholly to the study of philosophy. Being banished from Rome with certain other philosophers by Domitian, 90 A. D., he settled at Nicopolis, in Epirus. His pupil Arrian collected the maxims of Epictetus in the work entitled *Encheiridion*.

The sayings of Epictetus exhibit a simple and noble earnestness. They emphasize the desirability of indifference to external advantages and the duty of endurance and forebearance. The date of his death is unknown.

Epicurus (*ĕp'ĭ-kū'rŭs*) (**c. 342 B. C.-270 B. C.**), Greek philosopher, was born probably in Samos. His youth was spent in that island, whence he removed to Athens when about 18 years of age. He afterward taught at Colophon, Mytilene, and Lampsacus, but returned to Athens about 306 B. C. He was founder of the Epicurean school, which held that the highest good consists in pleasure. Epicurus was a man of amiable character, to whom his friends and pupils were warmly attached. None of his exceedingly numerous works have been preserved, but the great poem *De Rerum Natura*, by Lucretius, contains the substance of the Epicurean philosophy.

Epinay (*ā'pē'nĕ'*), **Louise d'** (**1726-1783**), French writer. In 1745, she formed a close intimacy with Rousseau and presented him with a small house, the now famous Hermitage, which stood on one of her husband's estates in the woods of Montmorency. An unfortunate jealousy, however, which Rousseau conceived for Grimm, another friend of Madame d'Epinay, was followed by an open rupture with his benefactress. With the assistance of Diderot, she carried on Grimm's celebrated *Correspondence with European Courts*. She wrote *Les conversations d'Emilie*, *Mémoires et correspondence*, *Correspondence de l'abbé Galiani*, *Lettres a mon fils*, and *Mes moments heureux*. Died at La Briche.

Epstein, Sir Jacob (**1880-1959**), sculptor, was born in New York, N. Y., of Russian and Polish parentage. He studied under Rodin in Paris and then settled in London in 1905. His first commission consisted of 18 large figures for the building of the British Medical Association, London. This and later works met with storms of criticism because of Epstein's departure from the decorative to express the abstract, often by figures resembling products of primitive art but conveying an impression of power and universality. Other works of his in marble or bronze include "Venus," "Ecce Homo," "Day and Night," "Genesis," and "American Soldier," the last being in the Metropolitan Museum of Art, New York. He was knighted in 1953.

Erasistratus (*ĕr-ă-sĭs'tră-tŭs*), Greek physician and anatomist, who flourished in the 3d century B. C. and is said to have been born in the Island of Ceos. He was a pupil of Theophrastus and resided for some time at the court of Seleucus Nicator, king of Syria. He founded a school of medicine and wrote several works on anatomy and practical medicine, some fragments of which have been preserved by Galen. Erasistratus was the first anatomist to distinguish between motor and sensory nerves and to trace both sets back to the brain.

Erasmus (*ē-răz'mŭs*), **Desiderius** (**c. 1466-1536**), Dutch scholar, was born in Rotterdam. On his parents' death he entered a monastery, which he left to become a teacher at Paris. At the invitation of his pupil Lord Mountjoy, he went to England; settled at Oxford, where he became the friend of More; and studied divinity under Colet and Greek under Grocyn and Linacre. In 1506, he visited Italy, staying at Bologna and Rome, where he was warmly received, but returned to England and became a teacher of Greek at Cambridge. In 1513, he again visited the continent and, after a journey to the low countries, settled at Basel, where he published an edition of the New Testament. Erasmus was the man of culture par excellence. Although favoring moderate reform in the Church, he deprecated the religious strife of the day as the enemy of culture. His works include *Christian Soldier's Manual* and *Praise of Folly*.

Eratosthenes (*ĕr'ă-tŏs'thē-nēz*) (**c. 276 B. C.-c. 196 B. C.**), Greek geographer and astronomer, was born at Cyrene, Africa. He was called to Alexandria by Ptolemy Euergetes to superintend the great library. He measured the obliquity of the ecliptic, and the result at which he arrived, namely 23° 51′ 20″, must be reckoned a very fair observation, considering the age in which he lived. Eratosthenes' greatest claim to distinction is as a geographer, his work on geography being the first scientific treatise on the subject. He knew that the earth was round, and, in order to measure its circumference, he employed some of the means used at the present day. See *Geographical Discovery: Greeks*.

Erckmann-Chatrian (*ĕrk'män-shă'trê-äN'*) (Emile Erckmann and Alexandre Chatrian), two French men of letters, the first of whom was born at Pfalzburg, 1822, the second, in the village of Soldatenthal, 1826. The two friends employed their pens in the same works, which they signed with the two names united in one; it was not until about 1863 that the authors informed their readers that these numerous works of fiction were the fruits of their friendly collaboration.

The story "The Famous Doctor Matthew" was their first success and was followed by a widely popular series of which *Histoire d'un conscrit de 1813*, *L'Ami Fritz*, and *Waterloo* are the best-known. They dramatized *L'Ami Fritz* and wrote another play of merit, *Le juif polonais*, adapted in English as *The Bells*, long one of the most effective plays in Sir Henry Irving's repertoire. Their fiction shows humor, fine character drawing, local color, and patriotic spirit. Erckmann died in 1899; Chatrian, in 1890.

Erhard, Ludwig (**1897-**), economist and political leader, was born at Fürth, in Bavaria. He attended *Realschule*, but his education was interrupted when he was drafted into the German army in 1916. During convalescence from wounds he resumed his studies, giving special attention to economics. He is given much credit for the rebuilding of West Germany's economy after World War II. In 1963 he succeeded Adenauer as chancellor.

Ericsson (*ĕr'ĭk-sŭn*), **John** (**1803-1889**), Swedish-American engineer and inventor, was born in Vermland, Sweden. At the age of 12, he became cadet of engineers, and, at 17, he entered the Swedish army; in 1826, he was promoted captain. In 1828, he constructed a flame engine and went to London to introduce it. He also produced in succession an instrument for sea sounding, a hydrostatic weighing machine, a tubular steam boiler, a steam fire engine, a caloric engine, and a pyrometer.

In 1836, Ericsson invented and patented the screw propeller. In 1839, he came to the United States where, in 1841, he designed for the government the screw-propelled warship *Princeton*, the pioneer screw-propeller warship. In 1861, he built for the United States government, in 100 days, the ironclad *Monitor*, which, on March 9, 1862, in Hampton Roads, defeated the Confederate ironclad ram *Merrimac*. His scientific investigations included computations of the intensity of solar heat.

Erigena (*ē-rĭj'ē-nà*), **Johannes Scotus** (**?-c.897**), philosopher and scholar, was born probably of Scottish parents in Ireland during the 9th century. He appears to have resided principally in France at the court of Charles the Bald. He took part in the controversies of his time regarding predestination and transubstantiation. His philosophic opinions were those of a neo-Platonist rather than of a scholastic. He uttered his opinions with boldness, and

evinced great subtlety and strength of intellect in their defense. In logic he was a realist and insisted that "authority originates in reason, not reason in authority." His chief work was *De Divisione Naturae*, a system in which pantheism is everywhere apparent.

Erskine, John (**1879-1951**), American literary scholar and writer, was born in New York. After being graduated from Columbia University as doctor of philosophy in 1903, he taught at Amherst College until 1909 and thereafter at Columbia University. He wrote a number of works on American literature, then turned to popular philosophy with his *Moral Obligation to Be Intelligent, Democracy and Ideals*, and *Give Me Liberty*. With *The Private Life of Helen of Troy*, which became very popular, he began a series of novels in which he retold old stories made over with modern motivation as a vehicle for social satire.

Erskine (*ûr'skĭn*), **Thomas Erskine, Baron** (**1750-1823**), British jurist and orator, was born in Edinburgh. He entered the army but, seeing little chance of promotion, decided to study law and was admitted a student of Lincoln's Inn, 1775. His rise was immediate and brilliant. Without the advantage of a business training, he rose into practice with unprecedented rapidity. His eloquence and powers of cogent reasoning made him one of the greatest trial lawyers in English history. In 1786, he was made attorney general to the Prince of Wales.

Erskine was a strong Whig and acted for the defense in the political trials of the time, giving his aid to Horne Tooke, Thelwall, and Thomas Paine; his defense of the last named cost him the post of attorney general to the Prince of Wales. He was now regarded as the defender of popular liberties and constitutional rights. Beginning with 1790, he sat in Parliament as a supporter of Fox; in 1806, he became chancellor under Fox and was raised to the peerage.

Ervine, Saint John Greer (*sĭn' jŭn ĕr'vĭn*) (**1883-**), Irish dramatist and novelist, was born in Belfast. After service in World War I, he began writing novels, short stories, essays, and plays. The scenes of his principal dramas are located in and around Belfast. He excels in plays of character. He was dramatic critic for the New York *World* in 1928–29. His writings include *The Magnanimous Lover, Mixed Marriage, Mrs. Martin's Man, God's Soldier* (biography of William Booth), and *The Christian and the New Morality*.

Eshkol, Levi (**1896-**), political leader, was born in the Ukraine and was educated at Vilna, Lithuania. Active for many years in the Zionist movement, he settled in Palestine while it was still under Turkish rule. When the state of Israel was formed, he was made minister of defense. He served later as minister of agriculture and minister of finance. In 1963 he became prime minister, succeeding David Ben-Gurion.

Espy (*ĕs'pĭ*), **James Pollard** (**1785-1860**), American meteorologist, was born in Westmoreland County, Pa. His *Philosophy of Storms*, published in 1841, was commended by the French Academy of Sciences. Appointed in 1842 to the Washington Observatory, Espy laid the basis of the weather bureau and was the founder of modern physical, or theoretical, meteorology.

Estaing (*ĕs'tăN'*), **Charles Hector, Count d'** (**1729-1794**), French admiral, was born in Auvergne. After serving in the army in India, he entered the navy; was made lieutenant general in 1763 and vice admiral in 1777. In 1778, he was placed in command of a squadron sent to aid the United States against England; he captured the Island of Grenada, but, failing in his attack on Savannah, 1780, returned to France. In 1792, he was chosen admiral. Notwithstanding his work in behalf of the Revolution, he was condemned as a noble and guillotined.

Esterházy (*ĕs'tĕr-hä'zê*), **Prince Nicholas** (**1765-1833**), Hungarian patron of arts and sciences. He traveled over a great part of Europe and resided for a considerable time in England, France, and Italy. He founded a splendid collection of pictures, which is preserved at the Vienna Museum. When Napoleon, in 1809, entertained the notion of weakening Austria by the separation of Hungary, he made overtures to Prince Esterházy respecting the crown of Hungary, which, however, were declined. Haydn composed most of his works at the court of Prince Esterhazy.

Ethelbert (*ĕth'ĕl-bûrt*) (**c. 552-616**), first Christian king of Kent, England. He was converted in 597 by his wife, Bertha, of France, and by Saint Augustine. Ethelbert gave the English their first written code of laws. He reigned from 560 until his death.

Eucken (*oik'ĕn*), **Rudolph Christoph** (**1846-1926**), German philosopher, was born at Aurich, East Friesland. He was educated at the universities of Göttingen and Berlin. In 1871, he was made professor of philosophy at Basel and, in 1874, at the University of Jena. He became a prominent leader of philosophical protest against purely materialistic conceptions of man and life and the tendency to narrow the point exclusively to that of the physical and biological sciences. His emphasis of spiritual interests and the inspirational quality of his writings have given them wide popularity. In 1908, he received the Nobel prize for literature. He was exchange professor at Harvard in 1912–13 and at the University of Tokyo in 1914.

Eucken's writings include *The Fundamental Concepts Of Modern Philosophic Thought. The Life of the Spirit, The Problem of Human Life as Viewed by the Great Thinkers, Main Currents of Modern Thought, Religion and Life*, and *Can We Still be Christians?*

Euclid (*ū'klĭd*), Greek geometrician, said to have been a native of Alexandria, in which city he taught mathematics during the reign of Ptolemy Soter about 300 B. C. Euclid wrote on music, optics, and other subjects; but the work which has immortalized his name in mathematical science is his *Elements*, the basis of all modern textbooks on geometry. Tradition attributes to Euclid the saying, "There is no royal road" to learning, said to have been made to Ptolemy, who complained of the difficulty in understanding geometry.

Eugène (*ûˊzhĕn'*; Eng., *ū-jēn'*), **François** (**1663-1736**), usually called Prince Eugène of Savoy, Austrian general, was born in Paris. He was a son of Eugène Maurice, Count of Soissons. His application for a commission in the army of France having been refused, he offered his services to the Emperor of Austria, in whose court and army he spent the whole of his remaining life.

For 50 years, and under three emperors, Prince Eugène was one of the greatest generals of his day. He fought against the Turks and, with the English general Marlborough, won the victories of Blenheim, Fadenarde, and Malpaquet over the French in the War of the Spanish Succession.

Eugénie-Marie de Montijo (*ûˊzhā'nē' mà'rê' dĕ môn-tē'hô*) (**1826-1920**), empress of the French, 1853–70, was born in Spain. She was the grandaughter of William Kirkpatrick, at one time American consul at Malaga. During a visit to Paris with her mother, she met her future husband, the emperor Louis Napoleon.

The empress became the leader of the fashions of Europe and maintained a brilliant court. She urged the disastrous war of 1870 with Germany, which she spoke of as "my war." She was in Paris when the revolution broke out after Sedan. Escaping to England, she established a permanent residence at Chislehurst.

Euler (*oi'lēr*), **Leonhard** (**1707-1783**), Swiss mathematician, was born at Basel. At the age of 16, he received the master's degree from the University of Basel. In 1727, he went to Leningrad, where he became professor of physics and higher mathematics. In 1741, he was called to Berlin by Frederick II to take the chair of mathematics in the Academy of Sciences. Returning to Leningrad in 1766, he spent the remainder of his life there. His contributions to higher mathematics entitle him to be called a principal founder of the science. His later years were spent in total blindness.

Euripides (*ū-rĭp'ĭ-dēz*) (**c. 480 B. C.-406 B. C.**), Greek tragedian, was born at Salamis. The first play of Euripides which was performed was the *Peliades*. In 441 B. C., he gained the first prize for tragedy and continued to write for the Athenian stage until about 409, when he went to reside at the court of Archelaus, king of Macedonia.

In marked contrast to his two great predecessors, Æschylus and Sophocles, Euripides represents the new movements in the Athenian life of the time. His characters, although drawn from the ancient mythology, are treated in a realistic fashion with much psychological subtlety. His sentimentalism, tenderness, romanticism, and skepticism, combined with his exquisite lyrical qualities, made him, in later ages, by far the most popular of the Greek tragic poets. In his own day, however, his merits were the subject of sharp controversy, and he succeeded in winning the first prize in tragedy only five times.

Of his 92 plays, 18 are extant. These include *Alcestis, Hecuba, Medea, Bacchæ, Electra, The Trojan Women, Hippolytus*, and *Iphigenia Taurica*. He is said to have been killed by dogs, which were set upon him by envious courtiers. See *Iphigenia*.

Eusebius (*ū-sē'bĭ-ŭs*) **of Cæsarea** (**c. 264-c. 340**), ecclesiastical historian, was born in Palestine. He took the surname Pamphili. About 313 he became bishop of Cæsarea, and took a prominent part in the council of Nice. Eusebius was regarded as the most learned father of the Early Church, except Origen, and was one of the most voluminous writers of antiquity. His *Ecclesiastical History* relates the principal events in the Christian Church to the year 324.

Eustachio (*ā-ōō-stä'kyō*), **Bartolommeo** (**c. 1510-1574**), Italian anatomist. Little is known regarding his life, but in 1562 he was professor of medicine in the Colle-

gio della Sapienza at Rome. His name is indelibly associated with anatomical science through his discovery of the Eustachian tube of the ear and the Eustachian valve of the heart. He was also the first to give an accurate description of the thoracic duct. Eustachio is regarded as one of the founders of modern anatomy.

Evans, Mary Ann or **Marian.** See *Eliot, George.*

Evans, Maurice (1901-), actor, was born in Dorset England. After his first considerable stage success as Second Lieutenant Raleigh in *Journey's End,* he joined the "Old Vic" Company, as others had done, in order to study the classics. A tour of the United States as Romeo for Katherine Cornell's Juliet was followed by his memorable performance of *Richard II.* Other Shakespeare plays in which he appeared were *Henry IV* (Falstaff) and *Hamlet,* in which he played the title role. Among his more recent successes is his revival of Shaw's *Man and Superman* and *The Devil's Disciple.* He has been a U. S. citizen since 1941.

Evans, Oliver (1755-1819), American inventor, was born at Newport, Delaware. He was apprenticed to a wheelwright in early youth. At 22 he invented a machine for making the wire card-teeth used in carding cotton and wool. In 1779, he entered the milling business with his brothers and soon afterward invented machinery which revolutionized the flour milling industry, enabling the miller to make 20 pounds more to the barrel of finer flour at one-half the former labor cost.

In 1786, Evans asked for a patent on his invention of a steam engine adapted to mill machinery and to a steam carriage. In 1800, he built the first high pressure steam engine, and, in 1803–04, he constructed by order of the Philadelphia Board of Health the first steam dredge used in the United States. This steam dredge propelled itself on a carriage to the Schuylkill River, near which it was built. This is the first instance of land travel by steam in America. Evans built many steam engines and has been called the "Watt of America." He died in New York.

Evans, Robley Dunglison (1846-1912), American admiral, was born in Floyd County, Va. He was graduated from the United States Naval Academy in 1863. In the Civil War he participated in both attacks on Fort Fisher, 1865, and in land attacks received four severe rifle-shot wounds. When in command of the *Yorktown* at Valparaiso, Chile, 1891, his actions in connection with various incidents earned him his popular name of "Fighting Bob." As commander of the *Iowa* in Sampson's fleet off Santiago, he took an active part in battle with Cervera's fleet, July 3, 1898. He was made rear admiral, 1901, and commanded the Asiatic expedition, 1907–08.

Everett, Edward (1794-1865), American statesman, orator, and scholar, was born at Dorchester, Mass. He was graduated from Harvard, 1811, and was for some time a Unitarian clergyman. He became professor of Greek at Harvard in 1815; traveled in Europe from 1815 to 1818; was editor of the *North American Review,* 1820–24. From 1824 to 1834, he was a member of Congress; from 1836 to 1840, he was governor of Massachusetts; and, from 1841 to 1845, he was minister to England. He was president of Harvard University, 1846–49; became secretary of state in 1852, and was elected to the United States Senate in 1853. In 1860, he was the candidate of the Constitutional Union party for vice president.

Everett was one of the foremost orators of his time and with his oration on Washington earned nearly $100,000, which he gave to the purchase of Mt. Vernon. The last of his great orations was delivered at Gettysburg in 1863 at the same time with Lincoln's immortal speech.

Eyck (*īk*), **Hubert** and **Jan** or **John van,** two painters of the old Flemish School, were born at Maeseyck between 1350 and 1400. They resided chiefly at Bruges and Ghent, and became the founders of the Flemish School of Painting. Tradition credits them with the invention of the modern method of oil painting with a drying varnish, with which they were the first to achieve success. With the exception of his work on their greatest painting, the altarpiece at Ghent, nothing by Hubert has been preserved. Among the important works by Jan van Eyck are "St. Ursula," Antwerp Museum; "Salvator Mundi" and "Man with Pinks," Berlin Museum; "Triumph of the Church," Madrid; portrait of John Arnolfini and his wife, London; and a Madonna in the Louvre. Hubert died about 1426 and Jan, about 1441.

Faber (*fā'bĕr*), **Frederick William (1814-1863),** English composer of hymns, was born at Calverley in Yorkshire; was graduated from Balliol College, Oxford; and, in 1837, became a fellow at University College. He came under the influence of Newman and, in 1845, after three years' tenure of the rectory of Elton in Huntingdonshire, he adopted Catholicism. He founded a community of converts at Birmingham—"the Wilfridians," with whom he joined, in 1848, the Oratory of Saint Philip Neri; the next year, a branch under his care was established in London; and, in 1854, he finally located at South Kensington. Faber wrote many theological works; but his fame rests chiefly upon his hymns, which include "O Paradise, O Paradise," "The Pilgrims of the Night," and "The Land Beyond the Sea."

Faber (*fā'bĕr*), **Johann Lothar von (1817-1896),** German manufacturer of lead pencils, was born at Stein, Bavaria, where he became the proprietor of a small lead pencil factory. He enlarged the establishment to international proportions, opening branches in France, Great Britain, and the United States. To the manufacture of lead pencils he added that of other writing and drawing materials. He received a patent of nobility and was made a counsellor of state for his services to German industry.

Fabius (*fā'bĭ-ŭs*), **Maximus Quintus (c. 275 B. C.-203 B. C.),** Roman general, was surnamed Cunctator, "Delayer," because, having in 217 been appointed dictator and intrusted with the defense of Italy against the victorious Hannibal, he pursued a course of cautious and patient generalship, now proverbially known as "Fabian policy." He never risked a general engagement with his opponent, but cut off his enemy's supplies and gradually wore him out, in the end meeting with signal success. Before his appointment to the dictatorship he was five times consul.

Fabre (*fä'br'*), **Jean Henri (1823-1915),** French entomologist, was born at Saint Leons, Aveyron. He became a teacher in the Lycée of Avignon and later professor of physics at the College of Ajaccio. After retiring to Serignan, he produced, 1879–1907, his *Souvenirs entomologiques,* a monumental work on insects in 10 volumes, which was crowned by the French Institute. His books contain some of the most interesting discoveries yet made in the life history of insects and have been widely translated into other languages. The following works of Fabre are available in English: *Insect Life, The Life and Love of the Insect, Social Life in the Insect World, The Life of the Spider,* and *The Life of the Fly.*

Fabricius (*fä-brĭsh'ĭ-ŭs*), or **Fabrizio** (*fä-brēt'syō*), **Hieronymus (1537-1619),** Italian anatomist and surgeon. He was graduated from the University of Padua, where, in addition to the usual instruction in the classics, he studied anatomy and surgery under Fallopius. On the death of the latter in 1562, Fabricius was appointed to fill the vacant professorship. Among his students was William Harvey, who derived from Fabricius' observations on the valves of the veins the first clue to his own discovery of the circulation of the blood. He was a most laborious investigator in comparative anatomy and made comparative studies of the eye, the larynx, the ear, the intestinal canal, the development of the fœtus, and many other subjects. His chief work was his *Opera Chirurgica.*

Fahrenheit (*fä'rĕn-hīt*), **Gabriel Daniel (1686-1736),** German physicist, was born at Danzig. In 1720, he conceived the idea of using quicksilver instead of alcohol in the construction of thermometers, by means of which the accuracy of the instrument was greatly improved. His method of graduating thermometers, known as the Fahrenheit scale, is in general use in the United States, Great Britain, the Netherlands, and other countries.

Fairbairn (*fâr'bârn*), **Sir William (1789-1874),** Scottish engineer, was born at Kelso, Scotland. He was the first to use iron instead of wood in the shafting of cotton mills. He was also among the earliest of iron shipbuilders, and made many improvements in ship construction. Fairbairn built the tubular bridge across the Menai Strait, after a plan of Robert Stephenson's; also the Britannia and Conway bridges, and numerous others. He also devised improvements for steam boilers and other steam machinery by means of the riveting machine. He was knighted in 1869.

Fairbanks, Douglas (1883-1939), American actor, was born at Denver, Colo. He was educated at the Denver High School and at the Colorado School of Mines. He made his first appearance on the regular stage at New York in 1901. Later, he played leading parts in *Frenzied Finance, All for a Girl, A Gentleman from Mississippi, He Comes Up Smiling,* and *Show Shop.* Entering the motion picture drama, he starred in various motion pictures. In 1916, he became the head of his own producing company. His productions include *His Majesty the American, The Three Musketeers, Robin Hood, The Thief of Bagdad,* and *The Taming of the Shrew.*

Fairchild, David Grandison (1869-1954), American botanist and agricultural explorer, was born at East Lansing, Mich. After being graduated from Kansas State Agricultural College, he studied in several European universities and was hired by the United States Department of Agriculture to search for plants which could be advantageously introduced into the United States from abroad. From 1903, he was in charge of foreign explorations, which took him and those under his direction to nearly all parts of the world. Among the most valuable of his importations are dates

and particularly soy beans. The latter, having been introduced from Manchuria, developed into one of the larger and most useful American crops. He wrote *The Book of Monsters, Exploring for Plants,* and *The World Was My Garden.*

Falconer (*fôk'n-ẽr*), **Sir Robert Alexander** (**1867-1943**), Canadian educator, was born at Charlottetown, Prince Edward Island. He was educated at Queen's Royal College, Trinidad, at the universities of London and Edinburgh, and also at Berlin, Leipzig, and Marburg. In 1892, he was ordained a Presbyterian minister. The same year, he began to teach in the Presbyterian College, Halifax, where he became professor of New Testament exegesis in 1895 and principal in 1904. In 1907, he was made president of Toronto University and served until 1932. In 1925, he was special lecturer on American history in British universities. He published *The Truth of the Apostolic Gospel, Idealism in National Character, Citizenship in an Enlarging World, The United States as a Neighbor.*

Fallières (*fäl'yâr'*), **Clément Armand** (**1841-1931**), French statesman, was born near Agen, South France. He received his education at Angoulême and Paris; settled as a barrister at Nerac, of which he became mayor; and was elected to the Chamber of Deputies, 1876. He held many important posts in that body and was elected president of the Senate eight times. He became president of France in 1906, in which capacity he accorded recognition to the working classes by placing Poincaré, Savrien, Clemenceau, and Briand in the same ministry. In 1913, he was succeeded as president by Raymond Poincaré.

Fallopius (*fäl-lō'pĭ-ŭs*), or **Fallopio, Gabriello** (**c. 1523-1562**), Italian anatomist, physician, and naturalist, was born at Modena, where he began his career as an ecclesiastic. He abandoned the priesthood for the pursuit of science, which he studied at Ferrara and Padua. At Pisa, he was for three years professor of anatomy, and afterward he went to Padua to accept the chair of anatomy and surgery and to take charge of the first botanical garden established there. He acquired great fame by being the first to describe the anatomical structure of the fœtus and by his discovery of the function of the oviducts, called after him the Fallopian tubes. *Observationes Anatomicæ* is his principal work. Cuvier characterizes him as one of the three *savants* who restored, rather than created, the science of anatomy in the 16th century, the other two being Vesalius and Eustachius.

Faneuil (*făn"l* or *făn'yĕl*), **Peter** (**1700-1743**), founder of Faneuil Hall, Boston, Mass., was born in New Rochelle, N. Y. He was a rich merchant in Boston and gave to the city a building for a market and town hall. The building was finished just before his death in 1743. It was burned in 1761, and the present hall was built two years later by the town. So many important patriotic meetings were held in Faneuil Hall during the Revolution that it has been called the "cradle of American liberty."

Faraday (*făr'ă-dā*), **Michael** (**1791-1867**), English chemist and physicist, was born near London. He was largely self-educated and, in 1833, became professor of chemistry in the Royal Institution, London, where his lectures attracted the admiring attention of both Europe and America. His manner, his happy illustrations, and his felicitous choice of expression, even in the most abstruse subjects, were such as to charm and attract all classes of hearers. The great work of his life is the series of *Experimental Researches in Electricity,* published in the *Philosophical Transactions.*

Faraday was one of the most brilliant experimentalists in the history of science, and his notable discoveries laid the foundations for many of the most important applications of electricity, as in magneto and dynamo machines and in electrolysis. He was the first to use the terms "anode" and "cathode." He also discovered benzol, the basis of aniline dyes, and was the first to detect the phenomenon known as polarization of light, which establishes a connection between light and electricity. It is related that when he showed Gladstone, prime minister of England, the effect which is basic to the dynamo and electric motor, Gladstone asked him of what value it was. Faraday replied that some day Gladstone might be able to tax it for revenue.

Fargo, William George (**1818-1881**), pioneer American expressman was born at Pompey, N. Y. After working as a grocery clerk, freight agent, express messenger, and resident agent at Buffalo, he organized, with Henry Wells, a carrying company to operate between Buffalo and Western points. The company was later reorganized as the American Express Company, of which Fargo was the first secretary and, from 1868 to 1881, the president. Wells, Fargo and Company was formed in 1851 to carry express between New York and San Francisco by way of the Panama Isthmus. An overland service was also instituted, operated by horses and popularly known as the "pony express." Fargo served as mayor of Buffalo, 1862–66, and was a director of several railroads.

Farley, James Aloysius (**1888-**), American politician and administrator, was born at Grassy Point, N. Y. Rising rapidly as salesman for building materials, he formed a corporation to engage in construction work, in which he was very successful. Franklin D. Roosevelt obtained his aid as campaign manager, which led to Roosevelt's nomination and election to the presidency in 1932. Farley was made postmaster general and continued to head the Democratic National Committee, in which capacity, in 1936, he succeeded in obtaining for his candidate the most sweeping electoral college victory in more than a century. When Roosevelt ran for a third term, Farley disapproved and resigned his post as campaign manager. He resigned later as postmaster general.

Farley, John Murphy (**1842-1918**), Catholic prelate, was born in Newton Hamilton, Ireland. He made his primary studies at Saint McCartan's College, Monaghan, and, after coming to New York, continued his education at Saint John's College, Fordham, and at the Provincial Seminary, Troy. He later studied at the American College, Rome, where he was ordained as priest, 1870. In 1872, he became secretary to Archbishop McCloskey, serving until 1884, when he was made pastor of Saint Gabriel's Church, New York. In 1891, he became vicar-general in the archdiocese of New York; in 1895, was made prothonotary apostolic; and, soon afterward, became assistant bishop. On the death of Archbishop Corrigan in 1902, he was unanimously chosen his successor, and, in 1911, was made cardinal. He did much to promote Catholic education in his diocese, increasing the number of primary and high schools and founding Cathedral College and a preparatory seminary.

Farmer, Fannie Merritt (**1857-1915**), American cookery expert, was born at Boston, Mass. She was graduated in 1889 from the Boston Cooking School, which she served as assistant director and director until she opened her own school, Miss Farmer's School of Cookery, in 1902. Plagued by ill-health much of her life, she lectured while seated in a wheel chair. Called "The Mother of Level Measurements" because of her insistence that recipes be strictly followed, she taught general cooking to housewives and special cooking for the sick and convalescent to nurses. Her famous work, *The Boston Cooking School Cook Book,* first appeared in 1896, and has since been reissued many times.

Farragut (*făr'ă-gŭt*), **David Glasgow** (**1801-1870**), American admiral, was born near Knoxville, Tenn. He entered the navy at nine years of age and first saw action in 1814, when the *Essex,* on which he served, engaged the English ships *Phœbe* and *Cherub.* In 1841, he was raised to the rank of commander and, with his ship, the *Saratoga,* helped to maintain a strict blockade of Tuxpan in the Mexican War.

When his native state seceded from the Union prior to the Civil War, he removed his residence to Hastings upon Hudson and placed his services at the disposal of the Federal government. In 1862, under orders from Porter, he brought a flotilla of ships past the Confederate batteries at New Orleans and destroyed a hostile fleet. In 1863, by controlling the Mississippi River from Vicksburg to Port Hudson, he aided materially in the capture of those strongholds. Finally, in 1864, he succeeded in annihilating a Confederate fleet in Mobile Bay. Congress appointed him vice admiral and later admiral, having created these grades expressly for him. Elected to the American Hall of Fame in 1900.

Farrar (*făr'ăr*), **Frederic William** (**1831-1903**), English clergyman and author, was born in Bombay, India; was educated at London and Cambridge; and was ordained in the Church of England in 1857. He became a master of Harrow and, from 1871 to 1876, was headmaster of Marlborough College. In 1876, he became canon of Westminster; in 1883, archdeacon; and, in 1895, dean of Canterbury. He was one of the most eloquent of English pulpit orators, and he published many works on educational, theological, and other subjects. His *Life of Christ* attained great popularity. Other works from his pen which were widely read include *Seekers After God, Witness of History to Christ, The Silence and the Voices of God, Eternal Hope,* and *Lives of the Fathers.*

Farrar (*făr-ăr'*), **Geraldine** (**1882-**), American dramatic soprano, was born at Melrose, Mass. She began her musical education in Boston and New York and studied further under Trabadello in Paris and Lilli Lehmann in Berlin, where she made her debut at the Royal Opera House as Marguerite in *Faust,* October 1901. She was offered a three years' contract and became one of the favorite singers in grand opera at Berlin. From 1906 to 1922 she was a member of the Metropolitan Opera Company, New York, where she was a leading soprano, creating principal roles in new productions and achieving marked distinction in standard repertoire. In accordance with a previously an-

nounced plan, she retired from opera at 40 and from concert singing at 50. She possesses a voice of unusual beauty, which she uses with great dramatic power.

Farrell, James Thomas (**1904-**), American novelist, was born in Chicago. He attended the University of Chicago for three years and then worked as a clerk, gas station attendant, and newspaper reporter, meanwhile writing in his spare time. His "Studs Lonigan," a series of related novels in part autobiographical, described life in Chicago among families in straitened circumstances. Its force and uncompromising realism brought immediate success. Farrell's later works include *A World I Never Made, Can All This Grandeur Perish, No Star Is Lost,* and *Father and Son.*

Faulkner, William (**1897-1962**), American novelist, was born at New Albany, Miss. After his high school days, he enlisted in the British Royal Air Force, in 1918. Returning to the United States, he attended the University of Mississippi and then was postmaster at University, Miss., 1922–24. From that time he wrote a number of novels, dealing chiefly with "poor whites" of the South, in which powerful use is made of suspense and bizarre incidents to create effects of pity and fear. His principal works include *The Marble Faun, Sanctuary, Light in August, Absalom Absalom!,* and *Wild Palms.* In 1950 he was awarded the Nobel prize in literature for 1949.

Faure (*fôr*), **Jean Baptiste** (**1830-1914**), French baritone singer and composer, was born at Moulins. He entered the Paris Conservatory at the age of 13 and became a chorister at the Madeleine. He made his first professional appearance as a singer at the Opera Comique in 1852 and, in 1861, began a long series of triumphs in grand opera. His best-known compositions are sacred songs, some of which, such as "The Palms," have become widely popular.

Favre (*fȧ'vr'*), **Jules Claude Gabriel** (**1809-1880**), French statesman and orator, was born at Lyons and studied for the bar. He took part in the July revolution of 1830 and thereafter played a prominent role in politics as an uncompromising Republican. After the fall of the Empire in 1870, he was appointed minister of foreign affairs, and, in 1871, settled the terms for the capitulation of the capital. He resigned his office in 1871 in protest at the harshness of the terms imposed by Germany and resumed practice at the bar

Fawcett (*fô'sĕt*), **Henry** (**1833-1884**), English statesman, was born at Salisbury. He was graduated with honors at Cambridge in 1856 and began to read for the bar. In 1858, by an accident, shots from his father's gun entered both of Fawcett's eyes, totally blinding him. His *Manual of Political Economy* led to his election to the chair of political economy at Cambridge in 1863. He was elected to Parliament in 1865. He opposed legislative restrictions upon the industry of women and was a warm supporter of their claims to representation. In 1880, he became postmaster general, in which capacity he introduced the parcel post, postal orders, sixpenny telegrams, and the banking of small savings by means of stamps.

Fawkes (*fôks*), **Guy** or **Guido** (**1570-1606**), English conspirator, was born of a Protestant family in Yorkshire. He became a zealous Roman Catholic at an early age and served in the Spanish army in the Netherlands. On his return to England, he entered into a plot to blow up the king, his ministers, and the members of both houses of Parliament, November 5, 1605. This conspiracy, known as the "gunpowder plot," was discovered when barrels of gunpowder had already been placed in the building and were prepared for ignition. Fawkes was tried, tortured, and publicly executed. Parliament set aside November 5 as a day of thanksgiving known as Guy Fawkes day, which continues to be celebrated in parts of England to the present day

Fechner (*fĕK'nĕr*), **Gustav Theodor** (**1801-1887**), German physicist and psychophysicist, was born at Gross-Sarchen, in lower Lusatia. He became professor of physics at Leipzig, but devoted himself to psychology, formulating Fechner's law, according to which sensations increasing in arithmetical progression require stimuli whose intensities increase in geometric progression.

Fénelon (*fā'n'-lôN'*), **François de Salignac de la Mothe** (**1651-1715**), French preacher and author, was born at the Château de Fenelo , in Perigord, France. As a preacher, he was remarkable for his persuasive eloquence; as a writer, he was distinguished for his tender and mystic devotion and for the purity of his style. He was, for some years, tutor to the grandson of Louis XIV, for whom he composed several works, among them a preliminary sketch of his best-known work, *Telemachus.* In 1695, he became archbishop of Cambrai. His *Maxims of the Saints* was strongly denounced by his great contemporary Bossuet and was condemned by Pope Innocent XII on account of its tendency to mysticism. As a man, Fenelon was distinguished for the simplicity of his character and for his Christian piety and charity.

Fenner, Mildred S. (**1910-**), journalist and educator, was born at Huntsville, Mo. She was educated at the Northwest Missouri State Teachers College and at George Washington University. Beginning as a staff assistant, she advanced to her present position as editor of the *N.E.A. Journal.* She is co-author (with Eleanor Fishburn) of *Pioneer American Educators.*

Ferber, Edna (**1887-**), American writer, was born at Kalamazoo, Mich., of Jewish parentage. At 17, she began writing as reporter on the Appleton *Daily Crescent* and was later employed on the Milwaukee *Journal* and the Chicago *Tribune.* She then took up short story writing. She produced *Dawn O'Hara* in 1911, followed by *Buttered Side Down, Personality Plus, Half Portions,* and *The Girls.* Her first successful novel, *So Big,* won a Pulitzer prize award in 1925. *Show Boat* and *Cimmaron* followed, both being highly successful not only as novels but in dramatized form.

Ferdinand I (**?-1065**), the Great, king of Castile and Leon, was the first king of Castile, to which he added by seizure the principality of Leon. By victories over the Moors, he began the reconquest of Spain and extended the Christian frontiers to the Mondego. He also reduced to vassalage the rulers of Toledo, Saragossa, and Seville. He assumed the title of Emperor of Spain in 1056, thus challenging the claimed authority of the German emperor and the pope over the peninsula.

Ferdinand I (**1503-1564**), emperor of Germany, son of Philip I of Spain and younger brother of Charles V of Germany. On the death of his grandfather Maximilian, he received the archduchy of Austria and the other German possessions of the House of Habsburg. He succeeded his brother-in-law Louis II of Bohemia and Hungary, and waged a long and bloody war with Zapolya for the possession of Hungary, only partly succeeding. During this period, Ferdinand acted in Germany as agent of Charles V, who turned over to him the empire in 1556, although not abdicating until 1558. Ferdinand negotiated the Peace of Augsburg between Lutherans and Catholics, under which each ruler might determine the affiliation of his subjects.

Ferdinand II (**1578-1637**), emperor of Germany, was a grandson of Ferdinand I. Educated by the Jesuits, he was a devout Catholic and enforced a Catholic policy in Hungary and Bohemia, of which he became king in 1617 and 1618 respectively. Chosen emperor in 1619, he was faced by a revolt of the nobles in Bohemia because of his Catholic policy. This revolt began the Thirty Years' War, in which Ferdinand's generals Tilly and Wallenstein won signal victories. The successful leadership of the Protestant cause by Gustavus Adolphus of Sweden made the crushing of the Protestant cause in the North impossible, and Ferdinand made peace in 1635.

Ferdinand V of Castile (**1452-1516**), surnamed the Catholic, son of John II, succeeded his father on the throne of Aragon and Sicily in 1479. In 1469, he was married to Isabella, sister of Henry IV of Castile, and, in 1474, became, through her, king of Castile, Isabella sharing with him the royal dignity. The reign of Ferdinand and Isabella was signalized by the discovery of America by Columbus, the conquest of Granada from the Moors, and the expulsion of the Jews from Spain. Ferdinand died in 1516, Isabella having died 12 years before him.

Fergusson, James (**1808-1886**), Scottish historian of architecture, was born at Ayr. After ten years as an indigo planter in Bengal, he extensively explored India, studying the rock temples, which were illustrated in his earliest works. His *History of Architecture* appeared first as a handbook in 1855. Besides works on fortification, he also published *The Palaces of Nineveh and Persepolis Restored, Tree and Serpent Worship,* and *Rude Stone Monuments in All Countries.* He died at London.

Fermi, Enrico (**1901-1954**), physicist, was born at Rome, Italy, and was educated at the University of Pisa. For twelve years he was professor of theoretical physics at the University of Rome. The quality of his work here earned him a Nobel Prize award in 1938. In the following year he was appointed professor of physics at Columbia University, from which position he was called, in 1942, to become physicist for the Manhattan Project. He was largely responsible for the successful demonstration of atomic fission at the University of Chicago and for the equally successful test explosion at Los Alamos, New Mexico, which prepared the way for the A-bombs used at Hiroshima and Nagasaki.

Ferreira (*fĕr-rĕ'ê-rä*), **Antonio** (**1528-1569**), Portuguese poet, was born at Lisbon. He was educated for the law, but devoted his attention mainly to literature. He was a professor at the University of Coimbra and won great celebrity by his *Castro,* the earliest Portuguese tragedy and the second regular tragedy produced after the revival of letters in Europe, being preceded only by Trissino's

Sophonisba. Writing in the vernacular, he exercised a great influence on the Portuguese as a literary language. In style he emulated the Roman poet Horace.

Ferrero (*fĕr-rā'rō*), **Guglielmo** (**1872-1942**), Italian historian, was born near Naples. He lectured at Milan on militarism and in the College de France, Paris, on Roman history. While in Paris he received the cross of the Legion of Honor. He traveled extensively in Europe and America and was known in the latter for his acute observations on American manners and institutions. In 1930 he was made professor of modern history at Geneva University. His publications include *Symbols, The Greatness and Decline of Rome, Between Two Worlds, Ancient Rome and Modern America, The Women of the Cæsars, Four Years of Fascism*, and *The Principles of Power*. His Italian books were condemned and seized in 1935 by the Italian government.

Fessenden (*fĕs'ĕn-dĕn*), **William Pitt** (**1806-1869**), American statesman, was born at Boscawen, N. H. He was graduated at Bowdoin College in 1823, was admitted to the bar in 1827, and settled in Portland, Me. He entered Congress in 1841, serving one term; was United States senator, 1854–64; was secretary of the treasury, 1864–65; and was again United States senator, 1865–69. He was one of the founders of the Republican party, distinguished himself as a debater in the Senate, and ranked among the leading lawyers of his time.

Feuchtwanger (*foiкt'väng'ĕr*), **Lion** (**1884-1958**), German novelist, was born at Munich. Educated at Berlin and Munich universities, he served in the German army during World War I, where his experiences and observations led to the writing of *Prisoners of War* in 1918. Ten years later appeared the first of a number of novels which dealt in forceful fashion with the social and national problems which were later to explode in revolutionary movements and general warfare in the late 1930's. They include. *Success, Power, The Jew of Rome, The Pretender*, and *The Paris Gazette*. Anticipating the storm of criticism in Germany which later broke over his works, he removed to France from where he escaped to America in 1940 with the aid of American friends.

Fichte (*fĭĸ'tĕ*), **Johann Gottlieg** (**1762-1814**), German philosopher, was born at Rammenau, in upper Lusatia. He studied at Jena and supported himself in a precarious way as tutor. In 1791, he went to Königsberg, where he became an ardent disciple of Kant. Here he wrote, in 1792, his *Tentative Critique of All Revelation*, whose favorable notice by Kant did much to make Fichte's reputation. In 1794, he was appointed to the chair of philosophy at Jena, where he expounded with extraordinary zeal a system of transcendental idealism.

In 1799, Fichte removed to Berlin. In 1800 appeared his *Vocation of Man*. In 1805, he obtained the chair of philosophy at Erlangen. The victories of Napoleon at Auerstadt and Jena drew forth the patriotic *Addresses to the German Nation*, which served as inspiration later not only to the revolutionists of 1848 but to the nationalists of 1871. The Prussian king requested him to draw up a constitution for the newly founded Berlin University. He was its first rector.

Fiedler, Arthur (**1894-**), American conductor. After studying violin, piano, chamber music, and conducting at the Royal Academy of Music, Berlin, he made his concert debut at the age of seventeen. On joining the Boston Symphony Orchestra in 1915 as a violinist, he became the youngest member of that organization. Since 1930 he has conducted the famous Boston Symphony "Pops" concerts. His recordings and broadcasts of these have won him wide popularity in America and Europe. As a guest conductor, he has appeared with the leading orchestras of the United States.

Field, Adelaide A. (**1916-**), journalist, was born at Memphis, Tennessee. A graduate of Radcliffe College, she worked on the editorial staff of *Life*, then edited *The Junior League Magazine*. Since 1951 she has been editor of *Child Life*.

Field, Cyrus West (**1819-1892**), American merchant and promoter, was born at Stockbridge, Mass., brother of David Dudley Field. He began commercial life as a clerk in New York, but soon developed a prosperous merchandising business of his own. Being joined in 1854 by Peter Cooper, Moses Taylor, and other American capitalists, he organized companies to span the Atlantic Ocean with a telegraph cable. After five attempts, the first cable was laid, but it snapped after two weeks. In 1866, eight years after the first failure, a permanent cable was established. He was rewarded by a gold medal from Congress. See *Cable, Submarine*.

Field, David Dudley (**1805-1894**), American jurist, was born at Haddam, Conn., brother of Cyrus W. Field. He was graduated at Williams College, 1825, studied law, and was admitted to the bar in 1828. He settled in New York, and soon made his way into the front rank of his profession. In 1847, he was appointed by the legislature of New York one of a commission to reform the legal practice of the state. In this work he was engaged for nearly a quarter of a century, at the same time carrying on a large professional practice. In 1866, he brought before the British association for social science a proposition to frame an international code. This led to the preparation of his *Draft Outlines of an International Code*, one feature of which was the principle of arbitration to settle disputes between nations.

Field, Eugene (**1850-1895**), American poet and journalist, was born at Saint Louis, Mo. He removed to New England, but was educated later in Missouri. At 23, he entered journalism and 10 years later became editor of the "Sharps and Flats" column of the Chicago *Daily News*. His humorous sayings therein during the following decade established his reputation in newspaper work. He was an author and poet of rare sympathy. His poems of childhood, which exhibit unusual qualities of appreciation and power of expression, gained for him the title "the child's poet." They include "Little Boy Blue" and "Wynken, Blynken and Nod." Among his books are *Culture's Garland, Love Affairs of a Bibliomaniac, Echoes from the Sabine Farm* (with his brother R. M. Field), and *Poems of Childhood*.

Field, Marshall (**1835-1906**), American merchant, was born at Conway, Mass. He spent his boyhood on a farm; studied at an academy until 1852; and was a dry goods clerk at Pittsfield, Mass., 1852–56, and Chicago, 1856–60. He was junior partner, 1860–65, then senior partner in the firm which became, 1865, Field, Palmer, and Leiter. Potter Palmer retired in 1867 and Levi Z. Leiter in 1881, Field then becoming head of Marshall Field and Company, which under his management became the largest wholesale and retail dry goods business in the world. He founded with a gift of $1,000,000 the Field Museum of Chicago, to which he bequeathed the further sum of $8,000,000. He also gave to the University of Chicago money and land to the amount of $400,000. He left an immense fortune.

Field, Stephen Johnson (**1816-1899**), American jurist, was born at Haddam, Conn., brother of David Dudley Field and Cyrus W. Field. He was graduated at Williams College in 1837, studied law, and began practice in New York. In 1849, he went to California and took up legal practice at Marysville. In 1857, he was elected judge of the State Supreme Court, of which he was made chief justice in 1859. In 1863, he was appointed associate justice of the United States Supreme Court, and served with marked usefulness and distinction for 34 years, a period of service equaled only by that of John Marshall, Joseph Story, and John Marshall Harlan.

Fielding, Henry (**1707-1754**), English novelist, often called the father of the modern novel, was born near Glastonbury, England. He was educated at Eton and at the University of Leiden. On his return from Leiden he began writing for the stage and, for ten years, was a prolific play writer. In 1737, he entered as a student of the Middle Temple, and, in 1740, was called to the bar; but, his new profession not proving remunerative, he returned to literature. Fielding's literary reputation rests upon four noted novels: *Joseph Andrews, Jonathan Wild, Tom Jones*, and *Amelia*. His novels, embodying his theory that "the novel is a comic epic in prose," are instinct with satire. They depict common-life characters, abound in picaresque adventure, and afford an invaluable picture of society at that time.

Fields, Gracie (**1898-**), English singer and comedienne, was born at Rochdale, Lancashire, England, where as a young girl she began work in a cotton mill, but was fired for wasting time entertaining the other girls. At fifteen she got her first job in a music hall. She made a name for herself in a revue, *Mr. Tower of London*, and was then starred in *By Request* (1925–27). Since then she has enjoyed great popularity, repeating her stage success on radio, screen, and television in England and America. Among her best known comic songs are "The Biggest Aspidistra in the World," and "Turn Herbert's Face to the Wall, Mother." Her home is in Capri.

Fiesole (*fyĕ'zō-lā*), **Fra Giovannida.** See *Angelico, Fra*.

Fillmore, Millard (**1800-1874**), American statesman, 13th president of the United States, was born in Summerhill, N. Y. He was apprenticed to a wool carder, but became a clerk in a judge's office; removed to Buffalo, N. Y.; and, in 1823, was admitted to the bar. He entered Congress in 1832, was appointed chairman of the committee of ways and means in 1840, and was author of the Tariff Act of 1842. He became comptroller of the state of New York in 1847, was elected vice president of the United States in 1848, and succeeded to the presidency on the death of Zachary Taylor in 1850. Diplomatic relations with Japan were established for the first time during his administration. By signing the act for the surrender of fugitive slaves

Fillmore brought about the utter defeat of the Whig party in 1852. In 1856, he was nominated for the presidency by the American, or Know-Nothing, party, but received only the electoral vote of Maryland. He died at Buffalo.

Finley, John Huston (1863-1940), American educator, was born at Grand Ridge, Ill. He was graduated at Knox College in 1887 and pursued postgraduate study at Johns Hopkins, 1887–89. He was secretary of the State Charities Aid Organization, New York, 1889–92; president of Knox College, 1892–99; editor of *Harper's Weekly* and *McClure's Magazine*, 1899–1900; professor of politics, Princeton, 1900–03; and president of the College of the City of New York, 1903–13. From 1913 to 1921, he was commissioner of education for New York State. In 1921, he became an editorial writer on the New York *Times*. With Richard T. Ely he wrote *Taxation in American States and Cities*. His writings include also *The French in the Heart of America*, *The Life of Grover Cleveland*, *French Schools in War Time*, and *A Pilgrim in Palestine*. He was elected to the American Academy of Arts and Letters in 1927.

Finsen (*fĭn'sĕn*), **Niels Ryberg (1860-1904),** Danish physician and inventor, was born in Thorshavn, Faroe Islands. He received his early education at Reykjavik, Iceland, studying later at the University of Copenhagen, from which he was graduated in medicine in 1890 and in which he subsequently became demonstrator in anatomy. After much research he demonstrated that the effects of light upon the body are due to the chemical, or violet and ultraviolet, rays. By filtering the light of the room through red glass, he shut off the chemical rays from smallpox patients with the result that the vesicles did not suppurate and scars and pitting were avoided.

Finsen found also that the chemical, or actinic, rays could be used to cure skin diseases, particularly lupus, or tuberculosis of the skin. The Light Institute established under his supervision in 1896 met with such success that Finsen institutes were soon established in other countries. He wrote *Chemical Rays and Variola* and *Phototherapy*. He was awarded, in 1903, the Nobel prize for medicine. He died in Copenhagen.

Firdousi (*fĕr-dōō'sē*), **(c.935-c.1020),** pseudonym of Abu'l Qasim Mansur, the greatest epic poet of Persia (Iran), was born near Tus, in Khorassan. He spent 30 years in writing the *Shah Nama* , or *Book of Kings*, a national epic, but, having received for his monumental literary labors only a meager reward from Sultan Mahmud, he gave vent to bitter satire against his royal master and fled from the court. For some time he led a wandering life until at length he returned to his birthplace, where he died.

Fischer, Ernst Kuno Berthold (1824-1907), German historian of philosophy, was born at Sandewalde, Silesia. After being graduated from Halle, he went to Heidelberg and established himself as a private lecturer. He was eminently successful, but, in 1853, he was deprived of his lectureship by the government, probably on account of the alleged pantheistic trend of his teaching. In 1856, however, he was elected to the chair of philosophy in Jena and, 16 years later, was called back to Heidelberg as Zeller's successor. His philosophical viewpoint is essentially Hegelian, and his chief work is a *History of Modern Philosophy*, which is one of the most authoritative works of its kind.

Fish, Hamilton (1808-1893), American statesman and diplomat, was born at New York. He was graduated at Columbia in 1827 and was admitted to the bar in 1830. He was elected congressman in 1842, lieutenant governor of the state in 1847, governor in 1848, and, in 1851, United States senator. As secretary of state under Grant from 1869 to 1877, he signed the Washington Treaty of 1871 and completed the settlement of the Alabama Question. See *Alabama Claims*.

Fisher, Dorothy Canfield (1879-1958), American author, was born at Lawrence, Kans. She was graduated from the Ohio State University, 1899, and received the degree of doctor of philosophy at Columbia, 1904. She studied and traveled extensively in Europe and, after serving three years as secretary of the Horace Mann School, devoted herself to writing. In 1907, she married John Redwood Fisher of New York. Beginning with *The Squirrel Cage* in 1912, she wrote more than a score of novels and books having an educational purpose. The novels *Hillsboro People* and *Raw Material* have a rural Vermont setting. *Home Fires In France* reflects three years of war work in France. *Why Stop Learning?* is one of the first books on adult education. Her other works include *Her Son's Wife*, *Fables for Parents*, and *Seasoned Timber*.

Fisher, Geoffrey Francis (1887-), English churchman, was born at Nuneaton, Warwickshire. Graduating with honors from Oxford, he taught at Marlborough College and Repton School from 1911 to 1932, when he was appointed bishop of Chester. He served as bishop of London from 1939 to 1945, when he was nominated archbishop of Canterbury. He favored social reforms and worked for interdenominational cooperation.

Fisher, Harrison (1877-1934), American illustrator, was born in Brooklyn, N. Y. He was educated in San Francisco, and at an early age evinced fine capabilities in drawing and illustration. He illustrated *The Market Place*, by Harold Frederic; *Three Men on Wheels*, by Jerome K. Jerome; *The Eagle's Heart*, by Hamlin Garland; and other books. Much of his work has appeared also in the *Saturday Evening Post*, *McClure's Magazine*, *Life*, *Puck*, *Ladies' Home Journal*, *Scribner's* and the *Cosmopolitan*. He became widely popular for his type of the "American girl." In 1907, he published *The Harrison Fisher Book*, a collection of drawings.

Fisher, Irving (1867-1947), American political economist, was born at Saugerties, N. Y. He was graduated at Yale, 1888; received the degree of doctor of philosophy, 1891; and studied at Berlin and Paris, 1893–94. He became an instructor in mathematics and later in political economy, Yale University, in which, in 1898, he was made professor of political economy. From 1896 to 1910, he was editor of the *Yale Review*. His published writings include *The Nature of Capital and Income*, *The Rate of Interest*, *Elementary Principles of Economics*. His *Stabilizing the Dollar* is an exposition of his proposal to vary the gold content of the dollar according to the fluctuations in a standard commodity price index, thereby keeping the purchasing power of money constant.

Fiske, Bradley Allen (1854-1942), American naval officer and inventor, was born at Lyons, N. Y. He entered the United States navy in 1870 and was made rear admiral in 1911. He distinguished himself at the battle of Manila, 1898. Of his naval inventions the most important is the naval telescope sight, which revolutionized naval gunnery. He obtained also the basic patent for the wireless controlled torpedo. His writings include *Electricity in Theory and Practice*, *War Times in Manila*, *The Navy as a Fighting Machine*, *From Midshipman to Rear Admiral*, and *The Art of Fighting*.

Fiske, Harrison Grey (1861-1942), American editor, dramatic manager, and playwright, was born at Harrison, N. Y. He was educated in private schools and spent two years in New York University. In 1890, he married Minnie Maddern, the actress. He was editorial writer and dramatic critic on the Jersey City *Argus*, and later on the New York *Star*. In 1879, he became contributor to the New York *Dramatic Mirror*, of which he later was proprietor and editor until 1911. He acted as manager for Mrs. Fiske, the Manhattan Company and others, producing over 140 plays. He wrote the plays *Hester Crewe*, *The Privateer*, and *A White Pink*.

Fiske, John (1842-1901), American philosopher and historian, whose original name was Edmund Fiske Green, was born at Hartford, Conn. He was graduated from Harvard in 1863 and from Harvard Law School in 1865. From 1869 to 1871, he was lecturer on philosophy at Harvard, and assistant librarian, 1872–79. In his earlier career, he lectured and wrote extensively to popularize Darwin's theory of evolution, which he held to be compatible with religion. His *Cosmic Philosophy* is an expansion of Herbert Spencer, and in *The Destiny of Man* he defended spiritual religion.

Fiske's later career was devoted to popularizing American history, to which end his lucid st le and dramatic imagination contributed. His published works in this field include *Discovery of America*, *The Beginnings of New England*, *The War of Independence*, *Dutch and Quaker Colonies in America*, *New France and New England*, and *The Mississippi Valley in the Civil War*.

Fiske, Minnie Maddern (1865-1932), American actress, was born in New Orleans, La., of theatrical parents She appeared in child's parts when 3 years old; at 12 was alternately playing leading roles and old women's parts, and at 15 became a star under the name of Minnie Maddern. In 1890 she retired for a period of study and married Harrison Grey Fiske, journalist and playwright, in whose *Hester Crewe* she returned to the stage in 1894.

She afterward appeared in *A Doll's House*, *Tess of the D' Urbervilles*, *A Bit of Old Chelsea*, *Little Italy*, *Frou Frou*, and other plays with increasing success. In 1899, she won distinction by her *Becky Sharp*, regarded as her greatest achievement. In 1901, she opened the Manhattan Theater as an independent playhouse. Here she produced *Leah Kleshna*, *Rosemersholm*, *The Pillars of Society*, *Hanneles Himmelfahrt*, and other plays, appearing in leading roles. She did much to popularize Ibsen's dramatic works in America.

Fitch, John (1743-1798), American inventor, was born at Windsor, Conn. He received a common school education, was a sailor for a brief period, and during the Revolution was a sutler with the American army, realizing extensive profits. In 1785, he completed a model steamboat with wheels at the sides. He built and operated three steam-driven ships on the Delaware River in 1787–90, having secured exclusive operating rights in several states. In 1793,

he went to France, to find hopes of financial assistance frustrated by the Revolution. Penniless, Fitch worked his passage back to America, and, disheartened by further reverses, poisoned himself.

Fitch, William Clyde (1865-1909), American dramatist, was born in New York, and was graduated from Amherst College, 1886. He immediately began writing poems, short stories, and sketches. In 1890, he commenced his dramatic career with *Beau Brummell,* written for Richard Mansfield, and soon arose to distinction. With Bronson Howard, Augustus Thomas, and William Vaughn Moody, he ranks among the foremost American dramatists of his time. He wrote about 40 plays, of which the best-known are *Nathan Hale, Barbara Frietchie, The Climbers, The Stubbornness of Geraldine, The Girl with the Green Eyes, Her Own Way, The Woman in the Case, The Truth, The Straight Road,* and *The City.* He died at Châlon sur Marne. See *Truth, The.*

Fitzgerald, Edward (1809-1883), English poet and translator, was born at Woodbridge, in Suffolk. In 1826, he entered Trinity College, Cambridge, where he took his degree in 1830. With the exception of periodical visits to London, he led a quiet country life, his chief amusements being gardening and yachting. In 1851, he published anonymously his *Euphranor,* which was followed in 1852 by *Polonius.* In 1853, the first of his noted translations, *Six Dramas of Calderón,* appeared. About this time he took up Persian and, in 1856, published an anonymous version of Jami's *Salaman and Absal.* In 1859 appeared his famous version of the *Rubaiyat.* The quatrains of Omar Khayyam were then little known, but Fitzgerald at once recognized their beauty, and his and Omar's names remain indissolubly linked together through his exquisite rendering of them.

Fitzgerald, F. Scott (1896-1940), American novelist, was born at St. Paul, Minn. He attended Princeton, where he was a close friend of the critic Edmund Wilson and the poet John Peale Bishop. He served as a staff officer in World War I. After an unsuccessful stint at writing advertising copy in New York City, Fitzgerald went to Minneapolis. He was despondent at being separated from his fiancee in Alabama, and he turned to writing. Though his novels, *This Side of Paradise* (1920) and *The Beautiful and Damned* (1922), reveal narrative power and a gift for irony, they are only spottily interesting today. But, in the early 1920's, they offered identity and a promise of romance to a young generation. Royalties poured in on Fitzgerald; he recaptured his fiancee, and began a peripatetic and often riotous life, divided between the United States and Europe. He wrote numerous short stories, most of which appeared in the *Saturday Evening Post.* In the early 1930's, Fitzgerald suffered a popular decline that coincided, paradoxically, with a great maturing of his powers as a novelist. *The Great Gatsby* (1925) is a masterpiece of swift, graceful narrative, and humor; *Tender Is the Night* (1934) is a powerful story of almost painful insight. Neither was successful until they were revived after World War II. Fitzgerald died of a heart attack in Hollywood in 1940. He was at work on *The Last Tycoon* (1941), a story of the motion picture industry. The unfinished chapters, together with the elaborate and interesting framework Fitzgerald had planned for the novel, were later published. Fitzgerald's essays, letters, and notebooks were edited by his friend Edmund Wilson and published as *The Crack Up* (1945).

Flagg, Ernest (1857-1947), American architect, was born at Brooklyn, N. Y. After preparing for his profession at the Ecole des Beaux-Arts, Paris, he began practice as an architect in New York City in 1891 and soon attained prominence. Notable buildings designed by him include Saint Luke's Hospital and the Singer Building, New York; Corcoran Gallery of Art, Washington; and the United States Naval Academy, Annapolis, Md. The tower of the Singer Building, 612 feet high, designed in modern French style of architecture, was the highest commercial structure in America at the time it was erected in 1908. His *Economic Design and Construction of Small Houses* contains important contributions to the problem of low-cost housing.

Flagg, James Montgomery (1877-1960), American illustrator, portrait painter, and writer, was born at Pelham Manor, N. Y. He studied at the Art Students' League, New York; also in England and in Paris. He published his first drawing in *Life* at the age of 14 and soon attained prominence as an illustrator for various magazines. His work is characterized by keen observation, marked technical ability, and never-failing humor, showing equal skill in charcoal, crayon, pen and ink, and oils. Among his best portraits is that of Mark Twain in the Lotos Club, New York. Among the volumes of prose and verse written and illustrated by him are *Tomfoolery, If: A Guide to Bad Manners, Why They Married, All in the Same Boat, City People, I Should Say So, The Mystery of the Hated Man,* and an autobiography, *Roses and Buckshot.*

Flagstad, Kirsten (1895-1962), Norwegian singer, was born at Hamar. She began voice training at the age of 16 and made her debut two years later as Nuri in *Tiefland* at the National Theater in Oslo. She appeared in various cities of northern Europe during the next 22 years and then, in 1935, made her debut at the Metropolitan Opera House as Sieglinde in Wagner's *Walküre.* Her success was immediate and led to concert tours through the principal cities of America, Europe, and Australia. Her rich soprano voice, used with great dramatic power, was at its best in the interpretation of Wagnerian operas. She married Sigurd Hall in 1919 and Henry Johansen in 1930.

Flammarion (*flà'mà'rê-ôN'*), **Camille (1842-1925),** French astronomer and writer, was born at Montigny le Roi. He was educated at Langres, the Paris Observatory, and the Sorbonne, Paris. Among his many contributions to astronomical science are *The Plurality of Inhabited Worlds, Celestial Marvels, The Atmosphere, The Lands of the Heavens, The Planet Mars, Popular Astronomy, The End of the World,* and *The Unknown.* He also wrote several astronomical and spiritualist romances. As an astronomer he did important work on double and multiple stars and on the physical constitution of Mars and of the moon.

Flamsteed (*flăm'stēd*), **John (1646-1719),** English astronomer, was born at Denby, near Derby. His success in mathematics and astronomy procured for him the appointment of astronomer to the king in 1675. The following year, Greenwich Observatory was built, and Flamsteed began there the observations that mark the rise of modern practical astronomy. He formed the first trustworthy catalogue of the fixed stars and furnished those observations by which Newton verified his lunar theory. His great work is *Historia Cœlestis Britannica,* an account of astronomical observation.

Flanagan, John (1865-1952), American sculptor, was born at Newark, N. J. He was a pupil of Augustus Saint-Gaudens, New York, and of Henry Chapu and Alexandre Falguière, Ecole des Beaux-Arts, Paris. He executed the monumental clock in the Library of Congress, Washington; the statue of Joseph Henry at Albany, N. Y.; the decorative groups for the Saint Louis Exposition; the tinted marble relief "Aphrodite" in the Knickerbocker Hotel, New York; the design for the Verdun medal, presented by President Harding to the French city of Verdun; and various works now in the Metropolitan Museum, New York, and the Luxembourg, Paris.

Flaubert (*flō'bâr'*), **Gustave (1821-1880),** French novelist, was born at Rouen. After long hesitation between medicine and literature, he chose literature, beginning with poetry, which he soon gave up for prose. He possessed means which enabled him to write at leisure. Being highly neurotic and possessed by a hatred of "middle class smugness," he lived largely in seclusion near Rouen. Here he produced, by devoting several years to the writing of each, a series of novels which are masterpieces of literary style and artistic precision.

His work formed the connecting link between the romantic and the realistic school of fiction and profoundly influenced the writings of French novelists for a generation. As a literary exponent of art for art's sake, he imbued his famous godson and pupil, Guy de Maupassant, with his own spirit and ideals. His works include *Madame Bovary, Salammbô, L'Education sentimentale, La tentation de St.-Antoine,* and *Bouvard et Pécuchet.*

Flaxman, John (1755-1826), English sculptor, was born at York. He worked in the pottery of Josiah Wedgwood and was associated with the poet William Blake. He studied at Rome from 1787 to 1794. In 1800 he was elected to the Royal Academy, in which he was made professor of sculpture in 1810. His best known sculptures are the monuments to the poet Collins at Chichester, to Lord Mansfield in Westminster Abbey, and to the Baring family at Micheldeaver Church, Hampshire. He produced outline illustrations of Homer, Æschylus, and Dante, and also of scriptural scenes.

Fleming, Sir Alexander (1881-1955), British physician and discoverer of penicillin. He served as professor of bacteriology in the University of London, St. Mary's Hospital Medical School. In 1929 an accidental observation of the effect of a certain mold, *penicillium notatum,* on cultures of bacteria, led him to develop a method by which an extract of this mold, penicillin, could be used to destroy malignant bacteria, leaving other bacteria unharmed. Later researches at Oxford showed that other molds had similar properties. Extracts of the penicillin group have been successfully used in the treatment of syphilis and of surface wounds. He was knighted in 1944. He received one-half the Nobel prize in medicine, 1945.

Fleming, Sir Sandford (1827-1915), Canadian civil engineer and scientist, was born in Scotland. He removed to Canada in 1845 and built up an extensive practice as chief engineer of railways and other public works; constructed the Intercolonial Railway through the provinces

of Nova Scotia, New Brunswick, and Quebec; was engineer in chief of the Canadian Pacific Railway, 1871–80, exploring and locating the route across the continent; and, for many years, took an active interest in the movement for establishing the Pacific cable and a Pan-Britannic telegraph service encircling the globe.

In 1880, Fleming began advocating the adoption of a universal time system for railway schedules, and his system, which was approved by international action in Washington in 1884, has been widely adopted throughout the world. In 1880, he was made chancellor of Queen's University, Kingston, and he was knighted in 1897. See *Standard Time*.

Flemming, Arthur S. (**1905-**), American educator, was born at Kingston, New York. He received his education at the Ohio Wesleyan and American universities. For a time he was a writer for the *U. S. Daily* and he also edited *Uncle Sam's Diary*, a weekly current events paper for high school students. He was a member of the U. S. Civil Service Commission from 1939 to 1948, when he became president of Ohio Wesleyan University During leaves of absence he has served the U. S. government as a member of the Manpower Survey Board and as chairman of the Defense Mobilization Board. In 1958 he was appointed Secretary of Health, Education, and Welfare to succeed Marion Folsom, resigned. Since 1961 he has been president of the University of Oregon.

Fletcher, John (**1579-1625**), English dramatist, whose name is inseparably associated with that of his friend and co-worker, Francis Beaumont, was born at Rye, in Sussex. He was educated with Beaumont at Cambridge, and there began the intimacy that led to their future collaborations. It is said that Beaumont supplied the judgment and Fletcher the fancy for the plays, nearly 50 in number, which they produced jointly. The chief piece largely of Fletcher's own unaided composition is a dramatic pastoral entitled *The Faithful Shepherdess*. Others of their joint authorship include *Philaster* and *The Maid's Tragedy*. Fletcher is now believed to have written portions of Shakespeare's *Henry VIII*, and Shakespeare is thought to have assisted Fletcher in writing *The Two Noble Kinsmen*.

Fletcher, John Gould (**1886-1950**), American poet, was born at Little Rock, Ark. After being graduated from Harvard College, he went to Europe in 1908 as a literary expatriate who believed that American materialism stifled culture. He actively participated in the imagist group of poets in England and France, publishing in England a number of volumes of verse, including *Fire and Wine*, *Goblins and Pagodas*, and *The Two Frontiers*.

Convinced by reading Spengler's *Decline of the West* that he had been mistaken in turning his back on America, he returned and, in 1936, published *The Epic of Arkansas*. On the basis of his *Selected Poems* and other works he was awarded the Pulitzer prize for poetry in 1939.

Fleury (*flü'rē'*), **Claude** (**1640-1723**), French Church historian, was born at Paris; was tutor to various princes, prior of Argenteuil, and confessor to young Louis XV. Among his numerous works were *Mœurs des Israelites*, *Mœurs des Chrétiens*, *Droit ecclésiastique*, and the great *Histoire ecclésiastique*,—the first complete church history,—on which he labored 30 years. Fleury's own work brought the history to the year 1414, but it was continued by other writers to the year 1768.

Flexner, Abraham (**1866-1959**), American educationist, was born at Louisville, Ky., and was educated at Johns Hopkins, Harvard, and the University of Berlin. He taught high school until 1886, then was employed by the Carnegie Foundation for the Advancement of Teaching; and, from 1912 until 1928, was associated with the General Education Board as adviser on distribution of funds for research. He wrote, among other works, *The American College*, *Prostitution in Europe*, *A Modern College*, *Do Americans Really Value Education?*, *Universities—American, English, German*, and *I Remember*, an autobiography.

Flinders (*flĭn'dĕrz*), **Matthew** (**1774-1814**), English navigator and hydrographer, was born at Donington, Lincolnshire. His first knowledge of geometry and navigation was acquired without regular schooling, and, in 1789, he entered the navy as a midshipman. In 1795, he sailed with the *Reliance* to Australia, where he spent five years in geographical explorations and coast surveys.

Returning to England, he was placed in command of the *Investigator* with instructions to complete the coastal survey of Australia, where he devoted two years to mapping the coast line from Cape Leeuwin to the Gulf of Carpentaria. On his return to England, he unfortunately stopped at Mauritius, where he was detained as a prisoner by the French for nearly seven years. Reaching England broken in health, he lived but a short time after completing his account of his discoveries under the title *A Voyage to Terra Australia*. His monumental survey is still the foundation of modern Australian coast charts.

Flint, Austin (**1836-1915**), American physician and physiologist, was born in Northampton, Mass. He was brought to Buffalo in infancy and was educated at Harvard, the University of Louisville, and Jefferson Medical College. He practiced in Buffalo and lectured at the University of Buffalo prior to 1859, and was later connected successively with New York Medical College, New Orleans School of Medicine, Bellevue Hospital Medical College, and Cornell University Medical College. He assisted in establishing the glycogenic function of the liver and determined the nature of cholesterin and stercorin. His publications include *Physiology of Man*, *Physiological Effects of Severe and Prolonged Muscular Strain*, and *Source of Muscular Power*.

Flint, Charles Wesley (**1878-**), preacher and educator, was born at Stouffville, Ont. He was graduated at the University of Toronto, Drew theological seminary, and Columbia University. He entered the ministry of the Methodist Episcopal Church in 1900 and, for 15 years, occupied important pastorates. In 1915, he became president of Cornell College at Mount Vernon, Iowa, and, in 1922, was made chancellor of Syracuse University. He was made bishop of the Methodist Church in 1936.

Flotow (*flō'tō*), **Friedrich, Freiherr von** (**1812-1883**), German composer of light opera, was born at Teutendorf in Mecklenburg. He studied musical composition under Reicha in Paris and made his reputation by *Le Naufrage de la Méduse*, *Stradella*, and *Martha*, the last two conspicuously characterized by pleasing melodies. His introduction of "The Last Rose of Summer" in *Martha* made both the opera and the old Irish melody immensely popular. His later operas were *Indra* and *L'Ombre*. From 1856 to 1863, he was director of the theater at Schwerin.

Foch (*fŏsh*), **Ferdinand** (**1851-1929**), French general, was born at Tarbes, France of Basque-Alsatian parentage. He joined the French army in 1870 and fought in the war against Prussia. In 1898, he was appointed lieutenant colonel and professor of strategy and tactics in the War College at Paris. In 1905, he was made regimental commander of artillery and, in 1910, commandant of the war college.

In the early stages of the invasion of France in 1914, Foch stopped the great German drive toward Calais and later won the victories of Ypres and La Bassée. The plan whereby Joffre defeated the German armies in the great battle of the Marne was largely due to Foch, who came to be regarded as the master tactician among the Allied commanders.

On March 26, 1918, following the gigantic German attacks which drove back the Allied line in Picardy, jeopardizing Paris and Calais, Foch was placed in supreme command of the Allied armies. Holding the enemy's powerful thrusts to local gains, he organized for the counter offensive. On July 18, he inflicted a stunning defeat upon the Germans, blocking their fifth great drive of the year, and began a campaign of continuous attack against all the Teutonic allies. His consummate ability as a strategist was shown in an uninterrupted series of victories on all fronts. By well timed offensives, the military power of Bulgaria, Turkey, and Austria was crushed. Under relentless pressure, the great German army, beaten in every important battle, was practically driven out of France. To escape the impending annihilation of her forces, Germany, on Nov. 11, 1918, signed an armistice, surrendering enormous war supplies and yielding the military occupation of the Rhine. In recognition of his distinguished services, Foch was created Marshal of France. He was later made a marshal in the British army. See *World War I*.

Foix (*fwă*), **Gaston de** (**1489-1512**), French general. When 23 years old, he was made commander of the French army in Italy. He defeated the army of Venice near Brescia and took the city by storm on the same day. A few weeks afterward, he won a victory over the Spanish forces at Ravenna in one of the fiercest battles ever fought. The victory was so splendid that the hot-blooded young hero grew impatient when he saw some of the enemy's infantry leave the field slowly and in good order, and madly rushed after them in person, followed by Bayard and about 20 knights. He broke the enemy's line, but was killed in the encounter.

Fokine, Michel (**1880-1942**), Russian dancer, was born at Leningrad. Trained in the Imperial School of Ballet there, he first appeared publicly in 1898. The first ballet of his creation, *Acis and Galatea*, was performed in 1905. Its significance lay in the new freedom which he introduced into the movements based on the study of Greek dances. With the aid of the decorative art of Leon Bakst, he gave a new turn to the art of dancing, exemplifying his ideas in *The Carnival*, *Cleopatre*, *Sylphides*, and *Coq d'Or*. Driven from Russia by the revolution, he went to New York in 1919, where his production of *Aphrodite* created a sensation. It was followed in succeeding years

by *Mecca* and *Medusa*, which appeared less novel because his influence had already made itself felt in the theater arts generally.

Foley, John Henry (1818-1874), Irish sculptor, was born in Dublin, and studied art at Dublin and at the Royal Academy, London, of which he was elected member in 1858. While he produced some ideal works, he excelled in portrait statues which are noted for their strength of characterization. Among them are the statues of Hampden and Selden, in the Houses of Parliament at Westminster; of Prince Albert, which forms a part of the Albert Memorial in Hyde Park, London; and of Burke, J. S. Mill, and Goldsmith. He designed the seal of the Confederate States of America and executed a bronze statue of Stonewall Jackson for Richmond, Va. He died at Hampstead, England.

Folger, Henry Clay (1857-1930), American capitalist and collector of Shakespearean items, was born in New York City. He was graduated from Amherst College, where he acquired a keen interest in Shakespeare. He later studied law at Columbia University. In 1879 he became associated with the Standard Oil Company, of which he eventually became chairman of the board of directors, retiring in 1928. With the cooperation of his wife, Emily Jordan Folger (1859–1936), he acquired over many years one of the richest Shakespearean collections in the world. It was housed in the magnificent Folger Memorial Library Building, Washington, D. C., which was dedicated in 1932, two years after Folger's death.

Folsom, Marion Bayard (1893-), American government official, was born at McRae, Georgia. After he was graduated from the University of Georgia (1912) and the Harvard School of Business Administration (1914), he began his business career with the Eastman Kodak Company at Rochester, N. Y. Because of his pioneer work in the field of social security while with Eastman, he was called upon to help draft the Social Security Act of 1935. He left Eastman in 1953 when President Eisenhower appointed him Undersecretary of the Treasury. He became a member of the cabinet in 1955, when, following the resignation of Mrs. Oveta Culp Hobby, he was appointed Secretary of Health, Education, and Welfare. He resigned in 1958.

Fong, Hiram L. (1907-), lawyer and political leader, was born in Honolulu. He was educated at McKinley High School there, and at the University of Hawaii. After graduation from the Harvard Law School, he returned to Honolulu, where he became active in the fields of investment and insurance, along with his law practice. During World War II, he was judge advocate with the U. S. Air Force in Hawaii. In 1960 he became U. S. Senator from the new state of Hawaii.

Fontana (*fôn-tä'nä*), **Domenico (1543-1607)**, Italian architect, was born on the borders of Lake Como. He obtained the favorable notice of Cardinal Montalto, who engaged him to erect a chapel in the Church of Santa Maria Maggiore and also the Villa Negroni. In 1585, after the cardinal had become Pope Sixtus V, he employed Fontana to plan the dome and lantern of Saint Peter's substantially in accordance with Michelangelo's design. He erected the obelisk near Saint Peter's, Rome, in 1586, and built the Lateran Palace and the Vatican Library.

Fontenelle (*fônt'nĕl'*), **Bernard le Bovier de (1657-1757)**, French writer, was born at Rouen. He was a nephew of Corneille, the tragic poet. In 1699, he was appointed perpetual secretary of the Academy of Sciences. His reputation rests chiefly upon *Dialogues of the Dead, Discourse on the Plurality of Worlds*, and an *Essay on the Geometry of the Infinite*. His long life, extending over nearly 100 years, was filled with literary activities, and, as a frequenter of the famous salons of Madame de Tencin and others, he was the literary arbitrator of his time.

Fonteyn, Margot (1919-), English prima ballerina of the Sadler's Wells Ballet, was educated in China and the United States. She has been a member of the Sadler's Wells company since she was fifteen. In 1937, she appeared as Giselle, and since then has had many leading roles in such ballets as *Les Sylphides, Coppelia, Le Lac des Cygnes, The Sleeping Beauty, Daphnis and Chloe*, and *Firebird*. She has been president of the Royal Academy of Dancing since 1954.

Foote, Andrew Hull (1806-1863), American naval officer, was born in New Haven, Conn. Entering the United States navy in 1822, he became a commander in 1852, saw service in China in 1856, and, after the outbreak of the Civil War, acted with signal credit in the reduction of Fort Henry and Fort Donelson, 1862. In the same year, he was promoted rear admiral. He died at New York.

Foote, Arthur (1853-1937), American composer, was was born at Salem, Mass. He was graduated from Harvard in 1874 and later studied music under S. A. Emery, J. K. Paine, and B. J. Lang. He settled in Boston as a teacher of music and was organist at the First Unitarian Church, 1878–1910. His compositions include an overture, *In the Mountains; Serenade in E;* a prologue, *Francesca da Rimini;* and the cantatas *The Skeleton in Armor, The Wreck of the Hesperus*, and *Farewell to Hiawatha*. Foote's music, classic rather than romantic in style, entitles him to high rank among American composers.

Forbes, Joan Rosita (c. 1895-), English traveler and writer. She drove an ambulance in France during World War I. She then began a series of travels which took her to many of the most inaccessible parts of the world, including a 1000 mile trip through the Libyan Desert into the secret capital of the Semissi sect, where she penetrated disguised as a Bedouin. She visited and wrote the biography of the outlaw chief Raisuli in Morocco, *The Sultan of the Mountains*. An 1100 mile trip through Ethiopia resulted in the film *Red Sea to Blue Nile*. Her interest was social and political rather than merely geographic, and she described her journeys in a number of colorful books, which include *The Secret of the Sahara-Kufara, Women Called Wild, A Unicorn in the Bahamas*, and an autobiography, *Gypsy in the Sun*.

Forbes-Robertson, Sir Johnston (1853-1937), English actor, was born in London. He was educated at Charterhouse, London, at Rouen, and at the Royal Academy of Arts. An actor from the age of 21, he became a member of prominent companies, including those of Sir Henry Irving and Sir Squire Bancroft. In 1895, he appeared in *The Notorious Mrs. Ebbsmith* and also in *Romeo and Juliet*. In 1898, he achieved the greatest successes of his career in *Othello* and *Hamlet*. He appeared in America also as Orlando in *As You Like It*, in Shaw's *Cæsar and Cleopatra*, and in *The Passing of the Third Floor Back*. He was knighted in 1913. He wrote *A Player under Three Reigns*.

Ford, Henry (1863-1947), American manufacturer, was born at Greenfield, Mich. He received his education in the district schools and learned the machinist's trade. In 1887 he removed to Detroit where he later became chief engineer of the Edison Illuminating Company. In 1903 he organized and became president of the Ford Motor Company, which under his management and control became one of the largest automobile manufacturing establishments in the world. Thirty years after the organization of the original company his establishment employed more than 100,000 persons and was capable of turning out over 7,500 automobiles a day. This result was secured by standardizing and quickly assembling parts, thereby securing economies that made possible the progressive reduction of prices and consequent widening of markets. About 15 million cars of the so-called model T type were produced before the design was changed in the interests of beauty in 1927. Beginning in 1914, Ford established a profit-sharing plan for the distribution of 10 to 30 million dollars annually among his employees.

Prior to America's entry into World War I, Ford was a pronounced pacifist and endeavored by a peace mission to bring the warring nations of Europe into conference. When war was declared against Germany, however, he placed his resources at the disposal of the government.

Ford took his son Edsel into the business, soon making him actual director of the enterprise, which was expanded to the manufacture of a high-priced car, tractors, and airplanes. Branches were established in many foreign countries. Ownership remained entirely in the hands of the Ford family. On Edsel's death in 1943, Henry Ford once more took active charge but retired again in 1945.

Henry Ford spent considerable money preserving or restoring objects and buildings typical of earlier generations in America. His Museum of American Life, near Dearborn, Mich., aims at assembling a complete series of every kind of article used or made in America from the first settlement to the present day.

The Ford factories demonstrated the value of mass production. This method soon spread to other industries and became a prime factor in a heightened standard of living while at the same time precipitating serious problems of employment.

Ford, Henry, II (1917-), American motor car manufacturer, was born at Detroit, Mich. A son of Edsel Ford and a grandson of Henry Ford, he was educated at Hotchkiss School, Lakeville, Conn., and Yale University. He joined the Ford Motor Company in 1941, and, except for two years' service as an officer in the Navy during World War II, he has been with the company ever since. He became president in 1945 and was made chairman of the board in 1960. It was his determination to help raise the level of salaries of the faculties of privately supported colleges, universities and hospitals throughout the United States that resulted in the Ford Foundation announcing in December 1955 the allocation of $500 million to 4157 American institutions—the largest philanthropic donation ever made.

Ford, John (1586-c. 1640), English dramatist, was born at Ilsington, Devonshire. He studied at Exeter College, Oxford, and entered the Middle Temple in 1602. His first literary work was an elegy on the earl of Devonshire entitled *Fame's Memorial.* The tragedies *'Tis Pity* and *The Broken Heart* are considered his masterpieces. His other dramas include *Honour Triumphant, The Lover's Melancholy,* and *The Lady's Trial.*

Ford, Paul Leicester (1865-1902), American historian and novelist, was born in Brooklyn, N. Y. He was educated privately, owing to physical deformity, and early devoted himself to literature. His works include *The Honorable Peter Sterling, The True George Washington, The Many Sided Franklin, Janice Meredith, Wanted: A Chaperon, Tattle Tales of Cupid, The Story of an Untold Love,* and *Wanted: A Matchmaker.* He also edited the works of Thomas Jefferson. See *Janice Meredith.*

Forester, C(ecil) S(cott) (1899-), English author, was born at Cairo, Egypt. He has written many novels, biographies, and books of travel, but is best known for his Horatio Hornblower stories, which include *Beat to Quarters* (1927), *Ship of the Line* (1938), and *Flying Colors* (1939), comprising the *Captain Horatio Hornblower* trilogy (1939). Other later Hornblower stories include *Commodore Hornblower* (1945), *Lord Hornblower* (1946), and *Lieutenant Hornblower* (1952).

Forrest, Edwin (1806-1872), American tragedian, was born in Philadelphia, Pa. He went on the stage at 14, and finally made his way to New York, where his rendering of Othello at the age of 20 raised him to the front rank among actors. He made three tours in England, but, during his last, in 1845, he lost popular favor through his conduct in an embittered quarrel with Macready. His greatest parts were those of Richard III, Macbeth, and Othello. He left the stage in 1871. At his death a part of his fortune was left to establish an asylum for aged and indigent actors. He left also a library rich in Shakespearean literature.

Forrestal, James (1892-1949), American businessman and politician, was born at Beacon, New York, educated at Dartmouth and Princeton, and served in the aviation force of the Navy in World War I. He engaged in banking in New York, becoming president of Dillon, Read and Company in 1938. He was Undersecretary of the Navy, 1940–44, and Secretary, 1944–47. While opposed to the merger of the armed forces, he cooperated with President Truman's plans, and, in 1947, was appointed Secretary of Defense.

Forster, John (1812-1876), English political and social writer, was born at Newcastle. He was educated for the bar, but turned to literature, editing successively the *Foreign Quarterly Review,* the *Daily News,* and, 1847–56, the London *Examiner.* His works include *A Life of Dickens,* biographies of Goldsmith, Swift, and Sir John Eliot, and historical essays on the *Debates on the Grand Remonstrance* and the *Arrest of the Five Members.*

Fortuny (*fûr-tōō'nê*), **Mariano (1838-1874),** Spanish painter, was born at Reus in Catalonia. Brought up in poverty, an allowance from his native town enabled him to study at Barcelona and Rome. His style, with its brilliance of color and dazzling effects, became, up to the rise of impressionism, a dominating influence in modern Spanish art. Among his celebrated pictures are "The Spanish Marriage," "Praying Arab," "Tribunal of a Cadi," "The Butterfly," and "Trial of the Model." Many of his works are found in American collections, including "An Ecclesiastic," "Don Quixote," "Mendicant," and "Rehearsal" in the Walters Gallery, Baltimore, and "Arab Fantasia at Tangiers," "A Court Fool," and "Lady in Black" in the Metropolitan Museum, New York. He died at Rome.

Fosdick, Harry Emerson (1878-), American clergyman and religious writer, was born at Buffalo, N. Y. He was graduated from Colgate University in 1900 and from Union Theological Seminary in 1904. Ordained to the Baptist ministry in 1903, he was pastor at Montclair, N. J., 1904–15. In 1908, he became instructor in homiletics, and, in 1915, was made professor of practical theology, Union Theological Seminary. He also occupied, at the same time, the pulpit of the First Presbyterian Church, New York City, which he left in 1924 as the result of a controversy growing out of his leadership in the so-called modernist school of religious thought. He accepted the pastorate of the Riverside Church, New York City. His writings include *The Second Mile, The Manhood of the Master, The Assurance of Immortality, The Meaning of Prayer, The Meaning of Faith, Spiritual Values and Eternal Life,* and *A Guide to Understanding the Bible.*

Fosdick, Raymond Blaine (1883-), American lawyer and publicist, was born at Buffalo, N. Y. He was graduated at Princeton University in 1905 and at New York Law School in 1908. In 1908–10, he was assistant corporation counsel, and in 1910–13 was commissioner of accounts, New York City. He spent 1913 in Europe in the study of police organization. In 1915–16, he was a member of the New York City Board of Education. He was chairman of the commission on training camp activities of the War and Navy departments, 1917–18, was civilian aid to General Pershing in France, 1919, and was undersecretary-general of the League of Nations, 1919–20. In 1935 he was made president of the Rockefeller Foundation and General Education Board. Among his writings are *European Police Systems, Keeping Our Fighters Fit, American Police Systems,* and *The Old Savage in the New Civilization.*

Foster, Stephen Collins (1826-1864), American song composer, was born at Lawrenceville, now a part of Pittsburgh, Pa. He first wrote Negro melodies, many of them composed primarily for the popular blackface minstrel shows of the 19th century. "Old Uncle Ned," "Campdown Races," and "Oh, Susanna," immediately gained a wide popularity. Of his song "Old Folks at Home" 300,000 copies were sold. "Nelly Bly," "My Old Kentucky Home," "O, Boys, Carry Me Long," "Come Where My Love Lies Dreaming," "Louisiana Belle," "Massa's in the Cold, Cold Ground," and "Ellen Boyne" were among the most popular. He published 175 songs, many of which achieved enduring popularity both in America and abroad. The naive pathos of his Negro songs has never been equaled. His life was marred by an unhappy marriage, addiction to drink, and poverty, which was due to his inability to profit substantially from his compositions. He was elected to American Hall of Fame, 1940.

The Stephen Collins Foster Memorial is on the grounds of the University of Pittsburgh. In it are housed a library devoted to Foster and his music, personal possessions, original manuscripts, letters, family records, and pictures.

Foucault (*fōō'kō'*), **Jean Bernard Leon (1819-1868),** French physicist, was born at Paris. He began the study of medicine but soon turned to physical science. In 1851, he demonstrated the rotation of the earth on its axis by means of a long pendulum and, in 1852, he invented the gyroscope. By means of a revolving mirror, he demonstrated that the velocity of light is greater in air than in water. In 1862, he determined that the velocity of light is about 185,000 miles per second. He also invented a polarizing prism and made applications of physics to the study of astronomy.

Fouché (*fōō'shā'*), **Joseph (1763-1820),** French Revolutionist and statesman, was born near Nantes. In 1792, he obtained a seat in the National Convention, and on the trial of Louis XVI voted for death without appeal. He became president of the Jacobins but was expelled by Robespierre and afterward imprisoned as a dangerous terrorist. At a later period, he became Napoleon Bonaparte's minister of police, long serving him as his ablest instrument. He was made Duke of Otranto in 1809, but was deprived of office after making the remark, "Let us prove that Napoleon's presence is not necessary to repel our enemies."

After Napoleon's return from Elba, Fouche again became minister of police. He advised Napoleon to abdicate after the battle of Waterloo, was placed at the head of the provisional government by the chambers, and negotiated with the allies. In 1816, Fouche was exiled from France by the edict against regicides, became an Austrian subject, and lived at Trieste until his death. It was Fouche who made the famous remark on the execution of the Duke of Enghieu: "It is worse than a crime; it is a blunder."

Fouqué (*fōō'kā'*), **(1777-1843), Friedrich Heinrich Karl, Baron de la Motte,** German novelist and poet, was born in Brandenburg. When young, he was a soldier and fought against Napoleon, but ill health obliged him to leave the army. He then gave himself up to study, and wrote many charming stories. *Undine, Sintram, Aslauga's Knight,* and *The Enchanted Ring* are the best of these. The fairy tale *Undine* ranks among the most exquisite in literature. He died in Berlin. See *Undine.*

Fourier (*fōō'rê-ā'*), **François Charles Marie (1772-1837),** French socialist, was born in Besançon. He served on the Rhine during the revolutionary period. Afterward he engaged in trade, at the same time earnestly studying the problems involved in the modern social system. In 1808 he disseminated the views which he had formulated on socialism by the publication of a work entitled *A Theory Of Four Movements and General Destinies.* He advocated the organization of society into communistic units, or phalanges, of 1620 people each, within which the individual would be put to work at the task best suited to his capabilities. The scheme was tried out later at various points in the United States, including Red Bank, N. J.

Fourier, Jean Baptiste Joseph, Baron (1768-1830), French geometrician, was born at Auxerre. He presented a mathematical memoir to the French Academy at the age of 19, and, in 1795, was made professor in the Ecole Polytechnique, Paris. He accompanied the French expedition to Egypt in 1798 and conducted explorations on the upper Nile.

In 1817, Fourier became a member of the Academy of Sciences and exercised with Cuvier the functions of perpetual secretary. His chief works are *Annales de physique, Theorie analytique de la chaleur,* and the *Analyse des equations determinees.* Fourier was one of the foremost mathematicians and physicists of his time and made valuable contributions to the theory of heat and to the solution of numerical equations.

Fox, Charles James (1749-1806), English statesman, was born in Westminster. He was educated at Eton and at Hertford College, Oxford. He entered Parliament at the age of 19 and immediately made his mark as a debater. In 1782, he became foreign secretary under Lord Rockingham. Fox brought the full effect of his brilliant oratory to bear in opposition to war with the American colonies and against the French revolutionaries, whom he favored. His policies, however, failed to prevail, the country following Pitt's leadership in the war against France.

On the death of Pitt, in 1806, Fox became foreign secretary in Grenville's ministry. But the term of his life had nearly run out, and he had no time to realize the high expectations of his followers. After carrying in Parliament his motion for the abolition of the slave trade, he died a few months before the measure became a law.

Fox, George (1624-1691), English religious leader, was born at Fenny Drayton. He became convinced of the futility of learning for the work of the ministry and held that the presence of Christ in the heart is sufficient as the "inner light" superseding all other lights, including the Scriptures. His views attracted followers, who were organized into "societies of friends" and became known as Quakers, a name expressing results of religious emotions excited among Fox's followers.

Fox was subject to persecution and numerous terms of imprisonment, but his following grew persistently. In 1671, he sailed for the West Indies and the American colonies to propagate the doctrines of the sect he had originated. On his return to England, in 1673, he was imprisoned at Worcester for 14 months because of his refusal to take the oath of supremacy. During the remaining years of his life, which he spent chiefly in London, the public worship of the Society of Friends became tolerated.

Fox, John William, Jr. (1863-1919), American novelist, was born in Kentucky. He was graduated from Harvard in 1883 and, after some experience in journalism traveled in the Southern States and in California. Subsequently, he engaged in business at Cumberland Gap and availed himself of the opportunity to study mountain life, which he described in novels that attained much popular success. Those most widely known are *The Little Shepherd of Kingdom Come* and *The Trail of the Lonesome Pine.*

Foxe, John (1516-1587), English martyrologist was born at Boston, in Lincolnshire. At 16 he entered Brasenose College, Oxford. He was a fellow of Magdalen College, 1539–45 and became tutor to the orphan children of the Earl of Surrey. During the reign of Mary, he retired to the continent, where he met Grindal and Aylmer. On Queen Elizabeth's accession he was made a prebendary of Salisbury Cathedral, 1563. He lived chiefly in London and often preached. He published numerous books, but the one upon which his fame rests is popularly known as *Foxe's Book of Martyrs.*

Fragonard (*frä'gô'när'*), **Jean Honoré (1732-1806),** French painter, was born at Grasse. In 1765, his "Callirhoe" secured his admission to the Academy and was commissioned for reproduction in Gobelin tapestry. He painted, with a loose touch and luscious coloring, genre pictures of contemporary life; he is also known for his landscapes. His art is the culmination of the rococo style of painting in France. In later years his pictures commanded high prices; his small "Billet Doux" sold for more than $90,000 after its exhibition in London in 1906.

In 1771, Fragonard was commissioned to decorate a pavilion for Madame du Barry with a series of subjects depicting the "Romance of Love and Youth." His work, rejected by Du Barry, was preserved by descendants of the artist's friend Maubert and sold in 1898 for $240,000. The series was purchased by J. P. Morgan, exhibited in the Metropolitan Museum, New York, in 1914, and in 1915, was bought by H. C. Frick of Pittsburgh.

France (*fräns*), **Anatole (1844-1924),** is the pen name of Jacques Anatole Thibault, French critic and author, who was born in Paris and educated at College Stanislaus. Through a long series of poems, dramas, stories, and critical essays, he attained an eminent position in French letters, being generally regarded as the most distinguished novelist, the keenest satirist, the most pleasing humorist, and the finest stylist of his time. In 1896, he was elected to the French Academy and, in 1921, he was awarded the Nobel prize for literature.

Of his numerous works, the following are among those that have been translated into English: *The Crime of Sylvestre Bonnard, At the Sign of the Reine Pedaque, The Red Lily, Mother of Pearl, Baltasar, The Wickerwork Woman, Joan of Arc, The Gods Are Athirst, The Revolt of the Angels, Thäis, The White Stone, Jocasta and the Famished Cat, On Life and Letters, Marguerite,* and *The Human Tragedy.*

Francis I (1494-1547), king of France, was born at Cognac, France, and became king in 1515. His first act was to reconquer Milan. Charles V, Henry VIII, and the pope were in alliance against him, driving his troops out of Italy and invading France on the north. Taken prisoner at the battle of Pavia, 1525, Francis was kept a year at Madrid, gaining his freedom only by renouncing Flanders, Artois, the Duchy of Burgundy, and all his Italian possessions. His struggles with Charles V continued until the Peace of Crespy, 1544. His reign is marked by the French Renaissance, the beginning of the Protestant Reformation, and the strengthening of the power of the monarchy. He fostered learning and art, invited painters and scholars to his kingdom, founded libraries, opened schools, and built several of the finest palaces in France.

Francis II (1768-1835), emperor of Germany, the last Holy Roman emperor, was born at Florence, Italy. He succeeded his father, Leopold II, in 1792. Joining the unsuccessful wars against Napoleon, he lost more and more of his scattered territories. In 1806, he formally abdicated the crown of the Holy Roman Empire, which was thereby dissolved after an existence of 1000 years. He continued, however, to rule Austria, which emerged from the wars in a strengthened condition and became the nucleus of the anti-revolutionary Holy Alliance.

Francis, Sir Philip (1740-1818), British politician and pamphleteer, was born in Dublin. Leaving Ireland at 12, he entered Saint Paul's School in London, and at 16 became a junior clerk in the Secretary of State's office. He held various minor positions in the government until 1773, when Lord North made him a member of the council of Bengal, which was equivalent to the government of India. There he vigorously opposed Warren Hastings, the governor general, with whom he fought a duel in 1780, and was seriously wounded. Francis entered Parliament in 1784 and pressed charges which led to the celebrated trial of Hastings.

Francis is remembered chiefly as the probable author of the "Letters of Junius," contributed to the *Public Advertiser* between 1769 and 1772. They attacked members of the government from the point of view of a liberal. In 1816, John Taylor wrote a book identifying Francis with "Junius" by remarkably strong circumstantial evidence. Francis, however, never acknowledged authorship. See *Junius, Letters of.*

Francis de Sales (*sālz*), **Saint (1567-1622),** theologian, orator, and writer, bishop of Geneva, was born at Sales, Savoy. He studied law at the University of Padua, where he was graduated with distinction but soon gave up the law for the Church. He received holy orders in 1593, and, in 1602, was made Bishop of Geneva. Together with Saint Jane Frances de Chantal he founded the Institute of the Visitation in 1607. His *Introduction to the Devout Life* ranks with the *Imitation of Christ* among the most widely read books of devotion. He wrote also a *Treatise on the Love of God.* He was canonized in 1665.

Francis Ferdinand of Austria (1863-1914), archduke, was born at Graz. By the death of Crown Prince Rudolph and of his own father, he became the heir apparent to the Austrian throne. In 1900, he contracted a morganatic marriage with Countess Sophia Chotek, who was made Princess von Hohenburg after renouncing for her children the right of succession to the throne. As a result of a political plot, both were assassinated at Sarajevo, Bosnia, June 28, 1914. This tragic event was the precipitating cause of World War I.

Francis Joseph Charles (1830-1916), emperor of Austria. The revolution of 1848 having compelled his uncle Ferdinand to abdicate, Francis Joseph was called at the age of 18 to rule an empire shaken by civil war. Restored to the mastery of his dominions, he proceeded to undo the work of 1848. The Hungarian constitution was suspended and the absolute authority of the Habsburg monarchy in the Austrian dominions was proclaimed.

Under pressure of the liberal groups, the emperor granted partial return to constitutionalism. His Italian subjects won independence through their victory at Solferino, and other racial groups within the empire were frequently on the verge of revolt.

After suffering defeat by Prussia in 1866, Francis restored national self-government to Hungary and, in 1867, was declared king of that country. In later years, his influence in foreign politics was directed chiefly to forming a closer alliance with Germany and Italy.

Francis of Assisi (*ăs-sē'zē*), **Saint (1182-1226),** founder of the Franciscan order, was born at Assisi near Perugia, Italy. His father was a rich merchant, named Pietro Bernardone. His baptismal name was Giovanni, "John," but he was renamed Francesco, "Frenchman," by his father, who cherished a fondness for France. As a youth, Francis shared eagerly in the exercises of chivalry and arms. In one of the petty feuds of the time, he was taken prisoner and detained for a year in captivity at Perugia. An illness, which he had contracted during his confinement in prison, forced on him those first religious musings which led to his pilgrimage to Rome in 1206.

Thereafter, Francis renounced his inheritance, broke from his family, and consecrated himself to poverty and religion. No humiliation, no self-sacrifice was too extreme for him. Arrayed in a single brown tunic of coarse woolen cloth, girt with a cord of hemp, he begged at the gates of monasteries, discharged the most menial duties, and served the lepers at Gubbio. He worked with his own hands at the building of the churches of Saint Damian and Santa Maria degli Angeli.

Francis founded the Franciscan order in 1208. When his brotherhood had increased to eleven, he drew up for them a rule, which was approved at Rome by word of mouth in 1210 by Pope Innocent III. Francis himself returned to Assisi in 1212 and settled the simple constitution of his order.

In common with the older orders of monastic life, the Franciscan order was founded on the three vows of chastity, poverty, and obedience. Poverty, in the thought of Francis, was first in importance and in spiritual efficacy, and he repudiated all ideas of property, alike for his order and for its members. The passionate fervor and mystic tenderness of the Franciscans spread with irresistible contagion over Europe, and, in 1216, the order was solemnly approved by Pope Innocent. At its first general assembly, held in 1219, 5000 members were present. The order was confirmed in 1223 by Pope Honorius.

The extant writings of Saint Francis consist of letters, sermons, ascetic treatises, prayers, proverbs, moral apothegms, and hymns. One prayer identified with him that has been widely quoted contains the words:

"Lord, make me an instrument of Thy Peace!
Where there is hatred . . . let me sow love;
Where there is injury . . . pardon;
Where there is doubt . . . faith;
Where there is despair . . . hope;
Where there is darkness . . . light;
Where there is sadness . . . joy!"

An order of nuns established by Saint Francis had for its first abbess Clara of Assisi, after whom it was generally called the order of Poor Clares. Another branch consisted of the tertiarians, or penitents of the Third Order of Saint Francis. The influence of the Franciscans in the disorganized social conditions of the time can hardly be overestimated. As a literary order, they have been eminent chiefly in theology. They were the earliest missionaries to America, having come over with Columbus on his second voyage in 1493. Saint Francis died near Assisi, and was canonized by Pope Gregory IX in 1228.

Francis of Paola (*pä'ô-lä*), **Saint (1416-1507),** founder of the order of Minims, was born at Paola in Calabria. At 13 he was a Franciscan; at 19 he retired to a cave and gave himself up to prayer and self-mortification. The fame of his piety having attracted emulators, he obtained permission to erect a convent, and the new order came to be known as the Minim-Hermits of Saint Francis of Paola. Communities were established throughout Europe, but the order did not become extensive and is now limited chiefly to Sicily, Italy, and southern France. Louis XI of France summoned Saint Francis to his deathbed, and Charles VIII built him a convent at Plessis les Tours. He was canonized in 1519.

Francis Xavier, Saint. See *Xavier, Saint Francis.*

Franck (*fränk*), **César Auguste (1822-1890),** French composer and organist, was born at Liege. He received his musical education at the conservatories of Liege and Paris. He became organist at Sainte Clotilde. His early compositions met with limited recognition, and, throughout his life, the circle of his admirers remained small though select. In 1872, he succeeded his former instructor Benoist at the Paris Conservatory, where his teaching influenced many of the later French composers. After 1900, his greatness as a composer received increasing appreciation, and, by many, he is accorded rank with Berlioz, whom he surpasses in originality. His greater works include a symphony in D minor; the oratorios *Ruth, The Redemption, The Beatitudes,* and *Rebecca;* and the operas *Hulda* and *Ghisèle.*

Franck (*fränk*), **James (1882-1964),** German physicist. In 1912, while at the University of Berlin, he, with a colleague, Dr. Gustav Hertz, devised the first experimental verification of Planck's theory that light and other forms of radiation travel, not in continuous waves, but in bundles, or "quanta." Franck later became professor of physics at the University of Göttingen but resigned in 1933 as a protest against the anti-Jewish activities of the Hitlerites. Coming to America, he was made professor of physics at Johns Hopkins University in 1935 and left to accept a chair at the University of Chicago in 1938. With Dr. Hertz, he received the Nobel prize in physics for 1952.

Franco, Francisco (1892-), Spanish general and dictator, was born in Galicia, Spain. He saw military service in Morocco, becoming colonel in 1926. Under the Spanish republic of 1931, he rose to the post of chief of staff in 1935. On the outbreak of civil war the next year, he sided with the insurgents, organizing and sending large numbers of Moroccan troops to assist them. Later the same year he was made commander and "Chief of the Spanish State." Assisted by German and Italian troops with mechanized equipment, he crushed the resistance of the republican regime and captured Madrid on March 27, 1939. Assuming the title of Prime Minister of Spain, Franco began the work of reconstruction by conscripting the labor of all able-bodied Spaniards for 15 days a year without pay. He declared neutrality in World War II but leaned strongly toward Germany.

Frankfurter, Felix (1882-), American jurist and educator, was born at Vienna, Austria, and was brought to America at six years of age. Educated at the College of the City of New York and Harvard University, he was an attorney for the Department of Justice and law officer for the War Department before being made professor of law at the Harvard Law School in 1914. President Roosevelt appointed him to the United States Supreme Court in 1939, from which office he resigned in 1962. His publications include *The Case of Sacco and Vanzetti, The Labor Injunction* (in collaboration), *The Public and Its Government,* and *Mr. Justice Holmes and the Supreme Court.*

Franklin, Benjamin (1706-1790), American statesman, diplomatist, author, and philosopher, was born in Boston, Massachusetts. After two years at school, he was obliged to leave his studies and assist his father, a dyer, tallow chandler, and soap boiler. In his twelfth year Franklin was apprenticed to his brother, a printer, in a business which promised to afford better opportunities to gratify his thirst for knowledge.

Original articles written by Franklin were accepted for publication in his brother's paper, the editor not knowing the source. His brother became jealous, and Franklin determined to leave him and begin in the world for himself. He consequently sold some of his books, ran away from Boston in October 1723, went to New York, and later to Philadelphia, where he soon found employment with a printer named Keimer.

Publishing Enterprises. In 1724, under the patronage of Sir William Keith, governor of the province, who proposed to set him up in business, Franklin embarked for London to buy type. He soon found that he had relied too confidently upon Sir William's promises, and he was compelled to find employment in London printing houses. He returned to Philadelphia in October 1726, and, shortly afterward, he joined with a fellow workman, Meredith, in establishing a newspaper, the Pennsylvania *Gazette.* Poverty and disappointments continued with him for a time, but ultimately his skill and industry prevailed.

His subsequent efforts in pursuit of fortune and independence were eminently successful. The first circulating library in America was established by him. In 1732, he first issued his celebrated almanac, commonly known as *Poor Richard's Almanac.* He continued this publication for 25 years, and its pithy sentences won him great popularity. In 1733, Franklin began to study languages, and became familiar with French, Italian, Spanish, and Latin.

Political Activities. In 1736, he was chosen clerk of the general assembly of Pennsylvania, and, in the following year, he became postmaster of Philadelphia. These preferments turned his attention to statecraft. He effected a reformation in the system of city police and promoted the establishment of a fire company, the first in America. He also organized a militia for the defense of the province. In 1743, he initiated the plans for an academy, which became the germ of the University of Pennsylvania.

Scientific Work. Notwithstanding the multiplicity of his public duties, Franklin found leisure to pursue scientific investigations on electricity. In 1752, he demonstrated the identity of electricity and lightning and announced a plan for defending houses from lightning by the use of pointed conductors. His renown spread over the whole civilized world.

Diplomatic Career. In 1753, Franklin was made deputy postmaster general for the British colonies in America, and, in the same year, he established the Academy of Sciences in Philadelphia. In 1757, he was sent to England as the agent for Pennsylvania and was employed in the same capacity by three other colonies. He returned to America in 1762 and took his seat in the Colonial Assembly.

But, two years later, he was again sent to England as an agent for Pennsylvania. He remained abroad until 1775. He was a member of the Continental Congress and signed the Declaration of Independence on July 4, 1776.

During the whole period of the Revolution, Franklin was active in a civil capacity at home or abroad. Congress sent him as a commissioner to the French Court in 1776. He was one of the most accomplished and adroit diplomats at Versailles, where he was received enthusiastically as a *savant* and patriot. In 1778, he induced the French government to form with the colonies the alliance that eventually compelled England to concede their independence.

In 1785, Franklin returned to Philadelphia. Two years later he was a delegate to the Federal Constitutional Convention, and, in 1788, he retired from active public life, using his pen, however, as vigorously as before.

Character and Genius. Franklin's genius was above all that of a practical man with a passion for human betterment, qualities seen alike in his scientific investigations, diplomatic activities, political views, and authorship. While prudent in the acquisition and management of property, he exhibited conspicuous generosity. His perseverance and energy defied discouragement. He wrote an *Autobiography* which has become classic. He died at Philadelphia and was elected to the American Hall of Fame in 1900.

Franklin, Sir John (1786-1847), English rear admiral, Arctic explorer, and colonial governor, was born at Spilsby, Lincolnshire. He was appointed to command the *Trent* in the expedition sent out in 1818 for the discovery of a Northwest Passage. He made a second expedition, during 1825–27, and for his achievements was knighted in 1829. In 1845, he commanded another expedition for the discovery of the northwest passage. He had with him two ships, the *Erebus* and the *Terror*, with 129 chosen officers and men. He sailed from Greenhithe, May 19, 1845, and was last seen July 26.

Many expeditions were sent out in search of the missing boats and their crews. The relics and skeletons found later proved that Sir John Franklin and his men perished by starvation and exposure. He is entitled to the honor of being the discoverer of the Northwest Passage from the Atlantic to the Pacific. A monument was erected to him, 1875, in Westminster Abbey.

Franklin, John H. (1915-), educator and historian, was born at Rentlesville, Okla. He was educated at Fisk University and at Harvard, where he received a Ph.D. degree. As professor at Howard University and Brooklyn College, and lecturer at many universities in America and abroad, he became widely known for his knowledge of Negro history. His writings include *From Slavery to Freedom* and *The Militant South*. In 1964 he was appointed professor of American History at University of Chicago.

Franzén (*frän-sān'*), **Frans Michael (1772-1847),** Swedish poet, was born in Uleaborg, Finland. He was educated at Abo, became librarian of the university there, and, in 1801, was made professor of history and ethics. After the conquest of Finland by the Russians, he settled in Sweden as a clergyman, finally removing to Stockholm, where he was made bishop. He wrote *Emili, or an Evening in Lapland; Columbus; Gustav Adolf in Germany;* and many religious songs.

Frasch, Herman (1852-1914), chemist and inventor, was born at Gaildorf, Germany. He was educated as a pharmacist; came to America in early youth; and, in 1874, established a laboratory at Philadelphia. His earlier inventions were concerned chiefly with the production of oil, salt, wax, and white lead. In 1885, he engaged in petroleum refining in Canada. In connection with the processes which he developed for producing oils of great purity, he secured many important patents. In 1890, Frasch patented an apparatus which largely revolutionized the sulphur industry. For his many achievements in chemical engineering, he was awarded the Perkin medal in 1912. See *Sulphur*.

Fraser, James Earle (1876-1953), American sculptor, was born at Winona. Minn. He was educated in the public schools of Minneapolis and studied sculpture at the Art Institute, Chicago, and under Falguiere in Paris. Among his principal works are the bust of Theodore Roosevelt, Senate Chamber, Washington; a statue of Bishop Potter; Cathedral of Saint John the Divine, New York; "End of the Trail," a statue now in San Francisco; the John Hay Memorial, Cleveland; a statue of Alexander Hamilton, Washington; and heroic figures at the entrances to the Supreme Court Building and the Archives Building, in Washington, D. C. He designed in 1913, the nickel five-cent piece having an Indian head and a buffalo and also the medal of the American Academy of Arts and Letters.

Fraunhofer (*froun'hō-fĕr*), **Joseph von (1787-1826),** German optician and physicist, was born at Straubing in Bavaria. In 1807, he was employed to found an optical institute at Benediktbeuern, which, under his management, was removed in 1819 to Munich. He invented many optical instruments, but is most celebrated for his improvements in telescope prisms, in the mechanism for manipulating large telescopes, and especially for his discovery of the dark lines in the sun's spectrum, called Fraunhofer's lines.

Frazer, Sir James George (1854-1941), British anthropologist, was born at Glasgow. He was educated at Glasgow University and at Trinity College, Cambridge. In 1879, he was elected fellow of Trinity College and was later called to the bar. In 1907, he was made professor of social anthropology at Liverpool. His published works are of great importance in the study of anthropology, especially those concerned with the development of religion and myth, which he connects closely with magic. His principal work is *The Golden Bough*. This was first published in 1890 and was reissued with enlargements many times in the next half century. It contains an elaborate study of the Greek cults, their varied origins, and their place in the comparative history of religion. Among his other works are *Totemism, Pausanias's Description of Greece, The Scope of Social Anthropology, Folklore in the Old Testament, Sir Roger de Coverly, Apollodorus,* and *Anthologia Anthropologica*.

Frederick, Pauline, news analyst, was born at Gallitzin, Pa. While still in high school she was correspondent for Harrisburg newspapers. At the American University in Washington, D. C. she made a special study of political science and international law. Wide experience in reporting for the North American Newspaper Alliance was followed by radio journalism. She is best known for her reports from the United Nations over the NBC network.

Frederick I (c. 1121-1190), called Barbarossa or "Redbeard," became emperor of Germany in 1152. His reign was a long struggle with powerful vassals at home and with Lombardy and the pope in Italy. He captured and razed Milan in 1162 and took Rome by storm five years later. His army was, however, smitten with the plague, and Lombardy again revolted, winning independence by defeating Frederick at Legnano in 1176. At home, he managed his vassals by conciliation and by keeping the balance of power among them equal. He asserted his power over Poland, Hungary, Denmark, and Burgundy. At the height of his fame and influence, he took the Cross to fight against Saladin. He defeated the Mohammedans in two battles, but was drowned in Cilicia.

Frederick VI (1768-1839), king of Denmark, son of Christian VII. In 1784, he was declared regent on account of his father's incapacity. With the help of his minister Count Bernstorff, he abolished serfdom, reformed the criminal code, removed the disabilities of the Jews, and prohibited the slave trade. By the advice of Bernstorff, he strove to maintain strict neutrality in the wars of the epoch. But, for refusing the demands of the English, the Danish fleet was almost destroyed in 1801, and, in 1807, Copenhagen was bombarded, and the remnants of the fleet were transferred to England. Denmark then became an ally of Napoleon and shared his fortune. Frederick ascended the throne on the death of his father in 1808. In 1814, Norway was taken from Denmark by the states allied against Napoleon and was given to Sweden. The country had become bankrupt in 1813, but, by Frederick's wise measures, financial order was finally restored.

Frederick the Great, or **Frederick II (1712-1786),** king of Prussia, was born in Berlin. In 1730, he endeavored by flight to escape from his father's control, but was arrested, tried as a deserter, and condemned to death. He was pardoned, however, through the intercession of Charles VI of Austria. In 1733, Frederick was compelled by his father to marry Elizabeth Christina of Brunswick. From 1732 to 1740, his time was devoted principally to literary amusements and society.

Conquest of Silesia. Frederick became King of Prussia on May 31, 1740, and his dormant energies at once awoke to action. In October, he marched an army into Silesia, most of which he obtained for Prussia by the Treaty of Breslau in 1742. This action was opposed by Austria, which proceeded to form, with England and Sardinia, the so-called Triple Alliance. Frederick executed a countermove by concluding a treaty with France and the Elector of Bavaria. In 1744, Frederick anticipated the designs of Austria upon Silesia by marching into Bohemia At the end of 1745, he found himself in possession of Dresden, the capital of Saxony. and in a position to dictate terms of peace to Austria and Saxony, thereby confirming himself in the possession of Silesia.

Patronage of Literature. During the next ten years, Frederick resided chiefly at Potsdam, exercising a minute superintendence over every branch of government, but without depriving himself of social pleasure or abandoning his literary pursuits. At this time, he began his *History of My Age* and wrote his *Memoirs of the House of Brandenburg*. He restored the Academy of Sciences of Berlin and was eager to enroll distinguished foreigners among its mem-

bers and to induce them to resort to his capital. Among the notable men attracted to his court were Euler and Voltaire. The latter, after a three-year sojourn, quarreled with the monarch and returned to France. Frederick ignored German writers and consistently fostered French culture at his court.

Later Activities. In 1756, Frederick learned that a new coalition, including Russia and his former ally, France, was forming against him. England was his only ally during the bitter struggles of the ensuing Seven Years' War, in which Frederick proved himself to be a brilliant military leader. Ultimately, by the Treaty of Hubertusburg, signed February 15, 1763, Frederick was again left in possession of Silesia. To cure the evils inflicted by warfare, Frederick set himself to restoring the strength of the exhausted population. He emancipated the peasants from hereditary servitude and then began a gradual alteration of the fiscal system. His *History of the Seven Years' War* was written at this period.

In 1772, Frederick joined in the project for the first partition of Poland. He gained a territory of no great extent, but of considerable value for strategic purposes. In 1778, he led an army into the field to prevent the partition of Bavaria, and, in 1785, he again found cause to oppose Austria, this time in defense of the integrity of the German constitution. To secure his purpose, he found it sufficient to negotiate a confederation among the chief powers of Germany, known as the Fürstenbund, which was bound to support the constitution of the empire and the rights of the several princes. Frederick died at Sans Souci, near Potsdam.

Frederick William (1620-1688), elector of Brandenburg, was born in Berlin. On his accession in 1640, he found the state disorganized and exhausted by the Thirty Years' War. He carefully regulated the finances, made a treaty of neutrality with Sweden, organized an army, and strove to repeople his deserted towns and villages.

By the Treaty of Westphalia, 1648, he recovered eastern Pomerania, Halberstadt, Minden, and the archbishopric of Magdeburg. Out of a quarrel between Sweden and Poland he contrived to secure the independence of the duchy of Prussia from Poland, 1657. Alarmed by the aggressions of Louis XIV on the Rhenish frontier, he organized a league against France and defeated the Swedes, the allies of Louis, at Fehrbellin, 1676. However, deserted by his friends, he was obliged to agree to the Treaty of Saint Germain, 1679, by which he restored all his conquests to the Swedes on the payment to him of 300,000 crowns.

The remainder of the elector's reign was devoted to the consolidation of his dominions and to the development of their resources. He encouraged the immigration of exiled French Protestants, Dutchmen, and other foreigners. He founded the Royal Library at Berlin, reorganized the universities, opened canals, established posts, greatly enlarged Berlin, and left a well filled exchequer and a highly organized army. He made Brandenburg virtually an absolute monarchy only less powerful than Austria. Died at Postdam.

Frederick William I (1688-1740), king of Prussia, son of Frederick I. On his accession in 1713, he became embroiled in the war waged by Sweden against Russia, Poland, and Denmark, at the end of which he acquired Pomerania with Stettin. The remainder of his reign was devoted to improving the internal condition of Prussia. He was sternly practical, blunt, and determined; he despised the arts and sciences, was rigidly economical, and strict in his ideas of justice. He fostered industry and agriculture, secured an adequate income for the state, and established an army of more than 80,000 men, the best disciplined force in Europe.

Freeman, Edward Augustus (1823-1892), English historian, was born at Harborne. He was educated at Trinity College, Oxford. His first work was a *History of Architecture*, 1849. After several minor works, his most important one, *The History of the Norman Conquest*, appeared between 1867 and 1879. It minimizes the effect of the conquest, exalting the Teutonic influences. This work was followed by *The Reign of William Rufus*. He also wrote histories of the Saracens and of the Ottoman power in Europe, *General Sketch of European History, Growth of the English Constitution, Comparative Politics, Historical Geography of Europe*, and various other works, all illustrating the two factors which, through him, influenced English historical writing—close dependence on sources and an appreciation of the unity of European history. In 1884, he was appointed regius professor of modern history at Oxford.

Freeman, Mary Eleanor Wilkins (1852-1930), American novelist, was born at Randolph, Mass. She was educated there and at Mt. Holyoke Seminary; for many years, was secretary to Oliver Wendell Holmes; and came into prominence as a writer for magazines, contributing poems, short stories, and novels. She married Dr. Charles M. Freeman, 1902. Her fiction, which is devoted chiefly to interesting portrayals of New England life, ranks among the best of its kind. Her writings include *Young Lucretia, Evelina's Garden, The Love of Parson Lord, The Portion of Labor, The Wind in the Rose Bush, By the Light of the Soul, Shoulders of Atlas*, and *A New England Nun and Other Stories*.

Frémiet (*frā'myĕ'*) **Emmanuel (1824-1910),** French sculptor, was born at Paris. He studied at La Petite Ecole and under Rude; made drawings at the Jardin des Plantes; and later drew plates for medical works. His first sculptural work was a gazelle. His masterpiece is an equestrian statute of Joan of Arc. His other pieces include "Gorilla Abducting a Woman," "Saint Michael," "Faun and Young Bear," "Dachshund," "The Man of the Stone Age," "Meissonier," and statues of De Lesseps, Du Guesclin, Napoleon, and Conde. At the Saint Louis Exhibition in 1904, his work was represented by bronze statues of Saint George, a "Gorilla of Gabun," and "Race Horses." Frémiet's work is marked by power, realism, and originality, and he ranks with Barye among the leading modern sculptors of animals.

Frémont (*frē'mŏnt*), **John Charles (1813-1890),** "the pathfinder," American explorer, was born at Savannah, Ga., and was educated at Charleston College, S. C. He taught mathematics on a warship for two years and, in 1838, began surveying. In 1842, he crossed the Rocky Mountains and demonstrated the feasibility of an overland route across the continent. In 1843, he explored Great Salt Lake advancing to the mouth of the Columbia River; in 1845, he examined the watershed between the Mississippi and the Pacific.

During the Mexican War, he cleared northern California of Mexican troops, but, quarreling with his superior officers, resigned his captaincy. In 1848, he started upon a fourth expedition, along the upper Rio Grande, but was compelled to return to Santa Fe after great sufferings. In 1849, he crossed over to California, where he settled and, in the following year, became United States senator from the new state. He discovered gold on his California estate, which made him very wealthy. In 1856, he was the Republican and Antislavery candidate for the presidency. In 1861-62, he served in the regular army as major general, but resigned rather than serve under General Pope. He was governor of Arizona, 1878-82.

Fremstad (*frĕm'stăd*), **Olive (c. 1870-1951),** dramatic soprano, was born at Stockholm, Sweden. She received her early musical education in Oslo and, at the age of 12, came with her parents to America, settling in Minneapolis. At 16, she sang in choirs, and, in 1890, she began musical study in New York. In 1895, she made her first appearance in opera as Azucena in *Il Trovatore* at Cologne, where she was a member of the opera, 1897-99, also appearing in Vienna, Antwerp, and Amsterdam. From 1900 to 1903, she was engaged by the Royal Opera in Munich, singing also at Covent Garden, London.

Late in 1903, with notable success, she made her first American appearance in opera as Sieglinde in *Die Walküre* at the Metropolitan Opera House, New York, where, for many seasons, she appeared in all the great Wagnerian roles, of which she ranked among the world's foremost interpreters. She also created the part of Salome in the opera by Strauss.

French, Daniel Chester (1850-1931), American sculptor, was born at Exeter, N. H. He was educated in Exeter, N. H., and at the Massachusetts Institute of Technology, Boston; studied art with William Rimmer in Boston, with J. Q. A. Ward in New York, and with Thomas Ball in Florence, Italy. After a short residence in Boston and in Concord, Mass., he became established in New York, 1887.

Among his best-known earlier works are "The Minute Man of Concord," at Concord Mass.; a statue of General Cass, in the Capitol at Washington; a statue of Rufus Choate, Boston Courthouse; one of John Harvard, at Cambridge, Mass.; "Dr. Gallaudet and His First Deaf-Mute Pupil"; "Death and the Sculptor"; and the colossal "Statue of the Republic," at the World's Columbian Exposition. Among his later works are the statue of Washington presented to the French nation; "Alma Mater," at Columbia University; the four groups of the "Continents," New York Customhouse; Alice Freeman Palmer Memorial, Wellesley College; the Melvin Memorial, "Mourning Victory," at Concord, Mass.; and the colossal seated figure of Lincoln in the Lincoln Memorial at Washington.

His style is distinctly American and combines beautiful technique and fine sculptural composition with high intellectual qualities. By his versatility and the sustained excellence of his numerous works, he ranks next to Saint-Gaudens among American sculptors. He was elected a member of the American Academy of Arts and Letters in 1905.

French, Lord John Denton Pinkstone (1852-1925), British soldier, was born at Ripple Vale, Kent. He served

first in the navy; entered the army in 1874; and was in the Sudan campaign, 1884-85. He became lieutenant general in the Boer War, having command of the British cavalry forces, and was made general in 1907 and field marshal in 1913. He resigned early in 1914 as a protest against an impending coercion of Ulster, but, on the outbreak of World War I in 1914, he immediately rejoined the army. He led the British expeditionary forces in France until December 1915, when he was made commander in chief of the armies in the United Kingdom and was created Earl of Ypres. At the end of the war, he published his personal narrative in *1914*. He was lord lieutenant of Ireland from 1918 to 1921.

Freneau (*frē-nō'*), **Philip (1752-1832),** American poet, was born in New York City of French Huguenot descent. He was graduated at Princeton in 1771. In 1776, he visited the West Indies and, in 1778, went to the Bermuda Islands. In 1780, during the Revolutionary War, he again sailed for the West Indies, but was captured by a British cruiser. After the return of peace, Freneau became in succession editor of a newspaper and captain of a ship that plied between New York, the West Indies, and the Southern states. When Jefferson was secretary of state, Freneau was made translator for the State Department. He also became editor of the *National Gazette* and the *Jersey Chronicle*.

Freneau was the earliest American poet of genuine ability. His finest poems are lyrics, among which are *The Indian Burying-Ground, The Wild Honeysuckle,* and *Eutaw Springs*. His effective satires include *The Prison Ship, The Midnight Consultation,* and *America Independent*.

Frère (*frâr*), **Pierre Edouard (1819-1886),** French painter, was born at Paris and studied under Delaroche and at the Ecole des Beaux-Arts. His paintings are mostly figures and scenes from domestic life, excellent in color and homely in sentiment. They are good subjects for engraving and are well known in art stores. Ruskin was enthusiastic in praise of several of his works. "The Seamstress," "Little Gourmand," "Preparing for Church," and the "Gleaner Boy" are among his best-known pictures. "Preparing for Church" is in the Corcoran Gallery at Washington.

Fresenius (*frâ-zā'nê-ŏŏs*), **Karl Remigius (1818-1897),** German chemist, was born at Frankfort on the Main. He studied at Bonn and Giessen under Liebig and, in 1845, became professor of chemistry at Wiesbaden. The laboratory founded by him in 1848 subsequently gained great celebrity in chemical science. His chief contributions were methods of chemical analysis. Many of his valuable and original papers were published in *Zeitschrift für analytische Chemie*, which he founded in 1862 and edited until his death.

Fresnel (*frā'nĕl'*), **Augustin Jean (1788-1827),** French physicist, was born at Broglie, Eure. He was educated at the Polytechnic School in Caen and, in 1816, received a permanent appointment as engineer in Paris, where he collaborated with the celebrated Arago. He distinguished himself by his experiments on the inflection and polarization of light and, in 1819, gained the prize offered for the best treatise explanatory of the phenomena of light.

Independently of Thomas Young, he disproved Newton's corpuscular theory of light by brilliant experiments which confirmed the undulatory theory. He advanced the theory that light is due to wave motion and that these waves are perpendicular, or transverse, to the direction of the propagation of the waves. He invented the compound lighthouse lens.

Freud (*froit*), **Sigmund (1856-1939),** Austrian physician, and the founder of psychoanalysis, was born at Freiberg, Germany, and was educated at the University of Vienna and in Paris. In 1892, he became assistant professor of neuropathology at the University of Vienna, in which capacity he attained wide celebrity for a method of treating hysteria and other nervous disorders by recalling to consciousness early sexual experiences which had been apparently forgotten but which continued to operate in unbalancing the personality. This treatment he called psychoanalysis. The influence of his viewpoint was widespread in literature, novelists finding the idea of the subconscious mind highly fruitful in developing springs of action for their characters. Freud's chief publications include *Studies on Hysteria, Interpretation of Dreams,* and *Psychoanalysis*. He died in England, where he had taken refuge after the German occupation of Austria, fearing persecution on account of his Jewish origin.

Freund (*froint*), **Wilhelm (1806-1894),** German philologist, was born of Jewish parents at Kempen in Posen. He studied at Berlin, Breslau, and Halle; taught at Breslau, Hirschberg, and Gleiwitz; and finally settled down to a literary life at Breslau. On his monumental *Wörterbuch der lateinischen Sprache* most Latin-English dictionaries are based.

Freytag (*frī'täĸ*), **Gustav (1816-1895),** German novelist and dramatic writer, was born in Silesia. He studied at Breslau and Berlin; lectured on German literature in the University of Breslau; and edited a newspaper at Leipzig, 1848-70. He wrote poems, successful plays, novels, and dramatic criticism. His best-known novel is *Soll und Haben,* "Debit and Credit." *The Lost Manuscript* and the historical series called *Our Ancestors* were almost as popular. His other important works include *Die Journalisten*—one of the finest of German comedies—and *Die Technik des Dramas*.

Frick, Henry Clay (1849-1919), American manufacturer and capitalist, was born in West Overton, Pa. He began business life as a clerk for his grandfather, a flour merchant and distiller, and later embarked in a small way in the coke business. He was president and, in 1897, was made chairman of the board of directors of the H. C. Frick Coke Company, which became the largest coke producer in the world, operating nearly 40,000 acres of coal and 12,000 coke ovens, with a daily capacity of 25,000 tons. He came into public notice by his vigorous management during the strike at Homestead, 1892, when he was shot and stabbed by Alexander Berkman, an anarchist. He was elected chairman of the board of managers of the Carnegie Steel Company in 1892. On his death he bequeathed his New York mansion with its art collection to the city. This bequest had an estimated value of 50 million dollars, and to it Frick added an endowment fund of 15 million dollars. He bequeathed also a handsome park to the city of Pittsburgh.

Friml, Carl Rudolf (1881-), Czech-American composer, was born at Prague, and studied at the Conservatoire there under Dvořák and others. He came to the United States as accompanist for Kubelik the violinist, in 1901, and at that time appeared also as a concert pianist. He returned briefly to Czechoslovakia, and then settled permanently in the United States before World War I. Although the writer of numerous compositions for the piano, violin, and cello, his fame rests on his work as a composer of operettas. Among his twenty-seven musical comedies were *The Firefly* (1912), which included "The Donkey Serenade" and the waltz "Sympathy;" *The Vagabond King* (1925), with the "March of the Vagabonds" and "Only a Rose;" and *Rose Marie* (1927), with its "Indian Love Call" and "O, Rose Marie, I Love You, I'm Always Dreaming of You." Friml also wrote the popular song *L'Amour, toujours*.

Frobisher (*frŏb'ĭsh-ĕr; frō'bĭsh-ĕr*), **Sir Martin (c. 1535-1594),** English navigator, was brought up to the sea. Persuaded that there was a northwest passage to the Indies, he obtained three vessels from the government of Queen Elizabeth in 1576, explored portions of the arctic coast, and, passing through the strait which has since borne his name, returned to England.

He was enabled by the queen to make two more voyages of exploration, in 1577 and 1578. In 1585, he went with Sir Francis Drake to the West Indies. He contributed by his gallantry toward the defeat of the Spanish Armada in 1588 and received the honor of knighthood. In 1590 and 1592, he successfully commanded squadrons against the Spaniards, winning recognition as one of England's great naval heroes in addition to being one of the ablest navigators of his time. Having been sent to the aid of Henry IV of France, he was wounded and died on his homeward voyage.

Froebel (*frû'bĕl*), **Friedrich Wilhelm August (1782-1852),** German educator, founder of the kindergarten system, was born at Oberweissbach, Thuringia. He studied at Jena, Göttingen, and Berlin; served in the German army against the French, 1813–14; and, in 1816, founded a school at Griesheim, which he removed in 1817 to Keilhau, near Rudolstadt. He also founded a kindergarten at Blankenburg in 1837.

His system was based on the principles advocated by Pestalozzi,—under whom he worked from 1807 to 1809,—which combined physical, moral, and intellectual training, beginning with the early years of childhood. See *Educational Reformers*.

Froehlich, Jack E. (1921-), engineer, was born at Stockton, California. He studied at the California Institute of Technology, from which he received advanced degrees in aeronautical engineering. In addition to research and development work at the Jet Propulsion Laboratory at "Caltech," he has been active in field testing of rockets and missiles at White Sands Proving Ground and in preparing Explorer and Pioneer satellites for launching.

Frohman, Charles (1860-1915), American theatrical manager, brother of Daniel Frohman, was born at Sandusky, Ohio. He was educated in the public schools of New York; in 1877, took charge of a company playing *Our Boys;* was with Wm. Haverly's minstrels in United States and Europe, 1879–80. In 1888, he saw *Shenandoah* at Boston Museum; organized a company and bought rights to that play, outside of Boston; enjoyed great success with that and succeeding ventures; and, in 1890, organized the

Charles Frohman Stock Company. He became proprietor and manager of the Empire, Criterion, Lyceum, Garrick, Savoy, and Knickerbocker theaters, New York, and the Duke of York's, Comedy, Globe, and Adelphi theaters, London. As manager, he brought out Maude Adams, Julia Marlowe, John Drew, and other prominent actors. In 1905-06, he managed the Shakespearean productions of E. H. Sothern and Julia Marlowe. He was drowned on the *Lusitania*.

Frohman, Daniel (**1853-1940**), American theatrical manager, brother of Charles Frohman, was born at Sandusky, Ohio. He received a common school education and became office boy of the New York *Tribune*, 1866. He remained in the newspaper business for five years; then appeared as manager of theatrical companies traveling through the United States and later as manager of Fifth Avenue, Madison Square, Lyceum, Daly's theaters, New York. He was also manager of English and American stars and theatrical companies. He wrote *Memories of a Manager*.

Froissart (*frwä'sär'*), **Jean** (**1338-1410**), French poet and chronicler, was born at Valenciennes. He was educated for the Church, but early devoted himself to poetry, to tales of chivalry, and to travel. In 1361, he went to England to present a poem to Queen Philippa and became secretary to King John. In 1365, he visited the Scottish court and, in 1368, traveled in Italy. About 1370, he entered the service of Duke Wenceslas of Luxemburg. For 10 years, he was devoted to the writing of his famous *Chronicles*. He again traveled for 15 years, after which he revised the *Chronicles*.

The most valuable part of this work is that describing events and wars from 1325 to 1400. While often inaccurate in details, it presents a remarkably faithful picture of the general character and manners of the age. He wrote many verses and a long poem of chivalry, *Meliador*. He is said to have died at Chimay.

Fromentin (*frô'mäN'tăN'*), **Eugène** (**1820-1876**), French painter and author, was born at La Rochelle, France. He was a pupil of Rémond and Cabat; traveled in Algeria, Egypt, and the East in 1846 and 1848; and was made an officer of the Legion of Honor, 1859. He wrote the successful romances *Dominique* and *Les Maîtres d'autrefois*. He became distinguished for his paintings of the Sahara and his portrayals of Arab life. Some of his best pictures are "Crossing the Ford," "Arabs Watering Horses," "Encampment in Atlas Mountains," "The Falcon Hunt," and "An Arab Camp." Many fine examples of his work are in American collections, particularly in the Walters Gallery, Baltimore, and the Metropolitan Museum, New York.

Frontenac (*frŏn'tē-năk;* Fr. *frôN'tē-näk'*), **Louis de Buade, Comte de** (**1620-1698**), French Colonial officer, governor of Canada. He served in the French army and, in 1672, was appointed governor of the French possessions in North America. He was recalled after ten years of controversy with the Jesuits, but he had gained the confidence of the settlers and the respect of the Indians; in 1689, when to constant attacks from the Iroquois a war with England was added, he was again made governor. He carried his punitive expeditions to the New England villages, repulsed a British attack on Quebec, and completely broke the power of the Iroquois. He died at Quebec.

Frost, Arthur Burdett (**1851-1928**), American illustrator and author, was born at Philadelphia, Pa. He worked as an engraver and lithographer, but was mainly self-taught in art. In 1876, he entered the employ of Harper and Brothers, New York, where he was associated with Abbey, Alexander, and Reinhart. Naturalness, fine draftsmanship, and good humor characterize his extensive illustrative work, which included the illustrations for Joel Chandler Harris's *Uncle Remus*. He published *Bull Calf and Other Tales, Golfer's Alphabet, Stuff and Nonsense, Sports and Games in the Open, Book of Drawings*, and *Carlo*.

Frost, Robert Lee (**1874-1963**), American poet, was born in San Francisco, and studied at Dartmouth and at Harvard. He engaged in farming at Derry, N. H., 1900–05; taught English at Pinkerton Academy there, 1905–11; and was instructor in psychology at the State Normal School, Plymouth, N. H., 1911–12. He then spent three years in England, during which time he published two volumes of poems,—*A Boy's Will* and *North of Boston*,—which display much poetic ability and won wide recognition. He served as professor of English at Amherst College from 1916 to 1938 with intervals of association with the University of Michigan in 1921–23 and 1925–26 and held positions at Harvard and Yale. He won Pulitzer prizes for poetry several times and was elected to the American Academy of Arts and Letters in 1930. His other publications include *The Lovely Shall Be Choosers, The Lone Striker, From Snow to Snow*, and *In the Clearing*.

Froude (*frōōd*), **James Anthony** (**1818-1894**), English historian was born at Dartington. He was educated at Oriel College, Oxford, and was intended for the Church, but he abandoned this career and a fellowship on account of a change of views explained in his *Nemesis of Faith*. In 1892, he became professor of history at Oxford University.

His chief historical work is *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada;* he wrote also *The English in Ireland*. In literature, his best-known works are those on the Carlyle family and *Erasmus*. He wrote also a novel—*The Two Chiefs of Dunboy*—and many miscellaneous works, including *Cæsar, Life of Lord Beaconsfield. Life of Carlyle*, and *Oceana*.

Fry, Christopher (**1907-**), English dramatist, has been a schoolmaster, actor, and director. He has served as director of the Tunbridge Wells Players, the Oxford Repertory Players, and as staff dramatist of the Arts Theater. He is known chiefly for his verse plays, among them *The Lady's Not for Burning* (1948), *Venus Observed* (1950), *A Sleep of Prisoners* (1951), and *The Dark Is Light Enough* (1954). His work has been produced in London, and New York.

Fry, Elizabeth (**1780-1845**), English philanthropist was born in Norfolk, of Quaker parentage. When she was 18 years old, she heard a sermon in a Friends' meetinghouse that turned her thoughts toward philanthropy. She began working among the poor and founded a school for poor children. She married and later became a preacher among the Friends. In 1813, she first saw the miserable condition of the women in the Newgate Prison, and her attention was turned to prison reform. She visited prisons in Great Britain and on the continent, everywhere effecting improved conditions.

Frye, William Pierce (**1831-1911**), American legislator, was born in Lewiston, Me. He was graduated from Bowdoin College, 1850, and studied and practiced law. He entered the Maine legislature in 1861 and later became attorney general of the state. He was a Republican representative in Congress, 1871-1881, when he was elected United States senator to succeed James G. Blaine, and served with distinction for 30 years. A debater of great power, he urged an expansionist policy and a subsidized merchant marine. At the end of the Spanish-American War, he was a member of the peace commission at Paris and was in large measure responsible for the acquisition of the Philippines by the United States.

Fuertes (*fwâr'tâs*), **Louis Agassiz** (**1874-1927**), American painter was born at Ithaca, N. Y. He was graduated at Cornell University in 1897. His most pronounced success was in the painting of birds. Besides illustrating numerous books, he constructed the habitat groups in the American Museum of Natural History, New York, and executed many mural paintings in various public buildings. He was killed in a railroad crossing accident.

Fulbright, James William (**1905-**), American legislator, was born at Sumner, Mo. After he was graduated from the University of Arkansas in 1925, he went to Oxford University as a Rhodes Scholar, receiving his master's degree there in 1931. He studied law at George Washington University and became professor of law at the University of Arkansas, where he was president 1939–41. He was elected to Congress in 1942 and to the U. S. Senate in 1944. Besides being a member, and more recently chairman of the Committee on Foreign Relations, he has encouraged better understanding between countries by providing visiting scholarships through the legislation which bears his name.

Fuller, Melville Weston (**1833-1910**), American jurist, was born in Augusta, Me. He was graduated from Bowdoin College in 1853, and studied at Harvard Law School. Admitted to the bar in 1855, he formed a law partnership at Augusta and became associate editor of *The Age*, a Democratic paper. He went to Chicago in 1856 and practiced law there until 1888, when he was appointed chief justice of the United States Supreme Court, which office he held until his death. He was chancellor of the Smithsonian Institution, was one of the arbitrators to settle the boundary line between Venezuela and British Guiana.

Fuller, R(ichard) Buckminster (**1895-**), engineer, was born at Milton, Mass. He attended Milton Academy, had a brief stay at Harvard, and received training as an ensign in the U. S. Navy in World War I. However, like many other inventors, he was largely self-educated. Extensive knowledge of mathematics, creative imagination, and a flair for designing equipped him for such highly original inventions as the "Dymaxion" house and the "Geodesic" construction used recently in theaters and other large structures built without inside posts. More than an architect or designer, Mr. Fuller is also a philosopher whose writings interpret clearly the life and needs of modern times.

Fuller, Sarah Margaret (**1810-1850**), Marchioness Ossoli, American critic and essayist, was born at Cambridgeport, Mass. At 25 she assisted her family by school and private teaching. In Boston she edited *The Dial*, the organ

of the "transcendentalists," with some members of which group she participated in the communist community of Brook Farm colony. Her *Woman in the Nineteenth Century* is the outgrowth of classes in conversation for young women which she conducted as a step in the intellectual emancipation of women. She wrote also *Summer on the Lakes in 1843* and *Papers on Literature and Art*.

In 1847, she married the Marquis Ossoli at Rome. In 1849, during the siege of Rome, she took charge of a hospital. After the capture of the city by the French, she and her husband sailed with their infant for America and all were drowned in the wreck of the vessel off Fire Island, near New York.

Fulton (*fo͝ol'tŭn*), **Robert** (**1765-1815**), American inventor and engineer, was born at Little Britain, Pa. He was apprenticed to a jeweler in Philadelphia at an early age, and, in addition to his labors at this trade, he applied himself to painting. The sale of his portraits and landscapes enabled him, in the space of four years, to purchase a small farm, in which he placed his widowed mother. At the age of 22, he went to London, where he studied painting under Benjamin West; but after several years thus spent he abandoned painting and applied himself wholly to mechanics.

In 1794, Fulton obtained from the British government a patent for an inclined plane, the object of which was to set aside the use of canal locks; in the same year, he invented also a mill for sawing and polishing marble. His next invention was a machine for spinning flax, followed by one for making ropes. He became qualified as a civil engineer in 1795, and wrote a work on canals. Accepting an invitation from the United States minister at Paris, he proceeded to that city in 1796 and remained there for seven years, devoting himself to new projects and inventions.

In 1803, Fulton constructed a small steamboat, and his experiments with it on the Seine were attended with great success. He returned in 1806 to New York and pursued his experiments there. In 1807 his steam vessel, the *Clermont*, in the presence of thousands of astonished spectators, made its first successful round trip between New York and Albany. From this period, steamers came into general use upon the rivers of the United States. In 1815, he launched the war steamer *Fulton*. He was elected to the American Hall of Fame in 1900.

Funk, Isaac Kaufman (**1839-1912**), author, publisher, and clergyman, was born at Clifton, Ohio. He was graduated at Wittenberg College, 1861, and from 1867 to 1872 filled various pastorates, the last of which was Saint Matthew's English Lutheran Church, Brooklyn. In 1878, he entered into a partnership with A. W. Wagnalls, and became editor in chief of various periodicals of the Funk and Wagnalls Company. He was editor in chief of the *Standard Dictionary*, chairman of the editorial board that produced the *Jewish Encyclopædia*, and founder-editor of *The Metropolitan Pulpit*, later the *Homiletic Review*. In connection with his house, he founded *The Voice*, 1880, *The Missionary Review*, 1888, and *The Literary Digest*, 1889. He also published numerous works of reference. He wrote *The Next Step in Evolution*, *The Widow's Mite and Other Psychic Phenomena*, and *The Psychic Riddle*.

Funston (*fŭn'stŭn*), **Fred** (**1865-1917**), American soldier, was born at New Carlisle, Ohio. He studied in the University of Kansas for two years and in 1890 became a newspaper reporter in Kansas City. In 1891, he was botanist in the United States Death Valley Expedition. In 1893, he was appointed commissioner for the Department of Agriculture to explore Alaska and to report on its flora. In carrying out this work, he crossed Alaska to the Arctic Ocean, traveled from the Mackenzie River to Bering Sea, 3500 miles, camped on the Klondike in winter of 1893-94, and floated down the Yukon, alone, in a canoe. In 1896-97, he was an officer in the insurgent army in Cuba.

At the beginning of the Spanish-American War, in 1898 he went as colonel to the Philippines, took part in several battles, and, for signal bravery at Calumpit, was promoted to brigadier general of United States volunteers and awarded a medal by Congress, 1899. He organized and commanded the expedition which resulted in the capture of Aguinaldo, head of the Filipino insurrection, and was appointed brigadier general of United States army, 1901. During 1905-07, he commanded the department of California, with headquarters at San Francisco, and performed valuable services for the city at the time of the earthquake-fire, 1906.

Funston, George Keith (**1910-**), educator and business executive, was born at Waterloo, Iowa, and was educated at Trinity College and Harvard University. He was for a time a member of the research staff of the Harvard Business School. During World War II he served as special assistant to the chairman of the War Production Board. He then became president of Trinity College, but since 1951 he has been president of the New York Stock Exchange.

Furness (*fûr'nĕs*), **Horace Howard** (**1833-1912**), American Shakespearean scholar, was born in Philadelphia, Pa. He was graduated from Harvard, 1854, and from the University of Halle, Germany, 1856. He studied law in Philadelphia and was admitted to the bar in 1859. He began publishing in 1871 the so-called Variorum edition of Shakespeare's plays, which brought together and summarized the results of the best Shakespearean scholarship in all languages. He completed 15 plays, and his son and namesake continued the work. Five universities honored him with degrees and, in 1905, he was elected member of the American Academy of Arts and Letters.

Furnivall (*fûr'nĭ-văl*), **Frederick James** (**1825-1910**), English philologist, was born at Egham, Surrey. He was educated at University College, London, and at Trinity Hall, Cambridge. In early life he associated himself with the Christian Socialist movement and was one of the founders of the Workingmen's College, in which he taught every term for ten years. He devoted himself to English philology and founded the Early English Text Society in 1864, the Chaucer Society in 1868, the Ballad Society in 1868, and the New Shakespeare Society in 1874. He was active in starting the Browning Society, 1881, the Wycliffe Society, 1882, and the Shelley Society, 1885. He personally edited many works, chiefly in connection with the foregoing societies. He was one of the original promoters of the Oxford *New English Dictionary* and was for a time its chief editor. His best works are his "six-text" edition of Chaucer's *Canterbury Tales*, and the *Century Shakespeare*.

Furtwängler, Wilhelm (**1886-1954**), German conductor, son of archaeology professor Adolf Furtwängler, received his education at Munich. Except for two years as guest conductor of the New York Philharmonic Orchestra he was occupied with musical activities in Germany and Austria. He was well known for his work as conductor of operas at Breslau, Munich, Strassburg, Bayreuth, and Berlin, and of symphony orchestras at Frankfort, Leipzig, Vienna, and Berlin. After World War II his musical leadership was somewhat hampered by discussion of the extent of his sympathy and collaboration with the Nazi regime.

Fust (*fo͝ost*) or **Faust** (*foust*), **Johann** (**?-c. 1466**), German printer, a citizen of Mainz, Germany, who was associated with Gutenberg in the introduction of printing. He probably had nothing to do with the invention of printing, but furnished the capital to introduce the new art. In 1455, he sued Gutenberg for money he had advanced. Upon nonpayment, it is claimed by some that Fust seized enough of the apparatus to satisfy the mortgage and continued the business of printing with his son-in-law, Peter Schöffer. There is, however, no direct evidence of such seizure. A Latin Bible in the Mazarin Library is the best-known book printed by Gutenberg and Fust.

Gade (*gä'dĕ*), **Niels Wilhelm** (**1817-1890**), Danish composer, was born at Copenhagen. He was court organist at Copenhagen and wrote several symphonies, overtures, and cantatas, as well as many choral and solo productions. His overture *Ossian* has received high praise, as have also his musical sketches *Aquarellen* and *Volkstänze*. His cantatas *The Crusaders*, *Comala*, *Psyche*, and *The Message of Spring* gave him a wide reputation. While greatly influenced by Mendelssohn, with whom he spent five years at Leipzig, his works show much originality and he is regarded as one of the founders of the Scandinavian school of music.

Gadsden (*găd'dĕn*), **Christopher** (**1724-1805**), American patriot, was born in Charleston, S. C. He was a member of the first Continental Congress, 1774; became brigadier general during the Revolution; and was lieutenant governor of South Carolina at the time of the surrender of Charleston to Sir Henry Clinton in 1780.

Gage, Thomas (**1721-1787**), English general and the last royal governor of Massachusetts. In 1763, he was made commander in chief of the British forces in America. His inflexible character led the British government to regard him as well fitted to end the disturbances in the American colonies. In 1774, he was nominated governor of Massachusetts, a post of peculiar difficulties.

In April 1775, he dispatched an expedition to seize a quantity of arms which had been stored at Concord. On the way thither, the detachment came upon a number of militia drilling and attacked them because of their refusal to lay down arms. This encounter, known as the battle of Lexington, was the signal for a general uprising throughout the colonies. On June 17, the battle of Bunker Hill was fought, which resulted in a dearly bought victory for the English; but, numerous complaints being lodged against Gage, he was recalled by the British government in October 1775.

Gaillard, David Du Bose (**1859-1913**), American engineer, was born in Sumter County, S. C. He was graduated from West Point in 1884; served on the boundary commission of the United States and Mexico, 1891-94; and became colonel of volunteer engineers during the Spanish-American War. In 1907, he was made member of the Isthmian

Canal Commission and engaged in dredging harbors and constructing breakwaters. In 1908, he was appointed engineer of the Gatun-Pedro Miguel division of the Panama Canal, where he demonstrated notable efficiency. After his death, the celebrated Culebra Cut was renamed Gaillard Cut by order of President Wilson in recognition of Gaillard's eminent services.

Gainsborough (*gānz'b'rō*), **Thomas** (**1727-1788**), English portrait and landscape painter, was born at Sudbury, Suffolk. He early displayed a decided talent for painting and began life as a portrait painter, producing during his successful career more than 200 portraits. These are distinguished by great nobility and refinement, and several rank among the greatest masterpieces of English portrait painting. His later genius found adequate expression in the delineation of the rich and quiet scenery of his native country, and to this he mainly devoted himself after settling in London in 1774. Among his finest productions are "The Shepherd's Boy," "The Fight Between Little Boys and Dogs," "The Sea-Shore," "The Woodman in a Storm," and "Duchess of Devonshire." The most celebrated of his pictures is "The Blue Boy," which is now in the Huntington Art Collection at San Marino, California.

Gaitskell, Hugh (**1906-1963**), statesman, was born to a British family long associated with the Indian Civil Service. He was educated at Winchester and at New College, Oxford. As head of the department of political economy at University College in London, he evolved a moderate form of socialism that shunned revolution. He entered the Labor government in 1940 and served successively as Minister of Fuel and Power, Minister of State for Economic Affairs, and Chancellor of the Exchequer. He had been a member of Parliament from Leeds since 1945.

Gaius (*gā'yŭs*), or **Caius,** Roman jurist, flourished in the 2d century of the Christian era. He is the author of numerous legal works, of which the *Institutes* is the most important. This is supposed to have been the first instance of a popular manual of Roman law in the sense of modern elementary textbooks. It was incorporated almost bodily into the celebrated *Institutes* of Justinian. The work was long lost, but a large part of it was recovered in 1816-17 from a much defaced palimpsest found by Niebuhr in the Cathedral Library at Verona.

Galbraith, J. Kenneth (**1908-**), economist, was born at Iona Station, Ontario, Canada. He studied at the universities of Toronto, California, and Cambridge, England. He has served as economic adviser to U.S. government departments and since 1948 has been professor of economics at Harvard University. In 1961 he was appointed U.S. Ambassador Extraordinary and Plenipotentiary to India. He is the author of several books, best known of which is *The Affluent Society*.

Galdós, Benito Pérez. See *Pérez Galdós, Benito*.

Galen (*gā'lĕn*), or **Claudius Galenus** (**130 A. D.-c. 201**), Greek physician, was born at Pergamum, in Mysia. He studied medicine first at Pergamum and afterward at Smyrna, Corinth, and Alexandria. He returned to his native city in his 29th year and was at once appointed physician to the School of Gladiators. In his 34th year, he went to Rome, where, in four years, he gained such a reputation that he was offered, but declined, the post of physician to the emperor. After a brief sojourn in his native country, he returned to Italy, where the sons of Marcus Aurelius were intrusted to his care.

His voluminous writings, believed to comprise nearly 500 treatises, covered the entire field of ancient medicine. Of these over 80 are still extant. His anatomical and physiological writings are the most important and indicate some knowledge of dissection. In diagnosis, he was the first to place great stress on the pulse, on which subject he was long considered an authority. In materia medica, he was inferior to Dioscorides, but his works dominated Greek, Roman, and Arabic medical practice for many centuries.

Galileo (*găl'ĭ-lē'ō;* It. *gä'lē-lā'ô*) **Galilei** (**1564-1642**), Italian physicist and astronomer, was born at Pisa, Italy. When a young boy he exhibited a genius in mechanical construction and a fondness for the classics, music, and painting. In 1581, he was sent to the University of Pisa. He first directed his attention to medical studies and to the prevailing Aristotelian philosophy, the dogmas of which he soon ventured to challenge.

At the age of 18, Galileo made one of his most important discoveries, the law of the vibration of the pendulum, which he subsequently utilized in constructing a clock for astronomical purposes. From 1586, he appears to have abandoned medicine and to have concentrated his attention upon mathematical sciences. He studied Euclid and Archimedes, and the first fruit of his geometrical investigations was the invention of a hydrostatic balance.

Life at Pisa and Padua. The years 1589-92 Galileo spent as lecturer and professor of mathematics at the University of Pisa. About this period, he turned his attention to the then very imperfectly comprehended laws of bodies in motion. In opposition to all received systems, he propounded the novel theorem that all falling bodies, great or small, descend with equal velocities. This soon led him to the discovery of "the three laws of motion" and the law regulating the motion of falling bodies. Enmity arising from disputes with his colleagues made him gladly accept, in 1592, the professorship of mathematics at Padua. There, under the shelter of the Venetian Republic, he spent the following 18 years and did most of his constructive work.

Galileo dwelt upon the importance of measuring all natural forces so as to bring them within the range of geometry and thus adapt them to the service of man. Among his notable discoveries were a thermometer, a proportional compass or sector, and a refracting telescope. He completed the last-named instrument in 1609 and soon discovered Jupiter's four moons, the irregular surface of our own satellite, the phases of Saturn, and the solar spots. These discoveries were made known in 1610 through his work entitled *Sidereal Messenger*.

Persecution. Galileo left Padua for Florence in 1610. The next year, he visited Rome, where he freely advocated the Copernican conception of the universe. Early in 1616, the propositions of the sun's fixity and the earth's diurnal motion were condemned by the Church authorities; the work of Copernicus, published 70 years before, was placed in the list of prohibited books; and a promise was extorted from Galileo not to defend the Copernican theory. Galileo remained silent for seven years, but he went to Rome in 1624 and strove though unsuccessfully, to get the edicts reversed. He still persisted in writing his celebrated *Dialogue on the Two Chief Systems*, which was printed in 1632. The author was summoned to Rome, and, on June 22, 1633, he was forced to read and sign a formal abjuration of his belief in the Copernican Doctrine. A tradition arose later to the effect that, on this occasion, after publicly declaring that the earth was stationary, he whispered to one of his friends, as he rose from his knees, *E pur si muove*, "It does move, though."

Galileo was sentenced to an indefinite imprisonment, but he finally obtained permission to return under surveillance to his villa at Arcetri near Florence. His strenuous activity continued, and his greatest book, the *Dialogues on the Two New Sciences*, was completed at this time and was published in 1638 in the Netherlands. In the course of 1636-37, he became blind. The strictness of his confinement was then relaxed, and he was allowed to receive his friends. He was visited by many distinguished foreigners, among them Milton. During this period, he co-operated with Torricelli in the investigation of the nature of percussion.

Greatest Achievement. The inventions due to his acute industry, his use of the telescope, the brilliant discoveries to which it led, and his patient investigation of the laws of weight and motion must all be looked upon as forming but a part of Galileo's real merits. He claimed, and helped to establish, the right of exercising one's faculties in examining the universe which surrounds us. See *Pendulum, Telescope*.

Gall (*gôl;* Ger., *gäl*), **Franz Joseph** (**1758-1828**), German physician, founder of phrenology, was born at Tiefenbronn, Baden. He studied medicine at Strasbourg and established himself as a physician in Vienna, where, for many years, he carried on a series of elaborate investigations on the nature of the brain and its relation to the outer cranium. He held that each faculty of the mind has a definite seat in the brain and that the contour of the skull affords an index of the relative developments of the faculties. In 1796, he gave publicity to his views in a series of lectures in Vienna, which were, however, condemned as subversive of morality and religion. Having settled in Paris in 1807, he published his phrenological treatise, *Fonctions du cerveau*. His chief work is his *Anatomy and Physiology of the Nervous System*.

Gallait (*gä'lā'*), **Louis** (**1810-1887**), Belgian historical painter, was born at Tournai. He became famous for pictures on subjects from the history of the Netherlands, such as "The Abdication of Charles V," "Last Honors to Egmont and Horn," "The Plague at Tournai," and "Last Moments of Egmont." Other works of his include "Tasso in Prison" and "The Temptation of Saint Anthony." Gallait represented the new art tendencies of his time in Belgium and exercised a great influence on painting in his native country.

Galland (*gä'lăn'*), **Antoine** (**1646-1715**), French Orientalist, was born at Rollot in Picardy. Attached to the French embassy at Istanbul in 1670, he traveled in Syria and the Levant, and made two subsequent journeys. In 1709, he became professor of Arabic in the Collège de France. He wrote on archeology, Eastern proverbs, and Indian fables, but is best known for his translation of the *Arabian Nights*, the first ever made into a European lan-

guage, which was published in 12 volumes, 1704–17. He died at Paris.

Gallatin (*găl'ə-tĭn*), **Albert (1761-1849)**, American financier and statesman, was born at Geneva, Switzerland. He was graduated from Geneva in 1779; came to the United States in 1780; taught French at Harvard; bought land in Virginia and Pennsylvania; and entered political life in 1789. In 1793, he was elected to the United States Senate, but was not permitted to retain his seat on the ground of ineligibility under the Constitution. In 1795, he entered Congress from Pennsylvania and, in 1801–13, was secretary of the treasury. He took an important part in the peace negotiations with England in 1814 and signed the Treaty of Ghent. In 1816–23, he was United States minister at Paris and in 1826 at London. From 1827, he devoted his time to historical and ethnological researches, writing on finance, politics, and the Indian tribes. He was one of the founders and the first president of the Ethnological Society of America. He died at Astoria, N. Y.

Gallaudet (*găl'ô-dĕt'*), **Edward Miner (1837-1917)**, American educator, was born at Hartford, Conn., a son of T. H. Gallaudet; was graduated from Trinity College, 1856; taught in his father's institution for deaf mutes, Hartford, 1856–57; and organized, 1857, the Columbia Institution for the Deaf, Dumb, and Blind, at Washington. He developed from it the Gallaudet College for the deaf, of which he became the first president, serving from 1864 to 1911. His writings include *Popular Manual of International Law* and *Life of Thomas Hopkins Gallaudet.*

Gallaudet, Thomas Hopkins (1787-1851), American educator of the deaf and dumb, was born in Philadelphia, Pa. He was educated at Yale College and Andover Theological Seminary, and, in 1814, was licensed to preach. He then studied the systems of deaf-mute instruction in London, Edinburgh, and Paris and, on his return to America in 1817, founded and became superintendent of the American Asylum for Deaf Mutes at Hartford. He held the office of president of the institution, 1817–30. In 1832–33, he was professor of education in New York University—the first American professorship of education.

Galle (*găl'ĕ*), **Johann Gottfried (1812-1910)**, German astronomer, was born in Prussian Saxony. He studied at Berlin, 1830–33; became director of the Berlin Observatory; and shares with Leverrier the honor of discovering the planet Neptune, 1846. He afterward became professor of astronomy at Breslau. He published several works on astronomy and climatology.

Galli-Curci (*gäl'lê-kōōr'chē*), **Amelita (1889-1963)**, coloratura soprano of Italian-Spanish parentage, was born at Milan, Italy. She was educated at the Liceo Alessandro Manzoni and the International Institute of Languages, from which she was graduated with first honors as a linguist. She studied music at the Milan Conservatory, graduating as a pianist. As Gilda in *Rigoletto* she made her operatic debut in Rome, 1910, and thereafter sang in leading theaters in Europe, and also in South America with Caruso and Titta Ruffo. Her first appearance in the United States, at Chicago in 1916, was a sensational success, and her subsequent engagements with the Metropolitan Opera Company sustained her fame. Her voice, cultivated largely without instruction, was of surpassing quality and remarkably even register. Her repertoire included such operatic roles as Lucia, Rosina, Violetta, and Juliette, and an immense range of concert music.

Gallieni (*gà'lyā'nê'*), **Joseph Simon (1849-1916)**, French soldier and military writer, was born at Saint Beat, Haute Garonne. He was graduated from the Military School, Saint Cyr, in 1870; served in the Franco-Prussian War, 1870-71; and, in 1878, went to Senegambia as captain. He was a colonial administrator from 1883 until 1905, when he returned to France and became military governor of Lyons.

As military governor of Paris in September 1914, he rushed 80,000 reserve troops in motor cars to the relief of General Manoury, thereby enabling him to drive von Kluck's attacking army back upon the Marne. Gallieni was gratefully acclaimed the "savior of Paris." In 1915, he became minister of war and, in 1916, assumed direction of the department of aviation.

Gallup, George Horace (1901-), American statistician of public opinion, was born at Jefferson, Iowa. Educated at the University of Iowa, he taught journalism and advertising at Drake University, 1929–31, and Northwestern University, 1931–32. He then joined an advertising agency in New York as director of research. He specialized in measuring the effect of advertising by interviews with persons selected by a scientific sampling method. In 1935, he organized the American Institute of Public Opinion to apply this method for discovering the state of opinion on public questions, the results being syndicated to newspapers. When applied to the presidential election of 1936, the method predicted results in the states with an average error of 6 per cent of the vote for major candidates. In the 1940 elections, this error was reduced to a little over 2 per cent, but in 1948 was wide of the mark. The method was applied also in Great Britain.

Galsworthy (*gôlz'wûr-thĭ*), **John (1867-1933)**, English dramatist and novelist, was born at Coombe, Surrey. He attended Harrow and then went to Oxford, where he was graduated in 1889. He planned at first to practice law, but disliked the profession and gave it up for travel in various parts of the world. Later he became interested in writing. He published the novel *Jocelyn* in 1898. It was followed by *The Country House, The Man of Property, The Dark Flower, Beyond, The Freelands, The Forsyte Saga,* and other novels, which stand in the front rank of recent literary achievements. In 1906, he produced his first play, *The Silver Box,* which was followed by essays, stories, novels, plays, and poems.

Galsworthy is one of the most sincere and straightforward of modern writers—clear, simple, direct, and unerring in conveying the meaning he desires to impress. The list of his plays includes *Joy, Strife, Justice, The Pigeon, The Eldest Son, The Mob, A Family Man, Loyalties,* and *Exiled.* He received the Nobel prize for literature in 1932. See *Strife.*

Galton (*gôl'tŭn*), **Sir Francis (1822-1911)**, English scientist and traveler, cousin of Charles Darwin, was born near Birmingham. He studied medicine and was graduated at Trinity College, Cambridge, 1844. In 1846, he traveled through North Africa and on the White Nile; in 1850–52 assisted in exploring Damaraland in South West Africa; and afterward entered the British civil service in the Board of Trade. He turned his attention to meteorology and in his *Meteorographica,* 1863, laid the basis of the now widely known weather maps.

Galton's most important contributions to knowledge were in the field of anthropology and heredity, in which he established the foundation for the science of eugenics. His works include *Narrative of an Explorer in Tropical South Africa, Art of Travel, Hereditary Genius, Human Faculty, Natural Inheritance, Finger Prints, Essays on Eugenics,* and numerous memoirs. He was knighted in 1909.

Galvani (*găl-vä'nē*), **Luigi (1737-1798)**, Italian physician and physicist from whom "galvanism" derived its name, was born in Bologna. He was educated for the profession of medicine and, in 1762, was appointed lecturer on anatomy in the University of Bologna, in which city he practiced. While holding this lectureship, he made the discoveries, partly by means of experiments on the muscles of frogs, 1786, which he published in 1791 in his treatise entitled *De Viribus Electricitatis in Motu Musculari Commentarius.* The now fully established doctrine of animal electricity owes its origin to his patient and laborious investigations.

Gama (*gä'mä*), **Vasco da (c. 1460-1524)**, Portuguese navigator, was born at Sines in Alemtejo. He early distinguished himself as an intrepid mariner and was selected by King Emanuel to discover the route to India around southern Africa. His expedition of four vessels with 168 men left Lisbon in July 1497, but was four months in reaching Saint Helena. After rounding the Cape of Good Hope, despite hurricanes and mutinies, he made Melinde early in the following year. Here he found a skillful Indian pilot, crossed the Indian Ocean, and arrived at Calicut in May 1498. The ruler of Calicut soon became actively hostile, and Da Gama had to fight his way out of the harbor. In September 1499, he arrived at Lisbon and was ennobled.

Emanuel immediately dispatched a fresh squadron of 13 ships under Cabral, who founded a factory at Calicut. But the Portuguese who had been left there were murdered, and, to avenge them, the king fitted out a squadron of 20 ships under Da Gama, 1502. The latter founded the colonies of Mozambique and Sofala, bombarded Calicut, and, late in 1503, reached the Tagus with 13 richly laden vessels. Twenty years later, Da Gama was again sent to India, but died soon after his arrival.

Gambetta (*găm-bĕt'ä*), **Léon (1838-1882)**, French statesman, was born at Cahors, France. He studied law and rose to prominence through his able defense of political offenders prosecuted by supporters of the Second Empire.

In the Franco-Prussian War, after the investment of Paris, Gambetta escaped from the city by balloon and, as minister of war, exerted himself to the utmost to effect the relief of the capital. He showed himself a violent partisan of Republicanism in the civil strife following the war and later as a political leader in the Assembly. He became premier in 1881, but his radical anticlerical program occasioned his defeat a few months later.

Gandhi, Mohandas Karamchand (1869-1948), Indian political leader, was born at Porbandar, Western India, the son of a statesman. He went to England in 1881 and was called to the bar there. After practicing in India for 18 months, he went to South Africa in 1893, where he led a campaign of "passive resistance" against various

government enactments aimed at Asiatics. He returned to India in 1914.

Partly under the influence of Tolstóy's writings, Gandhi devoted himself, in 1918, to uniting the Mohammedan and Hindu elements of India in a "non-co-operation" movement directed against British rule. He acquired enormous influence as a saint with the masses of India, and was alternately imprisoned and negotiated with by the British government. Under the home-rule constitution of 1937, he abandoned non-co-operation.

He favored at first a return to a primitive form of economy, with the spinning wheel replacing the textile factory. Later he took up the cause of the "untouchables." He opposed the war measures of the British government in World War II. When the British withdrew from India he made earnest efforts, even endangering his life by fasting, to end the communal rioting between Hindus and Moslems. On January 30, 1948, he was murdered by a Hindu fanatic.

Gannett (*găn'ĕt*), **Henry** (**1846-1914**), American geographer, was born at Bath, Maine. He was graduated from Harvard, 1869, and from Hooper Mining School, 1870. After serving as an assistant in Harvard Observatory, 1870-71, he was made topographer for the Hayden Survey. In 1882, he was appointed chief geographer and statistician of the United States Geological Survey, where he served with distinction for 30 years. Among his valuable published works are *Gazetteer of Cuba*, *Building of a Nation*, and *Contour Map of United States*.

Gannon, Robert Ignatius (**1893-**), American educator, was born in New York City. He was educated at Georgetown University and Woodstock College, with graduate study at Gregorian and Cambridge universities. He taught at Fordham University. In 1930 he founded St. Peter's College in Jersey City, and was its dean until 1936. He organized also, in 1932, the Hudson College of Commerce and Finance. From 1935 to 1949 he was president of Fordham University. He wrote *The Technique of The One-Act Play* and *After Black Coffee*.

Garbo, Greta (**1905-**), Swedish film actress, was born at Stockholm. After training at the Royal Dramatic Academy in Stockholm, she played in *Goesta Boerling*. Her acting attracted the attention of American producers, partly by reason of her beauty and partly for the range and depth of her expression. Coming to America, she took the leading role in many highly successful film dramas. Outside of her professional life, she sedulously avoided publicity. The more successful plays in which she starred include *The Temptress*, *The Flesh and the Devil*, *Mata Hari*, *Grand Hotel*, *Queen Christina*, and *The Painted Veil*.

Garcia, Carlos P. (**1896-**), Philippine political leader, was born in Bohol province in the Visayan group of the Philippine Islands. A law school graduate, he practiced for ten years in his native province and also took an active part in politics. Having escaped capture by the Japanese during World War II, he was appointed a member of his country's delegation at the United Nations Conference in 1945, and of the Philippine mission for rehabilitation and war damage claims. As running mate for Ramon Magsaysay, he was elected vice-president of the Philippine government and became president temporarily following Magsaysay's death in 1957. When an election was held, he was chosen president. Like his predecessor, Garcia is anticommunist, and friendly toward the United States.

García (*gär-thē'ä*), **Manuel** (**1805-1906**), singing teacher, son of Manuel del Pópolo García, was born in Madrid, Spain. He studied singing under his father and successfully appeared on the stage, but his voice was not remarkable. In 1829, he settled in Paris to devote himself to teaching and to the scientific investigation of the voice. In 1840, he presented to the French Academy a *Treatise on the Human Voice*, and in 1847, he wrote his valuable *Traité complet de chant*. In 1855, he won wide recognition by his invention of the laryngoscope. In 1850, he became professor of singing at the Royal Academy of Music in London, where he continued to teach until 1895, after which he gave private instruction until his death.

García, Manuel del Pópolo Vicente (**1775-1832**), Spanish tenor and singing master, was born at Seville. He manifested great talent at an early age, winning distinction at 17 years of age as a singer, composer, and conductor. After establishing his reputation in Cadiz and Madrid, he went to Paris in 1808, where he won marked success in Italian opera. Subsequently he studied five years in Spain, returning to Paris in 1816 and proceeding to London in 1817, where he was enthusiastically received. He then toured England, South America, Mexico, and the United States, with unqualified success. He published numerous compositions, including many operas, but his enduring fame rests upon his sterling work as a teacher of singing.

Garcilaso de la Vega (*gär'thē-lä'sō dā lä vä'gä*). See *Vega, Garcilaso de la.*

Garden, Mary (**1877-**), American operatic soprano, was born at Aberdeen, Scotland. At the age of six, she came to America with her parents, who located in Chicago in 1888. In 1893, she began instruction for the voice and, in 1896, went to Paris, where she studied under Trabadello, Chevallier, and Fugère. She made her debut at the Paris Opéra Comique in 1900 in Charpentier's *Louise*. Her success was immediate, and, in 1902, she was selected for the title role of *Mélisande* in Debussy's opera.

From her first appearance in the United States in *Thaïs* at the Manhattan Opera House in 1907, she was extremely popular and won success for impersonations of Marguerite, Grisélidis, Mélisande, Salome, Thaïs, Sappho, and Louise. While her repertoire was confined almost exclusively to modern French opera, she showed herself a dramatic singer of power and distinction, excelling in spontaneity, artistic detail, and striking delineation. She was general director of the Chicago Opera Association, 1921-22.

Gardner, Erle Stanley (**1889-**), American detective-story writer and lawyer, was born at Malden, Mass., but has lived most of his life in California, where he has been a member of the bar since 1911. His legal background has supplied him with material for many stories. One of his leading characters is Perry Mason, lawyer and detective. Following the publication of *The Case of the Velvet Claws* in 1932 and *The Case of the Sulky Girl* in 1933, Gardner has devoted all his time to writing, producing over eighty mystery stories under his own name or under one of his pseudonyms. His better-known works include *The Case of the Stuttering Bishop*, *The Case of the Dangerous Dowager*, *The D. A. Calls It Murder*, and *The Case of the Borrowed Brunette*. He is a leader in the Investigating organization known as The Court of Last Resort.

Garfield, James Abram (**1831-1881**), 20th president of the United States, was born in Orange, Ohio. He was left fatherless when two years of age and his early schooling was frequently interrupted by periods of labor necessary for earning the means of support and of education. He finally succeeded in being graduated with high honors from Williams College in 1856. He taught for a period, studying law in the meantime, and was admitted to the bar in 1861.

His political career began in 1859, when he was elected as a Republican to the state senate. During the Civil War, he rose from the rank of colonel of volunteers in 1861 to be major general in 1863, resigning at the end of that year to occupy the seat in Congress to which he had been elected. There he supported the draft law and, in the years following the war, he took a strong stand against inflation of the currency and in favor of severe measures toward the Confederacy. In 1880, he became a member of the United States Senate and, later the same year, was elected president of the United States. After holding office a few months, he was shot in Washington by the assassin Guiteau, whose vanity had been offended by the refusal of an office. Garfield died three months later, Sept. 19, 1881, and was buried at Cleveland, where his tomb is marked by a memorial erected in 1890 at a cost of about $225,000.

Garibaldi (*gä'rē-bäl'dē*), **Giuseppe** (**1807-1882**), Italian patriot, was born at Nice, France, and began life as a sailor. He associated himself enthusiastically with Mazzini for the liberation of his country, but, being convicted of conspiracy, fled to South America, where, both as a privateer and as a soldier, he gave his services to the young republics there struggling for life.

Returning to Europe, he took part in the defense of Rome against France, but, being defeated, fled to New York, to return to the Isle of Caprera, biding his time. He joined the Piedmontese against Austria and, in 1860, set himself to assist in the overthrow of the kingdom of Naples and in the union of Italy under Victor Emmanuel. Landing in Calabria, he entered Naples and drove the royal forces before him without striking a blow. In 1870-71, he commanded a French force in the Franco-Prussian War. He died at Caprera.

Garland, Hamlin (**1860-1940**), American novelist and poet, was born at West Salem, Wis. After attending the common schools, he went to Cedar Valley Seminary, Osage, Iowa, and later worked on farms and taught school until 1884, when he settled in Boston and devoted himself to literary work for nine years. He then returned to the Middle West. In 1890, his first volume of fiction. *Main-Traveled Roads*, written in frankly realistic style, attracted wide notice. Besides a collection of verse entitled *Prairie Songs*, his books include *Wayside Courtships*, *The Trail of the Gold Seekers*, *The Eagle's Heart*, *Her Mountain Lover*, and *Forty Years of Psychic Research*. His *Son of the Middle Border*, autobiographical in character, is also an important document of the social and political life of the Middle West. He was elected to the American Academy of Arts and Letters in 1918. See *Yarpe*.

Garner, John Nance (**1868-**), American politician, was born in Red River County, Tex. He had limited school advantages, but studied law and was admitted to the bar in 1890. Entering politics as a Democrat, he served in the Texas House of Representatives from 1898 to 1902 and as

United States Congressman from 1903 until 1933. He was elected Speaker of the House in 1931. In 1932 he was elected vice president of the United States and was reelect ed in 1936. An able parliamentarian, he was an effective helmsman of most New Deal legislation, but a coolness developed between him and President Roosevelt in 1937, and he was not nominated with Roosevelt for a third term in 1940.

Garnier (*gär'nyā'*), **Jean Louis Charles** (**1825-1898**), French architect, was born at Paris. He studied at the School of Fine Arts; in 1848, won the *prix de Rome;* and, after considerable travel in Italy and Greece, set up as an architect in Paris. In 1861, he competed for the design of the new Grand Opera House in Paris. His design was accepted, and in 1875, he completed the building, now world-famous for its ornamental facade, magnificent staircase, and foyer. He also built the conservatory at Nice and the casino at Monte Carlo, and designed the tombs of Bizet, Offenbach, and Victor Masse. Garnier's work has exercised a great influence upon monumental architecture in France and in other countries.

Garrick, David (**1717-1779**), English actor and theatrical manager was born in Hereford. He went to London with Dr. Samuel Johnson in 1736 to study law, but his instincts urged him to the stage. He made his first appearance under the name of Lyddal, at Ipswich, in 1741, and afterward played *Richard III*, his success in which enabled him to get an engagement at Drury Lane. In 1742, he went to Dublin; in 1747, he became joint manager of Drury Lane; and two years later, married Mademoiselle Violette. He acted at Drury Lane until 1776, when he retired and sold his share in the concern.

Garrick ranks as the greatest of English actors, his versatile genius enabling him to impersonate with great naturalness and power the whole range of characters from high tragedy to farce. He was buried beneath the Shakespeare monument in Westminster Abbey.

Garrison, William Lloyd (**1805-1879**), American abolitionist, was born at Newburyport, Mass. As a young man, he was engaged chiefly in newspaper work and soon made himself obnoxious to the then ruling powers by the boldness of his denunciation of slavery. In 1829, while editing *The Genius of Universal Emancipation*, which was published at Baltimore, his articles on this subject led to his being convicted and imprisoned for libel. He was released from prison on the payment of his fine by a friend, and thereupon commenced his career as an antislavery lecturer, which he continued until such agitation was no longer necessary.

In 1831, Garrison founded the *Liberator*, which he published at Boston for 35 years. His whole course met with the most malignant opposition. His life was frequently threatened, and more than once he was assaulted and roughly treated; but he lived to see slavery abolished. He made several visits to England on antislavery missions. On the abolition of slavery in 1865, he was presented by his friends in the United States with the sum of $30,000. He spent his last years in journalistic and reform work. See *Abolitionists*.

Gary, Elbert Henry (**1846-1927**), lawyer and financier, was born at Wheaton, Ill. He was educated at Wheaton College and Chicago University, and was admitted to the bar, 1867. He was chosen first mayor of Wheaton, and was elected county judge. After practicing law in Chicago 25 years, chiefly as counsel for railroad and manufacturing corporations, he retired to become president of the Federal Steel Company, 1898. He was actively identified with the organization of the United States Steel Corporation and, as a responsible official, was prominent before the public during the government prosecution of the Steel Corporation. He later became chairman of its board of directors and of its finance committee. The city of Gary, Ind., which contains one of the largest steel producing plants in the world, was named for him.

Gaskell, Elizabeth Cleghorn Stevenson (**1810-1865**), English novelist, was born at Chelsea. She married, in 1832, William Gaskell, a Unitarian minister in Manchester. Here she studied the lives of working men and women. In 1848, she published anonymously *Mary Barton*. It was followed by *Moorland Cottage; Cranford*, the most popular of her works; *Ruth; North and South; Sylvia's Lovers; Wives and Daughters;* and other stories. Besides her novels she wrote *The Life of Charlotte Brontë*, a masterpiece of English biography.

Gassendi (*gä'sȧN'dē'*), or **Gassend, Pierre** (**1592-1655**), French philosopher and mathematician, was born at Champtercier in Provence. He studied and taught at Aix, but revolted from the scholastic philosophy and applied himself to physics and astronomy. In 1623, he was appointed provost of Digne Cathedral and, in 1645, became professor of mathematics in the Collège Royale at Paris.

He attacked Aristotelian philosophy, revived the doctrines of Epicurus, and controverted the new philosophy of Descartes with such vigor that French savants became divided into two groups, Cartesians and Gassendists. Kepler and Galileo were among his friends, and he was the personal instructor of Molière. He wrote extensively on Epicurus; gave, in his *Institutio Astronomica*, a clear view of the science in his day; and published lives of Tycho Brahe, Copernicus, and Regiomontanus. His chief philosophical work is *Syntagma Philosophicum*, dealing with logic, physics, and ethics.

Gasser, Herbert Spencer (**1888-1963**), was born at Platteville, Wis. He studied at Wisconsin and Johns Hopkins universities and taught at Washington University and Cornell Medical College. In 1935 he became director of the Rockefeller Institute for Medical Reasearch. In 1944, he was awarded one-half the Nobel prize in physiology and medicine for researches on the differentiated functions of single nerve fibers.

Gaston de Foix. See *Foix, Gaston de.*

Gates, Horatio (**1728-1806**), American general, was born in England. Sent to America in 1755 as a captain of infantry, he served under General Braddock. On the peace of 1763, he purchased an estate in Virginia, where he resided until the Revolutionary War.

In 1775, he was made adjutant general in the Colonial army. In 1777, he superseded Schuyler in the command of the army of the North and soon compelled the entire British army to surrender at Saratoga. This brilliant success gained for him a great military reputation, and his considerate conduct toward his compatriots won for him the esteem of even his enemies. In 1780, he was called by Congress to the command of the army of the South, but in the unfortunate defeat at Camden he lost the laurels he had already won. He then retired to Virginia until 1790, when he emancipated all his slaves and settled in New York,

Gatling, Richard Jordan (**1818-1903**), American inventor, was born in Hertford County, N. C. While a boy, he assisted his father in the invention of a machine for sowing cottonseed. Subsequently he invented a machine for sowing rice, which he later adapted to sowing wheat in drills. He was graduated in medicine at Cincinnati in 1850.

Stimulated by the outbreak of the Civil War, he built, in 1861, the first types of the revolving battery gun, later known throughout the world as the Gatling gun. This was greatly improved in 1865 and was immediately adopted by the United States government. In 1886, he invented a new gun metal of steel and aluminum.

Gatti-Casazza (*gät'tē-kä-zät'sä*), **Giulio** (**1869-1940**), operatic manager, was born at Udine, Italy. He was educated in the universities of Ferrara and Bologna and the Naval School of Engineering at Genoa. In 1893, he gave up his career as an engineer and became director of the municipal theater at Ferrara. In 1895, he was appointed director of La Scala, in Milan, which in ten years he raised to the foremost opera house in Italy. From 1908 to 1935, he was general manager of the Metropolitan Opera House of New York, which achieved notable financial and artistic success under his administration. He inaugurated the policy of encouraging many American singers and of producing every year one new opera by an American composer. After 1935 he took up his residence in Italy.

Gauguin (*gō'gȧN'*), **Paul** (**1848-1903**), French painter, was born in Paris, of French and Peruvian lineage. He entered banking in 1871 in Paris. Four years later he began spending his spare time painting and acquired the impresprésionist technique. In 1881, he gave up his business connection, separated from his wife and children, and devoted himself solely to painting.

He became the leading spirit of a group of painters at Port Aven in Brittany, known as the "synthesists," who painted in pure, unmixed colors, and with exaggerated effects, each picture being intended as "the passionate equivalent of a sensation experienced." The decorative and pictorial qualities were by-products. In this period he produced "Le Christe Jaune" and "La Lutte de l'Ange avec Jacob."

In 1891, oppressed by poverty, Gauguin sold all his paintings by auction and went to Tahiti, where he lived as a native. His autobiographical *Noa Noa* describes this chapter of his life. Here he executed most of his paintings, depicting tropical landscapes, Tahitian nudes, and similar subjects, into which he imported a robust symbolism. The decorative beauty and originality of these pictures are attested by the great prices which they were to bring in later years and by the profound influence which their style had upon the subsequent design of posters and in arts and craft work. Among the more celebrated of the paintings of this period are "L'esprit Vielle." "La Fuite," "Jours Delicieux," and "Two Maori Women." His wood carving "Aviri," a Maori Diana, comes from this period.

In 1901, he removed to one of the Marquesas Islands, where he built himself a house, which he decorated with paintings and carvings. A huge canvas, "Whence, What, Whither," was painted as his last before an attempted

suicide. He lived on, however, suffering from a fatal disease and painting until within a few days of his death.

Gauss (*gous*), **Karl Friedrich** (**1777-1855**), German mathematician, was born in Brunswick. He was graduated at the Collegium Carolinum in his native city in 1795 and at the University of Göttingen in 1798. At the age of 19, he demonstrated that a circle can be divided into 17 equal arcs by elementary geometry, the first discovery of the kind since the ancient Greeks. In 1801, he completed his celebrated *Disquisitiones Arithmeticæ*, which at once stamped its author as a most profound and original mathematician. In 1809 appeared his *Theoria Motus Corporum Cælestium*, in which was contained the exposition of his newly discovered method of least squares. In 1807, he was called to the chair of mathematics in the University of Göttingen.

His investigations at Göttingen took a wide range, and much of his time was occupied with work in the field of terrestrial magnetism. Laplace regarded him as the foremost mathematician in Europe, and he is considered the founder of the mathematical theory of electricity.

Gautier (*gō'tyā'*), **Théophile** (**1811-1872**), French poet and novelist, was born at Tarbes. From painting he turned to literature, and became a "romanticist" of an extreme type. In 1830, he published his first long poem, *Albertus;* in 1832, the striking *Comédie de la mort;* and, in 1856, *Emaux et camées*, the best example of his poetic work, which is marked by a worship of beauty and blindness to all other interests. In 1835 appeared his celebrated novel *Mademoiselle de Maupin*, the unconventional theme of which narrowed the circle of readers. He wrote many other novels and shorter stories, among which are *Les Jeunes-France, Fortunio, Une larme du diable, Militona, Le peau de tigre, Jettatura, Le capitaine Fracasse, La Belle Jenny*, and *Spirite*.

Gautier's theatrical criticisms were in part collected as *L'Histoire de l'art dramatique en France*. He devoted his leisure to travel, of which he published characteristic accounts in his delightful *Caprices et zigzags, Constantinople, Voyage en Russie*, and *Voyage en Espagne*.

Gay, John (**1685-1732**), English poet, was born at Barnstable. He wrote a large number of poems and ballads besides several operas; but little of his poetry is now read. His greatest success was *The Beggar's Opera*, which ran 62 nights, made the actors celebrated, and in the popular phrase "made Rich (the manager) gay and Gay (the author) rich." Under cover of depicting activities of thieves and highwaymen, the opera obviously satirized the lives of the governing class in England. Swift and Pope collaborated in several of his plays. Gay's *Fables* and his ballad of *Black-eyed Susan* also deserve mention.

Gayley, Charles Mills (**1858-1932**), American author and educator, was born at Shanghai, China, of missionary parents. He was graduated at the University of Michigan, 1878, and was a student at Giessen and Halle, Germany, 1886–87. After teaching Latin and English at the University of Michigan for nine years, he was made professor of English in the University of California in 1889. He held this chair for more than 30 years, and, in 1918–20, served as dean of the faculties of the university.

Gayley's *Classic Myths in English Literature* became a standard and definitive work on the subject. He wrote also *Representative English Comedies, Plays of Our Forefathers, Beaumont the Dramatist*, and *Shakespeare and the Founders of American Liberty*. He also edited *Songs of California*.

Gay-Lussac (*gā'lü'sák'*), **Joseph Louis** (**1778-1850**), French chemist and physicist, was born at Saint-Leonard le Noblat. He was educated in Paris, studied chemistry under Berthollet, and became his assistant. Later, in conjunction with Biot, he made important researches on the composition of the atmosphere. These resulted in his important discovery that the proportions by volumes in which gases combine are simply related, both to each other and to the volume of the product. This is now known as the law of volumes, and is one of the most important in the domain of chemistry.

In collaboration with Humboldt, Gay-Lussac investigated the composition of water. He made important discoveries regarding the expansion of gases, the expansion of fluids, and the process of evaporation. With Thénard he discovered a method of obtaining metallic potassium, and was the first to obtain hydriodic and iodic acids and cyanogen. He devoted many years to practical applications of chemistry in connection with fermentation, bleaching, and the manufacture of sulphuric acid and gunpowder.

Ged (*gĕd*), **William** (**1690-1749**), British inventor, was born in Edinburgh. He developed the earliest method of stereotyping by soldering together loose types, securing a patent in 1725. Notwithstanding his success in obtaining casts of type pages in similar metal, Ged was unable to induce the printers of Edinburgh to make use of his invention. Finally he formed a partnership in London to promote it but this resulted disastrously. While Ged failed to see the process adopted in Great Britain during his lifetime, he steadfastly refused, from patriotic motives, repeated offers from Dutch printers to establish it in the Netherlands. His sons endeavored to carry out the patent, which was ultimately perfected by Andrew Wilson.

Geddes (*gĕd'ĭs*), **Auckland Campbell Geddes, Baron** (**1879-1954**), British scientist, administrator, and diplomatist, was born in Scotland. He studied medicine at Edinburgh, at London, and at Freiburg, Germany. He held professorships successively at Edinburgh University, at Trinity College, Dublin, and at McGill University, Montreal. At the outbreak of World War I, he returned to Great Britain, where he served as director of recruiting in 1916, minister of national service from 1917 to 1919, and, in 1919, as minister of reconstruction and president of the British Board of Trade. He was British ambassador to the United States from 1920 to 1924. He then entered business, engaging in mining enterprises. He was raised to the peerage in 1942.

Geddes, Norman Bel (**1893-1958**), American scenic artist, was born in Adrian, Mich. He studied at the Cleveland School of Art and the Art Institute in Chicago, thereafter engaging in commercial art at Detroit. Removing to Los Angeles, he presented there his first dramatic production, *Nyu*, in 1916. In 1918, he presented *Shanewis* at the Metropolitan Opera House in New York and, in 1925, *Jeanne d'Arc* at Paris. *The Miracle* was his most popular success. He designed the first streamlined ocean liner and the General Motors exhibit in the New York World's Fair. His scenic work is characterized by grandeur and simplicity, all superfluous detail being suppressed to heighten the dominant impression.

Geddes, Patrick (**1854-1932**), Scottish biologist and educator, was born at Perth. He was educated at University College, London, at Edinburgh, and at the Sorbonne in Paris. After teaching and lecturing at London, Aberdeen, and Edinburgh, he was successively professor of botany at Saint Andrews University and professor of sociology at Bombay University, later retiring to devote his energies to city planning. While making valuable contributions to biological science, he also sought to embody fundamental principles of biology in sociological work and devoted much attention to art, social economy, and civics. He reconstructed the slum district of Edinburgh, designed the Hebrew University at Jerusalem, and laid out Visva-Bharati University in Bengal. His writings include *The Evolution of Sex* and *A Study in City Development*.

Gegenbaur (*gā'gĕn-bour*), **Karl** (**1826-1903**), German comparative anatomist, was born at Würzburg. He studied medicine at the university in his native city and was a pupil of Kölliker and Virchow. He received a chair at the University of Jena in 1855 and at the University of Heidelberg in 1873. By his masterly and comprehensive researches he took rank with Huxley and Owen among the great comparative anatomists of his time. He was the first to place the study of anatomy upon an evolutionary basis, and thereby became the founder of modern anatomy. His chief works are *Elements of Comparative Anatomy, Textbook of Human Anatomy*, and *Comparative Anatomy of the Vertebrates in Relation to the Invertebrates*.

Geikie (*gē'kĭ*), **Sir Archibald** (**1835-1924**), British geologist, was born at Edinburgh. He was educated at the University of Edinburgh. In 1855, he was appointed assistant on the Geological Survey, and, in 1867, he became director of the survey in Scotland. From 1871 to 1882, he was professor of geology and mineralogy at Edinburgh. He was director general of the Geological Survey of the United Kingdom and head of the Geological Museum, London, 1882–1901. From 1908 to 1913, he was president of the Royal Society. His studies of rock erosion are among the most valuable in the recent history of geology. Among his works are *Story of a Boulder, Phenomena of the Glacial Drift of Scotland, Ancient Volcanoes of Britain, Textbook of Geology, The Founders of Geology, Types of Scenery and Their Influence on Literature*, and *Love of Nature Among the Romans*.

Geissler (*gīs'lĕr*), **Heinrich** (**1814-1879**), German scientific-instrument maker, was born at Igelshieb. After becoming an expert glass blower, he established at Bonn, in 1854, a factory for making chemical and other scientific apparatus, which were widely known throughout the scientific world for their excellence. He invented the mercurial high vacuum air pump known as the Geissler pump. He also constructed the well-known Geissler's tubes, which enable investigators to examine incandescent gases with the spectroscope.

Gelée (*zhĕ-lā'*), **Claude.** See *Claude Lorraine*.

Gellius (*jĕl'ĭ-ŭs*), **Aulus** (**c. 130 A. D.-c. 180**), Latin author, was born at Rome. After studying philosophy at Athens, he practiced law at Rome. He wrote the *Noctes Atticæ*, or "Attic Nights," a medley on language, antiq-

uities, history, and literature, in 20 books, of which the 8th has not survived. The work contains many extracts from lost Greek and Latin authors and is a rich source of curious knowledge.

Gelon (*jē'lŏn*) (**?-478 B.C.**), tyrant of Gela and Syracuse, was the son of Dinomenes and a native of Gela. He figures in history first as one of the bodyguards in the service of Hippocrates, tyrant of Gela. On the death of the latter, he obtained the supreme power, 491 B. C., and, about 485 made himself master of Syracuse. His influence soon extended over the half of Sicily. Gelon refused to aid the Greeks against Xerxes, as they declined to comply with his demand that he should be appointed commander in chief.

In alliance with Theron, Gelon resisted the Carthaginians, and, on the same day on which the Greeks won the battle of Salamis, in 480, he gained a complete victory over the invaders at Himera. His clemency and the wisdom of his measures rendered him so generally beloved that, when he appeared unarmed in an assembly of the people and declared himself ready to resign his power, he was unanimously hailed as the deliverer and sovereign of Syracuse.

Genest, or **Genêt** (*zhĕ-nĕ'*), **Edmond Charles Edouard** (**1765-1834**), called "Citizen Genêt," French diplomat, was born in Versailles. He entered the French diplomatic service as *chargé d'affaires* at Leningrad in 1789, but was sent home in 1791, and, in December 1792, was accredited to the United States. He transgressed the laws of neutrality by issuing commissions to privateers to prey upon English commerce, France being then at war with England. He complained of the lack of sympathy displayed by the young republic to its old ally, and did his best to embroil the United States with Great Britain. Washington demanded and obtained his recall, but Genêt decided to become a naturalized citizen. He settled in New York and married a daughter of Governor George Clinton.

Geneviève (*zhĕn'vyĕv'*), **Saint** (**c. 422-512**), patroness of Paris, was born at Nanterre, near Paris. She took the veil, and acquired an extraordinary reputation for sanctity. This was increased by her assurance that Attila and his Huns would not touch Paris and by an expedition for the relief of the starving city during Childeric's Frankish invasion. In 460, she built a church over the tomb of Saint Denis, where she herself was buried. The Pantheon in Paris is built on the supposed site of her tomb and adjoining it is the noted library of Saint Geneviève. The Pantheon contains mural paintings of the saint by Puvis de Chavannes.

Genghis Khan (*jĕn'gĭz кän'*), (**1162-1227**), Mongol conqueror, was born in the region of Lake Baikal, the son of a Mongol chief. His career as a soldier began at the age of 13, when he boldly assumed the reins of government in succession to his father. By his military skill and daring example, he gradually raised his people to a position of supremacy in Asia and established a kingdom which, at his death, stretched from the Volga to the Pacific and from Siberia to the Persian Gulf. While his vast empire dissolved soon after his death, leaving no permanent institutions or remains, one direct result of his rule is the presence of the Turks in Europe. Driven out of their Asiatic homes by his armies, they fled westward and invaded Europe.

Genseric (*jĕn'sĕr-ĭk*), or **Gaiseric** (**c. 400 A. D.-477**), king of the Vandals. He was the son of Godigisdus and natural brother of Goderic, whom he succeeded in 428. From Spain he crossed to Africa, and in conjunction with the Moors added to his kingdom the land lying west of Carthage, ultimately gaining possession of Carthage itself, which he made his capital in 439. He next set himself to organize a naval force, with which he systematically from year to year pillaged Spain, Italy, Greece, and the opposite lands of Asia Minor, sacking Rome in 455. He continued master of the seas until his death, despite strenuous efforts of the Roman emperors to crush his power.

Geoffroy Saint-Hilaire (*zhŏ'frwä' săn'tē'lâr'*), **Etienne** (**1772-1844**), French zoologist, was born at Etampes. He studied at the College of Navarre, Paris, and, in 1793, became professor of zoology in the Museum of Natural History. He accompanied Napoleon's expedition to Egypt, for the collection of specimens. After his return, he laid the basis of scientific anatomy by enunciating his theory of the unity of organic structure. He was appointed to the chair of zoology at the Faculty of Sciences, 1809.

George, Saint, the patron saint of England, Portugal, and Aragon. His true history is not clearly known. Some say the real Saint George was a soldier in the army of Diocletian, 300 A. D., and that he suffered death in Palestine for the Christian faith. English crusaders brought home his fame from the East, and Edward III made him patron of his new order of the garter. His name became the English battle cry. There is a story that he slew a dragon, which had been sent by a magician to devour an Egyptian princess. In pictures he is generally shown in the act of killing the monster.

George I (**1660-1727**), king of Great Britain from 1714 to 1727. He was the son of Ernest Augustus, elector of Hanover, and of Sophia, the granddaughter of James I of England. On the death of Queen Anne, he ascended the throne, being the first monarch of the house of Hanover. The early part of his reign was troubled by the conspiracies and rebellions of the Jacobites, which were aggravated by foreign wars. In 1720, the collapse of the famous South Sea scheme occurred, and thousands of families were ruined. He had one son, George Augustus, who succeeded him.

George II (**1683-1760**), king of Great Britain from 1727 to 1760. He succeeded his father George I, ascending the throne when 44 years of age. He had the advantage over his father of being able to speak English, which George I could never do. But he had to cope with Jacobite conspiracies and also to contend with Charles Edward Stuart, the young pretender who was not entirely defeated until the battle of Culloden, 1746. In this reign occurred the war of the Austrian succession. King George espoused the cause of Maria Theresa. In 1756, the Seven Years' War broke out, in which England sided with Prussia. The last years of the king's reign saw the British victors in India, Canada, and on the seas.

George III (**1738-1820**), king of Great Britain from 1760 to 1820, was born in London. In 1761, he married Princess Charlotte Sophia of Mecklenburg Strelitz, by whom he had fifteen children. More English in sentiment and education than his two predecessors, George's main interest was centered in his English kingdom, and never during his long life did he set foot in his Hanoverian possessions. He attempted to rule as well as reign, and one fruit of his policies was the loss of the American colonies. His reign spanned the period from the Seven Years' War to the Napoleonic wars. In 1801, the legislative union of Great Britain and Ireland was effected. He became insane in 1811.

George V (**1865-1936**), king of Great Britain and Northern Ireland and emperor of India, was born at Marlborough house, London. The death of his elder brother, Albert, in 1892 made him heir apparent to the British throne, and he took his seat in the House of Lords as Duke of York. Upon the accession of Edward VII in 1901, he received the title of Duke of Cornwall. At this time he made a tour of all the chief British dominions and gained great popularity. On his return he was created Prince of Wales. In 1893, he married Princess Victoria Mary of Teck, and six children were born to them. On the death of Edward VII, the new king ascended the throne under the title of George V, May 7, 1910. The coronation took place, June 22, 1911. He was crowned emperor of India at the durbar at Delhi, December 12, 1911. The chief events of the early part of his reign were in connection with World War I, 1914–1918. In 1935, he celebrated his Silver Jubilee.

George VI (**1895-1952**), king of Great Britain, was born at Sandringham, England. His given name was Albert Frederick Arthur George. While Duke of York, he married Elizabeth Bowes-Lyon, a Commoner, in 1923. When his elder brother, Edward VIII, abdicated on December 10, 1936, George was made king.

George, Henry (**1839-1897**), American economist and sociologist, was born in Philadelphia. After being successively at sea, in a countinghouse, and in a printer's office, he settled in California and, in 1866, joined the staff of a San Francisco paper. During periods of unemployment he suffered extreme poverty, which drew his attention to the problem of the existence of poverty. He concluded that it was due to the private appropriation of increased values of land, which he called unearned increment, and that it could be cured by taxation of land only, all improvements being tax free. Such an impost he called the "single tax."

In 1871, George, having by then become managing editor of the San Francisco *Times*, published his conclusions in *Our Land and Land Policy*. He removed to New York in 1880 and nine years later expanded his earlier publication into *Progress and Poverty*, of which millions of copies were sold in America and abroad. He twice ran for the mayoralty of New York City. Other books from his pen include *The Irish Land Question, Social Problems, Protection and Free Trade*, and *The Science of Political Economy*.

George, Walter Franklin (**1878-1957**), American statesman, was born at Preston, Ga., and was educated at Mercer University in that state. He received his law degree in 1901, and began practice at Vienna, Ga. From 1912 to 1917, he was a superior court judge. In the latter year he became an associate justice of the Georgia Supreme Court. Resigning in 1922 to run for the United States Senate, he was elected for the first of six successive terms (1922–1957). In the spring of 1956, while chairman of the Senate Foreign Relations Committee and president

pro tem of the Senate, he announced that he would not seek re-election. Although a Democrat, Senator George, because of his influence for bipartisanship in foreign policy, was asked by President Eisenhower to be his personal representative and special ambassador for North Atlantic Treaty Organization.

Gérard (*zhā'rär'*), **François Pascal, Baron (1770-1837)**, French painter, was born in Rome. Nearly the whole of his life was spent in Paris, where he was a pupil of and later an assistant to David, but he speedily acquired a reputation of his own. Most of the leading men and women of the French empire were painted by Gérard, and he became known as the "painter of kings." Among his famous portraits are those of Napoleon, Talleyrand, Moreau, and Mme. Récamier. Among his most noted paintings are the "Battle of Austerlitz" and the "Entry of Henry IV into Paris." He was appointed court painter to Louis XVIII, from whom he received the rank of baron. All his historical paintings were executed in the then dominant classical style.

Gerard (*jē-rärd'*), **James Watson (1867-1951)**, American jurist and diplomat, was born in Geneseo, N. Y. From 1908 to 1911, he was Associate Justice of the Supreme Court of New York. In 1913, he was appointed ambassador to Germany by President Wilson, and he served with marked distinction and ability during the difficult period following the outbreak of the European conflict in 1914. When the United States declared war against Germany in 1917, Gerard was recalled. After his return to America, he published *My Four Years in Germany* and *Face to Face with Kaiserism.*

Gerhardt (*zhā'rärt'*), **Charles Frederic (1816-1856)**, French chemist, was born at Strasbourg. He was one of the most famous of the pupils of Liebig. In 1838, he went to Paris, where he made researches with Cahours at the Jardin des Plantes, and, in 1844, he became professor of chemistry at Montpellier. He accepted a chair at Strasbourg in 1855.

With his contemporary, Laurent, Gerhardt was author of the system of chemical notation now in use. Their views regarding the formation and the constitution of salts are now generally accepted. Gerhardt invented the theory of types, a most valuable method of classifying chemical compounds and of showing their mutual relationships. His theories and discoveries are embodied in his *Treatise on Organic Chemistry.*

German, Edward (**1862-1936**), English orchestral composer, was born at Whitchurch, Shropshire. He is best known by his incidental music to various Shakespearean plays, including *Richard III, The Tempest, Romeo and Juliet, As You Like It,* and *Henry VIII.* He composed also the operas *Merrie England, The Princess of Kensington,* and *Tom Jones;* the operetta *The Rival Poets;* two symphonies; and chamber music. He finished Sullivan's *Emerald Isle,* and employed the folk-song style with marked success. With Rudyard Kipling, he produced the *Just So Song Book.*

Gérôme (*zhā'rōm'*), **Jean Léon (1824-1904)**, French painter and sculptor, was born at Vesoul, Haute Saône. After studying at Paris with Delaroche and traveling in the East, he was appointed professor of painting in the School of the Fine Arts at Paris. His reputation was established by his picture "Gladiators Before Cæsar." Among the best known of his works are "Phryne before Her Judges," "Cleopatra and Cæsar," "Thumbs Down" (a companion to his "Gladiators Before Cæsar"), and his Oriental pictures "Turkish Prisoner," "Prayer," "The Slave Market," and "The Promenade of the Harem."

Gérôme was an artist of great versatility and his work stands midway between the work of the classicists and that of the romanticists. After 1878, he attained eminence as a sculptor, producing, among other notable works, "Napoleon Entering Cairo," "Frederick the Great," "Tamerlane," "Tanagra," and "The Dying Eagle," a monument for Waterloo. Important examples of his works are found in American museums.

Gerry, Elbridge (1744-1814), American statesman, 5th vice president of the United States, was born in Marblehead, Mass. He was graduated at Harvard College, 1762. In 1776, he was elected a delegate to the Continental Congress, signed the Declaration of Independence, and was placed on the most important committees. He retired from Congress in 1780, but resumed his seat in 1783. As delegate to the convention in 1787 to revise the Articles of Confederation, he refused to sign the Constitution as proposed, but afterward supported it.

Gerry was member of Congress, 1789–93, and, in 1797–98, was special envoy to France, with Pinckney and Marshall. He was governor of Massachusetts in 1810 and 1811. In the latter term, he signed the famous act redistricting the state so as to destroy the Federalist representation in the legislature. From this act the term "gerrymander" has its origin. In 1812, he was elected vice president of the United States.

Gershwin, George (1898-1937), American composer, was born in New York City. Largely self-taught, he obtained work as a pianist to a firm of music publishers. He developed skill in adapting themes in jazz form for the orchestra. Some of his compositions became extremely popular, more particularly his "Rhapsody in Blue," one of the best known of all jazz compositions. His other compositions include "The King of Jazz" and "An American in Paris." His "Concerto in F," first performed in 1925, is a distinctive and original contribution to American music.

Gervinus (*gĕr-vē'nōōs*), **Georg Gottfried (1805-1871)**, German critic and publicist, was born at Darmstadt. In 1836, he became professor of history at Göttingen. In 1837, he was one of the seven Göttingen professors who protested against the abolition of the Hanoverian constitution, and was ordered to leave the country. In 1844, he was appointed honorary professor in Heidelberg, and, from this period forward, wrote in behalf of constitutional liberty. In 1847, he helped to establish the *Deutsche Zeitung;* in 1848, was elected to the National Assembly. His commentaries on Shakespeare were translated into English in 1862. Besides these, he published a *History of German Poetry* and a *History of the 19th Century.* He died at Heidelberg.

Gesell, Arnold (1880-1961), American psychologist and physician, was born at Alma, Wisconsin. Because of his special training in education, he was chosen to conduct the child development clinic at the Yale School of Medicine. Beginning with a study of backward children and their pre-school history, Dr. Gesell later turned his attention to normal children. He came gradually to the conclusion that "the first five years of life are the most consequential in the history of the human individual." Besides numerous studies in collaboration with others, he is author of *Exceptional Children and Public School Policy, Handicapped Children in School and Court, Infancy and Human Growth, How a Baby Grows,* and *The Embryology of Human Behavior.*

Ghiberti (*gē-bĕr'tē*), **Lorenzo (c. 1378-1455)**, Italian sculptor, was born in Florence. He was engaged in painting in fresco at Rimini, in the palace of Prince Pandolfo Malatesta, when the Merchants' Guild of Florence invited artists to propose models for one of the bronze doors of the baptistery of San Giovanni. The offering up of Isaac was to be executed in gilt bronze, as a specimen of the work. The judges selected the works of Brunelleschi and Ghiberti as the best, but the former voluntarily withdrew his claims giving the preference to Ghiberti.

After 21 years' labor, Ghiberti completed the door, and, at the request of the Merchants' Guild, executed a second after almost as long a period. Michelangelo said of these that they were worthy of adorning the entrance to paradise. During these 40 years, Ghiberti completed also a statue of John the Baptist for the church Or San Michele, two bas-reliefs for the baptistery of the Cathedral of Siena, and other works.

Ghirlandajo (*gēr'län-dä'yō*), **Domenico (1449-1494)**, Florentine painter. He assisted in the decoration of the Sistine Chapel in Rome, and executed a series of frescoes in the Sassetti Chapel in Santa Trinità, Florence, which are considered his most important work. He painted also many easel pictures in oil and distemper, but his frescoes are incomparably his finest works. In artistic ability he ranks with Giotto, Masaccio, Lippo Lippi, and Botticelli among early Florentine painters. He was the instructor of Michelangelo.

Ghirlandajo, Ridolfo (1483-1561), Italian painter, son of Domenico Ghirlandajo. He was educated in art in his father's studio. About 1503, he began to study the works of Leonardo da Vinci and produced many fine paintings that are hardly distinguishable from those of that great master. The "Annunciation" in the Uffizi Gallery, Florence, the "Goldsmith" in the Pitti Palace, and other paintings attributed to Da Vinci were painted by Ghirlandajo. His best works in this style are the "Coronation of the Virgin," in the Louvre, and the "Betrothal of St. Catherine." Later, he came under Raphael's influence. This is reflected in his noted portrait of an "Old Woman" in the Pitti Palace. According to Vasari, he assisted Raphael in painting the draperies of "La Belle Jardinitèr."

Giannini (*jän-nē'nē*), **Amadeo Peter (1870-1949)**, American banker, was born of Italian parentage at San Jose, Cal. After a childhood on a farm and a common school education, he worked for a commission firm, becoming a partner at 19. At 24, he was director of a savings bank; at 26, manager of a million dollar estate. He founded the Bank of Italy (now Bank of America) in 1904 in San Francisco. At the time of the earthquake in 1906, Giannini salvaged the bank's assets, and his was the first financial institution to reopen and extend loans for reconstruction. In the panic of 1907, it was the only bank in the state that could meet every demand in gold. In the same year, Giannini began a policy of establishing branch banks, which eventually numbered over 300 and spanned the nation. At first an institution for Italian Americans, the

Bank of Italy became national in scope through its liberal policy and friendly atmosphere.

Gibbon, Edward (**1737-1794**), English historian, was born at Putney, in Surrey, England. On account of his delicate health, his early education was carried on with difficulty at Kingston on Thames and later at Westminster School. Having been fully restored to health at Bath, he entered Oxford and matriculated at Magdalen College in 1752. His erudition at this time was enormous; his readings took a serious, religious turn.

His father sent him to Lausanne, Switzerland, for further training. When he returned to England in 1758, he brought with him the first pages of his *Essay on the Study of Literature*, a work which served as his card of admission to the society of notable literary men when he made his trip to France and Italy in 1764. While in Rome, in October of that year, he conceived the idea of writing a book on the decline of that empire.

When once again in England, Gibbon devoted a portion of each year to the army, where he had risen to the rank of lieutenant colonel, and the remainder to literary activities in London. His father died in 1770, leaving him in comparatively easy circumstances. In 1774, he was elected to Parliament, but he entered a public career without ambition and proved an indifferent politician.

Meanwhile, the first volume of his projected *Decline and Fall of the Roman Empire* appeared in 1776 and was received with unbounded admiration. Gibbon's reputation was firmly established. Two more volumes of this work were ready in 1781. He then settled in Lausanne and there completed his great history, of which the last two volumes were published in May 1788. It is virtually a history of the world for 13 centuries,—from the reign of Trajan to the capture of Istanbul by the Turks,—during all which time Christianity was superseding paganism.

Gibbon's brain was vigorous, and he had a vast capacity for both work and enjoyment. His style is polished and elegant. His unique merit is his supreme power of unifying a bewildering multitude of details and giving life and sequence to the whole.

Gibbons, Grinling (**1648-1721**), English sculptor and wood carver, was born probably at Rotterdam. He had for some time practiced his art in England when he was made wood carver to the crown, serving for Charles II and succeeding monarchs to George I. Sir Christopher Wren engaged him for architectural decorations and many public buildings and private houses of the period display his tasteful and delicately finished carvings.

Gibbons, James (**1834-1921**), American Roman Catholic cardinal, was born in Baltimore, Md. At an early age, he was taken by his parents to their former home in Ireland, where he began his education. He returned to the United States in 1848 and resided with his family in New Orleans. Ordained priest in 1861, he served the Church in various capacities and, in 1868, he was made vicar apostolic of North Carolina, with rank and title of bishop. He became archbishop of Baltimore in 1877, and, in 1886, was created cardinal. Gibbons was the Church's most persuasive spokesman to non-Catholic Americans. He championed democracy and praised the separation of Church and state. His *Faith of Our Fathers* is a plea for Catholicism addressed to conservative Protestants.

Gibbs, Josiah Willard (**1839-1903**), American physicist, was born at New Haven, Conn. He was graduated at Yale in 1858, was an instructor there for three years, and then studied in Berlin, Heidelberg, and Paris. In 1871, he became professor of mathematical physics at Yale, continuing until his death 32 years later. In 1878, he completed the publication of a paper *On the Equilibrium of Heterogeneous Substances*, which laid the basis of the science of physical chemistry. This publication contained the important formula called the "Gibbs phase rule," the use of which has greatly increased scientific knowledge of solutions, alloys, and crystallizations.

For his original researches, Gibbs was awarded the Copley medal of the Royal Society, the Rumford medal of the American Academy, and numerous honorary degrees in America and Europe. Ostwald called him the founder of chemical energetics. Between 1881 and 1884 he developed a system of vector analysis. He published numerous papers on mathematical physics. His final work was on the *Elementary Principles of Statistical Mechanics*. Elected to the American Hall of Fame in 1950.

Gibbs, Sir Philip (**1877-1962**), English author and journalist. Privately educated, he entered journalism in 1902, acting as editor of various London newspapers. From 1915 to 1918, he was war correspondent with the British armies in France and achieved distinction by his graphic accounts of the great conflict. His extensive writings include the novels *Venetian Lovers*, *The Individualist*, and *The Reckless Lady;* the historical works *Founders of Empire*, *The Battles of the Somme*, *Ten Years After*, and *Across the Frontiers*. He was knighted in 1920.

Gibson, Charles Dana (**1867-1944**), American illustrator, was born in Roxbury, Mass. He studied under Saint-Gaudens and, in 1886, he began his career as an artist with illustrations for periodicals. After a period of further study in Paris in 1889, he returned to New York. He resumed illustrating work for *Life*, *Scribner's*, *Century*, *Harper's*, and became a master of black-and-white pictorial art. He created the so-called "Gibson girl" type.

In 1905, Gibson began to study color painting in Europe, but later he returned to black-and-white illustration work. In 1921, he was elected member of the American Academy of Arts and Letters. Among his published works are *People of Dickens*, *Pictures of People*, *The Americans*, *A Widow and Her Friends*, *The Social Ladder*, and *Our Neighbors*.

Gide (*zhēd*), **André Paul Guillaume** (**1869-1951**), French novelist and essayist, was born in Paris. His earlier novels, the first of which appeared in 1893, reveal a disillusioned, anti-intellectual view of life. They were followed by fiction of increasing power and psychological insight which gained him a recognized place in the forefront of the liberal thinkers of his generation. Among his best-known works are *The Counterfeiters*, *The Immoralist*, *Strait Is the Gate*, and *Travels in the Congo*. He received the Nobel prize for literature in 1947.

Gifford, Sandford Robinson (**1823-1880**), American painter, was born in Greenfield, N. Y. He studied with J. R. Smith, a water-color painter, in New York, and was much influenced by the methods of Thomas Cole. In 1855-57, he sketched in England, Scotland, France, Belgium, the Netherlands, Switzerland, and Italy, and, in 1868-70 in Italy, Syria, Greece, Turkey, and Egypt.

Among Gifford's best pictures are "Morning in the Adirondacks," "Mansfield Mountain," and "Sunset on the Sweetwater." Among his most noted paintings of foreign subjects are "Ruins of the Parthenon" in the Corcoran Gallery, Washington, and "Tivoli" and "Near Palermo" in the Metropolitan Museum, New York. Gifford made artistic effect rather than pictorial detail his controlling aim. He was one of the best-known of the Hudson River School of painters.

Gifford, Walter Sherman (**1885-**), American industrial leader, was born at Salem, Mass. After being graduated from Harvard University in 1905, he entered the employ of the Western Electric Company. He became chief statistician of the American Telephone and Telegraph Company in 1911, vice president in 1919, and president in 1925. As executive head of the world's largest public utility corporation, he provided vigorous leadership in the scientific and technical development, not only of communication arts, but also in allied fields, including that of sound motion pictures. He wrote *Does Business Want Scholars?; Pensions, Charity and Old Age;* and *Can Prosperity Be Managed?* He was ambassador to Great Britain, 1950-1953.

Gilbert, Cass (**1859-1934**), American architect, was born at Zanesville, O. He was educated at Massachusetts Institute of Technology, and began practice as an architect in 1883. Among the buildings designed by him are the Minnesota Capitol at St. Paul, the New York Customhouse, and the Central Public Library, St. Louis. He was one of the architects of the new Union Club, New York, and made plans for the Arkansas capitol and for the universities of Minnesota and Texas. His most noted achievement is the Woolworth Building, New York. In 1914, he was elected member of the American Academy of Arts and Letters.

Gilbert, William (**1540-1603**), English physicist and physician was born at Colchester. He was educated at the University of Cambridge. Settling in London about 1573, he began medical practice, joined the College of Physicians, and was appointed physician to Queen Elizabeth. He became president of the College of Physicians in 1600 and was made court physician in the following year.

Gilbert devoted his spare time to scientific experiments, particularly in connection with the magnet. He demonstrated the bearing of magnetic phenomena on navigation and was the first investigator to use the terms "electric force," "electric attraction," and "magnetic pole." His treatise *De Magnete* was the earliest great work on physical science in England.

Gilbert, Sir William Schwenck (**1836-1911**), English dramatist, was born in London. He was graduated at London University; was a clerk in the privy council office from 1857 to 1862; and, in 1864, was admitted to the bar. He was for many years on the staff of *Fun*, in whose columns his *Bab Ballads* first appeared. His stage work began with a Christmas burlesque, *Dulcamara*, 1866, which was followed by a succession of burlesques, dramas, comedies, fairy comedies, and operas.

Gilbert won a world-wide reputation for the series of comic operas collaborated in conjunction with Sir Arthur Sullivan. Among these are *Thespis*, *Trial by Jury*, *The Sorcerer*, *H. M. S. Pinafore*, *The Pirates of Penzance*, *Patience*, *Iolanthe*, *Princess Ida*, *The Mikado*, *Utopia Limited*, and *The Grand Duke*. See *Bab Ballads*.

Gildersleeve, Basil Lanneau (1831-1924), American classical scholar, was born in Charleston, S. C. He was graduated from Princeton, 1849, and later studied at the universities of Berlin, Bonn, and Göttingen. He was professor of Greek at the University of Virginia from 1856 to 1876, when he was called to the chair of Greek in Johns Hopkins University, which he filled with distinction until 1915. He founded and, in 1880, became editor of the *American Journal of Philology.*

Gildersleeve's contributions to Greek and Latin syntax and to the history of Greek literature rank among the best products of modern scholarship. He is the author of several works, including a *Latin Grammar, Essays and Studies, Hellas and Hesperia,* and editions of Persius and Pindar. In collaboration with C. W. E. Miller, he produced the important work entitled *Syntax of Classical Greek from Homer to Demosthenes.* In 1908, he was elected member of the American Academy of Arts and Letters.

Gillette, William (1855-1937), American actor and playwright, was born at Hartford, Conn. He received an academic education with special university courses. He won much popularity playing with stock companies in many cities of the East and South and wrote several plays which were notably successful. Among these are *Secret Service, Because She Loved Him So, Settled Out of Court,* and *Clarice.* He became best known both in America and England for his dramatization and impersonation of Sir Conan Doyle's *Sherlock Holmes,* first produced in 1899. He acted also in *The Admirable Crichton* and *Dear Brutus* with great acclaim. In 1915, he was elected member of the American Academy of Arts and Letters.

Gilman, Charlotte Perkins (1860-1935), American author and lecturer, was born in Hartford, Conn. In 1884, she married C. W. Stetson and, in 1900, G. H. Gilman of New York. She began giving lectures on economics, sociology, and ethics in 1890. She contributed numerous articles on similar subjects to magazines and was well known for her efforts to improve labor conditions and for her interest in the advance of woman. She edited the *Forerunner* from 1909 to 1916. In 1914 her lectures entitled "The Larger Feminism" attracted wide attention. Among her writings are *Woman and Economics, In This Our World* (verse), *Concerning Children, The Man-Made World,* and *His Religion and Hers.* Suffering from an incurable disease, she took her own life.

Gilman, Daniel Coit (1831-1908), American educator, was born in Norwich, Conn. He was graduated at Yale in 1852 and continued studies at Yale, Harvard, and Berlin. He was librarian, secretary of the Sheffield Scientific School, and professor of physical and political geography, Yale, 1856–72. From 1872 to 1875, he was president of the University of California. In 1875, he was entrusted with the task of organizing Johns Hopkins University, which he made a graduate institution of pioneer influence in American education. He served as president until 1901. From 1901 to 1904, he was president of the Carnegie Institution, Washington. His writings include *James Monroe, University Problems, Introduction to De Tocqueville's Democracy in America, Life of James D. Dana, Geologist,* and *Science and Letters in Yale.* He was editor in chief of the *New International Encyclopædia.* In 1908, he was elected member of the American Academy of Arts and Letters.

Ginn (*gĭn*), **Edwin (1838-1914),** American publisher, was born at Orland, Me. He was graduated at Tufts College in 1862; engaged in publishing, and became head of the firm of Ginn and Company, publishers of school and college textbooks. The first book which he produced was Allen's *Latin Grammar,* published in 1868. Under his constructive policy, his house rose to foremost rank among American textbook publishers. He became deeply interested in social problems and in the movement for universal peace. In 1909, he set aside $1,000,000 for the endowment of a world peace foundation and, in 1913, established an international school of peace.

Giorgione (*jôr-jô'nā*), or **Giorgio Barbarelli (c. 1477-1511),** Italian painter, was born at Castelfranco. He studied at Venice under Giovanni Bellini, and soon developed a free and large manner, characterized by intense poetic feeling and by great beauty and richness of coloring. Several early portraits by him have disappeared, but his "Enthroned Madonna" is an altarpiece at Castelfranco. In Venice he was extensively employed in fresco painting but some fragments in the Fondaco de' Tedeschi are all that now remain of this work.

Of his existing works, "The Family of Giorgione" at Venice, "The Three Philosophers" at Vienna, "The Concert" at the Pitti Palace, Florence, and the "Sleeping Venus" in the Dresden Gallery are representative canvases. Giorgione ranks with the greatest of Venetian painters and powerfully influenced his contemporaries, including Titian.

Giotto (*jôt'tū*) **di Bondone (c. 1266-1336),** Italian painter and architect, was born at Colle. He is said to have been a pupil of Cimabue and a friend of Dante, whose portrait he painted at Ravenna. He painted a series of fine frescoes at Assisi, and was probably the founder of the modern school of portrait painting. About 1298, he went to Rome, where he painted and worked in mosaics; he subsequently was employed at Padua and Florence, where he painted frescoes in the Peruzzi Chapel of Santa Croce.

Giotto painted also the "Miracle of the Loaves and Fishes," at Naples, and designed the beautiful campanile at Florence, often called "Giotto's Tower." Giotto was the greatest and most influential painter in Italy before the Renaissance. He humanized and vitalized Italian painting and imbued it with natural action and feeling. See *Painting.*

Girard (*zhē'rär'*), **Jean Baptiste (1765-1850),** "Le Père Girard," Swiss educator, was born at Fribourg. At the age of 16, he entered the Franciscan order, and, although engaged in teaching to a limited extent, did not devote himself definitely to education until 1798. He then published a *Projet d'éducation pour toute l'Helvétie,* and, in 1805, became director of primary schools at Fribourg, where he remained until 1823. He then taught philosophy at Lucerne until 1834, retiring in that year to Fribourg, where he wrote his noted *Enseignement regulier de la langue maternelle,* published, 1844–46.

Girard's theory emphasized the element of interest as the chief factor in learning and the awakening of it for all the elements of study as the chief factor in teaching. His influence has been very great in elementary teaching in France, Italy, and Switzerland. He stands next to Pestalozzi among Swiss educators.

Girard (*jĭ-rärd'*), **Stephen (1750-1831),** banker and philanthropist, was born near Bordeaux, France. He became a sailor and, before the Revolution, engaged as the master of vessels in the American coasting and West Indian trade. During the Revolutionary War, he was a grocer and sutler in and near Philadelphia. He was again in the West Indian and coastwise trade in partnership with John his brother, in 1780–90. Eventually, he became a banker, and amassed a large fortune. He was eccentric in his habits, a freethinker, ungracious in manner and ill-tempered, but a liberal benefactor of public charities. During several yellow-fever seasons in Philadelphia, no citizen was more active in relieving distress. At his death, nearly all his estate was bequeathed to various charitable and municipal institutions of Philadelphia and New Orleans and to the founding of Girard College.

Giulio Romano (*jōōl'yō rō-mä'nō*), **(c. 1492-1546),** Italian painter and architect, the most eminent of Raphael's pupils, was born at Rome. He assisted Raphael in the execution of several of his finest works, and at Raphael's death completed the "Apparition of the Cross" in the Vatican.

In 1524, Giulio Romano went to Mantua on the invitation of the duke. The drainage of the marshes and the protection of the city from the inundations of the Po and the Mincio attest his skill as an engineer, while his genius as an architect found scope in the restoration and adornment of the Palazzo del Té, the cathedral, and a ducal palace. In Bologna, he designed the façade of the church of San Petronio. Among his representative works are the "Martyrdom of St. Stephen," a "Holy Family," "Apollo and the Muses," "The Education of the Muses," and the "Madonna della Gatta."

Gladstone (*glăd'stŭn*), **William Ewart (1809-1898),** English statesman, orator, and man of letters, was born in Liverpool. He was graduated at Oxford, and, in 1832, entered the House of Commons. In 1838, he published his first work, *The State in Its Relations with the Church.* In 1845–46, he was colonial secretary under Peel and this was the only break in his remarkable parliamentary career, which extended from 1832 to 1894. In 1847, he was elected a member of Parliament for the University of Oxford, which he represented for 18 years. In 1858, he published an elaborate work on *Homer and the Homeric Age.*

In 1860, Gladstone carried through Parliament a commercial treaty with France. In 1866, as leader of the House of Commons, he brought in a reform bill, the defeat of which caused Earl Russell to resign. Gladstone, in 1869, disestablished the Irish Church; in 1870, he carried his Irish Land bill; and, in 1872, he carried the Ballot bill. In 1874, he dissolved Parliament, and, on the unfavorable result of the ensuing election, the Gladstone ministry resigned. In 1876, he strongly denounced, by voice and pen, the Turkish cruelties in Bulgaria. On the defeat of the Disraeli administration at the polls, 1880, he became premier, but resigned in 1885.

Early in 1886, after the short-lived administration of Lord Salisbury, Gladstone again came into power, and signalized his return to office by presenting in 1886 a dual scheme of Irish government—a land bill and a home rule bill. Intense and bitter opposition from Liberals and Conservatives alike greeted the measure, and the bill was rejected. In consequence, Parliament was dissolved and Gladstone and his colleagues appealed to the country, but

were defeated. During the succeeding years, 1887–91, Gladstone was in opposition, the chief incident in his career being his outspoken advocacy of home rule in Ireland and his consequent alliance with the Irish party. Following the general election of 1892, he became prime minister for the fourth time. He resigned in 1894 on account of advanced age and spent his last days chiefly in literary work. He died at Hawarden, and was buried in Westminster Abbey.

Glasgow, Ellen Anderson Gholson (1874-1945), American novelist, was born at Richmond, Va. She received a private education and began early to devote herself to literary work. She pictured realistically the transition of Southern life from ante-bellum conditions to the new order and advocated woman's emancipation. Her writings include *The Battleground, The Freeman and Other Poems, Phases of an Inferior Planet, Life and Gabriella, They Stooped to Folly,* and *Vein of Iron.* She was elected to the American Academy of Arts and Letters in 1938.

Glass, Carter (1858-1946), American politician and cabinet officer, was born at Lynchburg, Va. He was educated in private and public schools in his native town. After several years in newspaper work, he was elected congressman. In 1918 he was appointed Secretary of the Treasury, resigning in 1920 to become U.S. Senator from Virginia.

Glass, Montague (Marsden) (1877-1934), American story-writer, was born at Manchester, England, of Jewish parentage. He came to the United States in 1890, and was educated at the College of the City of New York and at New York University. He began the practice of law, but soon became a writer of short stories. He is most widely known as the author of *Potash and Perlmutter,* which appeared in 1910 and was successfully dramatized in 1913. His plays, written chiefly in collaboration with other dramatists, include *Abe and Mawruss, Object: Matrimony, Business Before Pleasure, Why Worry?,* and *His Honor Abe Potash.*

Glauber (*glou'bĕr*), **Johann Rudolph (1604-1668),** German chemist and physician, was born at Karlstadt in Bavaria. In 1648, he discovered hydrochloric acid, and he was probably the first to procure nitric acid. His name lives in Glauber's salt (hydrated sodium sulphate), discovered by him in 1658 by treating sodium chloride (common salt) with sulphuric acid. He was a voluminous writer on chemical subjects.

Glazunov (*glä'zōō-nôf'*), **Alexander (1865-1936),** Russian composer, was born in Leningrad. He studied under Rimski-Korsakov, and at 19 he wrote a symphony, which was produced at Weimar under the auspices of Liszt. In 1889, he publicly conducted his own compositions in Paris with notable success. In 1899, he became professor in the Leningrad Conservatory and, in 1900, was made director. With Rimski-Korsakov, he completed Borodin's famous opera *Prince Igor.* His musical compositions were numerous and varied.

Glendower (*glĕn'dōōr*), or **Glendwr, Owen (c. 1369-c.1415),** Welsh chief, was educated in England, but in 1401 a dispute over land led him into war against the English. He proclaimed himself Prince of Wales and joined his English son-in-law, Mortimer, and Harry Percy (Hotspur) in a coalition against King Henry IV, which was defeated at Shrewsbury, 1403. In 1405 he received assistance from Charles VI of France, and, in spite of repeated defeats, carried on guerilla warfare against the English until his death. He is regarded as the Welsh national hero.

Glennan, T. Keith (1906-), engineer was born at Enderlin, North Dakota. Following graduation from Yale, he was employed by Electrical Research Products, Inc. and later engaged in war research. Having been elected president of Case Institute of Technology in 1947, he was called in 1950 to serve on the Atomic Energy Commission. In 1958 he was appointed director of the National Aeronautics and Space Administration.

Glennon, John Joseph (1862-1946), American clergyman, was born in Kinnegad, Ireland, and was ordained priest in 1884. In that year he came to St. Patrick's Church in Kansas City. He became coadjutor bishop of Kansas City in 1896, and archbishop of St. Louis in 1903. He was created cardinal, February 1946.

Glicenstein, Henri (1870-1942), a sculptor with international relationships, was born in Turek, Poland, studied art in Munich, won a *Prix de Rome* and spent some time in Italy, worked for several years in France, and became an American citizen in 1935. Rodin admired his work and nominated him for membership in the *Societé Internationale des Beaux Arts.* Many of his finest pieces are in wood, though some are in bronze, marble, and terra cotta. Seen in important museum collections in Europe and America, they include such titles as "Ecce Homo," "The Wounded Soldier," and "Defense." In America he made portraits of President F. D. Roosevelt, Admiral Byrd, Paderewski, and others.

Glinka (*glĭng'kä*), **Mikhail Ivanovitch (1804-1857),** Russian composer, pioneer of the National School and forerunner of Tchaikovsky, was born near Novospaskoi. He studied at Leningrad, Rome, and Berlin. In 1836, he wrote *A Life for the Czar,* the first Russian national opera. His second opera, *Russlan and Ludmilla,* similar in character, was also a great success. His compositions include symphonies, piano music, and songs. He died in Berlin.

Gluck (*glōōk*), **Alma (1884-1938),** stage name of Reba Fiersohn, American dramatic soprano, was born at Bucharest, Rumania. Her parents came to New York in 1890. She received her education in the public schools and at Union College, Schenectady, N. Y. After studying music under Buzzi-Peccia from 1906 to 1909, she was engaged by Gatti-Casazza for the Metropolitan Opera House, New York. She made her first appearance as Sophie in Massenet's *Werther,* and, during the first season, sang with notable success in eleven roles.

Gluck, Christoph Willibald (1714-1787), German composer, was born at Weidenwang, in Bavaria. He studied at Prague, Vienna, and Milan, and began his musical career at Vienna at the age of 22. His best-known works are *Alceste, Paride ed Elena,* and *Orfeo,* composed in Vienna, and *Iphigénie en Tauride,* composed in Paris. Gluck sought to reform the opera by putting into the music great expressive power and dramatic force. He cleared the way for the modern opera and was a forerunner of Wagner and the later dramatic composers.

Glueck, Nelson (1900-), archeologist and educator, was born at Cincinnati, O. He was graduated from the University of Cincinnati and from the Hebrew Union College, where he later served as professor of Bible and Biblical archeology and for a time as president. As director of the American School of Oriental Research at Jerusalem, in charge of explorations in Palestine and Trans-Jordan, he made important contributions, particularly to the archeology of the Negev region. His books include *The River Jordan, Rivers in the Desert,* and *A History of the Negev.*

Godard (*gô'därʹ*), **Benjamin (1849-1895),** French composer, was born in Paris. He displayed marked musical talent at an early age. After receiving private instruction, he entered the Paris Conservatory, where he studied violin under Vieuxtemps and composition under Reber. At the age of 16, he published a violin sonata and soon thereafter was awarded a prize by the French Institute. His most successful opera was *La Vivandière.* Among his other compositions are *Pedro de Zalaméa, Jeanne d'Arc,* and many symphonies, concertos, suites, and songs.

Goddard, Robert H. (1882-1945), physicist and inventor, was born at Worcester, Mass. Except for a brief interval in which he taught physics at Princeton University he spent much of his life at Worcester, where he became professor of physics at Clark University and director of the physics research laboratory there. As a result of his experiments and of the publication in 1919 of his pamphlet, *A Method of Reaching Extreme Altitudes,* he became known as "the father of American rocketry." Tests made in New England as early as 1923 showed the possibilities of liquid propellants for rockets. Using larger models in later experiments at Roswell, New Mexico, he laid the groundwork for successful rockets of the future.

Godfrey de Bouillon (*bōō'yôNʹ*) **(c. 1061-1100),** Duke of lower Lorraine, gained distinction in the armies of the emperor Henry IV and was the great leader of the First Crusade. According to the chroniclers, he performed prodigies of strength and valor against the Saracens, and was proclaimed king of Jerusalem on its capture in 1099. He accepted the office, but declined the title. At Ascalon, with 20,000 men, he defeated the sultan of Egypt, who is said to have had a vastly greater force. He then devoted himself to organizing his government, and drew up, for his courts of justice, the assizes of Jerusalem, a code of laws which was the fullest embodiment of feudal jurisprudence. His deeds are celebrated in Tasso's *Jerusalem Delivered.*

Godowski (*gô-dŏv'skê*), **Leopold (1870-1938),** Polish pianist, was born at Vilna. He received his early instruction from local teachers. He studied with Saint-Saëns in Paris from 1886 to 1890, following which he made a tour of two years in the United States. In 1895 he became director of pianoforte teaching at the Chicago Conservatory. In 1900, he was made director of the Imperial Piano-Teachers' School in Vienna. After a highly successful concert tour of the United States in 1912, he took up his residence in New York. Godowski's playing was characterized by brilliant technique, and he made many paraphrases of works by Chopin, Weber, and Strauss which required unusual technical skill.

Goebbels (*gûb'ĕls*), **Josef (1897-1945),** German political leader, born at Rheydt. After graduation from Heidelberg, he joined the Nazi organization. He founded and edited the party organ, *Der Angriff.* Under Hitler he became minister for propaganda and ardently supported Hitler's anti-Semitic policy. At the fall of Berlin, he committed suicide.

Goering, Hermann. See *Göring, Hermann.*

Goethals (*gō'thălz*), **George Washington** (**1858-1928**), American military and civil engineer, was born in Brooklyn. He was a student at the College of the City of New York, 1873-76, and was graduated from the United States Military Academy, 1880. He was appointed second lieutenant of engineers, 1880, and rose by successive promotions to major general of engineers, 1915. His early river and harbor work was the construction of the Muscle Shoals locks and dams on the Tennessee River.

In 1907, Goethals was appointed chief engineer and chairman of the military board of engineers authorized by President Roosevelt to construct the Panama Canal. His services in the performance of this great task, which he completed in 1914, a year in advance of his schedule, won him unqualified praise throughout the civilized world and the thanks of Congress. In 1914, he was appointed civil governor of the Canal Zone by President Wilson.

During the American participation in World War I, he was successively general manager of the emergency fleet corporation, acting quartermaster general of the United States, and chief of division of purchase, storage, and traffic. In 1918, "for especially meritorious and conspicuous service," he was awarded the distinguished service medal. See *Panama Canal.*

Goethe (*gû'tĕ*), **Johann Wolfgang von** (**1749-1832**), German author, was born at Frankfort on the Main, Prussia. His father was a traveled and distinguished doctor of laws; his mother, a woman of noble and wide sympathies. He was a precocious, handsome, and sensitive child. Before he was ten years of age, he wrote in several languages and had a considerable familiarity with works of art. The circumstances of his early life favored the development of his great and varied powers. His boyhood came at the period when Germany was in the throes of the Seven Years' War and when Lessing was laying the foundation of philosophical literary criticism.

Education. Besides the common branches of education, Goethe busied himself with drawing, music, and natural history. He was sent to the University of Leipzig in 1765 to prepare for the legal profession. To law, however, he gave little heed, and he had a disgust for speculative philosophy. He paid more attention to classical studies and read extensively in French and English. The discrepancies existing between the different poetical schools, which he cculd not reconcile as yet by any critical theory he had met, almost gave him a distaste for poetry. He made some attempts at play writing and relieved somewhat the uneasy state of his mind by the study of fine arts.

In 1768, Goethe left Leipzig and resided in the country, where he studied alchemy, chemistry, and occult philosophy. A couple of years later he went to Strasbourg University and devoted himself earnestly to chemistry, anatomy, literature, antiquities, and law. At Strasbourg, he formed the acquaintance of Herder, who influenced Goethe's mind greatly and directed his reading to Ossian, Homer, Shakespeare, Goldsmith, and the Hebrew poets.

Earlier Literary Works. In 1771, Goethe took his degree of doctor of laws and went to Wetzlar, the seat of the imperial chamber of the German Empire, which afforded peculiar facilities for young men engaged in the study of public law. His profession, however, had less attraction for him than his literary pursuits. Wetzlar became to him the scene of the famous *Sorrows of Young Werther*, which was published in 1774, depicting the hopeless love of a young man for a married woman who chose to abide by her marriage. He returned to Frankfort in 1772, and, in the following year, published *Götz von Berlichingen.* This was cast in the mold of Shakespeare's dramatic histories. The novelty of the undertaking was as attractive as the force of imagination behind it. Here, as in *Werther*, the poet poured forth his emotions with infectious enthusiasm.

In its design, *Werther* was nothing more than a sentimental novel, and it thus bid for a popularity much wider than that of *Götz.* The German language possessed previously nothing comparable with either of these works. Goethe's success immediately enabled him to devote his energies, without interruption or anxiety, to literary study and composition.

Life At Weimar. In 1774, in the course of his travels, Goethe met the young son of the Duchess of Saxe Weimar and later accepted an invitation to the court at Weimar, then the intellectual center of Germany. Goethe was the leading spirit of the group, which included Wieland, Herder, and, later Schiller. Here he met Charlotte von Stein, who became his dearest friend and the object of his homage. He was ennobled, made privy councilor in 1779, and received other appointments; but, in the period of his greatest activity, his most important office was that of theatrical director.

In 1786, a visit to Italy gave fresh impetus to Goethe's literary and poetic interests, and he visited Italy again in 1790. At Rome, he finished his *Iphigenia at Taurus*, described as a "marriage between philosophy of Germany and the ancient Greek tragedy." *Egmont* followed *Iphigenia*, and *Tasso* appeared in 1790.

Goethe had returned to Weimar in 1788, and at that time he met Schiller. That autumn, he met Christine Vulpius, whom he married in 1806. He accompanied the Duke of Saxe Weimar in 1792, when the Prussian army invaded France. The most productive period of Goethe's life was between 1794 and 1805, during his intimacy with Schiller, the poet. This friendship gave a literary stimulus to the activities of each.

Wilhelm Meister's Apprenticeship was completed in 1796. In 1796-97, the charming epic idyl *Hermann and Dorothea* was written; also much of the first part of *Faust*, which, however, was not completed until 1808. It is impossible not to feel the singular poetic beauty of this wonderful poem, its unsurpassed felicities of imagery and diction, and the impressivenesss of the despondent melancholy, which is the ruling temper of the whole. Philosophically considered, *Faust* is a propounding of the enigma of human life, with a refusal to accept the solution offered by religion.

Later Works. Now occurred in Goethe's career a long interval marked by nothing of distinguished note. *Elective Affinities*, of 1809, however, may be regarded as the forerunner of the psychological novel. In 1811, he published his interesting autobiography, *Poetry and Truth.* In 1821, *Wilhelm Meister's Traveling Years* was completed. After this, Goethe's only sustained effort in poetry was the second part of *Faust*, which was finished near the end of his life.

Goethe was so versatile and initiated so much that it is difficult to say in what he was greatest. His *Götz* founded the romantic school; *Werther*, the sentimental school; *Metamorphosis of Plants* was one of the pillars of Darwinism; and, in *Faust*, Goethe appears as at once the representative and the prophet of the modern spirit. He was buried near Schiller in the ducal vault at Weimar. See *Faust.*

Gógol (*gō'gôl*), **Nikolai Vasilievitch** (**1809-1852**), Russian novelist, was born at Sorochinstki in Poltava. In 1828, he went to Leningrad, and became famous through two series of stories of Little Russia. One of the best Russian comedies is his *Inspector-General*, attacking the corruption, ignorance, and vanity of provincial officials. His masterpiece *Dead Souls* is a powerful social satire. After unsatisfactory trials of official life and of public teaching, Gógol left Russia in 1836 to live abroad. He resided chiefly in Rome until 1846, when he again setted in Russia. He was the first great master of the Russian novel and is regarded as the founder of realism in modern Russian literature. His other books include *The Cloak* and *Taras Bulba*, an epic of Cossack life.

Goheen, Robert (**1919-**), American educator, was born at Venguria, India, where his parents were medical missionaries. He lived in India until he entered Lawrenceville School in New Jersey at the age of fifteen. From there he went to Princeton, where he was graduated with honors in 1940. After a year of graduate work, he enlisted in the United States Army as a private, winning many decorations before his discharge in 1945 with the rank of lieutenant colonel. Returning to Princeton on a fellowship, he earned his Ph.D. in 1948, and then remained at Princeton as an assistant professor in the classics department. While serving as director of the National Woodrow Wilson Fellowship Program, Dr. Goheen continued to give courses in Latin and Greek. In December 1956, at the age of 37, he was elected sixteenth president of Princeton University, to succeed Dr. Harold Willis Dodds on the latter's retirement in June 1957.

Goldberg, Arthur J. (**1908-**), lawyer, was born at Chicago. After graduation from Northwestern University, he studied law. In his practice he was retained as counsel by the United Steelworkers of America and the AFL-CIO. In 1961, he became secretary of labor under President Kennedy who, in 1962, appointed him U.S. Supreme Court Justice to succeed Felix Frankfurter, resigned.

Goldoni (*gôl-dō'nē*), **Carlo** (**1707-1793**), Italian dramatist, was born at Venice. He studied for the law, but his heart was set upon playwriting. A tragedy, *Belisario*, proved successful, but he soon discovered that his forte was comedy, and set himself to effect a revolution in the Italian comic stage.

In 1761, Goldoni undertook to write for the Italian theater in Paris, and became Italian instructor to the king's children. He wrote a successful comedy in French, *Le bourru bienfaisant*, for Marie Antoinette's wedding, and was attached to the French court until the Revolution. In all, Goldoni produced about 150 comedies, among the most noted of which are *La donna di garbo*, *La bottega di caffe*, *Pamela nubile*, *La casa nova*, *Todero Bron-talon*, *Gli innamorati*, and *La locandiera.* He ranks as the foremost Italian writer of comedy.

Goldsmith, Oliver (**1728-1774**), British poet and novelist, was born in Ireland. He was graduated at the University of Dublin, 1749, studied medicine for a time at Edinburgh, and then led a wandering life on the continent, visiting

the Netherlands, France, Switzerland, and Italy. He returned to England but, failing in practice as a physician, became an usher in an academy. During this period he supported himself by contributions to the *Monthly Review*. His first publication of note, an *Inquiry into the Present State of Polite Learning in Europe*, was published in 1759. In 1764, *The Traveler* appeared and at once placed him in the front rank of English authors.

Two years later, Goldsmith published the classic novel *Vicar of Wakefield*, which permanently established his rank in the literary world. In rapid succession he produced other works, including the comedy of the *Good-Natured Man*, in 1768; *Roman History*, in 1769; *The Deserted Village*—the finest of all his poems—in 1770. In 1773, his comedy *She Stoops to Conquer* was produced at Covent Garden with great success. He is said to have written the most charming novel, the finest poem, and one of the best comedies of his time.

Goldwater, Barry M. (**1909-**), political leader, was born at Phoenix, Ariz. and was educated at Staunton Military Academy and the University of Arizona. As a merchant connected with the family enterprise of Goldwater's, Inc., he advanced to become president of the firm in 1937, and in 1953 to become chairman of the board. He was a pilot in the U.S. Air Force in World War II and was chief of staff of the Arizona National Guard from 1945 to 1952. Following his election as U.S. senator in 1953, he was particularly active on committees dealing with labor, public welfare, and Indian affairs. He also served as chairman of the Republican senatorial campaign committee. His writings include *Arizona Portraits, Speeches of Henry Ashurst*, and *The Conscience of a Conservative*. In the 1962 volume entitled *Great Ideas Today* he is represented by a debate with U.S. senator Jacob Javits on the question "Does America's best hope for the future lie in political conservatism?" In the 1964 election, he ran unsuccessfully for the presidency of the United States.

Goldwyn, Samuel (**1882-**), American movie impresario, was born in Warsaw, Poland. He came to the United States in 1896. Goldwyn has been an original and dominant figure in picture-making since 1913, when he and Jesse Lasky, another pioneer in the art, formed a company and made *The Squaw Man*. He was a founder of United Artists, and of the famous Metro-Goldwyn-Mayer, but his genius is a personal one, and he formed his own company, Samuel Goldwyn Productions, in 1914. It has enjoyed great box office and artistic success. Goldwyn's sure appreciation of talent was responsible for the film debuts of such stars as Vilma Banky, Eddie Cantor, and Gary Cooper.

Golgi (*gôl'jē*), **Camillo** (**1844-1926**), Italian biologist, was born in Corteno. He was educated at the University of Pavia. He studied and practiced medicine and taught at Siena and then at Pavia. In 1870, he was the first to use silver nitrate to color nervous tissue for histological study. In 1885, he proved that there is not a network but only an interlacement of nerves, which revolutionized the theory of nervous physiology. His greatest work in pathology was the discovery of three varieties of the protozoan blood parasite which causes malaria. In 1906, jointly with Ramon y Cajal, he received the Nobel prize for medicine.

Gómez y Báez (*gō'mās ē bä'ās*), **Maximo** (**1826-1905**), Cuban patriot, was born at Bani, Dominican Republic. He served in the Spanish army in his native country and in Cuba; became hostile to Spanish rule; and retired as a farmer. In the insurrection of 1868–78, he became a colonel and later commander of the insurgent forces in Port au Prince, retiring to the Dominican Republic after the war. In 1895, on the breaking out of the second revolution, he returned to Cuba and became general in chief of the Cuban army.

Gompers (*gŏm'pĕrz*), **Samuel** (**1850-1924**), American labor leader, was born in London, England. At the age of 10, he began work for a shoemaker, but was soon after apprenticed to a cigar maker and learned the cigar maker's trade. In 1863, he came to New York City with his parents. In his 15th year, he became an advocate of the rights of labor and took an active part in the organizing work of the Cigar Makers' International Union. In 1881, he assisted in founding the American Federation of Labor, and, in 1882, became its president. With the exception of one year, he held this office continuously for more than 40 years.

During this long period of leadership, Gompers maintained a policy of firmness and moderation, steadfastly opposing the formation of a labor party but urging the members of the organization to vote for candidates who were friends of labor. Some of the results of this policy are seen in the employers' liability laws, in the eight-hour day on government contracts, and in other legislation for the benefit of the laboring man. He vigorously supported American participation in World War I, and, after its close, fought determinedly against radical movements.

Gomulka, Wladyslaw (**1905-**), political leader, was born at Krosno, Poland, and grew up as an ardent Communist, working in youth groups and trade unions. In World War II he was a leader of underground resistance against the Nazis. At the close of the War, he was Minister of Recovered Western Areas and arranged for settling Poles in former German lands east of the Oder-Neisse line. Because he placed Polish interests first, Stalinist leaders imprisoned him, but later, to avert a threatened revolution, he was released and made premier of a more liberal government

Goodhue, Bertram Grosvenor (**1869-1924**), American architect, was born at Pomfret, Conn. He was educated at Russell's Collegiate and Commercial Institute, New Haven, Conn., and studied architecture for six years under James Renwick. From 1891 to 1914, he was a member of the architectural firm of Cram, Goodhue, and Ferguson. He then began professional practice alone. Among noteworthy buildings designed by him are the Dominican Church of Saint Vincent Ferrer, in New York City, the Baltimore Cathedral, and the State Capitol at Lincoln, Nebraska. His writings include *Mexican Memories* and contributions to the work entitled *Spanish Colonial Architecture in Mexico*, by Sylvester Baxter.

Goodspeed, Edgar Johnson (**1871-**), American Greek scholar, was born at Quincy, Ill., and was educated at Denison, Ohio, Yale, Chicago, and Berlin universities. Subsequently to 1898, he was connected with the University of Chicago as a lecturer, being made professor of Patristic Greek in 1915 and serving as secretary to the president in 1920–24. He spent many years adapting the Bible to modern readers. He is the author of *The Conflict of Severus, The Story of the New Testament, Things Seen and Heard*, and, in collaboration with E. D. Burton, *Harmony of the Synoptic Gospels*. In 1923, he published *The New Testament—An American Translation* and, in 1940, *The Complete Bible—An American Translation*.

Goodwin, William Watson (**1831-1912**), American Greek scholar and educator, was born in Concord, Mass. He was graduated at Harvard in 1851 and subsequently studied at the universities of Göttingen, Berlin, and Bonn. He was tutor at Harvard from 1856 to 1860, when he was elected to the Eliot chair of Greek, in which he taught with increasing distinction for 40 years, becoming professor emeritus in 1901. In 1860, he published his valuable *Syntax of the Moods and Tenses of the Greek Verb*, which was followed in 1870 by his widely used *Greek Grammar*. He edited Demosthenes' *On the Crown* and *Against Meidias*.

Goodyear, Charles (**1800-1860**), American inventor, was born in New Haven, Conn. In 1844, after ten years' labor, amidst every disadvantage of poverty and privation, he discovered a process for vulcanizing rubber by means of sulphur. When treated with this process, rubber becomes more resistant to wear and will not melt at the warmer natural-air temperatures. He immediately became involved in a fresh series of troubles consequent to the infringement of his patents, which reached about 60 in number. Because of these infringements, he remained poor while others were enriched by his inventions.

Gordon, Charles George (**1833-1885**), British soldier, familiarly known as "Chinese Gordon." He served in the Crimean War, 1854-56, and was wounded at Sebastopol. Later, he entered the Chinese service and assisted in suppressing the Taiping rebellion, 1863-64, whence his sobriquet of "Chinese Gordon." In 1874, he took command of the forces employed to follow up Baker's African explorations, during which time he totally suppressed the slave traffic on the Red Sea.

In 1884, Gordon went to the Sudan, in lower Egypt, as an emissary of England to quiet the insurgent tribes under El Mahdi, the "false prophet of the Sudan." His memorable journey to Khartum with one or two attendants and the influence which his presence exercised over the tribes of the desert form one of the most thrilling episodes in his career. He was killed when Khartum was captured by El Mahdi.

Gordon, Charles William (**1860-1937**), "Ralph Connor," Canadian clergyman and novelist, was born in County Glengarry, Ontario. After graduation at Toronto University in 1883, he was classical master at Chatham High School, 1883-84. Upon graduating from the theological course, Knox College, Toronto, in 1887, he continued postgraduate study in New College, Edinburgh, Scotland, and spent a year in travel on the continent. He was a missionary to Banff and elsewhere in the Rocky Mountains from 1890 to 1894, when he became minister of Saint Stephen's Church, Winnipeg. In 1915, he became chaplain to Canadian forces at the front in France. His novels, which combine story-telling skill with a moral viewpoint, include *Black Rock, Beyond the Marshes, The Sky Pilot, Glengarry School Days, The Prospector, The Doctor, The Foreigner, The Recall of Love*, and *The Runner*.

Gorgas (*gôr'găs*), **William Crawford** (**1854-1920**), American sanitary engineer, was born at Mobile, Ala. He

was graduated from the University of the South in 1875, from Bellevue Medical College in 1879, and became a surgeon in the army in 1880. As chief sanitary officer at Havana, Cuba, 1898-1902, he eliminated yellow fever from the city. From 1904 to 1913, as chief sanitary officer of the Panama canal, he established and maintained remarkably healthful conditions for the workers, thereby preventing the enormous sacrifice of life that otherwise would have ensued among men not acclimated to the tropics.

In 1914, he was made surgeon general in the United States army with rank of brigadier general. In 1916, he was made major general, and, in 1918, was retired. He then became director of the yellow-fever work of the international health board established by the Rockefeller Foundation. In 1919, he accepted a contract to carry out a sanitary program for the government of Peru. Elected to American Hall of Fame in 1950.

Gorgias (*gôr'jĭ-ăs*) **(c. 483-c. 380 B. C.),** Greek sophist and rhetorician of the time of Socrates, was born at Leontini and settled in Greece, residing for the most part at Athens and at Larissa in Thessaly. He has been immortalized by Plato in a dialogue which bears his name. Two works attributed to him are extant, *The Apology of Palamedes* and the *Encomium on Helen*. He is known for a highly ornamented style abounding in balance and assonance.

Göring, Hermann Wilhelm (1893-1946), German statesman, was born at Rosenheim, Bavaria. He distinguished himself as an "ace" in the German air force in World War I. Participating with Hitler in the abortive attempt in Munich in 1923 to seize the government, he fled to Italy, returning in 1927, and became an active leader in the Nazi party. He was elected to the Reichstag in 1928 and was made president of it in 1932, assisting it in voting itself out of existence as a legislative body the next year.

Under Hitler, Göring was made cabinet minister for the air force, president of Prussia, minister of the interior with authority over the police, and general of infantry. In 1936, he was put in charge of the four-year plan and gradually became economic dictator. As air field marshal, he adopted new and effective methods of using airplanes in war, results of which were seen in the quick collapse of Poland in 1939, the capture of The Netherlands in 1940, and the spectacular overthrow of the French army. His air raids upon Britain were unsuccessful. He lost favor with Hitler before the close of the war. After the surrender of Germany, he was tried by the Nuremberg war crimes court and sentenced to death.

Gorky (*gôr'kĭ*), **Maxim (1868-1936),** is the pen name of Alexei Maximovitch Pyeshkov, a self-educated Russian novelist, born in Nizhni Novgorod, the son of an upholsterer. His birthplace was renamed Gorki in his honor after his death. After the death of his parents he was engaged in various occupations until his attention was turned to literary work. His first story, *Makar Chudra*, appeared in 1892 and, in 1895, his *Chelkash* met with great success. He was one of the most original and popular of modern Russian writers, excelling in the short story but not so successful in his longer works. In 1914, he enlisted in the Russian army, and was identified with the movement that led to the dethronement of Czar Nicholas in 1917. He opposed the Bolshevik regime at first but later became an enthusiastic supporter. Among his works are *The Song of the Falcon, The Song of the Petrel, The Orloff Couple, Malva, Foma Gordeyeff, Children of the Sun, The Barbarians, Three Men, The Spy, My Childhood, My University Days, In the World, A Confession,* and *The New Russia.*

Gort, John Standish Surtees Prendergast Vereker, Viscount (1886-1946), English general. He joined the army in 1905 as second lieutenant and, in 1913, was made aide-de-camp to the officer commanding the London district. He served throughout World War I, sometimes on the staff and sometimes in the field, being wounded four times and mentioned in dispatches nine times. From 1921 to 1927, he was an instructor in the army college and then had assignments in Shanghai and India, being made a major general in 1935.

Having been appointed chief of the British imperial staff in 1937, he led the English expeditionary force to France in 1939. In May 1940 the Germans invaded Belgium, the British army was cut off by the surrender of the Belgians and the collapse of the French line, and driven back upon Dunkirk. Gort succeeded in maintaining his army intact and holding back the Germans until, with the help of the navy, the air force, and hundreds of volunteer ships, he brought the greater part of his forces back to England. He was then placed in command of Gibraltar. In 1942 he was made governor and commander in chief of Malta. In 1944-45 he was high commissioner and commander in chief for Palestine, and high commissioner for Jordan.

Gosnold (*gŏs'nŭld*), **Bartholomew (?-1607),** English navigator, was born in England about the middle of the 16th century. He was associated with Sir Walter Raleigh in his attempt to found a colony in Virginia, and later headed an expedition to found a colony in New England. In 1602, he left Falmouth for this purpose with a ship and 20 colonists, attempting to cross the ocean in a direct line. After a tedious voyage of seven weeks, he reached the coast of Maine. Following the land line in a southwesterly direction, he discovered Cape Cod and Martha's Vineyard. In 1606, Gosnold united with a company, of which Captain John Smith was one of the leaders, to locate in Virginia. Through their joint efforts the settlement at Jamestown was established in 1607.

Gosse (*gŏs*), **Edmund William (1849-1928),** English poet, critic, and biographer, son of Philip Henry Gosse, was born at London. He was privately educated and, in 1867, became assistant librarian in the British Museum. In 1884, he was made lecturer in English literature at Trinity College, Cambridge, and from 1904 to 1914 was librarian to the House of Lords. While a writer of graceful lyrics and of clear prose, he was especially conspicuous for bringing to the attention of English readers the works of Ibsen and other foreign writers. Among his other writings are *On Viol and Flute, Thomas Gray, History of Eighteenth Century Literature, The Secret of Narcisse, The Jacobean Poets, Short History of English Literature, Jeremy Taylor, French Profiles, Sir Thomas Browne, Two Visits to Denmark, Inter Arma,* and *Some Diversions of a Man of Letters.*

Gottschalk (*gŏt'shălk*), **Louis Moreau (1829-1869),** American pianist and musical composer, was born in New Orleans. He studied in Europe and, from 1845 to 1852, made successful tours of the continent. Returning to America in 1853, he toured the country with notable success, playing and conducting his own compositions. His reputation now rests upon his piano pieces, among which are *Bamboula, Bananier, Savane, Ojos Creolas, Ossian,* and *The Last Hope.* He died at Rio de Janeiro.

Goudy, Frederick (1865-1947), American typographer, was born in Bloomington, Ill. He exerted a tremendous influence on all kinds of printing, and his impressive body of work seems destined to survive for centuries. Among the hundred or more type faces which Goudy created are Kennerley, Forum, Garamont, and many faces bearing his name. All are characterized by elegance and classic good taste. Goudy was an industrious writer, and his books offer valuable advice on effective typography. They are *The Alphabet, Typologia: Studies in Type Design and Typography,* and *The Elements of Lettering.*

Goujon (*gōō'zhôN'*), **Jean (c. 1515-c. 1566),** French sculptor and architect, was born in Paris. He was employed on the Church of Saint Maclou, at Rouen, 1540, and on the Cathedral there, 1541. With Pierre Lescot, architect of the Louvre, he worked on the restorations of Saint Germain L'Auxerrois, 1542-44. On the accession of Henry II, he entered the royal service. In the Louvre, he executed the reliefs of the Escalier Henry II, the carvings at the southwestern angle of the court, and the Tribune des Cariatides. He is the author of what is considered the masterpiece of French Renaissance sculpture, the "Diane Chasseresse," now in the Louvre collection. See *Sculpture.*

Gould, Benjamin Apthorp (1824-1896), American astronomer, was born at Boston, Mass. He was graduated at Harvard College in 1844, afterward studied at Göttingen, and was an assistant in the observatory at Altona, Germany. From 1855 to 1859, he was director of the Dudley Observatory at Albany, N. Y. In 1866, he established an observatory at Valentia in Ireland, and made the first determination of transatlantic longitude by telegraph cable. In 1870, he established an observatory at Cordoba, Argentina, where he did valuable work in southern celestial astronomy until his return in 1885. His principal works are *Report on the Discovery of the Planet Neptune, Smithsonian Institution Reports, Investigation of the Orbit of the Comet V, On the Transatlantic Longitude,* and many charts of stars.

Gould, Helen Miller, See *Shepard, Helen Miller Gould.*

Gould, Jay (1836-1892), American financier, was born at Roxbury, N. Y. He was brought up on his father's farm, attended Hobart Academy a short time, and acquired a taste for mathematics and surveying. Shortly after the panic of 1857, he began investing in railroad securities. He first purchased bonds of the Rutland and Washington railroad, and became president, treasurer, and superintendent of the road. Soon afterward he effected a consolidation of his road with the Rensselaer and Saratoga road. He then withdrew his capital, removed to New York, opened a broker's office, and began dealing in Erie stocks and bonds.

In association with James Fisk, Jr., he entered the directory of the Erie Railroad Company, and was elected president. On the reorganization of the company, 1872, he lost official connection with it. He then invested heavily in the various Pacific railroads, secured control of a number of important lines, built branches, and effected combinations

which resulted in the establishment of what is known as the "Gould system," controlling 10,000 miles of road. At his death, he left an estate of 80 million dollars.

Gould, Morton (**1913-**), composer and conductor, was born at Richmond Hill, Long Island. He was a child musical prodigy, and made many appearances as a composer-pianist while still very young. He has been guest conductor of leading American symphony orchestras, and his compositions have been played by Toscanini, Stokowski, Mitropoulos, and other famous conductors. He has arranged and led network radio programs and has composed ballets and written music for stage shows.

Gounod (*gōō'nō'*), **Charles François** (**1818-1893**), French composer of sacred and dramatic music, was born at Paris. He studied music at the Paris Conservatory, and, in 1839, gained the prize for composition. He then visited Rome and Vienna, and, in 1849, became an organist in Paris. He first attracted attention by his *Messe solennelle* and by his opera *Sappho* in 1851. These were followed by *Ulysse*, *La nonne sanglante*, and *Le médecin malgré lui*. In 1859, he brought out his noted opera *Faust*, his greatest success and one of the most enduringly popular operas of the modern stage. His next greatest success in dramatic music was the opera *Roméo et Juliette*, 1867.

Among other operas by Gounod are *Philémon et Baucis*, *Mireille*, *La reine de Saba*, and *La Colombe*. In sacred music, his most notable compositions are the *Messe de Sainte Cécile* and the oratorios *Mors et Vita* and *The Redemption*. He wrote many beautiful songs, including the widely known "Ave Maria," based on Bach's first prelude. His influence on contemporary French music was very great. See *Faust*.

Goya (*gō'yä*), **Francisco José de** (**1746-1828**), Spanish painter, was born at Fuendetodos, near Saragossa. He is said to have first studied under Martinez at Saragossa. Later, he went to Madrid, where he was influenced by the works of Velasquez and Tiepolo, and, after some years, he went to Rome. He was unrivaled as a painter of Spanish national customs, stood first among Spanish designers of tapestries, and achieved great distinction as an etcher. He inclined to grimly realistic scenes of battle, bullfighting, and torture. His work is characterized by great emotional intensity and power. Representative examples of his works are found in leading American collections.

Graaf (*gräf*), **Regnier de** (**1641-1673**), Dutch physician and anatomist, was born in Schoonhoven. He studied under Sylvius at the University of Leiden, also at Lowen and Utrecht, finally settling at Delft. He became especially distinguished by his discovery that all animals are oviparous. He also discovered the Graafian vesicles named after him, though he mistook their functions. He was the author of works on the functions of the pancreas and on the generative organs.

Grady, Henry Woodfin (**1851-1889**), American journalist and orator, was born at Athens, Ga. He was graduated at the State University at Athens in 1868 and took a postgraduate course at the University of Virginia. He began his journalistic career in 1870, winning wide notice by a series of articles in the Atlanta *Constitution* describing the resources of Georgia. For some time he acted as Southern correspondent of the New York *Herald*, and, in 1880, became part owner and managing editor of the Atlanta *Constitution*, which he conducted until his death. He was an eloquent speaker, a man of broad and liberal views, and during his brief public life did much to advance the interests of Georgia and the South. He was widely known for a brilliant after-dinner oration entitled *The New South*.

Graetz (*grĕts*), **Heinrich** (**1817-1891**), Polish historian, was born in Posen, Poland. He was mostly self-educated, became a teacher in the Jewish seminary at Breslau, and, in 1870, was made professor in the University of Breslau. His principal work is *Geschichte der Juden*, begun in 1853 and completed in 1875. This has been translated into many languages and has won for nim the position of recognized master of Jewish history.

Grafly (*grä'flĭ*), **Charles** (**1862-1929**), American sculptor, was born in Philadelphia, Pa. He was educated at the Pennsylvania Academy of Fine Arts, Philadelphia, and studied under Chapu and Dampt in Paris. In 1892, he became instructor in sculpture at the Pennsylvania Academy of Fine Arts, and, in 1917, he accepted a similar position in the school of the Boston Museum of Fine Arts. His works include "General Reynolds," Fairmount Park, Philadelphia; "Fountain of Man," made for the Pan-American Exposition at Buffalo; "From Generation to Generation," "Symbol of Life," "Vulture of War," and "Truth," in the Saint Louis Museum; "Mauvais Présage," in the Detroit Museum; "England" and "France," in the New York Customhouse; "In Much Learning," in the Pennsylvania Academy; and many portrait busts. He ranks high among American sculptors for his strong, thoughtful work, simply and truthfully modeled.

Graham, Hugh (**1848-1938**), Canadian journalist, was born in Huntingdon, Quebec, and received his education at the Huntingdon Academy. Early in life he began newspaper work in Montreal, where he became editor and publisher of the *Commerical Advertiser* and the *Evening Telegram*. In 1869, he founded the Montreal *Star*, which, under his constructive management, became one of the most influential and widely circulated Canadian journals, independent in politics and devoted to civic improvement and the promotion of humanitarian projects. He was knighted in 1908 and was created baron in 1917 with the title of Lord Atholstan.

Graham, Martha, one of the foremost figures in the modern American dance, was born in Pittsburgh, Pa. She studied under the famous Ruth St. Denis. Martha Graham's style and grace won for her the distinction of dancing in Stravinsky's ballet *The Rites of Spring* at its American premiere in 1930. She exercises a profound influence both for classical purity and for imaginative experimentation in the dance. She created and operates the Martha Graham School of Contemporary Dance in New York City.

Graham, (Billy) William Franklin (**1918-**), evangelist, was born in Charlotte, North Carolina. He was educated at various colleges and seminaries and was ordained a minister in the Baptist Church. He has engaged in nationwide evangelistic campaigns since 1946, and has made a number of preaching trips to Europe. He is speaker on the radio and television program "Hour of Decision." His most extensive crusades to date were conducted during the summer of 1957 in New York's Madison Square Garden, and early in 1958 in the Cow Palace at San Francisco.

Grainger, Percy Aldridge (**1882-1961**), British pianist and composer, was born at Melbourne, Australia. He studied music with his mother in Australia until his tenth year and then went to Frankfort on the Main, Germany, where he studied several years. He then removed to London and, in 1914, took up his residence in the United States.

He gave concerts in all parts of the world, for many years producing over one hundred concerts annually and winning notable distinction as a musical artist. By his artistic settings he did much to revive interest in folk music. He wrote many compositions for the piano, voice, chorus, orchestra, and also chamber music. His publications include *British Folk-music Settings*, *Room-music Tit-bits*, *Kipling Settings*, *Father and Daughter*, and numerous piano pieces and songs.

Grand, Sarah (**1860-1943**), is the assumed name of Frances Elizabeth Clarke, British novelist, born in Ireland of English parents. At 16, she married Lieutenant Colonel McFall, who died in 1898. In 1893, she published *The Heavenly Twins*, which established her literary reputation. She was mayor of Bath in 1923, 1925, and several succeeding years. Her writings include *Singularly Deluded*, *A Domestic Experiment*, *Our Manifold Nature*, *The Beth Book*, *The Modern Man and Maid*, *Babs the Impossible*, *Emotional Moments*, *The Winged Victory*, and *Variety*.

Grandi (*grän'dē*), **Dino, Count** (**1895-**), Italian statesman, was born at Bologna. Educated for the law, he interrupted his studies to volunteer for service in World War I and was decorated several times for valor. After the war he turned to journalism and, in cooperation with Mussolini, helped organize the Fascist party. He was one of the leaders of the "march on Rome" in 1922. Thereafter he took a leading part in directing Italy's foreign relations. He was minister of foreign affairs from 1929 to 1932 and then went to London as ambassador for his country. In 1939, he returned to Rome and was made minister of justice. He retired with Mussolini in 1943.

Grant, (Hiram) Ulysses Simpson (**1822-1885**), 18th president of the United States, was born at Point Pleasant, Ohio; was graduated at the Military Academy, West Point, in 1843; and served under General Taylor in the war with Mexico, 1846, up to the capture of Monterey. His regiment was then transferred to the expedition under General Scott; he took part in every action from Vera Cruz to Mexico, and was brevetted first lieutenant and captain for meritorious conduct at Molino del Rey and Chapultepec. In 1852, he served in Oregon, but, in 1854, resigned his commission and settled in Saint Louis, Mo., whence, in 1860, he removed to Galena, Ill., and engaged in the leather trade.

At the beginning of the Civil War in 1861, Grant volunteered his services and was appointed colonel of an Illinois regiment. In August, he was appointed brigadier general, commanding the important post of Cairo, occupied Paducah, and led an expedition on the Mississippi. In February 1862, he distinguished himself in the capture of Fort Donelson, on the Tennessee River, and was made major general. On April 6 following, he won a great battle over the Confederates at Pittsburg Landing, or Shiloh.

Succeeding General Halleck in the West, Grant commanded the land forces which, in conjunction with the navy, captured Vicksburg. This action was followed by the fall of Port Hudson and the opening of the Mississippi. He then took command of the army of Tennessee, and defeated General Bragg at Chattanooga in September 1863. In the next year, Grant was appointed lieutenant

general and commander in chief, and personally directed the operations of the great final struggle in Virginia. In this campaign, the Northern forces, though often repulsed with heavy losses, finally compelled the evacuation of Richmond, April 2, 1865. This was followed on the 9th by the surrender of the Confederate army under General Lee, and soon after of the entire Confederate forces.

Congress, in recognition of Grant's eminent services, passed an act reviving the grade of "general of the army of the United States," to which Grant was immediately appointed. In 1868, he was elected, on the Republican platform, president of the United States, and, in 1872, was re-elected over a notable opponent, Horace Greeley of the New York *Tribune*. In 1877, after completing his second presidential term and failing to receive the hoped for nomination for a third term, Grant visited Europe, and toured the world, receiving an enthusiastic welcome, especially in England and France.

Simple, reticent, earnest, and persevering in his character, he owed his military success to singleness of purpose, relentless vigor, grim courage which rose higher with each obstacle, and, above all, to clear judgment as to the objects and issues of the war. Having lost his moderate fortune in an unfortunate investment, Grant wrote his *Personal Memoirs*, which now ranks among the best military biographies. The sales of this work earned for him and his family about a half million dollars. He was elected to the American Hall of Fame in 1900.

Granville-Barker, Harley (1877-1946), English actor, manager, and playwright, was born in London. Beginning under Ben Greet, continuing with the Elizabethan stage society, and later appearing with Mrs. Patrick Campbell, he worked his way to the front in the theatrical world. For many years he acted and produced plays for the stage society, presenting several of Bernard Shaw's plays for the first time. In 1904, he began the management of the Court Theater, where he introduced new plays by Shaw, Hankin, Barrie, Galsworthy, and himself. Combining keen observation with remarkable talent for dramatic expression, his plays are notably faithful portrayals of character. *The Voysey Inheritance* gives a fine picture of modern, middle-class English family life; *Waste* is a tragedy with a timely theme; *The Madras House* is a searching comedy of character. He wrote also *Prefaces to Shakespeare* and *On Dramatic Method*.

Grattan (*grăt'ăn*), **Henry (1746-1820),** Irish orator and statesman, was born in Dublin. He was educated at Trinity College, Dublin. In 1772, he was admitted to the Irish bar and, in 1775, was elected to the Irish parliament. Here he assisted in effecting the partial abolition of the heavy restrictions on Irish commerce. In 1800, he was elected to the Irish parliament from the borough of Wicklow to oppose the union with England. But the union was effected despite his efforts, and, in 1805, he was made member of the British Parliament. He was repeatedly re-elected and labored for Catholic emancipation until his death. His eulogy on Chatham and his invective against Bonaparte are not surpassed in British eloquence.

Graves, Robert (1895-), was born in London, and was educated at Oxford. He has had a busy and varied literary career. He taught literature in an Egyptian university, has written poetry and novels, and translated from the Greek. Graves is best known for his historical novels of ancient Rome, *I, Claudius* and *Claudius the God*, and for his two novels about a British soldier in the American Revolutionary War, *Sergeant Lamb's America* and *Proceed, Sergeant Lamb*. He has translated into English Apuleius' *The Golden Ass*. Graves is an active poet and collections of his works are published periodically.

Gray, Asa (1810-1888), American botanist, was born at Paris, N. Y. He was graduated in medicine at Fairfield College, and, in 1834, became botanist of the United States exploring expedition. He was afterward appointed professor of botany in the University of Michigan, but, before he had entered upon the duties of that office, he was elected in 1842 Fisher professor of natural history at Harvard University. His most important work was his now classic *Manual of the Botany of the Northern United States*, which passed through numerous editions. By its clearness, compactness, and accuracy, it was long indispensable to the student of eastern American botany.

Gray was the ablest and most influential of the early American advocates of Darwin's theory of evolution. His contributions to American scientific knowledge were monumental, and his personal influence upon two generations of American botanists was profound. He ranked among the leading botanists not only of America but of the age. He wrote *Elements of Botany; Flora of North America; How Plants Grow; Field, Forest, and Garden Botany; Darwiniana; Synoptical Flora of North America;* and *Natural Science and Religion*. He was elected to the American Hall of Fame, 1900.

Gray, Elisha (1835-1901), American inventor, was born at Barnesville, Ohio. He attended Oberlin College, where he supported himself by working as a carpenter. Becoming interested in electricity, he left college to devote himself to the improvement of electrical apparatus. In 1867, he received his first patent for a self-adjusting telegraph relay. He afterward invented the telegraphic switch and annunciator for hotels, the telephonic repeater, and the private telegraphic line printer. In all, he secured about 50 patents, chiefly for electrical inventions, among which were a system of multiplex telegraphy, a type-printing telephone, and the telautograph.

Gray entered claim to priority in the invention of the speaking telephone, which resulted in long litigation with Alexander Graham Bell. Bell's patent and rights were finally sustained by the Supreme Court. Among Gray's most important writings are *Experimental Researches in Electro-Harmonic Telegraphy and Telephony* and *Elementary Talks on Science*.

Gray, Thomas (1716-1771), English poet, was born in London. He was educated at Cambridge and, after many years of study and travel, was appointed professor of history and modern languages there in 1768. He had a just appreciation of the natural beauty of his native country, made notes wherever he went, and to his literary friends wrote copious descriptions of what he had seen. Gray was the most scholarly of early English romantic poets. He wrote but little, but some of his poems are notably perfect in form and finish. He published his *Ode to Eton College* in 1747 and his *Elegy Written in a Country Churchyard*, by which he is best known, in 1751. On the death of Colley Cibber, 1757, he was offered, but declined, the post of poet laureate.

Greeley, Horace (1811-1872), American journalist, was born at Amherst, N. H. He entered a printing office as an apprentice at East Poultney, Vt., 1826. On the completion of his apprenticeship, he worked for some time as a journeyman printer and, in 1834, founded the *New Yorker*, a literary weekly paper, for which he wrote essays, poetry, and other articles. After one or two other attempts at editorship, he founded, in 1841, the New York *Tribune* and became the leading editor. He was assisted by associates of unusual ability, including Bayard Taylor, Charles A. Dana, and George Ripley, and, for a quarter of a century, exercised a powerful influence in national affairs. The *Tribune*, under his editorship, was an earnest advocate of such causes as temperance, woman's rights, the abolition of slavery, organization of labor, and a protective tariff, and was recognized as the organ of the extreme or radical Republican party.

In 1848, Greeley was elected to Congress. His aspirations to high political position were defeated by the more conservative party leaders, and he, in turn, influenced the nomination of Lincoln instead of Seward in 1860. On the secession of several of the Southern states from the Union, Greeley at first admitted their right to secede, in accordance with the principles of the Declaration of Independence; but, when war broke out, he became its most zealous advocate. Later he sought to effect a compromise and, in 1864, with Lincoln's consent, arranged a fruitless conference with pretended Confederate delegates in Canada.

At the end of the war, he urged universal amnesty and signed the bail bond of Jefferson Davis. This brought upon him much hostile criticism and when, in 1872, he became presidential candidate against Grant, many of his stanchest friends accused him of conspiring to place the government in the control of the men who had recently sought to destroy it. Overwork and mortification at his overwhelming defeat hastened his death.

Greely, Adolphus Washington (1844-1935), American soldier, arctic explorer, and scientist, was born at Newburyport, Mass. Entering the volunteer service, he attained the rank of captain during the Civil War, and at its close was transferred to the regular army with the rank of lieutenant.

In 1881, he was assigned to the command of the Lady Franklin Bay expedition to northern Greenland. His expedition attained the then "farthest north," 83° 24′ N. He published an account of the expedition, in 1885, under the title of *Three Years of Arctic Service*. For this expedition, he was, in 1935, voted the Congressional medal of honor.

In 1887, he became chief of the United States Signal Service. Under his direction, 21,000 miles of military telegraph lines were built in the United States, Cuba, Puerto Rico, China, the Philippines, and Alaska. In 1906, he was made major general and was in command at San Francisco after the earthquake and fire. He retired in 1908. Besides many valuable scientific works, he wrote *American Explorers and Travelers, Handbook of Polar Discoveries*, and *Reminiscences of Travel and Adventure*.

Green, Hetty Howland Robinson (1835-1916), American financier, was born in New Bedford, Mass., daughter of Edward Mott Robinson, who died in 1865 leaving her a large fortune. In 1867, she married Edward H.

Green, who died in 1902. She was reputed to be the richest woman in America and was probably the greatest woman financier in the world. She personally managed a property of many millions in stocks, bonds, and real estate in Chicago, New York, and elsewhere, living m n hile in a very economical fashion.

Green, John Richard (**1837-1883**), English historian, was born at Oxford and was educated at Magdalen College School and Jesus College. He was ordained as a minister in 1860 and was for some time vicar of Saint Philip's, Stepney, becoming librarian at Lambeth in 1869, after which he turned his entire attention to history and politics. Among his valuable works are *A Short History of the English People*, *A History of the English People*, *The Making of England*, and *The Conquest of England*. The last was published after his death by his wife, Alice Stopford Green, who assisted him in various works and herself wrote *Henry II* in the "Twelve English Statesmen" series.

Green, Thomas Hill (**1836-1882**), English philosopher, was born in Yorkshire. He was educated at Balliol College, Oxford, where he was elected to a fellowship in 1860 and became professor of moral philosophy in 1878. His philosophical profundity and strong interest in social questions drew around him many of the best men at Oxford. In 1874, he contributed to the Clarendon press edition of Hume's *Treatise on Human Nature*, an introduction subjecting Hume's philosophy in detail to searching and hostile analysis from an idealist point of view. His *Prolegomena to Ethics*, left incomplete at his death, was edited by A. C. Bradley. His scattered essays in *Mind* and elsewhere were edited by R. L. Nettleship as *The Works of T. H. Green*.

Green, William (**1873-1952**), American labor leader, was born at Coshocton, O. Educated in the public schools, he became active in labor union work at an early age and was made president of a subdistrict of the United Mine Workers of America in 1900. In 1924, he was elected president of the American Federation of Labor, succeeding Samuel Gompers. Under his guidance, labor made substantial improvements in its position with very few of the costly hostilities which were the price of earlier gains.

The Federation, however, was divided in 1937 by the splitting off of the group later known as the Congress of Industrial Organizations. Both labor groups increased rapidly in membership although frequently found on opposing sides on political or legislative issues.

Greene, Graham (**1904-**), prolific English author of both intensely serious novels and suspense thrillers which he labels "Entertainments," was born in Hertfordshire and was educated at Balloil College, Oxford. Greene had his first book published in 1925. Among his early successes, all later adapted to the screen, were *This Gun for Hire*, *Brighton Rock*, and *Confidential Agent*. During World War II, he worked at the Foreign Office, and spent a period from 1942 to 1943 in West Africa, where he probably gained the material for *The Heart of the Matter*, his most successful religious-romantic novel, published in 1948. Greene is a convert to Catholicism. He has also written a number of books for children. Greene's style is powerful and notable in its range. In *Brighton Rock* it is often almost surrealistic; in *The Heart of the Matter* and *The End of the Affair* it is calm and moving.

Greene, James Sonnett (**1880-**), American physician, was born in New York City. Educated at Cornell University and in Berlin and Breslau, Germany, he began practice in New York. Having suffered from stuttering in early life, he gave his attention particularly to the diagnosis and cure of stuttering and other speech disorders lying on the borderland of physiology and psychology. In 1916, he founded in New York the National Hospital for Speech Disorders and acted as its medical director. In addition to many technical articles, he wrote *The Cause and Cure of Speech Disorders* (in collaboration) and *I Was a Stutterer*.

Greene, Nathanael (**1742-1786**), American general, was born in Patowomut, R. I., son of a Quaker preacher. In 1770, he was chosen a member of the Rhode Island Assembly and, to the great scandal of his fellow Quakers, was among the first to engage in the military exercises preparatory to resisting the mother country.

In 1774, he enlisted as private and, in 1775, was appointed to the command of the Rhode Island contingent to the army at Boston with the rank of brigadier general. At the battle of the Brandywine, he commanded a division and, by his skillful movements, saved the American army from utter destruction. In 1780, he succeeded Gates in the command of the army of the South. In 1781, with an army of new recruits, he entered upon active operations and finally defeated the English at Eutaw Springs, the hardest-fought field of the Revolution, which put an end to the war in South Carolina.

Congress presented him with a medal in honor of his services, and the Carolinas and Georgia made him valuable grants of land. When peace was restored in 1783, Greene returned to Rhode Island, where he received numerous testimonials of the public admiration. In 1785, he retired with his family to his estate in Georgia, where he died of sunstroke.

Greenewalt, Crawford H. (**1902-**), business executive, was born at Cummington, Mass. After graduation in chemical engineering at M.I.T., he entered the employ of E.I. du Pont de Nemours & Co., where he has served in various positions, rising to general manager, and to president from 1948 to 1962. In research he has specialized in explosives and pigments. He wrote *Hummingbirds*.

Greenough (*gren'ō*), **Horatio** (**1805-1852**), American sculptor, was born in Boston, Mass. He was graduated at Harvard in 1825 and, from that year until 1851, lived chiefly in Italy. His principal work is the colossal statue of Washington formerly in front of the Capitol and now in the Smithsonian Institution. Others are "Medora," "Venus Victrix," and a group of four figures, "The Rescue." His works are all in the severe classical style of the period, without personality or emotion.

Gregor, William (**1761-1817**), English chemist and mineralogist, was born at Trewarthenick, Cornwall. He was educated at Saint John's College, Cambridge. He entered the ministry and, in 1793, became rector of Creed, Cornwall, where he remained throughout his life. He was a painter and etcher of distinction and, after hearing a series of lectures on chemistry, devoted much time to analytical mineralogy. In 1791, in a peculiar black sand of the Menacchan Valley in Cornwall, he discovered a new metallic element, called by him menacchine, which Klaproth five years later described, and named titanium, although crediting the original discovery to Gregor.

Gregorovius (*grĕg'ô-rō'vĭ-ŭs*), **Ferdinand** (**1821-1891**), German historian, was born at Neidenburg in East Prussia. He studied theology, but devoted himself chiefly to poetry and literature. In 1852 he settled in Rome. His great work—the standard work on the subject—is the *History of the City of Rome in the Middle Ages*. He wrote on Italian geography and history, on Corsica, Capri, the graves of the popes, Lucrezia Borgia, Urban VIII, Athens, and the Byzantine empress Athenais; he also wrote a tragedy on the death of Tiberius and an epic, *Euphorion*.

Gregory I (**c. 540-604**), called "the Great,"pope, was born in Rome. He was appointed governor of Rome, but, on inheriting his father's wealth, resigned and became abbot of Saint Andrew's, Rome. After being secretary to Pelagius II, he succeeded him as pope in 590. Few pontiffs have surpassed Gregory as a constructive administrator. He organized the public services of the Church, perfected the ritual, and systematized sacred music. He composed chants, established a musical school in which he himself taught, and collected and arranged fragments of ancient hymns. He is the author of numerous sacred works, the chief of which is his *Morals from the Book of Job*. Gregory is the most notable figure in the ecclesiastical history of the middle ages and exercised a powerful and permanent influence on doctrine, organization, and discipline, being now regarded as one of the greatest doctors of the Church.

Gregory VII (**c. 1020-1085**), otherwise known as Hildebrand, a Roman pontiff, was born at Saona, near Siena, Italy. His youth was passed at Rome in the monastery of Saint Mary on the Aventine, of which his uncle was abbot. About 1045, he was made chaplain to Pope Gregory VI, whom he shortly afterward accompanied on his exile into Germany.

He attended the Diet of Worms in 1049, where Bruno, bishop of Toul, was elected pope as Leo IX. Hildebrand there came under the favorable notice of the new pope, over whom he won an ascendancy that he never thereafter lost. He virtually directed the conduct and succession of the Holy See through the reigns of five pontiffs, 1048–73. In 1050, he became a cardinal subdeacon, and, in the following years, he was intrusted with many important missions.

In 1073, Hildebrand was himself compelled by the tumultuous demands of the mob to accept the vacant tiara, and he was established on the papal throne under the title of Gregory VII. He lost no time in giving the utmost practical effect to the two leading ideas of his life: the establishment of the supremacy of the papacy within the Church and the assertion of the supremacy of the Church over the state. He repressed simony and enforced the observance of strict discipline among the clergy.

It was determined that any ecclesiastic who in the future should accept office from the hands of a layman should incur the penalty of deposition, while the secular lord who bestowed investiture should be excommunicated. Emperor Henry IV of Germany defied the ruling and, in 1076, declared Gregory deposed. Gregory lost no time in pronouncing against Henry a sentence of excommunication, which, according to the law of the Empire, involved a loss of the imperial prerogatives. Seeing that resistance

was impossible, Henry yielded, and sought absolution from the pope at Canossa in 1077. This triumph of Gregory's is regarded as the greatest temporal victory ever won by the papacy.

When Henry found his position sufficiently strong, he renewed his attitude of defiance and, in 1080, was again excommunicated. On this occasion, he retaliated by appointing the antipope Guibert, and proceeded to lay siege to Rome. In 1084, Gregory was compelled to take refuge in the castle of San Angelo, while Guibert was established on the pontifical throne as Clement III. Gregory retired to Salerno, where he spent his last days under the protection of Robert Guiscard. "I have loved justice and hated iniquity; therefore, I die in exile," were the last words he is said to have uttered before his death.

Gregory, Augusta, Lady (**1859-1932**), Irish dramatist, was born at Roxborough, County Galway. She worked many years for the creation of a national Irish theater and drama. With Yeats and others, she helped found the Irish National Theater Society, and she became director of the Abbey Theater, Dublin. She reconstructed ancient Irish legends, lectured extensively, and wrote numerous plays. She excels in one-act plays which are at once quaintly humorous, truly comic, kindly satirical, and intensely human. She translated plays by Moliére, Sudermann, and Goldoni. Her publications include *Poets and Dreamers, Gods and Fighting Men, Saints and Wonders, The Kiltartan History Book, The Full Moon, The Golden Apple*, and *Aristotle's Bellows*.

Grenfell, Wilfred Thomason (**1865-1940**), English missionary physician, was born at Parkgate, near Chester, Eng. After being graduated from Oxford University, he took a course in medicine at the London Hospital, Whitechapel, after which he devoted himself to reform work among the mariners of the North Sea, establishing homes on land and mission vessels at sea. In 1892, he began similar work on the coast of Labrador, erecting hospitals, co-operative stores, factories, schools, and orphans' homes. In 1912, he opened a seaman's institute at Saint John's, Newfoundland. While primarily evangelistic in purpose, he laid great stress from the first on improving the physical, social, and economic conditions of the seamen of the northeast coast. Among his books are *Off the Rocks, Adrift on an Ice Pan, The Adventure of Life*, and *Labrador Looks at the Orient*.

Gresham (*grĕsh'ăm*), **Sir Thomas** (**1519-1579**), English financier and philanthropist. After studying at Cambridge he became connected, in 1543, with the Mercers Company, and, in 1551, was employed as king's agent at Antwerp. In two years, he paid off a heavy loan and restored the king's credit. As a Protestant, he was dismissed by Queen Mary but was soon reinstated. He was knighted by Queen Elizabeth in 1559 and was, for a time, ambassador at Brussels. The troubles in the Netherlands compelled him to withdraw in 1567 from Antwerp and thereafter he lived in London. Having lost his only son, Richard, he devoted a portion of his great wealth to building an exchange in imitation of that of Antwerp. He also made provision for founding Gresham College. He formulated Gresham's law regarding debased currency, according to which bad money drives out good money.

Greuze (*grûz*), **Jean Baptiste** (**1725-1805**), French painter, was born at Tournus, Burgundy. He studied under Grandon at Lyons and at the Academy of Paris. His first notable works were historical. After a visit to Italy, 1755, he painted Italian subjects; but he is seen at his best in such studies of girls as "The Broken Pitcher," the "Girl with Doves," and "Girl with Dead Canary." His art, full of delicacy and grace, won great acclaim in his day and many of his subjects are still popular in prints. He ranks high among 18th century painters.

Grevy (*grā'vē'*), **François Paul Jules** (**1807-1891**), French statesman, was born at Mont sous Vaudrey. Going to Paris to study law, he became interested in politics and took part in the revolution of 1830. As a member of the Constituent Assembly he also took a leading part in the revolution of 1848. His opposition to Louis Napoleon kept him out of public affairs from 1852 to 1868. After Napoleon's downfall he presided over the National Assembly of 1871 and worked for the establishment of the Third Republic. He was chosen president in 1879 and was re-elected in 1885, but resigned in 1887.

Grey, Charles Grey, Earl (**1764-1845**), English statesman, was born at Fallodon, Northumberland, and was educated at King's College, Cambridge. He became a Whig member of Parliament for Northumberland, 1786, and was one of the managers of the impeachment of Warren Hastings. In 1806, Grey, now Lord Howick, became first lord of the admiralty and, on the death of Fox, foreign secretary and leader of the House of Commons. In 1807, he succeeded his father as second Earl Grey.

Grey became prime minister in 1830 and immediately introduced a reform bill extending the right of franchise. Its defeat and the subsequent dissolution of Parliament were followed by the return of a government more favorable to the bill. A second bill of reform was introduced in 1832, passed the Commons, but was defeated in the House of Lords. Grey resigned, but returned to office with the power to have a sufficient number of peers created to pass the measure. The Duke of Wellington, who had led the opposition in the House of Lords, yielded and allowed the bill to pass. This bill was one of the chief landmarks in the growth of British democracy. Another important measure due to Grey's statesmanship was the act for the abolition of slavery in British territory. He resigned in 1834.

Grey, Edward Grey, Viscount (**1862-1933**), English statesman, was born in Northumberland. He was graduated at Balliol College, Oxford, and succeeded to the baronetcy in 1882; entered Parliament in 1885; and was undersecretary of foreign affairs, 1892-95. In 1905, he became secretary of state for foreign affairs and soon rose to commanding prominence in European diplomacy.

He brought about the triple entente uniting Great Britain, Russia, and France. Although he suffered diplomatic defeat in the international conference over the annexation of Bosnia and Herzegovina by Austria in 1908, his firmness in the Morocco affair of 1911 prevented unwarranted concessions to Germany by France. His masterly handling of Balkan problems at the London Conference of 1912 greatly hastened the ending of the Balkan War. In 1914, his efforts to secure arbitration of the Austro-Serbian quarrel failed, and World War I followed. He served as British ambassador to Washington in 1919. He wrote his memoirs, *Twenty-five Years—1892-1916* and *The Charm of Birds*.

Grey, Lady Jane (**1537-1554**), eldest daughter of Henry Grey, Duke of Suffolk, and second cousin of Edward VI, was born at Bradgate, England. She was early distinguished for her scholastic ability. Before the death of Edward VI, the Duke of Northumberland had her married, at 16 years of age, to his own son, Lord Dudley, and persuaded the king to leave the crown to Lady Jane Grey. She was kept in innocence of the plan and fainted when, on the king's death, she found herself proclaimed queen. She later consented to the arrangement, but the late king's sister Mary intervened vigorously and secured the succession to herself. Lady Jane Grey was imprisoned and, her friends having revolted, she was put to death.

Grieg (*grēg*), **Edvard Hagerup** (**1843-1907**), Norwegian composer, was born at Bergen. In 1858, he began a four years' course of study at Leipzig under Hauptmann, Richter, Reinecke, and Moscheles, and, in 1863, continued his studies at Copenhagen under Gade. His nationality became a strong element even in his earliest compositions. He spent the winter of 1865-66 and some months of 1870 in Rome, where he inaugurated a Norse music concert. He settled in Oslo, later at Bergen, and devoted himself to musical composition.

Of his larger works the best-known are the *Peer Gynt* suites, the overture *Im Herbst*, the suites *Sigurd Jorsalfar* and *Aus Holberg's Zeit*, the choral work *Olaf Trygvason*, and a fine piano concerto. His piano music is characterized by melodic freshness, rich harmony, and piquant rhythm, while his numerous songs rank among the most beautiful in modern music. Bülow styled him the "Chopin of the North."

Griffith, David Wark (**1880-1948**), American motion picture producer, was born at La Grange, Ky.; was educated in the public schools; and was an actor on the regular stage for two years. Beginning in 1908, he was identified with the motion picture business, first as actor, then as producer. His pictures are noteworthy for their spectacular and their emotional effects. Among the best known are *Birth of a Nation, Intolerance, Hearts of the World, Way Down East*, and *Orphans of the Storm*.

Grignard (*grē'nyär'*), **Victor** (**1871-1935**), French chemist, was born at Cherbourg. He was educated in the Ecole Normale at Cluny and at the University of Lyons. He lectured and taught at Besançon and Lyons in 1905-09 and, in 1910, became professor of chemistry at Nancy, later accepting a chair at the Lyons Institute Chémique. In his doctor's thesis, he announced the discovery of new organometallic compounds of magnesium and demonstrated reactions which have proved valuable in synthetic chemistry, particularly in the preparation of organic compounds, including hydrocarbons, alcohols, aldehydes, and acids. For this discovery and for subsequent researches with the Grignard reaction, he was awarded one-half of the Nobel prize for chemistry in 1912.

Grillparzer (*grĭl'pär-tsĕr*), **Franz** (**1791-1872**), Austrian dramatic poet, was born at Vienna. He studied law and, in 1813, entered the imperial civil service, in which he remained until 1856. He first attracted notice in 1817 by a tragedy, *Die Ahnfrau*, which was followed by *Sappho, Das goldene Vlies, Des Meeres und der Liebe Wellen*, and *König Ottokars Glück und Ende*. He produced much meritorious lyric poetry and one good prose novel, *Der Arme Spiel-*

mann. Grillparzer ranks as the greatest modern Austrian dramatist, and, in German literature, he is the link between Lessing, Goethe, Schiller, and Herder and the more modern school. He died at Vienna.

Grimm, Friedrich Melchior, Baron von (1723-1807), critic and writer, was born at Ratisbon. After studying at Leipzig and failing with a tragedy, he accompanied a nobleman to Paris and became reader to the crown prince of Saxe Gotha. He became acquainted with Rousseau in 1749 and, through him, with Diderot and Madame d'Epinay.

His connection with the encyclopedists, added to his own acquirements, opened to him a brilliant career. In 1753, he began to write for several German princes the now famous literary bulletins, which for nearly 40 years gave the most trenchant criticism of all important French books. This correspondence was confidential, but, after his death, it was collected and published in 17 volumes.

Grimm, Jakob Ludwig Karl (1785-1863), German philologist and antiquary, was born at Hanau, in Hesse-Nassau. Though holding at various times important public offices, his life was devoted to philological and antiquarian studies. His German *Grammar,* in four volumes, is one of the greatest philological works of the age.

After 1814, in company with his brother Wilhelm, he published numerous popular works, the most celebrated of which is *Kinder-und Haus-märchen,* known in English as *Grimm's Fairy Tales.* From 1830 to 1837, they were joint professors at Gottingen; subsequently were joint librarians at Cassel; and, in 1841, settled in Berlin at the invitation of the King of Prussia. The greatest joint undertaking of the two brothers was the *Deutsches Wörterbuch,* begun in 1852. Jakob Grimm died in 1863, four years after his brother's death.

Griswold, Alfred Whitney (1906-1963), educator, was born at Morristown, New Jersey. Following his graduation from Yale University, he became an instructor in history there and also a research assistant in international relations. Subsequently, in addition to being professor of history, he was director of foreign area studies and director of the civil affairs training school. In 1950 he was inaugurated president of Yale University. He is the author of *The Far Eastern Policy of the United States* (1938) and *Farming and Democracy* (1948).

Gromyko, Andrei (1909-), Russian diplomat, has been one of the most lasting representatives of the Kremlin in international affairs. For several years Soviet delegate to the UN, he became known as the "*NYET*" member because of his numerous vetoes on behalf of his government. He succeeded Shepilov as Foreign Minister in 1957.

Gronouski, John A. (1919-), educator and political leader, was born at Dunbar, Wis. He is a graduate of the University of Wisconsin, from which he received a Ph.D. degree. In an interval of military service during World War II, he was a navigator for the U.S. Army Air Force and was shot down over the English Channel. He taught economics and public finance at the University of Maine and at Wayne University and, in 1959, he became resident director of the Wisconsin Tax Department. In 1963 President Kennedy appointed him postmaster general to succeed J. Edward Day, who resigned to re-enter law practice.

Gropius, Walter (1883-), German architect, was born at Berlin, Germany, where he practiced architecture for several years before World War I. He was a founder and the first director (1918-28) of the famous Bauhaus Art School at Weimar, later at Dessau, where the emphasis was on modern functionalism in architecture and craftmanship. A leader in this field, Gropius left Germany on Hitler's rise to power, carrying on his work in London and the United States. He was appointed professor of architecture at Harvard University, where he became chairman of the School of Architecture. He is the author of *The New Architecture and the Bauhaus, Rebuilding our Communities,* and other publications.

Grosvenor (*grōv'-nĕr*), **Gilbert Hovey (1875-),** American editor, was born at Istanbul, Turkey, of American parents. He was educated at the Presbyterian College, Istanbul, and Amherst College. After a brief period of teaching, he became connected with the *National Geographic Magazine* in 1899, being made editor in chief in 1903. He was made president of the National Geographic Society in 1920, in which capacity he sponsored many expeditions of exploration. Among his writings are *Young Russia, Flags of the World, Discovery and Exploration,* and *A Maryland Pilgrimage.* He retired in 1954.

Grosvenor, Melville Bell (1901-), editor, was born at Washington, D.C. and is a graduate of the United States Naval Academy. Over a period of more than 30 years, he served in both the illustrations and editorial departments of the *National Geographic* magazine, having advanced to the position of editor in 1957.

Grote (*grōt*), **George (1794-1871),** English historian, was born at Clay Hill, Kent. He was educated at Charterhouse; entered the family banking house; but devoted his leisure time to literary work. He published many pamphlets on reform and contributed to the *Westminster Review.* In 1832, he was elected to Parliament, and continued to sit until 1841 as one of the "philosophical radicals." He wrote *A History of Greece,* still a standing work, which appeared between 1846 and 1856, followed by *Pluto and the Other Companions of Socrates.* During his parliamentary life, he made himself conspicuous by his advocacy of the ballot. He took an active part in the foundation of the University of London, of which he was vice chancellor at the time of his death. He was buried in Westminster Abbey.

Grotius (*grō'shĭ-ŭs*), **Hugo (1583-1645),** otherwise known as Hugo de Groot, Dutch jurist and the founder of international law, was born of noble parentage at Delft, Holland. At 12, he entered the University of Leiden and, at 15, received his doctorate in law from the University of Paris. His *Martianus Capella,* a prodigy of juvenile learning, was published when he was but 16. In 1599, he issued a treatise for the instruction of seamen in ascertaining the exact situation of a ship at sea, and enrolled himself as an advocate at The Hague. In 1607, he was nominated advocate general of the provinces of Holland and Zealand. He married Mary Reygersburgh.

In 1608, Grotius composed his *Mare Liberum,* which undertook to show that the sea was open to all without distinction. He was advanced in 1613 to the judicial station of pensionary of Rotterdam. Two years later, he went to England on an embassy representing the rights of fishing for whales in the Northern Seas.

Shortly afterward, Grotius became deeply involved in the religious animosities which, at that time, vexed Holland. He had adopted the principles of the Arminian party in opposition to the tenets held by the followers of Gomar, the Calvinistic controversialist. Participation in the subsequent popular tumults caused Grotius to be arrested. In 1619, he was sentenced to life imprisonment and was confined in the castle of Loevestein. During his two years of captivity, he employed much time in legal studies and wrote a treatise entitled *The Truth of the Christian Religion.* By the aid of his wife, he escaped from prison in 1621.

Grotius made Paris his city of refuge. There he wrote, in 1622, his *Apology,* and, in order to place himself more fully under the protection of the French government, he obtained naturalization papers from Louis XIII. In 1625, he completed his greatest work, *De Jur Bellie et Pacis,* "The Law of War and Peace," which long remained the standard authority on international law. In order to estimate the magnitude and value of his labors, it must be considered that, before he wrote, the ground in this field was wholly unbroken.

In 1631, Grotius was invited by Prince Frederick of Orange to return to his native country, but a decree of perpetual exile was passed against him through the intrigues of his enemies. He was induced, partly by reason of Queen Christina's taste for literature, to enter the Swedish service. In 1635, he became resident ambassador for Sweden at the court of France.

Grouchy (*grōō'shē'*), **Emmanuel, Marquis de (1766-1847),** French marshal, was born in Paris. He entered the French army in 1781, rising, by 1794, to the rank of brigadier general. He took a prominent part in many of Napoleon's victories but, by following to the letter Napoleon's order to pursue Blücher, he is believed to have caused the French defeat at Waterloo. On the return of the Bourbons to the throne, he was banished, and lived for five years in Philadelphia, 1814–19. He was later permitted to return and was restored to his estates and titles.

Grove, Sir George (1820-1900), British engineer and writer on music, was born at Clapham. He was trained as a civil engineer; erected lighthouses in the West Indies; and assisted on the Britannia tubular bridge over Menai Strait. He was secretary to the Society of Arts, 1849–52, and then secretary and director of the Crystal Palace Exhibition. He was editor of *Macmillan's Magazine;* was a large contributor to Smith's *Dictionary of the Bible;* became editor and part author of the great *Dictionary of Music and Musicians;* and published a work on Beethoven. He was knighted in 1883 on the opening of the Royal College of Music, of which he was director until 1894.

Gruenther, Alfred Maximilian (1899-), United States army officer, was born at Platte Center, Nebr., and was educated at West Point. He was commissioned a second lieutenant in the Field Artillery in 1918, progressing through the grades to general in 1949. He taught for a number of years at West Point. On the outbreak of World War II, he was made chief of staff of the Third Army. In 1942, Gruenther was appointed deputy chief of staff of Allied Force Headquarters at London, under General Dwight Eisenhower. He was chief of staff of the Allied Army Group in Italy in 1944–45 and then, following the defeat of Germany, served as deputy commander of U. S. forces in Austria. After fulfilling other assign-

ments, he was made chief of staff to General Eisenhower when Eisenhower became supreme allied commander in Europe in 1950. From 1953 to 1956 Gruenther was himself supreme allied commander in Europe. He retired from the Army in 1956 and in 1957 became head of the American Red Cross.

Guedalla, Philip (1889-1944), British historian and biographer, showed early as an Oxford University debater a wit and keenness of observation that won him popularity as an author. One of his epigrams, "Historians' English is an occupational disease," refers to a style of writing which he was careful to avoid. He galvanized history and biography into life by making them vivid and human. He wrote *Wellington, The Second Empire, The Hundred Days, Palmerston, Fathers of the Revolution, Mr. Churchill, Bonnet and Shawl,* and *The Two Marshals.*

Guericke (*gä'rĭ-kĕ*), **Otto von (1602-1686),** German physicist, was born at Magdeburg. He studied at Leipzig, Jena, and Leiden, and traveled in France and England. As a physicist, he is known chiefly for his discoveries relative to the nature and effects of air. The experiments of Galileo and of Pascal on the weight of air led Guericke to attempt the creation of a vacuum. This resulted in the first air pump, invented about 1654. Guericke's invention became famous, and he was summoned to the presence of the emperor Ferdinand III of Germany at Ratisbon. Here, in 1654, he made the famous experiment commonly known as the "Magdeburg hemispheres," in demonstration of atmospheric pressure. Two hollow hemispheres having been fitted together, the air from the resulting sphere was exhausted. The pulling power of eight horses was insufficient to separate the hemispheres.

Guesclin, Bertrand du. See *Du Guesclin, Bertrand.*

Guest, Edgar Albert (1881-1959), American press humorist, was born at Birmingham, England. He was brought to America at ten years of age and received a high school education at Detroit, Mich. Following 1895, he was connected with the Detroit *Free Press* in various capacities. His publications include *A Heap o' Livin', Just Folks, Path to Home, When Day Is Done, The Friendly Way, Life's Highway,* and *All in a Lifetime.*

Guido d' Arezzo (*gwē'dō dä-rĕt'sō*), or **Guido Aretino (c. 995-c.1050),** medieval musician and Benedictine monk was born probably near Paris and was educated at Saint Maur des Fosses. At the Benedictine Monastery at Pomposa, he taught singing and introduced new methods in music. These met with local disfavor, which resulted in his flight to Arezzo, whence, about 1030, he was summoned to Rome to demonstrate his musical discoveries to Pope John XIX.

The invention of musical notation and the *solfeggio* are ascribed to him. He introduced the names Ut, Re, Mi, Fa, Sol, and La for the first six notes of the scale and originated the four-line staff, employing extra lines above and below whenever necessary. He used both lines and spaces, designating them by the first letters of the alphabet and thus insuring uniformity of pitch. He substituted fourths for the parallel fifths in the primitive harmonies of Hucbald. This innovation soon led to the use of the remaining intervals and hastened the development of harmony and measured rhythm, which distinguished modern musical composition from the purely melodic music of the ancients. In 1029, Guido became prior of the Monastery at Avellano, where he died.

Guido Reni. See *Reni, Guido.*

Guillaume (*gē'yōm'*), **Charles Edouard (1861-1938),** Swiss physicist, was born at Fleurier, Switzerland. Many important discoveries of alloys have been due to him. In 1896, he found a cheap alloy more stable than platinum. This alloy, called invar from its invariable quality and particularly its extremely small coefficient of thermal expansion, was found to be a suitable material for surveying instruments, reducing the cost to about 2 per cent of what it had been 20 years before. Guillaume was made director of the International Bureau of Standards in 1915 and, in 1920, received the Nobel prize in physics. He is the author of many technical publications on alloys and related topics.

Guilmant (*gēl'mäN'*), **Félix Alexandre (1837-1911),** French organist and composer, was born at Boulogne. His father, a professional musician, gave him his first musical instruction, and, at the age of 12, he began to play the organ as his father's substitute at the church of Saint Nicholas. He studied further under Carulli and, in 1853, was made organist at the church of Saint Joseph. In 1871, he became organist at La Trinité and, in 1896, was made professor of the organ at the Paris Conservatory. He was the foremost representative of the French school of organ music, a brilliant performer with a marvelous gift of improvisation. He made numerous successful tours in England, Russia, Italy, and the United States. His compositions include many works for the organ and orchestra, together with numerous choruses and masses.

Guinness, Alec (1914-), English actor whose bland countenance belies the remarkable range of the roles he has played, was born in London. He went on the stage first in 1933, and in 1938 acted the part of Osric in *Hamlet* at the Old Vic. Aside from playing the psychiatrist in T. S. Eliot's *The Cocktail Party,* and appearing in a few other plays, Guinness has devoted his considerable talent to the screen. Among the memorable films he has starred in are *Oliver Twist, Kind Hearts and Coronets* (in which his versatility and genius for makeup enabled him to play six parts), *The Lavender Hill Mob* (in which he played a bank thief), *The Captain's Paradise, The Prisoner* (in which he was an Eastern European churchman undergoing the torture of brainwashing), and *The Lady Killers,* in which he again became a fascinating rascal. In 1956, Guinness appeared in *The Swan* with Grace Kelly.

Guise (*gü-ēz'*), **Henri de Lorraine, Duke of (1550-1588),** French Catholic leader. At the age of 15, he distinguished himself fighting against the Turks in Hungary. He later took an active part in the wars against the Hugenots and in the massacre of Saint Bartholomew. Using his popularity with the Parisians, he formed the Holy League, which was designed to bring his family to the throne and to exclude that of Henry of Navarre. His ambitions were cut short by assassination in 1588.

Guizot (*gē'zô'*), **François Pierre Guillaume (1787-1874),** French statesman and historian, was born at Nimes. In 1805, he went to Paris, studied law, became a professor at the Sorbonne in 1812, and devoted himself to literature. His first work, the *Nouveau dictionnaire universel des synonymes de la langue française,* appeared in 1809. After the Second Restoration, he became general secretary to the minister of the interior and afterward to the minister of justice.

After the revolution of 1830, he became minister of the interior and, in 1832, minister of public instruction, an office which he held, with two interruptions, until 1837. On the outbreak of the Eastern disturbances in 1840, under Soult's administration, he was sent as ambassador to London; in 1847, became the official leader of the cabinet; was forced by the revolution of 1848 to flee to England; returned in 1849; but retired completely from politics after the *coup d'etat* of 1851. Among his numerous works are his *History of the English Revolution, Life of Oliver Cromwell, History of Civilization in Europe,* and *History of Civilization in France.*

Gulick, Luther Halsey (1865-1918), American pioneer in physical education, was born at Honolulu, Hawaii. He specialized in physical education and became superintendent of physical training at the Y. M. C. A. Training School, Springfield, Mass., in 1887, continuing until 1900. He devised the Association's symbol. In 1903, he took charge of physical training in the public schools of New York City. With his wife, he founded the Campfire Girls. He also assisted in creating the game of basketball.

In addition to the editing of journals on physical education and of the Gulick hygiene series, he wrote *Manual of Physical Measurements, Physical Education by Muscular Exercise, The Efficient Life, Mind and Work, The Healthful Art of Dancing,* and *The Dynamic of Manhood.*

Gullstrand (*gōōl'strănd*), **Allvar (1862-1930),** Swedish physicist, was born in Landskrona, the son of a physician. He was educated at the universities of Upsala, Vienna, and Stockholm. In 1894, he became professor of ophthalmology in the University of Upsala and, in 1913, professor of physiological and physical optics. In recognition of his researches on diseases of the eye and on the mechanics of vision, he was awarded the Nobel prize for medicine in 1911. His scientific writings include *Allgemeine Theorie der monochromatischen Aberrationen, Die reele optische Abbildung,* and *Einführung in die Methoden der Doptrik des Auges des Menschen.*

Gunter (*gŭn'tĕr*), **Edmund (c. 1581-1626),** English mathematician, was born in Hertfordshire. He was educated at Westminster and Christ Church, Oxford, and, in 1619, became professor of astronomy in Gresham College, London. He invented the sector, with the lines known as Gunter's scale. His principal works are *Canon Triangulorum*—a table of logarithmic sines and tangents—and *New Projection of the Sphere.* He invented the widely used surveying chain called Gunter's chain, and made the first observation of the variation of the compass.

Gunther, John (1901-), undoubtedly the most widely travelled of American authors and foreign correspondents, was born in Chicago, Ill. After a brief period of local reporting, he was sent by the Chicago *Daily News* in 1924 to cover England and the Continent. Thus Gunther began a remarkably intensive and far-ranging repertorial career that has carried him to practically every country in the world, and into personal contact with almost every ruler and head of state. During World War II, Gunther was a radio commentator for two American networks, and was chosen by the combined American press to repre-

sent the news corps at the invasion of Sicily. Gunther is best known for his series of "Inside" books, which began with *Inside Europe* in 1936, and includes *Inside Asia, Inside Latin America, Inside America, Inside Africa,* and *Inside Russia Today.* They reveal the skilled reporter at his best, presenting complete and accurate facts in a highly readable manner. Gunther has also written *Death Be Not Proud, The Riddle of MacArthur,* and is a frequent contributor of articles to magazines.

Gustavus I Vasa (*gŭs-tā'vŭs vä'sä*), (**1496-1560**), king of Sweden, was born at Lindholmen, In 1518, during the struggle with Christian II of Denmark, Gustavus was treacherously carried off to Denmark as a hostage. After a year, he escaped to Lübeck and thence to Sweden, where he strove in vain to rouse a spirit of resistance against the Danes. Retreating to Dalecarlia, he wandered for months, with a price set on his head, and worked on farms and in mines. At last the massacre at Stockholm, 1520, roused the Swedes, and soon Gustavus had an army large enough to attack the enemy. His capture of Stockholm in 1523 drove the Danes from Sweden. Thus ended the Scandinavian union which had existed for 126 years, and Gustavus I was elected king of Sweden.

He found the whole country demoralized. Yet, after a 40 years' rule, he left Sweden a peaceful and civilized realm, with a full exchequer and a well organized army. He promoted trade, fostered schools, and made roads, bridges, and canals.

Gustavus II Adolphus (**1594-1632**), king of Sweden, was born at Stockholm. He was the grandson of Gustavus Vasa and the son of Charles IX, at whose death, in 1611, Gustavus Adolphus succeeded to the throne of Sweden. He had been strictly brought up in the Lutheran faith, carefully trained in habits of business, and was one of the most accomplished princes of his age. He was acquainted with eight languages, five of which he spoke and wrote fluently, and he was well read in the classics and ancient history.

Having made various administrative reforms and availed himself of the short interval of peace to promote the material prosperity of the country, he intrusted the charge of the government to his chancellor, Oxenstierna, and set sail, in the summer of 1630, with an army of about 13,000 men, to aid the Protestants of Germany in their struggle against the Catholic League, which was backed by the power of the Empire. With and for the Germans he fought until his death on the battlefield of Lutzen, 1632. He was one of the greatest generals of modern times and made Sweden a power in northern Europe.

Gustavus III (**1746-1792**), king of Sweden, was born at Stockholm, and succeeded his father, Adolphus Frederick, in 1771. At this period the country was torn by the struggles of rival interests and classes. Failing to persuade them to cease hostilities, he staged a sham revolt and recovered all the legal powers that had been gradually lost by his immediate predecessors. In 1788, he entered upon a profitless war with Russia, and, in 1789, secured additional war powers from the diet. This so incensed the nobles that finally a conspiracy was formed against his life. In 1792, he was mortally wounded at a masked ball in the opera house which he himself had built.

Gustavus V (**1858-1950**), king of Sweden, was born at Drottningholm. He was educated at the University of Upsala, traveled extensively, entered the army, and, in 1881, married Princess Victoria of Baden, first cousin of the German emperor and a descendant of the old Swedish royal family of Vasa. He succeeded his father, King Oscar II, on December 8, 1907, having several times previously acted as regent.

Gutenberg (*gōō'tĕn-bĕrĸ*), **Johannes** (**c. 1400-1468**), the inventor of printing from movable types, was born of noble parentage at Mainz, Germany. Recent investigations tend to show that he changed his true name Hans Ganzfleisch de Sulgelock and, for political reasons, assumed the name of his mother's family, Gutenberg.

In 1434, Gutenberg was in Strasbourg, where, two years later, he formed a partnership with Andrew Dritzehn in the business of polishing stones and manufacturing mirrors. Subsequently he entered into a second compact with Dritzehn and others "for the working out of certain secret processes invented by him." The "secret processes" undoubtedly comprehended the first steps in the art of printing. There is mention in the written agreement of "materials and utensils, of lead, of a press, of a vise for holding the parts together," and of the plan to complete the work for the fair at Aix la Chapelle in 1438.

In 1439, the death of Andrew Dritzehn involved Gutenberg in an unfortunate lawsuit with the former's brother George. About 1446, Gutenberg permanently located at Mainz. His means were exhausted, but, in 1450, he formed a new partnership with a rich goldsmith, Fust, for the further exploitation of his invention. A third partner, Schoeffer, entered the firm later. In 1445, a financial adjustment forced Gutenberg to abandon his claims and to sacrifice his apparatus and nearly all his stock. Fust and Schoeffer continued to print.

Ultimately, by the aid of Conrad Humery, a councilor of Mainz, Gutenberg again established himself in the same city and brought out the first printed Bible. Four editions of a work by Donatus are likewise ascribed to him, and, in 1457, Gutenberg issued the Latin *Psalterium.* Hard work and poverty rendered these later years exceedingly unhappy. In 1465, however, Adolph of Nassau, elector of Mainz, named him one of his courtiers and raised him to the rank of noble.

The obscurity of the early history of printing is increased through the precautions necessarily taken by the inventor and his partners to conceal their proceedings. Printing from engraved wooden blocks had been in use for more than half a century, especially in Germany and the Low Countries, but it was obviously inapplicable to works of considerable length. The comparative rapidity of the new method gave rise to grave suspicions among the authorities, for, to them, it was apparently due to magic. The immediate effect of printing was to make accessible the literature of Greece and Rome. By facilitating the spread of ideas, this invention has exerted an influence of incalculable magnitude on the history of the world.

Guthrie (*gŭth'rĭ*), **Samuel** (**1782-1848**), American physician and chemist, was born at Brimfield, Mass. He studied medicine with his father and began practice at Sherburne, N. Y., where he became a pioneer in the introduction of vaccination. After the War of 1812, during which he served as examining surgeon, he established a vinegar factory, conducted experiments in the manufacture of gunpowder, and produced the first successful percussion powder.

In 1830, Guthrie invented a process for the rapid conversion of potato starch into sugar. Soon afterward he produced what is now known as chloroform by distilling a mixture of alcohol and chloride of lime. Concerning this discovery, he wrote an article in July 1831. Chloroform was independently discovered by Soubeiran in France, October 1831, and by Liebirg in Germany, November 1831. Guthrie was one of the earliest American investigators in practical chemistry.

Haakon VII (*hô'kôn*), (**1872-1957**), king of Norway, was the second son of King Frederick of Denmark and a nephew of Queen Alexandra of Great Britain. His baptismal name was Karl, but he assumed the above title when he became king, November 18, 1905, on the separation of Norway and Sweden. The king married Princess Maud Alexandra, daughter of King Edward VII, in 1896.

In 1940, Germany struck without warning at his country, overran Norway, and held it for five years. When further resistance was hopeless, the king embarked for England, and directed resistance from there. After the liberation of Norway, he returned, June 7, 1945, and was warmly welcomed by his people. Upon his death at the age of 85, he was succeeded by his son, who became Olav V.

Haas, Francis Joseph (**1889-**), American educator and administrator, was born at Racine, Wisc. A graduate of the St. Francis Seminary, Milwaukee, he was ordained a priest of the Catholic Church in 1913 and taught at the seminary, 1915-19 and 1922-31. He made a special study of social questions and, in 1937, was chosen dean of the school of social science at the Catholic University of America. His interest in labor problems brought him appointment to the National Labor Board in 1934, to the United States conciliation service as special commissioner in 1935, and to the chairmanship of the Wisconsin Labor Relations Board in 1937, where he served until 1938. President Roosevelt appointed him to direct a committee for elimination of racial and religious discrimination in employment, from which he resigned in 1943 to become bishop of Grand Rapids, Mich. He wrote *Shop Collective Bargaining* and *Man and Society.*

Haber (*hä'bĕr*), **Fritz** (**1868-1934**), German chemist, was born at Breslau. He was educated in the universities of Heidelberg, Charlottenburg, and Berlin. In 1894, he became assistant in the Institute of Chemical Technology at Karlsruhe and, in 1896, was made instructor in the Polytechnical School there. In 1898, he was appointed professor at Dahlem, near Berlin, and later became director of the Kaiser Wilhelm Institute for Physical and Electrical Chemistry. To him is due the discovery of a cheap process for converting nitrogen from the air into ammonia, in which form it may be used to make fertilizers and explosives. His publications include *Fundamentals of Electrochemical Technology* and *Thermodynamics of Gas Reactions.* In 1918, he was awarded the Nobel prize for chemistry.

Hackett, Francis (**1883-1962**), novelist and historian, was born in Kilkenny, Ireland. Coming to America in 1901, he secured work with a law firm in New York. He began to write for periodicals and, in 1906, joined the editorial staff of the Chicago *Evening Post.* From 1914 to 1922 he was associate editor of the *New Republic.* Thereafter he resided in England and Denmark. His first publications

dealt with his native land, Ireland, his *Story of the Irish Nation* appearing in 1922. Later he wrote a number of popular novels and histories, including *Henry the Eighth—A Personal History, Francis the First, The Green Lion, Queen Anne Boleyn,* and *I Chose Denmark.*

Hackett, James Keteltas (1869-1926), American actor and manager, was born of American parents at Wolfe Island, Ont. He was graduated at the College of the City of New York in 1891 and studied at the New York Law School. He made his debut in 1892 and became leading man at the New York Lyceum at the age of 24. His most notable earlier successes were in *The Prisoner of Zenda* and its sequel, *Rupert of Hentzau,* and in *The Pride of Jennico,* under the management of Daniel Frohman. His most noted later production was *Macbeth.* In 1918, he played the part of the Canadian in an all-star cast of *Out There* for the American Red Cross, through which that organization netted $700,000 in 3 weeks. Other plays in which he appeared include *A Grain of Dust, The Crook, Othello, Craig Kennedy,* and *The Better Ole.*

Hadley (*hăd'lĭ*), **Arthur Twining (1856-1930),** American educator and economist, was born in New Haven, Conn. He was graduated at Yale in 1876 and later studied at the University of Berlin. He was tutor and lecturer at Yale from 1879 to 1886, when he became professor of political science. In 1891, he was made professor of political economy serving until 1899, when he was elected president of the university. He filled this office with distinction until his retirement in 1921, as president emeritus.

Hadley's work on railway transportation established his position as an authority on the subject. His writings include *Railroad Transportation: Its History and Laws, The Education of the American Citizen, Freedom and Responsibility, Undercurrents in American Politics,* and *Standards of Public Morality.* In 1908, he was elected member of the American Academy of Arts and Letters.

Hadley, Henry Kimball (1871-1937), American composer, was born at Somerville, Mass. He studied music with G. W. Chadwick and S. A. Emery in Boston, and completed his training in Vienna. Returning to America in 1895, he became instructor of music at Saint Paul's School, Garden City, L. I. He was conductor of the San Francisco Symphony Orchestra, 1911–15, and toured Europe as guest conductor of his own works. His symphony *The Four Seasons* won the Paderewski prize in 1901. The list of his works includes a cantata, *In Musical Praise;* the symphonic poems *Salome, Lucifer,* and *The Culprit Fay;* the lyric drama *Merlin and Vivian;* and the operas *Safie, Azora, Bianca,* and *Cleopatra's Night.* He excels in descriptive music and ranks among the leading American composers. In 1924, he was elected to membership in the American Academy of Arts and Letters.

Hadrian, or **Publius Ælius Hadrianus (76 A. D.-138 A. D.),** Roman emperor, was elected by the army successor of Trajan in 117 A. D. His reign was one of the happiest periods in Roman history, the only important war which broke out during the reign being a rebellion of the Jews, which lasted for three years. He erected many magnificent works in various parts of his empire, the remains of some of which are still standing. He also founded several cities, including Hadrianopolis, now Adrianople. He was a lover of philosophy, poetry, and the fine arts. The mausoleum which he built for himself in Rome forms the groundwork of the present castle of Saint Angelo.

Haeckel (*hĕk'ĕl*), **Ernst Heinrich (1834-1919),** German naturalist and writer, was born at Potsdam, Prussia. He studied medicine and science at Würzburg, Berlin, and Vienna. In 1859, he went to Italy, and studied zoology at Naples and Messina, returning in 1861 to Jena, where he was appointed professor of zoology. He was a widely known exponent of monistic philosophy and was long regarded as the foremost supporter of Darwinism and the theory of evolution in Germany. He wrote in support of the thesis that the development of the individual recapitulates the evolution of the race. Among his works are *The History of Creation, The Origin of the Human Race, Life in the Deep Seas, The History of Man's Development, Popular Lectures on Evolution,* and *Voyage of H. M. S. Challenger.*

Hafiz (*hä'fĭz; hä-fēz'*), **Mohammed Shamsuddin,** or **Shams-Ud-Din (?-1388),** was a Persian lyrical poet. He was eminent also as a teacher of theology and mystic philosophy, but it was his poetic genius which gained for him a world-wide fame. The name of Hafiz is a household word throughout Iran, and his songs are recited in social gatherings, being much admired for their vigor and passion. He wrote love poems, drinking songs, and satires.

Hagen, John P. (1908-), American astronomer, was born at Amherst, Nova Scotia. He studied at Boston University, then successively at Wesleyan and Yale, giving special attention to astrophysics and radar. He was a member of several eclipse expeditions conducted by the Naval Research laboratory at Washington and has been a member of the panel on radio astronomy for the National Science Foundation. As a director of the earth satellite project, he has had charge of the Vanguard through the different stages of its development to an ultimately successful launching.

Haggard, Sir Henry Rider (1856-1925), English novelist, lawyer, and social reformer. He accompanied Sir Henry Bulwer, as secretary, to Natal in 1875, and formally hoisted the British flag over Transvaal territory, 1877. He retired from the colonial service in 1879; returned to England; and began the practice of law. His first book, *Cetywayo and His White Neighbors,* appeared in 1882. Subsequently he published *Dawn; The Witch's Head; King Solomon's Mines,* the work by which he established his reputation; and *She,* a novel of great power. These were followed by *Ayesha, Cleopatra,* and *The Virgin of the Sun.* He wrote also *Rural England* and *A Farmer's Year,* and made studies in socialistic settlements.

Hahnemann (*hä'nĕ-män*), **Samuel Christian Friedrich (1755-1843),** German physician, founder of the homeopathic system of medicine was born at Meissen, Saxony. He completed a course in medicine at Erlangen in 1779. While translating Cullen's *Materia Medica* from English into German, 1790, he noticed a similarity between the effects of Peruvian bark, or cinchona, upon a healthy person and the results of certain diseases for the cure of which that drug was used. In other words, he rediscovered, quite independently, Hippocrates' old "law of similars." After many experiments, he became convinced of the truth of the principle *similia similibus curantur*—that is, the cure for a disease is the very drug that would in a healthy individual produce the symptoms of such disease.

Further investigation caused Hahnemann to conclude that the conventional doses of his day were injurious, and this led him to another principle, that of very minute doses, made by a process of "potentization," described by him at length in his *Organon,* 1810, which was translated into many languages.

Haidinger (*hī'dĭng-ĕr*), **Wilhelm von (1795-1871),** Austrian mineralogist and physicist, was born at Vienna. He was educated at Gratz and at Freiberg, and lived for a time at Edinburgh. After returning to Austria, he engaged in porcelain manufacture at Elbogen. In 1840, he was made curator of the imperial mineralogical collections at Vienna, and, about 1845, began to lecture on mineralogy. He was appointed director of the geological institute in 1849.

Among Haidinger's many contributions to mineralogical science is his discovery of the phenomenon known as "Haidinger's brush," affording a means of detecting plane polarized light. During his sojourn in Edinburgh, he translated Mohs's work on mineralogy, which he enlarged, improved, and published under the title *Treatise on Mineralogy.* He also edited a geological map of Austria.

Haig, Douglas Haig, Earl (1861-1928), British soldier, was educated at Clifton and at Brasenose College, Oxford. He joined the 7th Hussars in 1885, served with distinction at Atbara and Khartum in the Sudan campaign in 1898, and was chief of staff to General French during the Colesberg campaign in South Africa, 1899-1900. He was promoted to inspector general of the cavalry in India in 1903, was made major general in 1904, and general commander of the officers at Aldershot in 1912. In the early stages of World War I, he commanded a division of the British expeditionary forces in France with marked ability. Late in 1915, he succeeded Sir John French in the command of all British armies at the front in France.

The culmination of his generalship came on September 28, 1918, when, in conjunction with a co-ordinated attack by the American, French, and Belgian armies on other parts of the front, the British army broke through the Hindenburg line between Cambrai and Saint Quentin. Thereafter, there was a steady and victorious advance along the whole British front until the day of armistice.

Haile Selassie (1892-), king of Ethiopia, was born in the province of Herrar. Receiving an education of the European type from French monks, he became regent for his aunt, Empress Zaditu, in 1916, and succeeded to the throne on her death in 1930. He succeeded in having Ethiopia admitted to the League of Nations in 1923. In 1935, Italy seized the occasion of a border incident to invade Ethiopia and occupied the capital, Addis Ababa, in 1936. Haile Selassie took ship to England and continued vainly to seek restoration of his kingdom through the League of Nations. When British forces invaded Ethiopia in 1941, he returned to assist in overthrowing the Italians.

Hakluyt (*hăk'lōōt*), **Richard (c. 1553-1616),** English geographer, was born at London. He was a lecturer on geography at Oxford University, and was the first to teach the use of globes. His work came to the notice of Sir Edward Stafford, who facilitated his request by taking him as his chaplain to Paris, 1583. Queen Elizabeth gave him an ecclesiastical appointment in 1586. He compiled information for making maps of the New World, chiefly by con-

sulting navigators. The first map on which the name Virginia occurs was published by him in 1588. His purpose was encouragement of American settlements. He was a member of the London Company which, under Raleigh's leadership, put up capital for sending colonists to Virginia. His chief work is *The Principal Navigations, Voyages, and Discoveries of the English Nation*, commonly called *Hakluyt's Voyages*. He was buried in Westminster Abbey.

Haldane, Richard Burdon, Viscount (1856-1928), British statesman and philosophical writer, was born at Cloanden, Perthshire, Scotland. He was educated at the universities of Edinburgh and Göttingen and, in 1879, was called to the bar. From 1885 to 1911, he was continuously elected to Parliament as a Liberal. In 1911, he was created Viscount Haldane of Cloanden. He was secretary of state for war, 1905-12, and lord chancellor, 1912-15. His influence effected a reorganization of the army and important reforms in education. Because of his German affinities, Haldane withdrew from political activity during World War I, devoting himself to philosophical studies and to the promotion of national education. He served as rector of Edinburgh University and as chancellor of the University of Bristol. In 1924, he became lord chancellor in Ramsay MacDonald's Labor cabinet. Among his writings are *Essays in Philosophical Criticism, Life of Adam Smith, The Pathway to Reality, Education and Empire, The Reign of Relativity*, and *The Philosophy of Humanism*.

Hale, Edward Everett (1822-1909), American clergyman and writer, was born in Boston, Mass. He was graduated at Harvard University in 1839, studied theology, and was ordained to the Unitarian ministry. He was pastor of the Church of the Unity, Worcester, Mass., from 1846 to 1856. He then became pastor of the South Congregational (Unitarian) Church in Boston, and for a half century was an active and forceful figure in the philanthropic movements of his city and time. In 1903, he was appointed chaplain of the United States Senate.

He wrote *My Double and How He Undid Me*, his first widely popular story; *The Man Without a Country*, a classic of patriotic fiction; *Ten Times One is Ten*, his most influential book, which with *In His Name* led to formation of lend-a-hand clubs, king's daughters, and similar organizations. In 1908, he was elected member of the American Academy of Arts and Letters.

Hale, George Ellery (1868-1938), American astronomer, was born at Chicago, Ill. He was graduated at the Massachusetts Institute of Technology in 1890; studied at Harvard College Observatory, 1889-90, and at the University of Berlin, 1893-94. He was director of the Kenwood Astrophysical Observatory in Chicago from 1890 to 1896. From 1892 to 1905, he was at the University of Chicago, first as associate professor of astrophysics, then as professor, and, from 1895 to 1905, as director of the Yerkes Observatory. In 1905, he became director of the Mount Wilson Observatory at Pasadena, California. He invented the spectroheliograph, first used in 1892, with which he discovered the solar vortices and magnetic fields of sun spots. By his solar and stellar spectroscopic work, Hale achieved an international reputation. Among his numerous scientific writings are *The Study of Stellar Evolution, Ten Years' Work of a Mountain Observatory, Beyond the Milky Way*, and *The New Heavens*. See *Sun Spots*.

Hale, Sir Matthew (1609-1676), English lawyer and jurist, was born at Alderley. He was graduated from Oxford, studied law at Lincoln's Inn, and was admitted to the bar in 1637. He became a judge of common pleas in 1653, and sat in Parliament until the Restoration in 1660, when he was made lord chief baron of the exchequer. In 1671, he became lord chief justice, and resigned shortly before his death. His *Analysis of the Law* provided Blackstone with an outline for his famous commentaries, and his *History of the Pleas of the Crown* is highly regarded.

Hale, Nathan (1755-1776), American patriot, was born in Coventry, Conn. He was graduated at Yale College in 1773, and devoted himself to the cause of the colonies in the contest with Great Britain. After the defeat of the colonial army on Long Island, he endeavored to obtain knowledge of the enemy's plans and position for the information of Washington. He obtained the knowledge, but was arrested by the British before he could return. The papers containing the information being found on his person, he was hanged as a spy, by order of Sir William Howe. His last words were, "I only regret that I have but one life to lose for my country." Statues to his memory have been erected in Hartford and New York City.

Hale, Sarah Josepha (1788-1879), American writer, author of *Mary's Lamb*, was born at Newport, N. H. On her husband's death, in 1822, she devoted herself to authorship, and became, in 1828, editor of the *Ladies' Magazine* (afterward *Godey's Lady's Book*). She helped to procure the employment of woman medical missionaries, to complete the Bunker Hill monument, and to secure the observance of Thanksgiving Day in all the states. Her works include poems, novels, and biography.

Halévy, Ludovic (1834-1908), French novelist and dramatic author, was born at Paris. He received his education at the Lycée Louis le Grand and entered the service of the government but resigned to devote himself to the drama. He was the librettist of many of Offenbach's operettas. With Henri Meilhac, he produced *La Belle Hélenè*, which had a great success; *La Barbe Bleue; La Grande Duchesse;* and *Frou Frou*, which was one of the notable theatrical successes of the century. In 1873 appeared the first of his three clever volumes on the *Cardinal Family*. In 1882, he wrote the novel, *L'Abbé Constantin*, which became widely known for its fresh and wholesome charm. While he wrote many trivial and farcial pieces, his serious literary work is characterized by exquisite taste, refinement, and pathos. He was elected to the French Academy, 1884.

Haliburton (*hăl'i-bûr't'n*), **Thomas Chandler (1796-1865)**, Canadian humorist, was born at Windsor, Nova Scotia. He was judge of the Supreme Court of Nova Scotia, but is best known as a satirical writer. In 1837, he published *The Clockmaker, or the Sayings and Doings of Samuel Slick of Slickville*, which became very popular. He is also the author of *The Attaché, or Sam Slick in England*, which was the result of a visit to that country in 1841. In 1856, he went to England to reside permanently, and, in 1859, entered the House of Commons as member for Launceston, which seat he held until within a few months of his death. Besides the works already mentioned, he wrote *The Old Judge, The Letter Bag of the Great Western, Traits of American Humor*, and several other books. See *Slick, Sam*.

Halifax, Charles Montagu, Earl of (1661-1715), English statesman and financier, was born at Horton. He was educated at Trinity College, Cambridge. He first attracted attention in 1685, by a poem in praise of Charles II and, in 1687, he wrote *The Town and Country Mouse* as a parody on *Dryden's Hind and Panther*. Montagu was a member of Parliament in 1689 and a lord of the treasury in 1692. In the latter year he proposed to raise a million sterling by way of loan. By placing of this loan, the British national debt was established.

In 1694 money was again wanted and Montagu supplied it by originating the Bank of England as proposed by William Paterson. For this service Montagu was made chancellor of the exchequer, in which office he appointed Newton in 1695 to recoin the money with a ribbed edge so as to make clipping easily detectable. In 1697 he became premier, but his arrogance and vanity soon made him unpopular. He was twice impeached for breach of trust, both times unsuccessfully.

Halifax, Edward Frederick Lindley Wood, Viscount (1881-1959), English statesman and diplomat. Educated at Oxford, he was elected to Parliament in 1910 and held various cabinet posts until 1925, in which year he was created Baron of Irwin. From 1926 to 1931, he was viceroy of India. Of a religious turn of mind, he established a basis of understanding with the mystic Gandhi, although opposing his objective of independence for India. In the years before World War II, he supported Chamberlain in avoiding a showdown with Hitler, but, when war broke out, he urged its prosecution to the limit. He became leader of the House of Lords in 1940, and Churchill relied heavily on his advice. He was ambassador to the United States from 1941 to 1946.

Hall, Charles Martin (1863-1914), American inventor, was born at Thompson, Ohio. He was graduated from Oberlin College in 1885. In February 1886, he invented an electrolytic process for obtaining aluminum, and, in 1888, a company was organized for the commercial manufacture of the metal, later utilizing extensive water power at Niagara Falls. The priority of his invention and the validity of his patents were upheld by the courts so that until 1912 his company controlled the production of the metal in the United States. By his process, aluminum, formerly as expensive as silver, became a common article of commerce, extensively employed in the arts, and largely used for cooking utensils and in airplanes. He was awarded the Perkin medal for chemistry in 1911. See *Aluminum*.

Hall, Granville Stanley (1846-1924), American educator and psychologist, was born in Ashfield, Mass. He was graduated at Williams College in 1867 and received the degree of doctor of philosophy at Harvard University in 1878. From 1872 to 1876, he was professor of psychology at Antioch College. He then pursued further studies in Berlin, Bonn, Heidelberg, and Leipzig. He was professor of psychology in Johns Hopkins University from 1881 to 1888, when he was elected president and made professor of psychology in Clark University. For 32 years he filled this chair and office with marked distinction, resigning in 1920.

As a champion of the culture-epoch theory of mental development, he won wide attention, and, by his important work on *Adolescence*, rose to an authoritative place among American educators. His writings include also *Aspects of German Culture; Youth—Its Education, Regimen, and Hygiene; Educational Problems; Founders of Modern*

Psychology; Jesus the Christ in the Light of Psychology; Recreations of a Psychologist; and *Morale: The Supreme Standard of Life and Conduct.* He founded and, in 1887–1921, was editor of *The American Journal of Psychology.* His later works include *Senescence* and *Life and Confessions of a Psychologist.*

Hall, James Norman (1887-1951), American writer, was born at Colfax, Iowa. He was graduated from Grinnell College in 1910, entered journalism, and rose to prominence as a writer during the early period of World War I. His earlier writings include *Kitchener's Mob,* published in 1916, and *High Adventure,* which appeared in 1918. After an extended journey in the Australasian region, he wrote jointly with C. Nordhoff, a book of travel titled *Faery Lands of the South Seas.* This was followed by *Mid-Pacific, Mutiny on the Bounty,* and *Hurricane.*

Hallam, Henry (1777-1859), English historian and critic, was born at Windsor. He was graduated at Christ Church, Oxford, 1799, and subsequently was called to the bar. His first writings were published in periodicals, especially the *Edinburgh Review.* He became distinguished for the extensive learning, powers of generalization, taste, judgment, and conscientiousness exhibited in a succession of notable works, the chief of which are *Europe during the Middle Ages, The Constitutional History of England,* and *Introduction to the Literature of Europe.* During the greater portion of his life he lived in London, devoting himself to linguistic and historical studies. His son, Arthur Henry, was the "A. H. H." of Tennyson's *In Memoriam.*

Halleck, Charles A. (1900-), political leader, was born at De Motte, Ind. After graduation from the University of Indiana, he studied law. He was prosecuting attorney for several terms, then was elected Congressman. He has served continuously from the 74th through the 87th Congress, being a notably active Republican member.

Halleck, Fitz-Greene (1790-1867), American poet, was born in Guilford, Conn. After working in a bank, he became the confidential agent of John Jacob Astor, who left him in his will an annuity for the rest of his life and named him one of the original trustees of the Astor Library. Halleck then retired from active life and passed the rest of his days at Guilford.

His earliest poem, the graceful and genial *Twilight,* was printed in 1818. In 1827, a volume of his poetry appeared. This included *Marco Bozzaris,* a spirited lyric, by which he will probably be longest remembered. A bronze statue to his memory has been erected in Central Park, New York.

Haller (*häl'ĕr*), **Albrecht von (1708-1777),** Swiss anatomist, botanist, physiologist, and poet, was born at Bern. He began practice in 1729, but, in 1736, was called to a chair at Göttingen. Here he organized a botanical garden, an anatomical museum and theater, and an obstetrical school. He also assisted in founding the academy of sciences, and took an active part in the literary movement of the day. In 1753, he resigned his professorship and returned to Bern. After this he wrote *Elements of Human Physiology* and prepared four large works on the bibliography connected with botany, anatomy, surgery, and medicine. His poems are descriptive, didactic, and lyrical.

Halley, Edmund (1656-1742), English astronomer, was born at London. He studied at Oxford and, in 1676, went to Saint Helena to study the southern heavens. In 1679, he published his *Catalogus Stellarum Australium.* In 1682, he observed the comet known by his name. His prediction of its return was the first of the kind that proved correct. In 1683, he published his *Theory of the Variation of the Magnetic Compass,* and from an examination of Kepler's laws of the planetary motions inferred that the centripetal force always varies inversely as the square of the distance.

Halley prevailed on Sir Isaac Newton to complete his *Principia,* the first volume of which was printed by Halley at his own expense. In 1703, he was chosen Savilian professor of geometry at Oxford. In 1720, he was appointed astronomer royal and for 20 years carried on the operations of the Greenwich Observatory. He made many astronomical discoveries, including the proper motions of the fixed stars and the acceleration of the moon's mean motion. See *Comet.*

Halliburton, Richard (1900-1939), American traveler and author, was born at Brownsville, Tenn. On graduating from Princeton University in 1921, he set out to travel. Beginning without money, he earned his way with the help of income from magazine articles. His adventures in the Swiss mountains, Egypt, India, Tibet, Thailand, Bali, China, Japan, and Siberia were narrated in his *Royal Road to Romance,* which attained great popularity.

On his later travels he conceived the idea of reliving fabulous exploits of history. He traveled the wanderings of Ulysses, swam the Hellespont, ran over the course from Marathon to Athens, and dived into the Maya well of death. Among his later books are *The Glorious Adventure, New Worlds to Conquer, The Flying Carpet, The Seven-League Boots.* A small sail boat in which he set out to cross the Pacific Ocean in 1939 was last seen in the mid-Pacific, where it was overtaken by a typhoon.

Hals (*häls*), **Frans (c. 1580-1666),** the elder, Dutch portrait and genre painter, was born, probably at Antwerp. He settled in Haarlem about 1604. Hals is regarded as the founder of the Dutch school of genre painting. His subjects of feasting and carousal are treated with marvelous vivacity and spirit. He is the first great painter of the Dutch National School, equaling Rembrandt in technical skill though inferior in imagination. His works are distributed among the chief galleries of the continent, England, and America. Excellent examples may be seen in the Metropolitan Museum, New York, in the Art Institute, Chicago, and in the Museum of Fine Arts, Boston. See *Painting.*

Halsey, William Frederick (1882-1959), American naval officer, was born at Elizabeth, N. J. After studying at the University of Virginia, he was graduated from Annapolis in 1904, and advanced through the grades to vice-admiral in 1940. In 1942, after heavy American losses at Guadalcanal, he was placed in command of the United States fleet in the South Pacific and was later promoted to admiral. He convoyed the American forces invading the Philippines, and decisively defeated the Japanese main fleet. His command, the Third fleet, bombed the coasts of Japan in the closing days of the war. He retired in 1947.

Hamilcar Barca (*hă-mĭl'kär bär'kä*) **(c. 270 B. C.- 228 B. C.),** Carthaginian general. While very young he was appointed to the command of the Carthaginian forces in Sicily in 247 B. C., at which time the Romans had possession of almost all the island. He established himself in Mount Ercte (now Pellegrino, near Palermo), making raids from there and resisting all the Roman attempts to dislodge him. After three years he left Ercte and established himself on Mount Eryx. He maintained his position there until 241, when, the Carthaginian fleet being hopelessly defeated off the Ægates Islands, Hamilcar was compelled to abandon Sicily. Still holding to his hatred of Rome, he went to Spain five years later and spent the next nine years in founding a new empire for Carthage. He was killed in battle with the Vettones.

Hamilton, Alexander (1757-1804), American statesman, was born in the West India Island of Nevis, son of a Scotch father and a French mother of Hugenot descent. His father failed in business and his mother died in 1768. In consequence, Alexander at the age of 12 entered the employ of an American merchant. His extraordinary abilities, however, induced some of his friends to procure for him a better education than could be secured at home. He was accordingly sent to a grammar school at Elizabethtown, N. J., and shortly afterward entered Columbia College, New York.

On the first appearance of disagreement between Great Britain and her colonies, Hamilton, still a schoolboy and barely 18, wrote a series of papers in defense of the rights of the latter. These articles were at first taken for the production of the statesman Jay, and secured for the writer the notice and consideration of the popular leaders. On the outbreak of the war, Hamilton obtained a commission as captain of artillery, gained the confidence of Washington, was made his aide-de-camp in 1777, and acquired great influence with him as his friend and adviser. On the termination of the war, he left the service with the rank of colonel, and, betaking himself to legal studies, soon became one of the most eminent lawyers in New York.

In 1782, Hamilton was elected by the state of New York a representative to the Continental Congress. In 1786, he became a member of the New York legislature, and, in 1787, he was appointed one of the delegates to the convention which met at Philadelphia for the purpose of revising the Articles of Confederation. In conjunction with Madison, he had the most important share in drawing up the Constitution afterward adopted. He was a strong supporter of the Federal as opposed to the Democratic party, and, along with Jay and Madison, defended the Constitution against all attacks by a series of letters in the New York *Daily Advertiser.* These letters were afterward collected and published under the title of *The Federalist.* It is due more to Hamilton than to any other one man that the Constitution was adopted in its present form and that the United States received a strong central organization.

On the establishment of the new government in 1789, with Washington as president, Hamilton was appointed secretary of the treasury. The disorder of the public credit and the lack of official accounts of the state treasury rendered this office one of peculiar difficulty. In order to re-establish public credit, he carried, in spite of much opposition, a measure for the funding of the domestic debt, founded a national bank, rearranged the system of duties, and altogether showed himself one of the greatest of American financiers. In 1795, he resigned his office and resumed the practice of law in New York.

When conflict with France arose in 1798, Hamilton was made major general of the United States army; and, on the death of Washington, he succeeded to the chief command. When peace was restored, he returned to his civil duties, but became involved in a political quarrel with Aaron Burr. This finally culminated in a duel, in which Hamilton was fatally wounded. He was elected to the American Hall of Fame, 1915.

Hamilton, Edith (**1867-1963**), educator and writer, was born of American parentage at Dresden, Germany. After graduation from Bryn Mawr College, with honors in Greek and Latin, she directed a college preparatory school and devoted much time also to European travel and writing. Her best-known books, *The Greek Way* (1930) and *The Roman Way* (1932), both recognized as classics, have gone through many editions and are still widely read.

Hamilton, Sir William (**1788-1856**), Scottish philosopher, was born at Glasgow. He studied at Glasgow and at Oxford; was admitted to the bar, but rarely practiced. In 1821, he became professor of history at Edinburgh, and was professor of logic and metaphysics there, 1936-56. An influential teacher, he gave impetus to the study of German philosophy in England. He held that, since the mind cannot grasp boundlessness such as that which characterizes space, reason is not sufficient in the search for truth but must be supplemented by faith. His chief books were *Discussions in Philosophy, Literature and Education, Metaphysics, Logic,* and *Lectures.* He left his library to the University of Glasgow.

Hamilton, Sir William Rowan (**1805-1865**), British mathematician was born in Dublin. He was educated at Trinity College, Dublin, and, at 19, undertook original investigation in conical refractions. In 1827, he was appointed professor of astronomy at Dublin and Irish astronomer royal. He invented quaternions, a mathematical tool which was to prove highly useful in the 20th century in the demonstration of the quantum theory. His earlier essays connected with caustics and contact of curves grew into the *Theory of Systems of Rays.* He wrote many important treatises and papers, including his *Lectures on Quaternions* and *Elements of Quaternions.*

Hamlin, Hannibal (**1809-1891**), American statesman, was born in Paris, Me. He studied law, was admitted to the bar, and, in 1833, began practice at Hampden, Me. In 1835, he was elected member of the state legislature, and entered upon an active political career of nearly 50 years. In 1842, he was elected to Congress; was United States senator from 1848 to 1856, when he was elected governor on the Republican ticket, but resigned immediately on again being elected senator. In 1861, he became vice president under Lincoln, serving until 1865. He was chiefly instrumental in passing the Wilmot Proviso through the House of Representatives. During the Civil War, he was a valued adviser of President Lincoln, whose policy he staunchly supported.

Hammarskjöld (*hăm'ər-shēld*), **Dag Hjalmar Agne Carl** (**1905-1961**), Swedish statesman, was born at Jönköping, Sweden. The son of a former Swedish prime minister, he was educated at Uppsala University and Stockholm University. He first intended a literary career, but went to work as a civil servant. He was under secretary of finance 1936–1945; under secretary of foreign affairs 1949–1951; and deputy foreign minister 1951–1953. In 1953 he succeeded Trygve Lie as secretary general of the United Nations. In this position he traveled widely, trying to adjust differences on the scene in Hungary, Egypt, Israel, and other trouble spots. While on a mission to unify the Congo, he was killed in an airplane crash.

Hammerstein (*hăm'ĕr-stīn*), **Oscar** (**1847-1919**), American impresario, was born in Berlin, Germany. At the age of 16 he came to America and, after a varied experience as inventor and playwright, he became, in 1870, manager of the Stadt Theater in New York. Prospering in this undertaking, he built, in 1888, the Harlem Opera House, his first theater. He established several other successful playhouses, among them the New York Theater, the Belasco, and the Victoria.

In 1906, Hammerstein opened the Manhattan Opera House with artists of the first rank as a rival of the well established Metropolitan Opera House. This greatly stimulated operatic interest and production in America, and to Hammerstein is due the credit of establishing French opera in the United States. He built the Philadelphia Opera House In 1908, and, in 1919, opened the London Opera House, which he was compelled to abandon on account of lack of interest in French opera in England. In 1912, he built the American Opera House in New York, which he opened in 1914 as the Lexington Theater.

Hammerstein, Oscar, II (**1895-1960**), librettist for the enormously successful *Oklahoma* and *South Pacific,* and many other musical plays, was born in New York City. He is a grandson of the famed Oscar Hammerstein who introduced the operas *Thaïs* and *Louise* to New York, and who built the London Opera House. Oscar Hammerstein II was graduated from Columbia University and quickly began a brilliant career as author and co-author of some of the most memorable stage productions in American dramatic history. Among them are *Rose Marie* (1924), *Sunny* (1925), which starred Marilyn Miller, and *The Desert Song* (1928), starring Dennis King. In collaboration with Richard Rodgers, the song writer, he produced the Pulitzer prize winners *Oklahoma* and *South Pacific,* and *The King and I,* which opened with the late Gertrude Lawrence in the lead. Hammerstein wrote the lyrics for "Old Man River," "The Last Time I Saw Paris," "Oh, What A Beautiful Morning," and a long list of equally popular songs. His style is marked by a refreshing combination of common idiom and unexpected originality of phrasing.

Hammond, James Bartlett (**1839-1913**), American inventor, was born in Boston. He was graduated at the University of Vermont in 1861; was newspaper correspondent during the Civil War; and was graduated at Union Theological Seminary in 1865. Later, he studied philosophy and science at the University of Halle, Germany, and devoted many years to mechanical experiments. In 1880, he patented a typewriting machine constructed on new scientific principles. In the Hammond typewriter, he introduced the "ideal" keyboard and a device for securing accurate alignment. He placed his machine on the market, 1884, and realized a substantial fortune from its sale.

Hammond, John Hays (**1855-1936**), American mining engineer, was born in San Francisco. He was graduated at the Sheffield Scientific School, Yale, in 1876 and later pursued a mining course at the Royal School of Mines, Freiberg, Saxony. In 1880, he was appointed special expert of United States Geological Survey, examining California gold fields. Later, he became consulting engineer of the Union Iron Works, San Francisco, and of the Central and the Southern Pacific railway. He examined mining properties in all parts of the world. In 1893, he became consulting engineer for Barnato Bros. in South Africa, and later for Cecil Rhodes, of whom he became a strong supporter.

After the Boer War he went to London and became interested in many large mining companies. In 1900, he returned to the United States and became associated with important financial groups, purchasing and promoting extensive mining properties in the United States and Mexico. He was also active in the development of hydroelectric and irrigation projects.

Hammurabi (*hăm'ōō-rä'bē*), king of Babylonia, flourished about 2150 B. C., the sixth of the so-called first dynasty, and seems to have extended his suzerainty over Assyria, whose great cities of Assur and Nineveh he mentions as part of his domain. He became famous as an organizer of his empire, and, in his inscriptions, he makes record of building canals, of granaries for wheat, and of many other constructive undertakings in Babylon and other cities of his domain. In order to establish justice and promote prosperity, he made an extensive classification of the laws embodied in the famous "code of Hammurabi." These laws and many records revealing the social life of Babylonia have been preserved. Hammurabi was one of the greatest of the Babylonian kings.

Hampden (*hăm'dĕn*), **John** (**1594-1643**), English patriot, was born in London. He was graduated at Oxford, studied law, and, in 1621, entered the House of Commons. In 1627, for refusing to pay his proportion of the general loan which the king attempted to raise on his own authority, Hampden was committed to close imprisonment. Subsequently, he was unconditionally liberated by order of council. After the dissolution of the Parliament of 1628–29, he retired to his country estate.

In the Short Parliament of 1640, Hampden took a prominent part in the great contest between the crown and the House of Commons. For his resistance to the king's proceedings, he was one of the five members whom Charles, in 1642, rashly attempted in person to seize in the House of Commons. On the outbreak of the Civil War he raised and became colonel of a regiment in the Parliamentary army under the Earl of Essex. Prince Rupert having attacked a Parliamentary force at Chinnor, near Thame, Hampden put himself at the head of a small troop of cavalry that was rallied in haste to oppose him. In the fight that ensued at Chalgrove Field, Hampden received a wound, of which he died.

Hampden, Walter (**1879-1955**), known in private life as Walter Hampden Dougherty, American actor, was born at Brooklyn, New York. He was educated at Harvard University and the Polytechnic Institute, Brooklyn. His first appearance on the stage was in 1901 at London, where, in the following six years, he acted many classic roles, including that of *Hamlet.* He returned to America in 1907, taking part in many plays, including *A Doll's House, The Servant in the House,* and *Salome.*

Hampton (*hăm'tŭn*), **Wade** (**1818-1902**), American politician and soldier, was born at Columbia, S. C. He was a grandson of General Wade Hampton, and, though op-

posed to secession he joined the Confederate army and raised a force called "Hampton's legion." These troops he led with distinction at the first battle of Bull Run. He subsequently served at Seven Pines, at Antietam, and at Gettysburg. In 1865, he commanded a body of cavalry. He attained the rank of lieutenant general, and was four times wounded. In 1877–79, he was governor of South Carolina; and, from 1879 to 1891, he was United States Senator.

Hamsun (*hăm'sōōn*), **Knut** (**1859-1952**), Norwegian writer, was born at Loni, Norway. Receiving practically no school education, he engaged in farming, was a clerk in a store and post office, and became a teacher. In early life, he spent several years in the United States, and, for a time, he was a street car conductor in Chicago. His experiences in various difficult and unhealthful occupations led him to return to Norway in 1888 with very unfavorable impressions of America which show in his writings.

Hamsun excels in psychological analyses of morbid types, and his style abounds in striking metaphors. His works of fiction include *Hunger*, *Growth of the Soil*, *Pan*, *Mysteries*, *The Woman at the Well*, *Vagabonds*, *August*, and *The Road Leads On*. In 1920, he was awarded the Nobel prize for literature.

Hancock, John (**1737-1793**), American patriot, was born at Braintree, now a part of the city of Quincy, Mass. He was one of the leaders in the revolt in Massachusetts; was very active in denouncing the "Boston massacre"; and was one of the persons whose seizure was attempted by the expedition which led to the battle of Lexington. He was president of the Continental Congress, 1775–77; was governor of Massachusetts, 1780–85 and 1787–93; and was the first signer of the Declaration of Independence. He presided at the state constitutional convention of 1788, and favored the adoption of the Federal Constitution.

Hancock, Winfield Scott (**1824-1886**), American general, was born at Montgomery Square, Pa. After being graduated from West Point in 1844, he served with great gallantry during the Mexican War. Appointed brigadier general of volunteers in 1861, he took part in the campaign on the Potomac, fought at Antietam, and commanded a corps in the battle of Gettysburg, where he was wounded, 1863. In 1864, he became brigadier general in the regular army, and, in 1866, major general. In 1880, he was the unsuccessful Democratic nominee for president.

Hand, Learned (**1872-1961**), eminent American jurist, was born in Albany, N. Y., and was educated at Harvard. He practiced law in Albany before he entered the judicature in 1909 as United States District Judge in New York State. He joined the Second United States Circuit Court in 1924, and served it with great distinction until his retirement in 1951. Learned Hand's profound beliefs on the meaning and the exercise of the law as a beneficial human agency were brilliantly summed up in his book *The Spirit of Liberty*, published in 1952.

Handel (*hăn'dĕl*), **George Frederick** (**1685-1759**), German composer and chief founder of oratorio, was born at Halle, Prussian Saxony, though for almost half a century he resided in England, his adopted country.

In his eighth year, he played for the Duke of Saxe Weissenfels, who was so impressed with his genius that he persuaded Handel's father to renounce his plan of training him for the law and to place him under the instruction of the organist Zachau. Handel now composed cantatas, learned all the orchestral instruments, and familiarized himself with the works of the most celebrated German composers. His education was furthered at the University of Halle, which he entered in 1702. He subsequently took a place in the orchestra of the Hamburg Opera House. Here he composed several operas and various works for the church and gave lessons to many pupils.

In 1707-08, Handel visited Italy. During the first year, he produced his *Rodrigo* at Florence, and his journey was continued with triumphal progress. On his return to Germany in 1709, Handel became chapelmaster at the court of the elector of Hanover.

In 1710, he visited London, where he performed his *Rinaldo* and was charmed with his reception by Queen Anne and the nobility. Compelled by his engagement to return to Hanover, he quitted England only to return in 1712. When, in 1714, his patron, the elector of Hanover, ascended the throne as George I of England, Handel again secured his favor by the composition of a symphony and several instrumental pieces and determined to remain in England. He was appointed musical director to the Duke of Chandos, for whom he composed the celebrated *Chandos Anthems* and his first English oratorio, *Esther*.

He next attempted to place Italian opera upon a firm foundation in London, and, through the Royal Academy of Music, he successfully produced many Italian operas of his own composition. From 1728 to 1734, Handel produced several operas in partnership with Heidegger of the Haymarket Theater. During the following three years, he produced independently at Convent Garden, but he was forced by heavy financial losses to abandon this project.

With shattered health and bankruptcy before him, Handel applied himself to sacred music and his famous oratorios—the works by which he achieved his lasting reputation. *Deborah* was composed in 1733, *Israel in Egypt* in 1738, and his superb masterpiece, the *Messiah*, at Dublin in 1742. Handel became blind in 1751, yet he continued to give concerts of sacred music and to compose.

Handel's art was universal, but he was also greatly influenced by the national spirit of his adopted land. He was in a singular degree the musical expression of the English, who at that time were saturated with biblical ideas and accustomed to public demonstrations of national and patriotic enthusiasm. His music is characterized by grandeur and sublimity. The operas are now seldom performed, but his oratorios hold a place in music similar to that of Shakespeare's plays in English drama. Handel was buried in Westminster Abbey.

Handy, William Christopher (**1873-1958**), American Negro composer and trumpeter, was born at Florence, Ala. Known as "The Father of the Blues" because he made this distinctive type of music available to interpreters and listeners everywhere, Handy began his musical career singing in the Methodist Church of which his father was minister. Following a number of years of teaching and playing in a quartet in Chicago and St. Louis, he joined Mahara's Minstrels as bandmaster and cornet soloist. At length, he settled in Memphis, where he organized his own band.

He published the first of his famous "blues" compositions, "The Memphis Blues," in 1909, and in 1914 wrote "The St. Louis Blues." These were followed by many others, including "The Beale Street Blues" (1917) and "The Atlanta Blues," not to mention his many arrangements of popular songs.

Hanna, Marcus Alonzo (**1837-1904**), American merchant and politician, was born in New Lisbon (now Lisbon), Ohio. He was educated in the Cleveland public schools and at Western Reserve University, leaving college, however, to engage as partner in his father's wholesale grocery house. In 1867, he entered the firm of Rhodes and Company, dealers in coal and iron, and obtained control of mines, furnaces, ships, a bank, the local street car system, and a theater. Entering politics, he soon controlled the Republican party in Ohio, through which he supported William McKinley as governor of Ohio. He later was instrumental in having him nominated as president of the United States and conducted the campaign successfully with an appeal to "property rights."

In 1897, Hanna was appointed to the United States Senate by Governor Bushnell, to fill a vacancy, and, in 1898, he was elected for a full term, serving until his death. See *Standpat Policy*.

Hannah, John Alfred (**1902-**), American educator, was born at Grand Rapids, Michigan. He was educated at the University of Michigan and at the Michigan State College of Agriculture and Applied Science, now Michigan State University. He has been president of the latter institution since 1941, having previously served as secretary of its governing body, the State Board of Agriculture. His educational policy has emphasized "core courses" in a year-round study program. In 1957 President Eisenhower named him as chairman of the Civil Rights Commission.

Hannay, James Owen ("George A. Birmingham") (**1865-1950**), Irish novelist, the son of a Belfast clergyman, was born in the north of Ireland. He received his education at Haileybury, England, and at Trinity College, Dublin. He took orders and was made rector at Westport in 1892, and, in 1912, was made canon of Saint Patrick's Cathedral, Dublin. In 1922, he was made British chaplain at Budapest; two years later he became rector of Mells, England.

In his novels *The Seething Pot*, *Hyacinth*, *The Red Hand of Ulster*, and *Northern Iron*, Hannay made serious studies of contemporary life in Ireland. His later works include *Adventures of Dr. Whitty*, *Irishmen All*, *Eleanor's Enterprise*, *From Dublin to Chicago*, *Gossamer*, *The Island of Mystery*, *The Lady of the Abbey*, *The Runaway*, and *Magilligan Strand*.

Hannibal (**c. 247 B. C. -183 B. C.**), Carthaginian general, the son of Hamilcar Barca, was born about 247 B. C. He remained with his father when the latter was building up in Spain a strong Carthaginian colony to dispute with Rome the mastery of the peninsula. When the boy was nine years old, he took an oath at his father's instance, swearing eternal enmity to Rome. After his father's death, he was employed by his brother-in-law Hasdrubal in military undertakings, and, when Hasdrubal was assassinated in 221, Hannibal was made commander in chief.

Hannibal began his activities against Rome by attacking one of that city's allies, Saguntum. After an eight months' siege, the city was taken, and the Romans

declared war against the Carthaginians in 218. Hannibal took the initiative by setting out to invade Italy immediately with 90,000 foot and 12,000 horse. His passage of the Alps with unprecedented rapidity and in spite of hostile tribes was costly, but it stands as one of the most celebrated exploits in military history.

In Italy, Hannibal forced into his service the Celtic tribes in the north and hastened to meet the Roman forces sent against him. He defeated successively three Roman armies at the river Ticenus, the river Trebia, and Lake Trasimenus. In 216, he virtually annihilated a Roman army of 90,000 men at Cannæ. One Roman counsul was slain, and the city itself remained without effective protection. The victor hesitated, however, to march against the city, waiting to receive the capitulation of various Latin towns throughout Italy. The delay enabled Rome to organize a defense, and most of the Italian towns remained loyal. This miscalculation and the subsequent defeat of re-enforcements under his brother Hasdrubal, at Metaurus river in 207, heralded the failure of Hannibal's enterprise. After maintaining himself in Italy for upward of 15 years, he was recalled to Carthage, whither the Roman general Scipio had led an army of invasion. In the battle of Zama, 202, Hannibal met Scipio and was defeated.

Although his power was broken, he undertook to renew it in order finally to crush Rome. But upon the defeat of Antiochus, whom he had joined at Ephesus, the surrender of Hannibal to the Romans was stipulated as a condition of peace. Foreseeing such a result, he fled to Bithynia, and, seeing no hope of escape, he committed suicide by taking poison.

Hansen, Harry (**1884-**), American literary editor and newspaperman, was born in Davenport, Iowa. A war correspondent in Europe in World War I, he turned to writing about books and was literary editor of the Chicago *Daily News* from 1920 to 1926, a period during which Chicago still retained much of the heady intellectual atmosphere that had helped to inspire such writers as Sherwood Anderson and Theodore Dreiser, and later during the 1920's, helped produce such phenomena as Charles MacArthur and Ben Hecht. Hansen went to New York in 1926. He was book reviewer on the *World* and, after merger, on the *World-Telegram;* in all, he spent twenty-two years on the two papers, besides reviewing for *Harper's Magazine* from 1929 to 1939, and serving for a number of years as editor of the annual O. Henry Prize Stories. Hansen has lectured widely and is the author of many books. Since 1948, he has been editor of the *World Almanac*

Hanson, Howard (**1896-**) American composer and educator, was born at Wahoo, Nebr. He was a fellow of the American Academy in Rome from 1921 to 1924, and on his return was made director of the Eastman School of Music, Rochester, N. Y., a position he has held for more than thirty years. He has served as guest conductor of leading orchestras in this country and abroad. His compositions cover a wide range, including symphonies, symphonic poems, operas, choruses, and other works for particular instruments. His *Merry Mount* (1933) is considered outstanding among American operas.

Hapgood, Norman (**1868-1937**), American editor, author, and critic, was born in Chicago, Ill. He was graduated at Harvard in 1890. He was dramatic critic of the New York *Commercial Advertiser* and of the *Bookman*, 1897-1902. From 1903 to 1912, he was editor of *Collier's Weekly*, and, from 1913 to 1916, he was editor of *Harper's Weekly*, attracting wide attention by the force and versatility of his editorials. He edited *Hearst's International* in 1923-25. His writings include *Literary Statesmen*, *Daniel Webster*, *George Washington*, *Abraham Lincoln*, *The Stage in America*, and *The Advancing Hour*.

Hard, William (**1878-1962**), American writer, was born at Painted Post, N. Y. He was educated at University College, London, and at Northwestern University, Illinois. He was head of the Northwestern University settlement in 1901-02, and, later, was an editorial writer for the Chicago *Tribune*, and a contributing editor for the *Metropolitan Magazine*, the *New Republic*, and other periodicals. He conducted for several years the William Hard service, reporting Washington News for various evening papers, and later became a staff writer for *The Reader's Digest*.

Hardenberg (*här'dĕn-bĕrĸ*), **Karl August von, Prince** (**1750-1822**), Prussian statesman, was born at Essenrode in Hanover. On Beyreuth's union to Prussia in 1791, he became a Prussian minister and, in 1804, first Prussian minister. His policy was to preserve neutrality in the war between France and England; but, in 1806, under Napoleon's influence, he was dismissed. In 1810, he was appointed chancellor, and addressed himself to the task of completing the reforms begun by Stein. In the war of liberation, he played a prominent part, and, after the Treaty of Paris in 1814, was made a prince. He took part in the Congress of Vienna and in the treaties of Paris. To Hardenberg Prussia is mainly indebted for the improvements in her army system, the abolition of serfdom and the privileges of the nobles, the encouragement of municipalities, and the reform of education.

Hardie (*här'dĭ*), **James Keir** (**1856-1915**), British labor leader, was born in Legbrannock, Scotland. He was a worker in the coal mines from the age of 7 to 24; became secretary of a miners' union; edited the Cumnock *News*, 1882–86, and the *Labor Leader*, 1887–1903. He was elected to Parliament in 1892; founded the Socialist Independent Labor party in 1893; and, in 1896, became the leader of the Labor party in the House of Commons. His writings include *Labor Politics*, *From Serfdom to Socialism*, and *After Twenty Years*.

Harding, Warren Gamaliel (**1865-1923**), 29th president of the United States, was born at Corsica (then Blooming Grove), Morrow County, Ohio. He attended Ohio Central College at Iberia, 1879–82. He taught a country school for a year and read law for a short time. In 1884, he entered the newspaper business at Marion, Ohio, and later became editor and publisher of the Marion *Star*.

Encouraged to enter political life by Senator Foraker, Harding was elected to the Ohio senate, 1900–04; was lieutenant governor of Ohio, 1904–06; Republican candidate for governor in 1910; United States senator, 1915–21.

During his term in the Senate, Harding urged preparedness for national defense. He gave his support to the declaration of war against Germany and to all the important war measures, including the Selective Draft Bill and the Espionage Bill. He favored the prohibition amendment and voted for the Volstead Act enforcing war time prohibition, over President Wilson's veto. He stood for the exemption of American shipping from Panama Canal tolls and supported woman suffrage. He was opposed to the Covenant of the League of Nations, favored the Lodge reservations to it, and voted against the ratification of the peace treaty as submitted by President Wilson.

In 1920, at the Republican national convention held in Chicago, he was nominated for president. Strongly opposing the unconditional ratification of the Versailles Peace Treaty, he won overwhelming endorsement at the polls. He received about 7 million more votes than J. M. Cox, his Democratic opponent. The electoral vote was 404 to 127 in Harding's favor.

In his first message to Congress, President Harding urged a "return to normalcy," advocating retrenchment in national expenditures, reduction of war-time taxation, the enactment of an emergency tariff, and the adoption of a national budget system. Upon President Harding's invitation, authorized by Congress, delegates from the leading nations met at an Arms Conference in Washington, November 1921, to consider the reduction of naval armaments and the status of international relations in the Pacific.

Among important legislative and executive enactments supported and approved by President Harding were the declaration of peace between the United States and Germany, the Fordney-McCumber tariff, the restriction of post-war immigration, the restoration of the railways to private control, the refunding of the British war loans, and the withdrawal of American forces from Germany.

In 1923, President Harding made an extensive tour of the western United States, in connection with which he also visited Alaska, with the view of furthering the development of the territory. While returning from this journey, he became ill and died suddenly at San Francisco. He was buried near Marion, Ohio, and, in 1931, a memorial was erected about his grave.

Hardwicke, Sir Cedric (**1893-1964**), British actor and producer, was born at Lye, England. World War I interrupted his stage career, which he resumed as a member of the Birmingham Repertory Company. Some of his most successful roles were in George Bernard Shaw's plays; for example, Cæsar in *Cæsar and Cleopatra* and King Magnus in *The Apple Cart*. He came to America in 1936 and first attracted general notice when he was given the Drama League's 1938 award for his acting in *Shadow and Substance*. In addition to his work in the theater, he did much acting and directing in film plays.

Hardy, Arthur Sherburne (**1847-1930**), American diplomat and author, was born at Boston, Mass. He was graduated at West Point in 1869, served one year in the United States artillery, and was professor of civil engineering, Iowa College, 1871–73. He studied at Ecole des Ponts et Chaussées, 1873–74. From 1874 to 1878, he was professor of civil engineering and, from 1878 to 1893, was professor of mathematics, Dartmouth College. After serving as editor of the *Cosmopolitan Magazine*, 1893–95, he was United States minister to Iran, Greece, Rumania, Serbia, Switzerland, and Spain.

His mathematical works include *Elements of Quaternions*, *Elements of Calculus*, and *Imaginary Quantities*. He is better known, however, for his novels, among which are *But Yet a Woman*, *Diane and Her Friends*, and *No. 13, Rue du Bon Diable*. He wrote also the poetical works *Songs of Two* and *Francesca of Rimini*.

Hardy, Thomas (**1840-1928**), English novelist, was born in Dorsetshire. He was educated as an architect, but,

in 1868, gave up his profession to devote himself to literature, and won a high place among modern writers of fiction. He achieved his first success in *Far from the Madding Crowd*, published anonymously in 1874 and generally attributed to George Eliot. *The Return of the Native* and *The Woodlanders* are usually considered his masterpieces, but his later novels, *Tess of the D' Urbervilles* and *Jude the Obscure* more accurately embody his mature style and spirit. He combined the technique of the Victorian writers with a frank objectivity which was more characteristic of his younger contemporaries. Hardy's numerous works include *Desperate Remedies, Under the Greenwood Tree, Life's Little Ironies, The Pursuit of the Well-Beloved, Poems of the Past and the Present, The Dynasts, Time's Laughingstocks and Other Verses, Satires of Circumstance, Moments of Vision,* and *Late Lyrics.* He was buried in Westminster Abbey.

Hargreaves (*här'grēvz*), **James** (**c.1745-1778**), English mechanic and inventor, was born probably at Blackburn. He was an illiterate weaver and carpenter of Stanhill, near Blackburn. In 1760, he invented a carding machine and, about 1764, the spinning jenny, although the first machine of the latter type was not known to the public until 1867. His fellow spinners, prejudiced against machinery, broke into his house and destroyed his frame in 1768. He removed to Nottingham, where he erected a spinning mill, but his patent proved invalid. He continued to carry on business as a yarn manufacturer until his death.

Harkness, Edward Stephen (**1874-1940**), American philanthropist, was born at Cleveland, Ohio, and was graduated from Yale University in 1897. Inheriting a fortune from his father, he made many gifts to colleges, hospitals, and museums. He served as a trustee of the Metropolitan Museum and the Presbyterian Hospital in New York, and the Commonwealth Fund, founded by his mother, Mrs. Stephen V. Harkness, in 1918. He expanded the endowment of the fund, and in 1918 founded the Pilgrim Trust for the benefit of Great Britain. Substantial grants from this trust have been made for the repair of ancient buildings, ecclesiastical and secular, the preservation of historical records, the support of learned societies, the purchase of works of art, and the assistance of social welfare schemes.

Harlan (*här'lăn*), **John Marshall** (**1833-1911**), American jurist, was born in Boyle county, Ky. He was graduated at Centre College, Ky., in 1850 and studied law at Transylvania University. After practicing at Frankfort, Ky., he was elected county judge in 1858. He removed to Louisville in 1867 and practiced law there. He served as colonel in the Union army, 1861–63; was attorney general of Kentucky, 1863–67; and then returned to practice. He was a member of the Louisiana commission in 1877 and one of the American arbitrators on the Bering Sea tribunal, which met in Paris in 1893. In 1877, he became associate justice of the United States Supreme Court.

Harlan, John Marshall (**1899-**), lawyer and grandson of Justice Harlan, was born in Chicago. He was educated at Princeton (1920), Balliol College, Oxford (1923), and New York Law School (1924). Admitted to the New York bar in 1924, he served as assistant U. S. attorney for the Southern District of New York 1925–27, and assistant attorney general of New York 1928–30, 1951–53. During World War II he served overseas as colonel with the United States Army Air Force. He was a member of a New York City law firm from 1932 until he was made associate justice of the United States Supreme Court in 1955.

Harley, Robert. See *Oxford, Robert Harley, Earl of.*

Harnack (*här'näk*), **Adolf** (**1851-1930**), German Church historian, was born in Dorpat, Estonia. He studied at Dorpat University, 1869–72, became professor of church history at Leipzig in 1876, at Giessen in 1879, at Marburg in 1886, and at Berlin in 1889. His strong and inspiring personality attracted to his lectures many hundreds of students from Europe and America. His writings include many standard works on theology, among the most important of which are, entitled in their English translations, *What is Christianity?* and *History of Dogma.*

Harnett, William Michael (**1848-1892**), still-life artist. Born in Cloakilty, near Cork, Ireland, he was brought to Philadelphia when a child. Trained as an engraver, he studied at the Pennsylvania Academy of Fine Arts and afterwards in New York. He went to Germany in 1878, where he remained four years, studying in Frankfort and Munich. Too poor to employ a model, he painted still-lifes. Neglected for more than half a century after his death, he has come to be recognized as one of America's greatest still-life painters.

Haroun-al-Raschid (**c.765-809**), (*hă-rōōn'ăl-rā'shēd*) caliph of Baghdad, the fifth of the Abbasside dynasty, became caliph in 786. He invaded Greece and obtained from the empress Irene 70,000 gold dinars. He was successful also in numerous Byzantine wars, and, in 801, he sent presents to Charlemagne. With the help of the Barmecides Jahia and Jiaffar, whom he murdered later in 803, he raised Baghdad to unprecedented eminence in learning, commerce, and splendor. He is a character in the *Arabian Nights* and in other Oriental tales.

Harper, William Rainey (**1856-1906**), American educator and Hebrew scholar, was born in New Concord, Ohio. He was graduated at Muskingum College in 1870 and received the degree of doctor of philosophy at Yale University in 1875. He was instructor in Masonic College, Macon, Tenn., and in the preparatory school of Denison University until 1879, when he became professor of Hebrew, Baptist Union Theological Seminary, Chicago, where he developed a method of teaching Hebrew by correspondence. From 1886 to 1891, he was professor of Semitic languages at Yale. He was then made first president and head of Semitic languages at the University of Chicago and occupied this chair and office until his death.

Harper was one of the foremost American Hebraists, and, in addition to high scholarship, possessed great ability as an organizer and administrator. The rapid and substantial growth of the University of Chicago was due largely to his constructive leadership. The Harper Memorial Library was erected in his honor. He is the author of many textbooks and philological papers, founded and edited several publications, and extended the work of the university by offering correspondence instruction.

Harriman, Edward Henry (**1848-1909**), American capitalist and railroad administrator, was born at Hempstead, N. Y. At 14 he became a broker's clerk in Wall Street and later a stockbroker on his own account. He became president of the Southern Pacific railway, reorganized it and placed it on a prosperous footing. This success led to the acquisition of other large holdings. His contest, in 1909, with James J. Hill for railway control precipitated a financial crisis in Wall Street and led to increased government regulation of railroads.

Harriman, W(illiam) Averell (**1891-**), American business man and diplomat, the son of Edward H. Harriman. Graduating from Yale, he succeeded to his father's business position. After serving at Washington he was sent to Great Britain and later to Russia to arrange for lend-lease aid. He was ambassador to Russia and later to Great Britain, 1943-46. He was secretary of commerce, 1946-48, resigning to become chief European representative of the Economic Cooperation Administration. In 1950 he left his post as roving ambassador for the E C A to become special assistant to President Truman. In 1954 he was elected governor of New York. In 1956 he was defeated by Adlai Stevenson for nomination for president on the Democratic ticket. He was governor of New York until 1958, but was defeated for re-election by Nelson Rockefeller. In 1961 he was made assistant secretary of state for Far Eastern Affairs.

Harris, Frank (**1856-1931**), Irish American novelist and biographer, was born at Galway, Ireland. Coming to America, he studied at the University of Kansas and became a naturalized citizen. He later took up his residence in England and edited various literary journals, including the *Saturday Review.* He gathered about him a group of writers who later became famous, including George Bernard Shaw and Max Beerbohm. His numerous writings include several volumes of Shakespeare studies; two volumes of stories, *The Veils of Isis* and *Undream'd of Shores; The Life and Confessions of Oscar Wilde;* and *My Life and Loves.* The frankness of the last named work led to its suppression in England and the United States.

Harris, Joel Chandler (**1848-1908**), American author, was born in Eatonton, Ga. He served an apprenticeship to the printing trade, and, for 25 years, was one of the editors of the Atlanta *Constitution.* Here he produced his Afro-American folklore studies which brought him world-wide popularity. His *Uncle Remus* tales have become classic, and no writer has more charmingly pictured the humorous and imaginative side of Negro character.

Among his many books are *Uncle Remus: His Songs and His Sayings, Nights with Uncle Remus, Mingo, Little Mr. Thimblefinger, Mr. Rabbit at Home, Stories of Georgia, Tales of the Home Folks, Evening Tales, Chronicles of Aunt Minervy Ann, On the Wings of Occasion, Gabriel Tolliver, Wally Wanderoon,* and *The Tar-Baby and Other Rhymes.* In 1905, he was elected a member of the American Academy of Arts and Letters. See *Br'er Rabbit.*

Harris, Robert (**1849-1919**), Canadian painter, was born in the Vale of Conway, North Wales. He received his education at Prince of Wales School, Charlottetown, Prince Edward Island, and became a land surveyor. After practicing as a self-taught painter for a time, he studied under Legros in London and with Bonnat in Paris. Following a period of travel in Italy and other European countries, he located in Toronto but soon removed to Montreal, where he was director of the art school,1883-87. He became an original member of the Canadian Royal Academy in 1884 and is known chiefly as a genre and por-

trait painter. Among his best-known works are "The Fathers of the Confederation," in the Parliament Building, Ottawa, "The School Trustees," in the National Gallery, and "A Man of Small Importance," in the Montreal Museum.

Harris, William Torrey (**1835-1909**), American educator and philosophical writer, was born at North Killingly, Conn. He entered Yale with the class of 1858, but was not graduated. From 1867 to 1880, he was superintendent of the Saint Louis public schools. He was an ardent Hegelian and contributed much to make Hegelian philosophy influential in America. In 1867, he established the *Journal of Speculative Philosophy*. He edited the department of philosophy in *Johnson's Cyclopædia*, writing many important articles, and was editor in chief of *Webster's New International Dictionary*.

In the field of education, Harris was one of the most vigorous American advocates of Froebel's principles. Under his leadership, assisted by Miss Susan Blow, the kindergarten was first made a part of the public school system in Saint Louis in 1873. As United States commissioner of education for 17 years, beginning in 1889, he rendered distinguished service. His works include *Introduction to the Study of Philosophy*, *The Spiritual Sense of Dante's Divina Commedia*, *Hegel's Logic*, and *Psychologic Foundation of Education*.

Harrison, Benjamin (**1833-1901**), 23d president of the United States, was born in North Bend, Ohio. He was a great-grandson of Benjamin Harrison, signer of the Declaration of Independence, and grandson of William Henry Harrison, 9th president of the United States. He was graduated at Miami University in 1852 and studied law in Cincinnati. He removed to Indianapolis, Ind., in 1854, and laid the foundation of a lucrative legal practice. Entering the Union army in 1862, he served with conspicuous gallantry in the Atlanta campaign, finally returning to civil life at the close of the war with the rank of brevet brigadier general.

In 1881, he entered the United States Senate and, in 1888, was nominated for the presidency of the United States by the Republican national convention. He was elected in the ensuing November and was inaugurated in 1889. His administration was quiet, successful, and measurably popular. It was marked by the amicable settlement of a dispute with Chile and by the passage of the McKinley Tariff Bill. In 1892, he again received the nomination in the national Republican convention. By this time, however, the able and persistent attacks of the Democrats on the high tariff policy led to a general repudiation of it, and, at the election, he was defeated by Grover Cleveland. He was the chief representative of the United States at the Hague Conference, 1899.

Harrison, John (**1693-1776**), British inventor, was born at Foulby. By 1726, he constructed a timekeeper with compensating apparatus for correcting errors due to variations of climate. In 1713, the government had offered three prizes for the discovery of a method to determine the longitude accurately. After long perseverance, Harrison invented and constructed a chronometer which, in a voyage to Jamaica in 1761-62, determined the longitude within 18 geographical miles. After further trials, he was awarded the largest prize of £20,000. He made other inventions and improvements for timepieces.

Harrison, Thomas Alexander (**1853-1930**), American landscape painter, was born in Philadelphia, 1853. He studied art at the Pennsylvania Academy of Fine Arts in his native city and later under Gérôme and Bastien-Lepage in Paris. He became noted for his fine marine paintings. After many visits to the United States, he finally established himself in Paris, where he attained high rank among the American group of artists. In America he is represented by "Castles in Spain," in the Metropolitan Museum, New York; "Amateurs," in the Art Institute, Chicago; "Twilight," the Saint Louis Museum; and "The Great Mirror" and "Marine" in the Wilstach collection, Philadelphia. His "Arcady" and "Solitude" are in the Luxembourg Museum, Paris. Among his other important works are "Setting Sun," "Golden Sands," and "Caressing Waves." With Winslow Homer and C. H. Woodbury, he ranks among the leading American marine painters.

Harrison, William Henry (**1773-1841**), 9th president of the United States, was born in Virginia, son of Benjamin Harrison, who signed the Declaration of Independence. In 1791, he joined the army which Wayne was leading against the Indians of the Northwest and served until 1798. In 1801, he became governor of Indiana territory, and, as its representative in Congress, succeeded in passing a law relating to the sale of the Federal land in sections or parts of sections. To this act the Western states owe much of their prosperity.

In the war against the Indians in 1811, which soon became also a war against the English in Canada, Harrison, as commander in chief of the American army, showed great military talent. He defeated the Indians in an important battle at Tippecanoe, and, by the victory of Perry on Lake Erie, was enabled to pursue the British invaders into Canada, where, in 1813, he totally routed them in the battle of the Thames. In 1814, he resigned his commission in the army; in 1816, he was elected to Congress; and, in 1825, became a member of the United States Senate. The Whig party tried in vain to make him president of the United States in 1836, and succeeded in 1840. He died after serving one month.

Hart, Albert Bushnell (**1854-1943**), American educator and historian, was born in Clarksville, Pa. Graduated at Harvard in 1880, he received the degree of doctor of philosophy from the University of Freiburg in Baden, Germany, in 1883. He was successively instructor, assistant professor, and professor of history in Harvard University from 1883 to 1910. From 1910 to 1926, he was professor of government. He became prominent as a leader in developing the method of studying history direct from original sources. Among his numerous works are *Formation of the Union*, *Practical Essays on American Government*, *Studies in American Education*, *Foundations of American Foreign Policy*, *Slavery and Abolition*, *The Southern South*, *The Monroe Doctrine*, *America at War*, and *We and Our History*.

He was editor of *Epochs of American History*, *Source-Book of American History*, *The American Nation*, and other works. He was joint editor of *American History Leaflets* and the *Cyclopædia of American Government*.

Harte (*härt*), **Francis Bret** (**1839-1902**), American poet and novelist, was born in Albany, N. Y. He was at different times a miner, school teacher, printer, and editor. From 1864 to 1870, he was secretary of the United States mint at San Francisco. From 1868 to 1871, he edited the *Overland Monthly*. In 1870, he published his famous poem "The Heathen Chinee." He was appointed American consul at Crefeld in 1878, at Glasgow in 1880, and, after leaving Glasgow in 1885, he lived in London. His most widely known stories and poems depict frontier life on the Pacific slope ln the early gold mining days. He was a realist and portrayed life with great vividness and vigor.

In his best stories, *The Luck of Roaring Camp*, *The Outcasts of Poker Flat*, and *Tennessee's Partner*, Harte introduced an entirely new type of fiction, which became immensely popular. In his later work he did not sustain his early success. Among his other writings are *Tales of the Argonauts*, *A Millionaire of Rough and Ready*, *Devil's Ford*, and *A Ward of the Golden Gate*. See *Luck of Roaring Camp*.

Hartmann (*härt'män*), **Karl Robert Edouard von** (**1842-1906**), German philosopher, was born at Berlin. He served as an artillery officer from 1861 to 1865. From 1867 until his death, he lived in Berlin, working out his philosophical scheme, a synthesis of Hegel, Schelling, and Schopenhauer, in which "the Unconscious" plays the role of creator and providence. His great work was *The Philosophy of the Unconscious*. This was followed by books on the ethical consciousness, the development of the religious consciousness, German æsthetics, Lotze, and Kant, besides a work on the self-destruction of Christianity, criticisms of Neo-Kantianism and contemporary philosophies, defenses of his own system, and political and educational treatises. He was a pessimist as regards the inevitable misery of existence, but an optimist as champion of evolutionary progress.

Harvard, John (**1607-1638**) founder of Harvard College, was born in Southwark, England. He was graduated at Emmanuel College, Cambridge, in 1631, and, in 1637, was married and came to America. He was made a freeman of Massachusetts, and received a tract of land in Charlestown, where he began preaching as a Congregational minister. He bequeathed about £400 and about 300 volumes from his library for the establishment of a college. This was added to £400 which the colony in 1636 had voted to establish "a schoale or colledge," which, in 1637, was ordered to be at "New Towne." In 1638, the town was named Cambridge, and, in 1639, the school was named Harvard College.

Harvey, Edmund Newton (**1887-1959**), American physiologist, was born in Philadelphia. Educated at the University of Pennsylvania and Columbia University, he was instructor in physiology, 1911–15, assistant professor, 1915–19, professor from 1919 to 1933, when he was made H. F. Osborn professor, at Princeton University. He made extensive researches in bioluminescence, regulation in plants, cell permeability, and nerve conduction. In 1920, he published a valuable work entitled *The Nature of Animal Light*.

Harvey, George Brinton McClellan (**1864-1928**), American editor and diplomat, was born at Peacham, Vt. He was educated at Peacham Academy, entered journalism, and, during the period 1882–86, was reporter for several leading newspapers. In 1890–91, he was insurance commissioner of New Jersey. From 1891 to 1893, he was

managing editor of the New York *World*. During the period 1894–98, he was the constructor and president of various electric railways. In 1899, he purchased and became editor of the *North American Review*, and, in 1903, he bought the *Metropolitan Magazine*. He edited *Harper's Weekly* from 1902 to 1913. Harvey is said to have been the first to suggest Woodrow Wilson as a presidential possibility. He later became one of Wilson's bitterest critics. In 1921, he was appointed ambassador to England and served until his resignation in 1923. His writings include *Women* and *The Power of Tolerance and Other Speeches*.

Harvey, William (1578-1657), English anatomist and discoverer of the circulation of the blood, was born at Folkestone, England. He was graduated at Cambridge University in 1597. The next four years he spent at Padua, Italy, in the study of medicine under Fabricius, Casserius, and Galileo.

Harvey married in 1604 and settled down to the practice of medicine in London. He devoted himself assiduously to his professional duties and rose rapidly to distinction. When, in 1615, he was chosen lecturer on anatomy and surgery to the College of Physicians, he began to expound orally his views on the action of the heart and the motion of the blood through all parts of the body in a continuous circle.

It was not until 1628 that he gave wider publicity to his discoveries by the appearance at Frankfort on the Main of his *Treatise on the Motion of the Heart and Blood*. Harvey availed himself of the discovery, made by Fabricius, of the valves in the veins, which favor the flow of blood in a special direction. He then showed the precise manner in which the mechanism worked. It was the first application of the laws of mechanical science to biology. Being at variance with current and long-accredited notions, Harvey's inferences were at first unanimously rejected by the authorities of continental Europe.

Though his scientific inquiries led to the decline of his general practice, Harvey's reputation grew steadily at court and in the world at large. He was physician to James I and later to Charles I. In 1636, at Nuremberg, he met Hoffmann, the chief opponent of his theory, and demonstrated conclusively its anatomical particulars and necessary conclusions.

Oxford University conferred upon Harvey an honorary degree, and, in 1645, he was made warden of Merton College. In 1651, he published his *Treatise on Generation of Animals*. This was a new field, in which he presented a mass of carefully classified observations on the reproduction of human beings and other animals. He was one of the first to perceive the relations between the simplest and the most highly organized beings and, by means of the simplicity of structure and function of the lower orders, to explain the complexity of the others.

In 1654, he was elected president of the College of Physicians, but he declined the office on account of his age. He died in London.

Hassam, Childe (1859-1935), American artist, was born in Boston. He was educated in Boston public schools and studied art in Boston and under Boulanger and Lefebvre in Paris, 1886–89. He exhibited widely in this country and in Europe, and followed generally the methods of the French impressionist school. His pictures are represented in many American galleries. Among his most important works are "Evening Bells," "The Little June Idyll," "Winter," "Manhattan's Sunset Towers," "Aphrodite," "Lorelei," and "The Summer Sea." He was elected to the American Academy of Arts and Letters in 1920.

Hastie, William Henry (1904-), American Negro jurist, was born at Knoxville, Tenn. He was graduated from Amherst College in 1925 and from Harvard Law School in 1930. After engaging in the general practice of the law, he was, in 1933, made assistant solicitor of the Department of the Interior. In 1937, he was named district judge of the Virgin Islands, where he served two years. Returning to the United States, he was from 1939 to 1946 dean of Howard University School of Law. He was then appointed governor of the Virgin Islands, serving from 1946 to 1949. In 1949, he was appointed judge of the U. S. Circuit Court of Appeals.

Hastings, Thomas (1860-1929), American architect, was born in New York City, 1860. He was graduated from the Ecole des Beaux-Arts, Paris, in 1884, and at once entered into partnership with J. M. Carrère, forming the firm of Carrère and Hastings. Among the notable buildings designed by them jointly are the Ponce de Leon and Alcazar hotels at Saint Augustine, Fla.; the Edison Building, the Century Opera House, and the New York Public Library, New York City; and the Senate Office Building at Washington, D. C. Hastings was elected a member of the American Academy of Arts and Letters and was made chevalier of the Legion of Honor.

Hastings, Warren (1732-1818), English statesman and administrator, was born at Churchill, Oxfordshire. He went to Bengal as a writer in 1750, and, seven years later, was appointed agent of the East India Company at the court of the nabob of Bengal. In 1764, he returned to England, where he remained four years studying Eastern literature. On his return to India, he became a member of the council of Madras and, in 1772, governor of Bengal. an office which, in 1774, became that of governor general of India. He was continuously involved in quarrels with his council, which seemed determined upon his downfall. In order to obtain money, he took measures against the rajah of Benares and the nabob of Oudh, which were afterward charged against him, but he left the affairs of the company in a very prosperous condition.

Three years after his return to England, he was impeached before the Lords for high crimes and misdemeanors, but, after a trial which proceeded at intervals for seven years and in spite of the eloquence of Burke and Sheridan, he was acquitted in 1795. He was ruined by the expense, but was granted an annuity by the East India Company. To him the British government is largely indebted for its political and judicial organization in India and for its method of Indian administration.

Hatcher, Harland Henthorne (1898-), American writer and educator, was born at Ironton, Ohio. After he was graduated from Ohio State University in 1922, he became an instructor in English there (1922-28), then assistant professor (1928-32), and professor (1932-44). He was dean of the College of Arts and Sciences from 1944 to 1948, and vice president from 1948 to 1951. In the latter year, he was made president of the University of Michigan.

Among the books he has written about Ohio and the Northwest Territory are *Buckeye Country* (1937), *Lake Erie* (1945), *The Western Reserve* (1949), and *A Century of Iron and Men* (1950). Before turning to non-fiction, Dr. Hatcher had published three novels, *Tunnel Hill* (1931), *Patterns of Wolfpen* (1934), a poetic novel of Kentucky hill folk, and *Central Standard Time* (1937).

Hauptmann (*houpt'män*), **Gerhart (1862-1946)**, German dramatist and novelist, was born in Obersalzbrunn, Silesia. At 18, he decided to become a sculptor and studied at Breslau and Jena, and later in Italy. In 1885, he settled in Berlin and devoted himself to literary work. His first play, *Before Dawn*, inaugurated a new dramatic movement in Germany and brought him wide reputation. This was followed by *The Festival of Peace*, *Lonely Lives*, and *The Weavers*, which reflect the influence of Zola, Ibsen, and Tolstoy in their realistic protest against social conditions in a capitalistic and militaraistic state.

In *The Sunken Bell*, his best-known work, which he calls a "fairy drama," in *Florian Geyer*, and in *Hannele*, he changed from naturalism to mysticism. By these and many other powerful plays, he attained the foremost rank in German drama, and is recognized as one of the finest poets and strongest novelists of modern times. His works include *Drayman Henschel*, *The Rats*, *Pippa Dances*, *The Bow of Odysseus*, *Atlantis*, *The Heretic of Soana*, and *The Island of the Great Mother*. He was awarded the Nobel prize for literature in 1912. See *Sunken Bell*.

Havelock (*hăv'lŏk*), **Sir Henry (1795-1857)**, English general, was born at Bishop Wearmouth, in Durham. He entered the army a month or two after the battle of Waterloo; went to India in 1823; and honorably distinguished himself in the Afghan and Sikh wars.

On the outbreak of the Indian mutiny in 1857, Havelock was directed to organize a small movable column at Allahabad and to push on to the relief of the British at Lucknow. He made a forced march to Futtehpur, where, at the head of 2000 men, he engaged and broke the rebels. He continued his march upon Cawnpore and twice defeated the enemy. The consequence of the latter victory was the massacre of all the European women and children in the hands of Nana Shahib. After fighting eight battles with the rebels, in all of which he was victorious, his little army found itself so thinned by fatigue and sickness that it was obliged to retire upon Cownpore.

Early in September 1857, General Outram arrived with re-enforcements, and Havelock again advanced to the relief of Lucknow. The army fought its way with desperate bravery through streets of houses, each forming a separate fortress, until they gained the British residency, to the indescribable joy of the beleaguered garrison. The victorious army was now in turn besieged, but held its own until November, when Sir Colin Campbell (Lord Clyde) forced his way to its rescue. Havelock died five days after the relief.

Hawkins, Sir Anthony Hope (1863-1933), English novelist, widely known as "Anthony Hope," was born in London. He was educated at Marlborough and at Balliol College, Oxford, and was admitted as a barrister of the Middle Temple, 1887. In 1894, he achieved immense popular success with his *Prisoner of Zenda*, which ran to 60 editions in 20 years. His other works, similarly semimodern and semiromantic, include *The God in the Car*, *The King's Mirror*, *Tristram of Blent*, *The Intrusions of Peggy*, *A*

Servant of the Public, *Second String*, and *Lucinda*. He was knighted in 1918.

Hawkins, Sir John (**1532-1595**), English naval commander, was born at Plymouth. He followed the sea from an early age, making several voyages to the Canaries before 1561. Between 1562 and 1567, he made voyages to the west coast of Africa, taking Negro slaves to the West Indies and South America and exchanging them for merchandise. In 1568, his fleet of six ships, one of which was commanded by Francis Drake, was attacked by a large Spanish fleet in the harbor of Vera Cruz, Mexico; but Hawkins and Drake succeeded in escaping with two ships. Hawkins was elected to Parliament in 1572 and, in 1573, was made treasurer of the navy. In 1588, as rear admiral commanding the *Victory*, he took part in the defeat of the Spanish armada and was knighted for bravery in action. In 1595, he accompanied Sir Francis Drake on a voyage to the West Indies and died at sea off Puerto Rico.

Hawthorne, Nathaniel (**1804-1864**), American novelist, was born at Salem, Mass. He was graduated at Bowdoin College in 1825 and, three years later, published his first novel, *Fanshawe*. He then wrote a number of stories for the journals, which he afterward collected and published under the title of *Twicetold Tales*. In 1843, he took up his residence in the village of Concord, in a manse which had formerly been the dwelling of William Emerson and which suggested the title of his next work, *Mosses from an Old Manse*, published in 1843. These sketches, in which he gives some interesting recollections of his boyhood, first made his name known in Europe.

In 1842, he published *The Liberty Tree* and, in 1845, *The Journal of an African Cruiser*. After a three years' residence at Concord, he accepted a place in the customhouse at Salem and removed to that city. This, however, did not stop his literary work. His masterpiece, *The Scarlet Letter*, appeared in 1850 and was received with universal approbation, as was likewise *The House of the Seven Gables*, published in 1851. His *Blithedale Romance*, published in 1852, may be regarded as a kind of autobiography and is founded on incidents in his own life. In 1853, he was appointed consul at Liverpool by his friend President Pierce, whose life he had written.

Hawthorne resided in Liverpool discharging the duties of his office for five years and afterward went to Italy to recruit his impaired health. This journey furnished him with material for his fantastic romance *The Marble Faun*, generally regarded as one of the best of his works. After his return to America, he published a sketch of England and the English.

As a writer, Hawthorne combined a true poetic spirit with a charming style and displayed a deep knowledge of human nature. As a character analyst, no early American writer excels him and he holds a place in the foremost rank among American novelists. He was elected to the American Hall of Fame in 1900. See *Marble Faun*, *Scarlet Letter*, *Twicetold Tales*.

Hay, John (**1838-1905**), American statesman and writer, was born in Salem, Ind. He was graduated from Brown University, 1858, and settled in Illinois as a lawyer. He went to Washington in 1861 as one of Lincoln's private secretaries. He served under generals Hunter and Gillmore and was subsequently in the United States diplomatic service, stationed at Paris, Vienna, and Madrid. In 1897, he was made ambassador to England and, in 1898, became secretary of state.

As secretary of state, Hay inaugurated the "open door" policy for all nations, in China, and laid the foundation for subsequent diplomatic relations with the Orient. In coolness, foresight, and statesmanlike appreciation of current and coming events, he had no superior among contemporary diplomats. His literary reputation rests upon *Pike County Ballads; Castilian Days*, a volume of travel; and the *Life of Abraham Lincoln*, of which he was coauthor with J. G. Nicolay. He was one of the seven original members of the American Academy of Arts and Letters.

Hayden (*hā'd'n*), **Ferdinand Vendeveer** (**1829-1887**), American geologist, was born in Westfield, Mass. He was graduated at Oberlin College. Prior to the Civil War, in which he served as a surgeon, he explored the Bad Lands of Dakota in search of fossils of extinct animals. After spending the years from 1865 to 1872 as professor of geology in the University of Pennsylvania, he acted as director of the territorial survey and, after 1879, as a geologist on the United States Geological Survey. His explorations in Dakota, Wyoming, Colorado, and Utah had, as a direct result in addition to their scientific value, the establishment of Yellowstone Park.

Haydn (*hā'd'n; G., hī'd'n*), **Joseph** (**1732-1809**), Austrian composer, was born at Rohrau, Austria, the son of a poor wheelwright. He early manifested great musical talent and was received at the age of eight into the choir of the Cathedral of Saint Stephen's at Vienna. Subsequently Metastasio introduced him to the celebrated singer Porpora, who employed Haydn to accompany him on the piano during his singing lessons and from whom Haydn obtained the instruction in composition he so anxiously desired. In 1760, Prince Paul Esterházy placed him at the head of his private chapel. For him and his successor Nicholas Esterházy, Haydn composed his beautiful symphonies and the greater number of his magnificent quartets. He is often called "Father Haydn," as having been the inventor of the symphonic form essentially as we now know it.

After the death of Prince Nicholas Esterházy in 1790, Haydn accompanied Salomon, the violinist, to England, where, in 1791-92, he produced six of his "Twelve Grand Symphonies." In England, he first obtained that recognition which afterward fell to his share in his own country. On his return to Austria, he purchased a small house with a garden in one of the suburbs of Vienna. Here he composed his oratorios, the *Creation* and the *Seasons*. The former work, the harmonies of which are pervaded with the fire of youth, was written in his 65th year.

Hayes, Helen (**1900-**), American actress, was born at Washington, D. C. She was educated at the Sacred Heart Academy, Washington, and took part with the Columbia players in local performances. She toured with John Drew and acquired a reputation as an actress with unusual gifts. Among her more successful plays in which she starred were *Dear Brutus*, *Bab*, *Mary of Scotland*, *Victoria Regina*, and as Viola in Shakespeare's *Twelfth Night*. In motion pictures she played the title role in *The Sin of Madelon Claudet*, her acting being recognized by the award of a gold statuette by the Motion Picture Academy of Arts and Sciences in 1932. She later appeared with conspicuous success in the film version of Sinclair Lewis's *Arrowsmith*. She married Charles MacArthur in 1928.

Hayes, Patrick Joseph (**1867-1938**), American prelate, was born in New York City. He was educated at Manhattan College, New York, and at the Catholic University of America. Having been ordained a Roman Catholic priest in 1892, he acted as president of Cathedral College from 1903 to 1914, when he was consecrated auxiliary bishop of New York. In 1917, he was made Catholic chaplain bishop for the American army and navy. He became archbishop of New York in 1919 and cardinal in 1924. He lent his influence to the furtherance of social and industrial reforms.

Hayes, Roland (**1887-**), American Negro singer, was born at Curryville, Ga. Working his way through Fisk University, he first took singing lessons from a teacher in Chattanooga, Tenn., who encouraged him to continue the cultivation of his voice, a rich tenor. He studied singing further in Boston and in Europe. In 1916, he conducted his own concert tour in the United States winning great applause for his interpretations of classic songs and Negro spirituals. In 1921, he went to Europe, appearing with great success in the leading cities. He later returned to America and sang with the Boston, Philadelphia, Detroit, and New York symphony orchestras.

Hayes, Rutherford Birchard (**1822-1893**), 19th president of the United States, was born at Delaware, Ohio. He was graduated at Kenyon College and at Harvard Law School, and began the practice of law at Fremont in 1845. He removed in 1849 to Cincinnati, where he was city solicitor, 1858–61. At the outbreak of the Civil War, he was appointed major of infantry, and shortly afterward he became lieutenant colonel. He distinguished himself in the campaigns of West Virginia, and in the battles around Winchester, and was severely wounded at South Mountain. In 1864, he was made brigadier general and, in 1865, was brevetted major general.

Hayes was elected to Congress from Ohio, 1864–66, and was governor of that state, 1868–72 and 1876–77. He was the Republican candidate for the presidency in 1876 and, after a memorable contest with Samuel J. Tilden, was inaugurated in 1877. As chief magistrate, his career was marked by moderation and wisdom. He favored civil service reform and sought to heal the wounds of the Civil War by withdrawing Federal troops from the South.

Hayne (*hān*), **Paul Hamilton** (**1831-1886**), American poet, was born at Charleston, S. C. He was educated at South Carolina College and studied law, but gave up practicing to follow his literary bent. Between 1850 and 1855, he edited *Russell's Magazine* and made notable contributions to the *Southern Literary Messenger*. He became a prominent figure in a brilliant literary group led by William Gilmore Simms, and he published, between 1855 and 1859, three volumes of poems During the Civil War, in which he engaged in active service, he suffered the loss of health and fortune, and his library was burned. In 1865, he removed to a small cottage home near Augusta, Ga., which he named Copse Hill, and there he continued literary work in partial invalidism. Hayne belongs in the first rank of Southern poets, and his graceful verse reflects the spirit of the land and the people. His books include *Legends and Lyrics* and *The Mountain of the Lovers*.

Hayne, Robert Young (**1791-1839**), American statesman, was born in South Carolina. He was admitted to the

bar in 1812; served in the war with Great Britain; and, at its close, returned to his practice in Charleston. He sat in the United States Senate from 1823 to 1832. He was a vigorous opponent of protection and, in 1832, boldly supported in Congress the doctrine of nullification. The great debates between Daniel Webster and Hayne on the principles of the Constitution, the authority of the general government, and the rights of the individual states are of unusual historical value. In November 1832, South Carolina adopted an ordinance of nullification; in December, Hayne was elected governor, and the state prepared to resist the Federal power by force of arms. A compromise, however, was agreed upon, and the ordinance was repealed. He was mayor of Charleston, 1835–37. See *Nullification, Right of.*

Hays, William Harrison (1879-1954), American administrator, was born at Sullivan, Ind. He was educated at Wabash College and practiced law for several years. Having served as a director of the People's State Bank at Sullivan, Ind., and the chairman of numerous committees of the Republican party, he was appointed postmaster general in the cabinet of President Harding. From 1922 to October 1945 he was president of the Motion Picture Producers and Distributors of America.

Hazen, Charles Downer (1868-1941), American historian, was born at Barnet, Vt. Educated at Dartmouth, Johns Hopkins, and various European universities, he occupied a chair in history at Smith College, 1894–1914, and in 1916, became professor of history at Columbia University. His *Modern Europe,* following a number of other able historical works, established him in the foremost rank of American historical writers.

Hazlitt (*hăz'lĭt*), **William (1778-1830),** English essayist and critic, was born in Kent. In 1802, he visited Paris and studied in the Louvre. On his return, he attempted to support himself by portrait painting; but, as he could please neither himself nor his patrons, he relinquished the easel and devoted himself to literature, for which he was much better adapted. In 1803, he went to London and, shortly afterward, published his *Essay on the Principles of Human Action.* In conjunction with Leigh Hunt, he wrote essays for the *Examiner,* which were afterward republished in a volume entitled *The Round Table.* He wrote also *Characters of Shakespeare's Plays, Review of the English Stage, Life of Napoleon,* and *The Spirit of the Age.*

Hearn, Lafcadio (1850-1904), writer on Japan, was born in Leucadia, one of the Ionian Islands, of Irish and Greek parentage. He adopted the name Lafcadio, a phonetic adaptation of the name of his birthplace. Educated in England and France, he came, at the age of 19, to the United States, where he engaged in journalism, exhibiting picturesque descriptive powers. In 1891, he went to Japan, where he taught English in Tokyo University. He became a citizen of Japan and married a Japanese wife. His later writings represent an attempt to interpret the life of Japan to the Western world. They include *Out of the East, Gleanings in Buddha Fields,* and *Japan: An Attempt at an Interpretation.*

Hearst (*hûrst*), **Phebe Apperson (1842-1919),** American philanthropist. She taught school for a short period and, in 1862, married George Hearst, United States senator from California, a man of large wealth. She established kindergarten classes in San Francisco; also classes and a training class for kindergarten teachers in Washington, D. C., and later at Lead, S. D., where she had important mining interests. She made donations to the American University at Washington, the National Cathedral School for girls at Washington, the University of California, and free libraries at Lead, S. D., and Anaconda, Mont., which she had founded.

Hearst, William Randolph (1863-1951), American newspaper publisher and politician, was born in San Francisco. He was educated in the public schools of San Francisco and at Harvard. He became editor and proprietor of the San Francisco *Examiner,* 1886; bought the New York *Journal,* 1895; and later purchased the New York *Advertiser* to secure a news franchise, changing its name to the New York *Morning American.* He started the Chicago *American* in 1900 and, in 1902, the Chicago *Morning Examiner.* In 1904, he acquired the Boston *American* and the Los Angeles *Examiner,* and he later bought various other newspapers and magazines, including several in England. He was elected to Congress, 1903–07, as a Democrat; was candidate for mayor of New York in 1905 and 1909, and for governor in 1906.

Hearst's group of newspapers became known for sensational features, among them the "spread news head." He also developed the International News Service syndicate. In his later years, he resided mainly in a magnificent retreat which he built at San Simeon, Calif. In 1958 the Hearst family presented this "castle" to the state of California as a historical monument in memory of William Randolph Hearst and his mother, Mrs. Phebe Hearst. The State Division of Parks later assumed its operation. A biography, *Citizen Hearst,* by W. A. Swanberg, gives a complete review of Hearst's career.

Heber (*hē'bĕr*), **Reginald (1783-1826),** English hymn-writer and bishop, was born at Malpas, Cheshire. He entered Brasenose College, Oxford, 1800, and, in 1803, wrote prize-winning poem, *Palestine.* He was ordained for the ministry in the English Church in 1807; was appointed a prebendary of Saint Asaph in 1812; and became Bampton lecturer in 1815 and preacher of Lincoln's Inn in 1822. In 1823, he accepted the see of Calcutta, serving there as bishop throughout the remainder of his life. He published *Sermons, A Journey Through India,* and *A Life of Jeremy Taylor.* As a poet, his fame rests upon *Palestine* and his hymns, which include "Lord of Mercy and of Might," "From Greenland's Icy Mountains," "Holy, Holy, Holy," and "The Son of God Goes Forth to War."

Hébert (*ā'bâr'*) **Louis Philippe (1850-1917),** French Canadian sculptor, was born in the province of Quebec. He studied sculpture in Montreal and afterward in Paris, and, in 1882, won a prize given by the Dominion government for a statue of Georges Cartier. His chief works consist of statues and monuments, among which are the statues to Maisonneuve and Chénier, Montreal; the McKenzie, Macdonald, and Queen Victoria monuments in Parliament Square, Ottawa; the Laval monument, Quebec; and the Howe monument, Halifax.

Hecker, Isaac Thomas (1819-1888), American priest, was born in New York. His brothers established the Hecker mills; but he was not content to labor in mercantile pursuits, and, in 1843, he joined the Brook Farm community in West Roxbury, Mass. Later he established a similar communistic society at Fruitlands, Mass., then took up study for the Episcopal ministry, but, in 1845, joined the Roman Catholic Church and became a Redemptorist father. Having difficulties with other members of the order, he was expelled, but the Pope released him from his vows and gave permission for the founding of the Paulist fathers, of which order he served as the first superior. Much of his time was devoted to literature. He founded the *Catholic World,* organized the Catholic Publication Society, and wrote *Questions of the Soul, Aspirations of Nature,* and *The Church and the Age.*

Hedin (*hĕ-dēn'*), **Sven Anders (1865-1952),** Swedish traveler and geographer, was born in Stockholm. He was educated at Stockholm, at Upsala, and in Germany. He began his explorations in Iran in 1885, traveled through Khorassan and Turkestan, and several times through Tibet and other parts of Central Asia. His books, some of which have been translated into many languages, include *Through Asia, Scientific Results of a Journey in Central Asia, Trans-Himalaya, From Pole to Pole, With the German Armies in the West, Southern Tibet, The Gobi Desert, A Conquest of Tibet,* and *The Silkroad.*

Hegan, Alice Caldwell. See *Rice, Alice Caldwell Hegan.*

Hegel (*hā'gĕl*), **Georg Wilhelm Friedrich, (1770-1831),** German philosopher, was born at Stuttgart, Württemberg. The gravity, straightforwardness, and perseverance that he inherited from a long line of Swabian ancestors declared itself early in his life and conversation. His student days evidenced indefatigable industry rather than precocity of genius.

At the University of Tübingen, to which he proceeded in 1788, he met Schelling, the philosopher, who proved a kindred spirit and lifelong friend. After completing his university course, Hegel devoted himself to tutorial duties in Switzerland and Frankfort and to the study of ancient history and the philosophy of religion. In 1801, he began lecturing on philosophy at the University of Jena as an instructor. Here, by careful thought, he laid the foundations of his rigorous and logical system, which first found expression in *The Phenomenology of the Spirit.* This work he completed after he had accepted the chair of philosophy at Jena and on the eve of the victory of Napoleon over the Prussians.

In 1808, Hegel was made rector of the *Gymnasium* at Nüremberg. In 1811, he married Marie von Tucher. He remained at Nüremberg, seeing the first two volumes of his *Logic* through the press and giving elementary courses in philosophy and religion, until 1816, when he accepted the professorship of philosophy at Heidelberg. In the ensuing years, he completed his *Logic* under the title of *Encyclopedia of the Philosophical Sciences,* His entire scheme of philosophy is comprised in this work.

In 1818, Hegel accepted the chair of philosophy in the University of Berlin, becoming rector in 1829. His fame increased rapidly and his lectures attracted hearers from all ranks and professions. He rose to great political influence by reason of his defense of existing political institutions. The noted aphorism in which he summed up his teaching, "The rational is the actual, and the actual is the rational," was taken to imply that the Prussian organization was the perfection of reason and freedom.

Hegel's system, which is usually termed the "philosophy of the absolute," falls into three departments: logic, or the science of thought in its pure unity with itself; the philosophy of nature, in which the ideal principle is shown

to underlie even the material world; and the philosophy of spirit. Hegelianism compelled men to think and to stand for or against it. Its influence has been extensive throughout Europe and America.

Heidenstam (*hī'dĕn-stăm*), **Karl Gustav Verner von (1859-1940)**, Swedish novelist and poet, was born at Olshammar. He studied painting at the Stockholm Academy, but, after extensive travel, devoted himself to literature. He published, in 1888, *Vallfart och Vandringsar*, which quickly established his rank as a poet. He published his first story, *Endymion*, in 1889 and, in 1892, produced his fantastic romance, *Hans Alienus*, by which his literary style is best known. His *Charles XII and His Wars* brought him great popularity and was followed by *Saint George and the Dragon, The Pilgrimage of the Holy Bridget, Classicism and Teutonism, Folkungaträdet, Dagar och händelser, Stridsskrifter*, and other novels and essays which assured his position in Swedish literature. In 1916, he was awarded the Nobel prize for literature.

Heifetz (*hī'fĕts*), **Jascha (1901-)**, violinist, was born at Vilna, Poland. He began learning the violin at the age of three and made his first public appearance when less than five years old. Four years later, at Lenigrad, he gave his first recital, later touring the greater part of Europe and visiting Australia and New Zealand. Following his first performance in America, at New York in 1917, he obtained recognition in all musical centers of the country as a master of the violin. He donated a concert hall to Tel-Aviv.

Heine (*hī'nĕ*), **Heinrich (1797-1856)**, German lyric poet and satirist, was born at Düsseldorf, of Jewish parents. He was educated privately by Catholic monks and French intellectuals, and early exhibited a spirit of daring skepticism. He learned English, French, and Italian, and began his career as a merchant in Hamburg. The venture failed, and he devoted himself to study successively at Bonn, Göttingen, and Berlin, obtaining an advocate's license in 1825. Five years later, he went to Paris, where he resided throughout the remainder of his life.

Heine possessed two incompatible elements in his character—a Greek joy of life and a congenital Hebrew earnestness. The lack of harmony between these elements resulted in a spirit of mocking irony which, combined with an extraordinary keenness of wit and a capacity for writing the most exquisite lyrics, made Heine one of the most striking figures in European literature. His preference for French culture prevented his full recognition in Germany during his life and for many decades later.

His *Gedichte*, which appeared in 1822, contains many of the finest lyrics in the German language. The *Nordsee Cyclus* places Heine among the best poets of the sea. The *Reisebilder*, largely in prose, was banned by the Prussian censor for its revolutionary tendency. His *Buch der Lieder* was published in 1827. *Die romantische Schule* procured him great popularity in France, where he met Madame Recamier, "George Sand," Balzac, Béranger, Chopin, Liszt, and other famous people. About 1845, he was attacked by a disease of the spine and was thereafter almost continuously bedridden. Nevertheless, in this period were written some of his wittiest satires and most delicately graceful songs.

Heins (*hīnz*), **George Lewis (1860-1907)**, American architect, was born in Philadelphia. He was educated at the University of Pennsylvania and studied architecture at the Massachusetts Institute of Technology, where he was graduated in 1882. In 1883, he began practice in Minneapolis with C. G. LaFarge. In 1886, the firm was established in New York, where, in collaboration with his partner, Heins designed the Protestant Episcopal Cathedral of Saint John the Divine. He was the architect of numerous other buildings in New York, including those of the New York Zoological Park. He was first state architect of New York from 1898 until his death.

Heller, Stephen (1815-1888), Hungarian composer and pianist, was born in Budapest. He displayed marked musical ability at an early age and, when only 9, was sent to Vienna to continue his studies. At 13, he played publicly in Vienna and, at 15, began with his father an extensive concert tour through Europe. This was interrupted in the following year, 1830, by his serious illness at Augsburg, where he remained, continuing his musical studies, until 1838. He then went to Paris, where he formed intimate friendships with Chopin, Liszt, and Berlioz and soon became well known as a pianist. His compositions, characterized by exquisite melody and by fresh and vigorous treatment of theme, won their way to fame much more slowly. In style, Heller much resembles Mendelssohn, whom he surpasses in the originality of his themes. His studies for the piano rank among the very best and are still in wide use.

Hellriegel (*hĕl'rē-gĕl*), **Hermann (1831-1895)**, German agricultural chemist, was born at Mausitz, Saxony. From 1857 to 1873, he was director of the agricultural experiment station of Brandenburg at Dahme. He was traveling instructor at Bernberg from 1873 to 1882, when he was made director. While he made many agricultural investigations, his permanent fame rests upon his demonstration of the ability of the leguminous plants—such as peas, beans, clover, and alfalfa—to assimilate free nitrogen from the air, thus acting as fertilizers of the soil. He discovered also that this process takes place in the tubercles on the roots of the plants.

Helmholtz (*hĕlm'hôlts*), **Hermann Ludwig Ferdinand von (1821-1894)**, German physiologist and physicist, was born at Potsdam, Prussia. In 1838, he entered the Royal Medicochirurgical Institute of Berlin, at which he was graduated in 1842. The thesis which he presented at that time was itself an important contribution to the minute anatomy of nerve cells and fibers. For several years he acted as assistant surgeon in the army. Being then relieved of further military duties, he became assistant at the Anatomical Museum at Berlin, lecturer on anatomy at the Academy of Arts, and professor extraordinary of physiology at Albert University. The first of his scientific writings to attract general attention was an essay on the *Conservation of Force*, published in 1847. It proved to be one of the most important scientific contributions of the 19th century.

In 1849, Helmholtz was appointed to the chair of physiology and general pathology in the University of Königsberg. From 1851 to 1856, his researches were confined mainly to physiological optics, with an occasional paper on electrical problems. His systematic investigation of the eye resulted in the invention of the myograph, the ophthalmometer, and the ophthalmoscope, thus making possible the examination of the inmost recesses of the living eye.

Helmholtz was appointed professor of physiology at the University of Bonn in 1855, and, in 1858, he accepted a similar chair at Heidelberg. In 1863, he published *Sensations of Tone as the Physiological Basis of Music*. He was at work on optics while still engaged in the study of sound, and his *Handbook of Physiological Optics* appeared in sections in 1856, 1860, and 1867.

In 1871, Helmholtz became professor of physics at the University of Berlin, a post which, after 1887, he held concurrently with that of director of the Physicotechnical Institute at Charlottenburg, near Berlin. During his last 23 years, he devoted his energies almost entirely to the investigation of physical problems. His greatest researches fall under the following heads: the conservation of energy; hydrodynamics; electrodynamics and theories of electricity; meteorological physics; optics; and the principles of dynamics. In these fields, he succeeded, by the technical merits of his work, in establishing for himself a foremost place among the scientific thinkers of the world.

Honors of all sorts were showered upon him. He was ennobled by William I in 1883. The kings of Sweden and Italy, the grand duke of Baden, and the president o, France bestowed the insignia of various orders. Academiesf universities, and learned societies participated in the national celebration of his 70th birthday.

Helmont (*hĕl'mônt*), **Jan Baptista van (c. 1577-1644)**, Belgian chemist, was born at Brussels. He studied at Louvain, where he was graduated in medicine in 1599. In 1609, he settled at Vilvorde, near Brussels, where he practiced medicine gratuitously for 30 years and carried on notable experiments in chemistry. He paid much attention to the study of the gases, and he claimed to have been the first to apply the term *gases* to elastic aeriform fluids. Of these gases he distinguished several kinds. His works were published under the title *Ortus Medicinæ*.

Hemans (*hĕm'ănz*), **Felicia Dorothea (1793-1835)**, English poet, was born in Liverpool. She was the daughter of George Browne, a Liverpool merchant, and became the wife of Captain Hemans. A few years after their marriage, Captain Hemans removed to Italy, and they never afterward met. Mrs. Heman's subsequent life was spent in North Wales, in Lancashire, and in Dublin. Her shorter pieces are by far the most popular. Many of these, such as *The Better Land, Casabianca, The Treasures of the Deep, The Homes of England*, and *The Lost Pleiad*, have become standard English lyrics, and upon them depends her chief claim to remembrance.

Hemingway, Ernest (1898-1961), American novelist, was born at Oak Park, Ill. Educated in the public schools, he entered service in World War I when 19 and his experiences at the front left an indelible impression upon him. From his first stories, published in 1923, his writings were preoccupied with the theme of death and the psychological unsettlement which characterized the war generation. *A Farewell to Arms*, published in 1929, one of the most poignant and tragic love stories of recent times, established his reputation as a novelist of power. His unadorned, direct style evoked many imitators. He spent most of his years in Europe after the War, chiefly in France and Spain, and, during the Spanish Civil War, reported it for an American news service. This war was made the setting also for one of his most impressive

novels, *For Whom the Bell Tolls*. He wrote also *The Torrents of Spring*, *The Sun Also Rises*, *Death in the Afternoon*, *To Have and to Have Not*, and *The Old Man and the Sea*. In 1954 he was awarded the Nobel prize in literature. Still active, and at the height of his powers, he died suddenly as the result of a gunshot wound.

Henderson, Arthur (1863-1935), British labor leader and statesman, was born in Glasgow, Scotland. He served an apprenticeship in an iron works at Newcastle and became prominent in the labor movement. Entering politics, he was mayor of Newcastle in 1903 and was elected to Parliament the same year, becoming chairman of the Labor party in 1908. During World War I he was taken into the cabinet as labor member. In the labor administrations of Ramsay MacDonald, he was home secretary in 1924 and foreign secretary in 1929–31. He presided at the disarmament conference which met in 1933 at London. Although this conference accomplished little, Henderson's efforts were rewarded by the Nobel peace prize in 1934.

Henderson, Leon (1895-), American economist and administrator, was born at Millville, N. J. Educated at Swarthmore College and the University of Pennsylvania, he taught economics at the Carnegie Institute of Technology, 1922–23; was deputy secretary of Pennsylvania, 1924–25; and director of consumer credit research for the Russell Sage Foundation until 1934. Henderson then entered the employ of the Federal government, first as economic adviser to the National Recovery Administration and later to the Works Progress Administration. He was appointed to the Securities and Exchange Commission in 1939 and the next year President Roosevelt selected him as member of the defense advisory commission to control price increases. As director of the Office of Price Administration in 1941–42, he made this policy effective, though it was unpopular with Congress, and he resigned.

Hendrick, Burton Jesse (1871-1949), American biographer and historian, was born at New Haven, Conn. Educated at Yale University, he edited a paper in New Haven, 1896–98, and then was employed on the staff of the New York *Post* and *McClure's Magazine*. He was associate editor of *The World's Work* from 1913 to 1927. Meanwhile he had been writing on an exhaustive work on the *Life and Letters of Walter H. Page*, which established his reputation for scholarly and skillful handling of source material. This and *The Training of an American* (Page) received Pulitzer prize awards as biographies, as did his *Victory at Sea*, written with Admiral Sims, as history. His other biographies include *The Life of Andrew Carnegie*, *The Lees of Virginia*, and *Statesmen of the Lost Cause*.

Henley, William Ernest (1849-1903), English poet, playwright, critic, and editor, was born at Gloucester. While enduring months of illness in Edinburgh Infirmary, 1873–75, he wrote *Hospital Rhymes* and *A Book of Verse*, which won much attention and were followed by *Views and Reviews*, *The Song of the Sword*, *For England's Sake*, and *Hawthorn and Lavender*. He edited the *Magazine of Art*, the *Scots Observer*, and the *New Review*, besides an edition of Burns. He also collaborated with R. L. Stevenson in four plays: *Deacon Brodie*, *Beau Austin*, *Robert Macaire*, and *Admiral Guinea*. He was a brilliant writer with a vigorous, pungent style and the originality, power, and intensity of his poems insure them a permanent place among modern lyrics.

Hennepin (*hĕn'ĕ-pĭn;* Fr., *ĕn'păN'*), **Louis (1640-c. 1701)**, French priest, missionary, and traveler, was born in Ath, Belgium. He served in the army as chaplain and, in 1675, went to Canada as a missionary priest. When La Salle undertook his exploration of the Mississippi valley, Father Hennepin was assigned to his command. They visited Niagara Falls and Hennepin wrote the first description of it. The party traveled west as far as Mackinac, proceeding thence to Peoria, on the Illinois River. From this point Father Hennepin and two companions in a canoe went down the Illinois River to its mouth in the Mississippi, where they fell into the hands of a party of Sioux Indians. He spent three months among the Indians and was finally rescued by Du Lhut, after whom Duluth was named. Hennepin discovered and named the falls of Saint Anthony, now in Minneapolis. Upon his return to Europe, he published a history of his travels, which is of the greatest value in dealing with the early explorations of the Mississippi Valley.

Henri (*hĕn'rĭ*), **Robert (1865-1929)**, American painter, was born at Cincinnati, Ohio. He studied art in Philadelphia and in Paris. After an extensive period of travel in Italy, France, and Spain, he established himself in New York, where he became the leading representative of the radical movement in American art. As the head of the "independent" school, he exercised a marked influence upon the younger group of American painters. His style is characterized by bold originality, sincerity of purpose, and simplicity. Among his best-known paintings are "Snow," in the Luxembourg Gallery, Paris; "Spanish Gypsy," in the Metropolitan Museum, New York; "Young Woman in Black," Art Institute, Chicago; and "Equestrian," Carnegie Institute, Pittsburgh. His work includes portrait, landscape, and figure paintings. He wrote *The Art Spirit*.

Henry I (1068-1135), king of England, the youngest son of William the Conqueror. When his predecessor, William II, was found slain, Henry's brother Robert, Duke of Normandy, was in Italy. Henry seized the opportunity and had himself crowned king, maintaining his position against Robert, whom he defeated at Tinchebrai in 1106 and thereafter kept imprisoned. Henry thereby secured control of Normandy, which he held at the cost of a struggle with the French king Louis VI. He was called Beauclerc, or "The Scholar," in allusion to his learning, which entitled him to some distinction in his day. The death of his only son, William, in 1120 is said to have permanently darkened the king's life.

Henry II (1133-1189), king of England, grandson of Henry I. In 1154, he was crowned with his queen, Eleanor, who was Countess of Poitou and Duchess of Aquitaine. These territories of France, together with others inherited by Henry from his father, were thus brought under the crown of England.

The chief obstacle to Henry's authority was the Church. In the hope of rendering it subject to the civil power, he appointed his trusted chancellor, Thomas á Becket, to the see of Canterbury. Becket refused, however, to be subservient to the king and a long struggle between the two was terminated only by the murder of Becket, for which Henry could not entirely escape blame. The king did penance for the crime, but, for the future, enjoyed a power unchallenged by the Church. Henry's later years were clouded by a rebellion on the part of his three sons.

Henry III (1207-1272), king of England, grandson of Henry II, and eldest son of King John. He came to the throne in 1261 when a minor, and, in the course of a long reign, provoked much hostility by his fondness for foreign favorites and by his submission to papal exactions. This discontent culminated in the Baron's War, 1262-65, in which he was defeated and compelled to submit to the control of the government by De Montfort and his friends. De Montfort summoned, in 1265, the first Parliament to which representatives from both towns and counties were called. De Montfort was later defeated by Henry's son Edward, who continued to control the government. Westminster Abbey was almost entirely rebuilt in Henry's reign.

Henry III (1551-1589), king of France, third son of Henry II and Catherine de' Medici. In 1569, he gained victories over the Protestants at Jarnac and Moncontour, and he took an active share in the massacre of Saint Bartholomew. In 1574, he succeeded his brother Charles IX on the French throne.

Henry showed fickleness and want of courage in his public conduct; his private life was spent in an alternation of dissolute excesses and wild outbreaks of religious fanaticism. His reign was a period of almost incessant civil war between Hugenots and Catholics, the Duke of Guise having formed the Holy League to assert the supremacy of Catholicism and secure the reversion of the throne to the Guises. In 1588, the assassination of the Duke of Guise roused the Catholics to the utmost pitch of exasperation; Henry threw himself into the arms of Henry of Navarre, and the two marched upon Paris at the head of a Huguenot army. But, in August 1589, Henry was stabbed by a fanatical Dominican named Jacques Clement; he died, the last of the house of Valois, on the following day, nominating Henry of Navarre as his successor.

Henry IV (1050-1106), emperor of the Holy Roman Empire, was born at Goslar, Prussia, son of Henry III. He was crowned emperor in 1084 by Pope Clement III. His reign was notable for the struggle with Pope Gregory VII, with whom he began the investiture disputes. During this celebrated controversy, Henry was excommunicated and was obliged to submit. Gaining absolution from the pope at Canossa, he recovered his power by the defeat of Rudolph of Swabia and other enemies in Germany and invaded Italy. He took Rome and deposed Gregory. He was dethroned by his son Henry in 1105. See *Canossa*.

Henry IV (1367-1413), king of England, the first of the house of Lancaster, was surnamed Bolingbroke from his birthplace. Before his accession, he won considerable fame by his military prowess. He led an expedition that compelled the ruling monarch, Richard II, to dismiss his foreign favorites, and he fought in Lithuania and in the Holy Land. He was later banished by Richard II, but, taking advantage of Richard's absence in Ireland, he landed and was acclaimed ruler by Parliament in 1399. Richard, finding himself deserted, was compelled to abdicate.

Henry's reign was marked by wars, finally successful, with Owen Glendower of Wales, with James I of Scotland, and with Hotspur, leader of the Percy family in England.

Another unhappy feature of his time was the campaign of persecution against the Lollards.

Henry IV (1553-1610), king of France. He was founder of the Bourbon dynasty, succeeding Henry III in 1589. His marriage with Marguerite de Valois, in 1572, was the occasion for the massacre of Saint Bartholomew. In 1576, he quitted the court and became leader of the Huguenots and opponent of the Holy League, being the rival of the Guises for the succession. He defeated them at Arques and Ivry, but was unable to conquer Paris without becoming a Roman Catholic. He accordingly changed his faith in 1593 and was accepted as king by the city. He concluded peace with Philip II at Vervins and, in 1598, issued the edict of Nantes, allowing the Protestants liberty of conscience. The rest of his reign was occupied by domestic reforms. He was assassinated by Ravaillac.

Henry V (1387-1422), king of England, was born at Monmouth, the eldest son of Henry IV. He won considerable celebrity in the wars against Owen Glendower and Hotspur before his father's death, but, on his accession, took steps to conciliate his father's enemies. The persecutions of the Lollards, however, continued throughout his reign.

Henry V began the Hundred Years' War against France, claiming the French crown through his great-grandfather Edward III. He invaded France in 1415 with 30,000 men; took Harfleur; defeated the French at Agincourt; and, by 1418, reduced Normandy to subserviency. He was recognized as regent and "heir of France" in 1420; but hostilities were renewed in 1421, and he died before bringing his enemies into final submission.

Henry VII (1457-1509), king of England, the first of the Tudor dynasty. He became head of the Lancaster house and, by his defeat of the Yorkist Richard III at Bosworth in 1485 and by his subsequent marriage with the Yorkist princess Elizabeth, he brought to a close the Wars of the Roses. He was crowned by Parliament in 1485.

Yorkist risings in Scotland led Henry to arrange a marriage alliance between his daughter and the king of Scotland, the result of which, a century later, was the union of England and Scotland under one ruler. Disturbances in Ireland led to the passing of Poyning's law, by which acts of the English Parliament were applicable also to Ireland. Henry crushed the power of the nobles by a secret court called the Star Chamber. Parliament was subservient to his wish, and the royal power notably increased during his reign.

Henry VIII (1491-1547), king of England, succeeded Henry VII on the throne at the age of 18. Being handsome and generous, he was popular with all classes and exercised, through his ministers, an almost unlimited power over the kingdom. Europe was at this time divided between the hostile camps of Francis I of France and the emperor Charles V. Henry took some part in this struggle, usually favoring Charles, and he defeated the French at Guinegate, Therouanne, and Tournay. James IV of Scotland invaded England, but was defeated and killed at Flodden.

Henry had married, at 19, his brother's widow, Catherine of Aragon. Failing to obtain a son by her and being fascinated by a court maid, Anne Boleyn, he requested the pope to declare his marriage void. His minister Wolsey, who was charged with obtaining the papal decision, failed and was dismissed. Henry took a new minister, Cranmer, who advised Henry to abrogate the papal power in England and have the sovereign recognized as head of the Church in the kingdom. Henry brought about this change through Parliament and then married Anne Boleyn. Each succeeding sovereign, except Mary, has been the head of the Church of England. The Bible was translated into English and was introduced into the churches. Henry deviated little from the orthodox doctrine, but it was made a treasonable act to deny his supremacy as head of the Church in England. The property of many monasteries was seized and was used to enrich the national treasury.

Anne Boleyn was charged with infidelity in 1536 and was executed. Henry's next wife was Jane Seymour, who died in 1537 and was succeeded by Anne of Cleves. He divorced her shortly and married Catherine Howard, who was beheaded for alleged infidelity. His last wife, Catherine Parr, survived his death.

Henry, Joseph (1797-1878), American physicist, was born in Albany, N. Y.; was appointed professor of natural philosophy in the College of New Jersey at Princeton, 1832; and, in 1846, was called to the office of director of the Smithsonian Institution at Washington, to the organization and wide reputation of which he had greatly contributed.

Henry made important discoveries in electromagnetism and disputed with Morse the invention of the electric telegraph. He originated the principle and Morse perfected the method of using the electromagnet for commercial telegraphy. His most notable contribution to electrical science was his discovery of the method of producing induced currents, 1829–30. This is the underlying principle governing the construction of dynamos and transformers. In 1842, he discovered that the discharge of a Leyden jar would induce discharges in other circuits at a distance. This anticipated the essentials of modern wireless telegraphy. Later he became interested in meteorology and suggested using the telegraph to collect and distribute weather information. He was an original member and president of the National Academy of Sciences. He was elected to the American Hall of Fame, 1915.

Henry, Patrick (1736-1799), American orator and statesman, was born in Virginia. After receiving a common school education and spending some time in trade and agriculture, he commenced the practice of law with only six weeks of preparatory study. After several years of poverty, he rose to distinction in managing the popular cause in a controversy between the legislature and the clergy touching the stipend which was claimed by the latter.

In 1765, he was elected a member of the Virginia house of burgesses on the issue of opposition to the British Stamp Act. In this assembly, he obtained the honor of being the first to commence that opposition to the measures of the British government which terminated in the Revolution. He was one of the delegates sent by Virginia to the First Continental Congress of the colonies, in 1774, and, in that body, he distinguished himself by his boldness and eloquence. In 1776, he was appointed the first governor of the commonwealth, and to this office he was repeatedly re-elected. In 1786, he was appointed by the legislature one of the deputies to the convention held at Philadelphia for the purpose of revising the Federal Constitution. In 1788, he was a member of the convention which met in Virginia to consider the Constitution of the United States, and he exerted himself strenuously against its adoption. He retired from the bar in 1794.

Without extensive information upon legal or political topics, he was a natural orator of the highest order, possessing great powers of imagination, sarcasm, and humor. He was elected to the American Hall of Fame in 1920.

Henry the Navigator (1394-1460), son of John I, king of Portugal. He distinguished himself at the capture of Ceuta in 1415; took up his residence at Sagres, in Algarve; and devoted himself to extending geographical discovery. He erected an observatory and a school for navigation and dispatched some of his pupils on voyages that resulted in the discovery of the Madeira Islands in 1420. Henry's thoughts were now directed toward the gold producing coasts of Guinea. In 1434, one of his mariners touched Cape Bojador; in 1441, Cape Blanco was reached; Cape Verde was doubled in 1445; and, in 1455, Cadamosto sailed to the mouth of the Gambia. This enterprise continued for a half century after Henry's death and resulted in the rounding of the Cape of Good Hope and the founding of Portuguese empires in India and Brazil.

Hepburn, James Curtis (1815-1911), American medical missionary and scholar, was born at Milton, Pa. He was graduated at Princeton College and at the University of Pennsylvania medical department. He went to China as a medical missionary in 1840; returned to New York, 1846; went to Japan, 1859, residing in Yokohama until 1892; and returned to the United States, 1893, and retired. He compiled the first English dictionary of the Japanese language and translated the Bible into the Japanese language.

Hepburn, Katharine (1909-), actress, was born in Hartford, Connecticut. After she was graduated from Bryn Mawr College, she began her stage career in 1928. Commencing in 1932, she appeared in many motion pictures, including *A Bill of Divorcement*, *Little Women*, *The Little Minister*, *Quality Street*, *The Philadelphia Story*, and *The African Queen*. One of her more recent successful stage appearances was in *As You Like It*.

Hepburn, Mitchell (1897-1953), Canadian politician, was born on a farm in western Ontario. Attracting attention by his successful management of a large farm and as county secretary of the United Farmers of Ontario, he was elected to the Dominion Parliament in 1926. He accepted an invitation in 1930 to lead the Liberal party in Ontario and became provincial premier in 1935.

As premier, he exhibited a marked degree of initiative, cancelling a contract which the Province's hydroelectric system had made for purchase of power at a price he believed too high. He took measures to reduce the number of those on relief. Hepburn was re-elected in 1937 but resigned in 1942.

Heppelwhite, George (?-1786), English cabinetmaker, worked in London in the 18th century. He exerted a profound influence over furniture design and lent his name to a style. The date of his birth is unknown. The Heppelwhite style is distinguished by slender elegance, and embellishment by carved and inlaid decorations, such as sheaves of wheat and ostrich plumes. While noted mostly for his tables and chairs, especially his famed winged easy chair, Heppelwhite also inspired a school

which produced tea caddies, knife boxes, and other small objects which are much prized by collectors today. He was a craftsman whose work reflected a changing civilization; rejecting the heaviness of 17th century design, he created new airy and graceful forms.

Heraclius (*hĕr-ā-klī'ŭs*) **(c. 575-641)**, Byzantine emperor, was born in Cappadocia. In 610, he headed a revolt against Phocas, slew him, and mounted his throne. At this time, the Avars threatened the Empire on the northwest, and the Persians invaded it. Chosroes II of Persia (Iran) captured Damascus in 613 and Jerusalem in 614; then all Syria, Egypt, and Asia Minor were conquered. At length Heraclius, having, in 620, concluded a treaty with the Avars, took the field against the Persians in 622, routed them in a series of brilliant campaigns, won back his lost provinces, and shut up Chosroes in Ctesiphon, 628. But the followers of Mohammed won from Heraclius nearly all he had gained from the Persians, he meanwhile spending his time in self-indulgence and theological disputes.

Herbart (*hĕr'bärt*), **Johann Friedrich (1776-1841)**, German philosopher and educationist, was born at Oldenburg. He studied at Jena, became the pupil of Fichte, and received his philosophy with enthusiasm; but, after reflection, he found himself obliged to reject much of Fichte's system and formed one of his own. In 1805, he was appointed professor at Göttingen and, in 1809, obtained the chair of philosophy at Königsberg. In 1833, he returned to Göttingen.

Herbart's system exercised a great influence in philosophy and in education. He taught that character, the moral end of life, is the aim of education and that it has its beginning in knowledge and its end in action. His principles of interest, correlation, apperception, method of the recitation, and moral education, introduced into the United States under the leadership of Charles DeGarmo and C. A. McMurry, have been widely adopted in colleges of education and elementary schools. See *Educational Reformers*.

Herbert, Victor(1859-1924), composer and conductor, was born in Dublin, Ireland. He studied music in Germany and gained his first position of prominence as principal violoncello player in court orchestra, Stuttgart. He came to the United States as solo violoncellist in the Metropolitan Orchestra, New York, 1886. Subsequently he was connected with Theodore Thomas's, Seidl's, and other orchestral organizations as soloist and conductor. He founded and was conductor of the Pittsburgh Symphony Orchestra, 1898–1904, and became conductor of his own New York orchestra, 1904. Among his compositions are the comic operas *Prince Ananias, The Wizard of the Nile, The Serenade, Cyrano de Bergerac, The Ameer, The Viceroy, The Idol's Eye, The Fortune Teller, Babette, Babes in Toyland, It Happened in Nordland*, and *Hearts of Erin*. He also wrote the oratorio *The Captive;* and the operas *Natoma* and *Madeleine*. One of his many operettas, *Naughty Marietta*, became very popular as a motion picture and gave wide currency to the song "Ah, Sweet Mystery of Life."

Herder (*hĕr'dĕr*), **Johann Gottfried von (1744-1803)** German critic and poet, was born at Mohrungen in East Prussia. He studied at Königsberg and there became acquainted with Kant. In 1764, he became a teacher in a school and assistant pastor of a church at Riga. Between 1766 and 1769, he wrote two works, in which he maintained that the truest poetry is the poetry of the people. In 1769, he made the acquaintance of Goethe at Strasbourg; in 1771, was appointed court preacher at Buckeburg; and, in 1776, was made first preacher in Weimar. In 1802, he was ennobled by the elector of Bavaria. Herder's notable work in æsthetics, philosophy, philology, and literature exercised a profound influence on German thought. Among his many important works are *Fragments of the More Modern German Literature, Origin of Language, The Oldest Record of the Human Race, Folk-Songs, Voices of the Nations in Songs*, and *Letters for the Advancement of Humanity*.

Hergesheimer, Joseph (1880-1954), American author, was born at Philadelphia. He was educated at a Quaker school in Philadelphia and in the Pennsylvania Academy of Fine Arts. His numerous popular novels and short stories include *Java Head, The Lay Anthony, Gold and Iron, Steel, Cytherea, Swords and Roses*, and *The Foolscap Rose*.

Herkimer (*hûr'kĭ-mĕr*), **Nicholas (c.1715-1777)**, American general, was born in New York. In 1758, he was appointed a lieutenant of militia, and he commanded Fort Herkimer at the time the French and Indians attacked German Flats. In 1776, he was made brigadier general. In the next year, when Colonel Saint Leger, sent out by General Burgoyne, was besieging Fort Stanwix, Herkimer, with 800 militia, marched to its relief. In this movement, he fell into an ambuscade at Oriskany in August 1777, but drove back his assailants. He himself was fatally wounded.

Herne (*hĕrn*), **James A. (1840-1901)** American actor and dramatist, was born at Troy, N. Y. He appeared mainly in his own plays, the chief of which are *Hearts of Oak, Margaret Fleming, The Rev. Griffith Davenport*, and *Sag Harbor*. His rural comedy, *Shore Acres*, was one of the most successful dramas of the American stage.

Herodotus (c. 484 B. C.-c. 424 B.C.), Greek historian, was born in Halicarnassus, a Doric colony of Asia Minor. His father, Lyxes, belonged to a prominent family there. The epic poet Panyasis was his uncle, from whom probably Herodotus acquired the familiarity with Greek poetry that he showed later in his writings. In 457 B. C., Panyasis was put to death for conspiring against Lygdamis, the tyrant of Halicarnassus, and Herodotus went into exile, taking up his abode temporarily in the island of Samos. He later resided in Athens.

The work on which rests the fame of Herodotus is called *Histories*. It is an account of the wars waged by the Persians against the Greeks from 500 B. C. to 479 B. C. These wars, however, are regarded by the author merely as the culmination of a long struggle between the East and the West that arose as early as the period of the Trojan War. In the *Histories*, Herodotus undertakes to describe this struggle and thereby has occasion to narrate the whole history of the world as then discoverable. Writing of a period in which accurate records were conspicuously lacking, he was obliged to rely much on traditions, regarding which he adopted a critical attitude. His work is a rich storehouse of fascinating stories and interesting facts.

In order to describe adequately the peoples and places mentioned in his *Histories*, he traveled over the greater part of the known world, including what is now southern Russia, the Balkan countries, Turkey, and Egypt. His shrewd geographical and anthropological observations add a scientific value to a work otherwise distinguished by a singular charm of narrative. Herodotus was the first writer who so unified the record of facts as to raise historical narrative to the level of literature. On these grounds, he merits the title first given him by Cicero, "the father of history."

Herodotus is said to have read his composition amid marked approbation at the Olympic games and to have received 10 talents from Athens in recognition of his literary services to Greece. In 444 B. C., he joined an Athenian colony then being founded at Thurii, Italy, where he died.

Herrick, Robert (1591-1674), English poet, was born in Cheapside, London. He was educated at Cambridge. After taking orders as a clergyman of the Church of England, he was presented by Charles I to the vicarage of Dean Prior. After about 20 years' residence, his living was sequestered in the Civil War, and he went to reside in Westminster. After the Restoration, he was replaced in his vicarage. In 1648, he published *Hesperides*, a collection of lyric poems. His poems, which include some of the best-known lyrics in the language, are distinguished for their freshness, sweetness, and melody.

Herrick, Robert (1868-1938), American educator and novelist, was born at Cambridge, Mass. He was graduated at Harvard, 1890; taught at Massachusetts Institute of Technology, 1890-93; and was instructor in rhetoric and English at the University of Chicago, 1893 to 1905, and professor of English until 1923. In 1935, he was named government secretary of the Virgin Islands. His fiction presents broad pictures of American life, discussing the conflict of commercialism and idealism, and problems of sex discord, somewhat in the manner of Ibsen and Sudermann. His first novel of note was *The Gospel of Freedom*, 1898. His other works include *Love's Dilemmas, The Web of Life, Their Child, and Chimes*.

Herriot (*ĕr'ē-ō'*), **Edouard (1872-1957)**, French statesman, was born at Troyes. He taught school at Lyons and won a reputation there as a scholar, lecturer, and journalist. In 1905 he was elected mayor and held that post continuously for about 30 years. He became a senator in 1912 and was chosen as a member of Briand's cabinet in 1916-17. In 1919, he was elected to the Chamber of Deputies, where he led the Radical party. He was prime minister in 1924-25 and again in 1932. Herriot's influence was exerted consistently in the interests of peaceful co-operation with other nations. His government was defeated in December 1932 on its policy of meeting the war debt installment due by France to the United States. He became president of the Chamber of Deputies in 1936. In 1942 he was arrested, sent to Germany, and later reported dead. He returned to France in 1945, was elected mayor of Lyons, and sent to the constituent assemblies. He was named to the French Academy in 1946, and the next year was chosen president of the National Assembly. He is the author of *Madame Récamier et ses amis*.

Herschel (*hûr'shĕl*), **Caroline Lucretia (1750-1848)**, sister of the astronomer Sir William Herschel, was born in Hanover, Germany. When William was appointed astronomer to George III, she acted as his assistant, living with him during his entire career, and in that character received a small salary from the king. She discovered seven comets, for five of which she has the credit of priority of discovery.

Several remarkable nebulæ and clusters of stars included in her brother's catalogues were described from her original observations. In 1798, she published, with an introduction by her brother. *A Catalogue of Stars Taken from Mr. Flamsteed's Observations.* This valuable work was published at the expense of the Royal Society and contained 561 stars omitted in the British catalogue.

Herschel, Sir John Frederick William (1792-1871), English astronomer, son of Sir William Herschel. About 1825, he began his observations in sidereal astronomy, to which he chiefly devoted himself. His greatest enterprise was an expedition, in 1833, to the Cape of Good Hope to take observations of the southern firmament. In 1847 appeared his *Results of Astronomical Observations at the Cape of Good Hope,* one of the most valuable works of the time. His residence at the Cape brought contributions not only to astronomy but also to meteorology. His observations on the milky way, on the brightness and the color of stars, on variable stars, on the sun's rays, on the atmospheric air, and on the Magellanic clouds are all very important.

Herschel conducted researches also in light, sound, and celestial physics. In chemistry, he discovered the solvent power of sodium hyposulphite upon the salts of silver, which was the prelude to its use in photography; and he was the first to apply the now universally known term "positive" and "negative" to photographic images. His best-known work is *Outlines of Astronomy.*

Herschel, Sir William (1738-1822), astronomer, was born in Hanover. He was educated as a professional musician. In 1757, he went to England, where he became a teacher of music in the town of Leeds, from which he went to Halifax as organist and subsequently in the same capacity to Bath. Here he turned his attention to astronomy. Wanting a telescope and unable to afford a reflector, he made one for himself. In 1781, he discovered the planet Uranus, which discovery resulted in his appointment as private astronomer to George III with a salary of £200 a year. This was the first discovery of a planet in modern times. He was knighted and was made a D. C. L. by the University of Oxford. He added greatly to our knowledge of the solar system; discovered four satellites of Uranus and two satellites of Saturn; detected the rotation of Saturn's rings, the period of rotation of Saturn itself, and the existence of the motion of binary stars—the first revelation of systems besides our own. He contributed to our knowledge of the Milky Way and the constitution of nebulæ. He was, in fact, the first to give the human mind a proper conception of the immensity of the universe. He erected a monster telescope, as it was then considered, of 40 feet focal length. It was begun in 1785, finished in 1789.

Hersey, John (1914-), American novelist and war correspondent, was born in China. After studying at Cambridge, England, and being graduated from Yale, he was employed as secretary to Sinclair Lewis, the novelist. Next, Hersey became a writer for *Time* magazine, advancing to senior editor, and later to senior editor of *Life* magazine. He spent much time in the Pacific theater during World War II, and drew on his experiences to write *Men on Bataan* and *Into the Valley.* His first popular success, *A Bell for Adano,* is a novel set in Italy during the Allied invasion, and won the Pulitzer prize in 1945. Hersey is most famous for his brilliant report, *Hiroshima,* which told the terrible effects of the dropping of the first atomic bomb. The late Harold Ross, then editor of *The New Yorker,* caused a sensation by printing the long *Hiroshima* in its entirety, to the exclusion of all other editorial matter. Hersey has also written *The Wall,* a novel of a Warsaw ghetto during the Nazi persecutions.

Herter, Christian Archibald (1895-), American public official, was born at Paris, France, of American parents. He was graduated from Harvard in 1915, and the following year went to Berlin, Germany, as attache at the American embassy. He was with the State Department in 1917-18, and attended the Paris Peace Conference. From 1919 to 1924 he was assistant to Secretary of Commerce Herbert Hoover. He was editor of *The Independent* (1924-28), and associate editor of *The Sportsman* (1927-36). From 1943 to 1953 he was a member of Congress. He became governor of Massachusetts in 1953. After serving as under-secretary of state he became secretary following the death of his superior, John Foster Dulles.

Hertz, Heinrich (1857-1894), German physicist, was born in Hamburg. He was educated at the University of Berlin, receiving his final training under Helmholtz. While professor of physics at the Technical High School at Karlsruhe, 1885-89, he detected the electromagnetic waves now known as Hertzian waves. After proving the existence of electric waves propagated through space, he proved also that they could be reflected, refracted, polarized, and diffracted just as light is, and that they travel at the same speed as light. Radio is the direct practical outcome of this momentous discovery. Investigation, stimulated by this discovery completely revolutionized the scientific world's conception of matter, energy, and electricity. In 1889, Hertz succeeded Clausius as professor of physics at Bonn. He died at Bonn. See *Hertzian Waves.*

Hertz, Henrik (1798-1870), Danish poet and dramatist, of Jewish descent, was born in Copenhagen. He was educated at the University of Copenhagen, traveled abroad, and returned as a professor of the university. His first important work was *Letters of a Ghost,* a rimed satirical poem. His subsequent works include *Amor's Strokes of Genius, Love and Policy,* and *The Youngest.* Hertz ranks among the foremost Danish lyric poets, and his romantic dramas, *Svend Dyring's House* and *King René's Daughter,* have become classics of the Danish theater.

Hesburgh, Theodore M. (1917-), clergyman and educator, was born at Syracuse, N.Y. He was educated at Notre Dame, Holy Cross College, and the Catholic University of America. Following ordination to the priesthood in 1943, he was chaplain of the National Training School for Boys at Washington, D.C., then became chaplain and professor of religion at Notre Dame University. He has been president of Notre Dame since 1952. He is the author of *Theology of Catholic Action* and *God and the World of Man.*

Hesiod (*hē'sĭ-ŏd*), Greek poet, lived probably in the 8th century B. C. Of the works ascribed to him, the principal are the *Works and Days,* the *Theogony,* and the *Shield of Hercules.* His poems treat of the quiet pursuits of agricultural life, the origin of the world, and the genealogy of the gods and heroes. They are pervaded by a certain pessimism and a sense of the hardness of the human lot.

Hewitt, Peter Cooper (1861-1921), American inventor and capitalist, was born in New York City. He was educated at Stevens Institute and at Columbia College. After entering his father's business, he invented improvements in the manufacture of glue. Turning his attention to electricity, he invented the Cooper Hewitt lamp, which consists of a glass tube filled with mercury vapor with suitable electrodes at each end. Upon passing a direct current through the tube, the vapor becomes incandescent, giving off a brilliant greenish light which is of great value as an artificial illuminant in photography.

Heyerdahl, Thor (1914-), explorer, was born at Larvik, Norway. He was educated at Larvik College and at the University of Oslo. Becoming interested in ethnological research, he paid special attention to the natives of Polynesia. To test his theories regarding the migration of peoples, he built a raft of balsa wood, on which he and a small crew of scientists drifted 4300 miles across the Pacific from Callao, Peru. This voyage is described in his book *Kontiki,* and the crew's experiences are shown in detail in a film on the subject. A later book describing Heyerdahl's explorations is *Aku-Aku, The Story of Easter Island.*

Heyne (*hī'nĕ*), **Christian Gottlob (1729-1812),** German classical scholar, was born in Chemnitz. He was educated at the University of Leipzig. In 1753, he became underclerk in the Brühl Library at Dresden. While there he prepared his edition of *Tibullus,* which appeared in 1755. In 1756, unfortunately for Heyne, the Seven Years' War broke out. Frederick the Great marched against Dresden, and among other things burned the Brühl Library, but not before Heyne had edited, from a *codex* there, the *Encheiridion* of Epictetus. In 1763, following the death of Gesner, professor of rhetoric at Göttingen, Heyne was appointed his successor. Among his other works were editions of Virgil, Pindar, Apollodorus, and Homer's *Iliad.*

Heyse (*hī'zĕ*), **Paul Johann (1830-1914),** German poet, dramatist, and novelist, was born in Berlin. He was educated at Berlin and Bonn, settled at Munich in 1854, and devoted himself to literature, becoming a dominant figure among German men of letters. His short stories, of which he wrote over 150, are miniature masterpieces of fiction. *Das Buch der Freundschaft* is the best single volume of these stories and the widely admired *L'Arrabbiata* is the most noted single example. His poetic works include narrative poems, such as *Urica,* epics such as *Die Braut von Cypern* and *Thekla,* and many lyrics. He wrote also some 60 dramas, the most noteworthy of which are *Die Sabinerinnen, Maria von Magdala, Der Heligie,* and *Die Tochter der Semiramis.* Among his successful novels are *Kinder der Welt, Im Paradiese, Merlin,* and *Ueber Allen Gipfeln.* He received the Nobel prize for literature, 1910.

Heyward, DuBose (1885-1940), American novelist and poet, was born at Charleston, S. C. Educated in the public schools, he devoted his spare time at first to poetry, and organized the Poetry Society of South Carolina. He turned later to novels of Negro life, in which he won speedy recognition by *Porgy* in 1925, followed by *Mamba's Daughters* in 1929. These novels were dramatized with the aid of the author's wife, Dorothy Hartzell Kuhns, and proved highly successful on the stage. They are characterized by an uncompromising realism in their delineation of Negro life. Heyward wrote also *Skylines and Horizons, Peter Ashley, Lost Morning,* and *Star Spangled Virgin.*

Hibben, John Grier (1861-1933), American educator, was born at Peoria, Ill. He was graduated from Princeton University in 1882, studied at the University of Berlin, 1882–83, and at Princeton Theological Seminary, 1883–86. Ordained to the Presbyterian ministry, he was pastor at Chambersburg, Pa., from 1887 to 1891. Returning to Princeton University, he was successively instructor, assistant professor, and professor of logic from 1891 to 1912, when he was made president of the university, succeeding Woodrow Wilson. He retired in 1932. His works include *Inductive Logic, Problems of Philosophy, The Philosophy of the Enlightenment, A Defense of Prejudice,* and *The Higher Patriotism.*

Hichens (*hĭch'ĕnz*), **Robert Smythe (1864-1950),** English novelist, was born at Speldburst in Kent. He received his education at Clifton College, the Royal College of Music, and the London School of Journalism. In 1894, he published anonymously *The Green Carnation,* satirizing the decadents. It was attributed to Oscar Wilde and produced a great sensation.

The list of Hichens' works includes *The Slave, The Garden of Allah* (later elaborately presented as a drama), *Bella Donna, The Daughters of Babylon* (with Wilson Barrett), *The Spirit of the Time,* and *The Way Up.*

Hicks, Elias (1748-1830), American minister of the Society of Friends, was born at Hempstead, L. I. At 27, he was a well-known and influential Quaker preacher, and for many years traveled through the United States and Canada. He exercised great influence among his coreligionists until his Unitarianism brought him into disfavor with orthodox Friends. He defended his views with perseverance, and, at 80, he still preached. The result was a schism of the society into two divisions, known as the Orthodox and the Hicksite Friends.

Higginson, Henry Lee (1834-1919), American banker, was born in New York. He entered Harvard in 1851, but did not complete his course. He became an employee in the countinghouse of S. and E. Austin, Boston; then went to Vienna; studied music; served in the United States volunteers in the Civil War, becoming major. In 1868, he entered the firm of Lee, Higginson and Company, bankers, Boston, and later became an officer and director in many important corporations. In 1881, he founded the Symphony Orchestra and, for a long period, he contributed to its support. His patronage of music, extensive donations to Harvard University, liberal benefactions to charities, and prominence in civic affairs caused him to be styled "Boston's first citizen."

Higginson, Thomas Wentworth (1823-1911), American writer, was born in Cambridge, Mass. He was graduated at Harvard in 1841. After several years in the ministry he entered keenly into the movement against slavery. He took part in the Civil War first as captain of volunteers and later as colonel of colored troops. After the war he devoted himself to literature, education, and the political rights of women. He was a clear, graceful, vigorous writer and his books reflect his generous ideals and the power and courage of his convictions.

Among Higginson's numerous works are *Outdoor Papers, Army Life in a Black Regiment, Oldport Days, Young Folks' History of the United States, Common Sense About Women, Larger History of the United States, Women and Men, Concerning All of Us, A Reader's History of American Literature,* and *Part of a Man's Life* (autobiographical).

Hildebrand, Saint. See *Gregory VII.*

Hill, Ambrose Powell (1825-1865), American soldier, was born in Virginia. He was graduated at West Point in 1847, served in the Mexican War, and, in 1861, entered the Confederate army as colonel. He served in Johnston's command at the first battle of Bull Run, commanded a brigade at Williamsburg, and, in 1862, became a major general. He took part in the seven days' battle around Richmond and in the second battle of Bull Run. At Fredericksburg, he commanded the right wing of Jackson's corps. In 1863, he was promoted to lieutenant general and commanded a corps at Gettysburg. In 1864, he temporarily repelled the attack on Weldon railroad. While reconnoitering, he was killed near Petersburg, Va.

Hill, David Jayne (1850-1932), American diplomat and historian, was born in Plainfield, N. J. In 1874 he was graduated at Bucknell University, Pa., of which he was president in 1879–88. After eight years' service as president of Rochester University, 1888–96, he studied international law at Berlin and at Paris. Following his return to the United States, he was assistant secretary of state, 1898–1903; minister to Switzerland, 1903–05; minister to the Netherlands, 1905–08; and ambassador to Germany, 1908–11.

Hill's greatest literary work was a three-volume *History of Diplomacy in the International Development of Europe.* He wrote also *Elements of Psychology, A Primer of Finance, The Life and Work of Hugo Grotius, World Organization as Affected by the Nature of the Modern State, The People's Government,* and *The Problem of a World Court.*

Hill, James Jerome (1838-1916), American railway promoter and capitalist, was born near Guelph, Ont. He was educated at Rockwood Academy; left his father's farm for business life in Minnesota; engaged in a general fuel and transportation business, becoming head of Hill, Griggs and Company. He established in 1870 the Red River Transportation Company, which was the first to maintain communication between Saint Paul and Winnipeg. In 1878, he secured control of the Saint Paul and Pacific Railroad from the Dutch owners of the securities. He reorganized the system as the Saint Paul, Minneapolis, and Manitoba Railway Company, and managed it until 1890, when this railway became part of the Great Northern system.

Hill then interested himself in building the Great Northern Railway, completing, 1888–93, the main line from Lake Superior to Puget Sound, with northern and southern branches and a direct steamship connection with China and Japan. He became president of the entire Great Northern system, 1889, and was chief promoter and president of the Northern Securities Company, Edward H. Harriman's attempt to buy control of which led to the panic of 1901. He gave $500,000 toward establishing the Roman Catholic Theological Seminary at Saint Paul, Minn., was interested in many philanthropies, and made notable art collections.

Hill, Sir Rowland (1795-1879), English administrator originator of penny postage, was born at Kidderminster. From an early age to 1833 he was a teacher. He was one of the founders of the society for the diffusion of useful knowledge, 1826; interested himself in the socialistic schemes of Robert Owen; and took an active share in the colonization of South Australia. Realizing the urgent need for reducing the high rates of postage, he published in 1837 a pamphlet, *Post-office Reform,* in which he advocated an adhesive postage stamp and a low and uniform rate between all places in the British isles.

In 1839, Hill was attached to the treasury department for the purpose of putting his projected reforms into execution, and, in the year 1840, a uniform penny rate came into force. In 1841, the Conservative government, which had opposed the reduction, came into office, and, in 1842, Hill was dismissed. Four years later a sum of £13,000, raised by public subscription, was presented to him. The Liberals, returning to power, made Hill secretary to the postmaster general, and, in 1854, secretary to the post office. In 1864 he resigned, owing to ill health, and was awarded a pension of £2000 for life, together with a parliamentary grant of £20,000. He was buried in Westminster Abbey.

Hillary, Sir Edmond (1919-), beekeeper and mountaineer, was born in New Zealand, where he was educated at the Auckland Grammar School. He has been an apiarist since 1936, except during World War II, when he served with the New Zealand air force in the South Pacific. Becoming an enthusiastic mountaineer in his youth, he participated in climbing expeditions to the Himalayas in 1951 and 1952. In the British expedition led by Sir John Hunt the following year, he succeeded, in company with the Nepalese mountaineer Tensing Norkay, in reaching the summit of Mount Everest, the world's highest peak. In recognition of his achievement in climbing Everest for the first time, he was knighted by Queen Elizabeth. On January 3, 1958, he completed a 1200-mile overland trip to the South Pole from the Ross Sea coast.

Hillel (*hĭl'ĕl*) **(c.60 B.C.-10 A.D.),** surnamed Hababli, "the Babylonian," and Hazaken, "the Elder," one of the greatest doctors of the Jewish law, was born in Babylonia. He was president of the sanhedrin in Jerusalem, through appointment of Herod I, 30 B. C. to 10 A. D., and was distinguished for his humility, gentleness, and humane spirit. He founded the Talmudic Judaism and wrote extensively on law and morals.

Hillman, Sidney (1887-1946), American labor leader, was born at Zagare, Lithuania, and came to the United States when 20 years old. Attaining prominence through his leadership of a successful strike against Hart, Schaffner and Marx at Chicago in 1910, he rose rapidly in union ranks and was made president of the Amalgamated Clothing Workers in 1915. He was a member of the Labor Advisory Board of the National Recovery Administration, 1933–35. In the latter year he took his union from the American Federation of Labor into the Committee for Industrial Organization, in which body he became one of the most influential leaders. In 1942, after serving on the Defense Advisory Commission, the Office of Production Management, and the War Production Board, he was invited by the president to be his labor adviser. In 1944 he organized the Political Action Committee to bring out the labor vote for President Roosevelt.

Hillquit, Morris (1869-1933), American socialist, was born at Riga, Russia. He was educated in the schools of his

native city, 1881–86. In 1886, his parents brought him to the United States. He was graduated at the New York University Law School in 1893. He joined the socialists in 1888 and rose to prominence in the organization through his ability as a writer, speaker, and debater. He served as a member of the national committee, and was a delegate to several international socialist congresses. His writings on socialism include *History of Socialism in the United States, Socialism in Theory and Practice, Socialism Summed Up,* and *From Marx to Lenin.*

Himmler, Heinrich (1900-1945), German police official, was born at Munich. He studied agriculture at the University of Munich. After World War I, he joined Hitler in his early efforts to organize the Nazi party, providing a bodyguard for him and assisting in guerrilla fighting when necessary. He formed the private army of Black Shirts which contributed substantially to Hitler's final success. He was rewarded by being placed in charge of the German secret police force, popularly known as the "Gestapo." With ruthless efficiency, he succeeded in extirpating all opposition to Hitler even before it found expression and became one of the most feared persons in the nation. He left Berlin before its fall, but was captured and committed suicide.

Hindemith (*hĭn'dĕ-mĭt*), **Paul (1895-1963),** German composer, was born at Hanau. His family disapproving of his musical bent, he left home at an early age, supporting himself by playing in theaters and dance halls. He later studied at the Hoch Conservatory in Frankfort-on-the-Main and became conductor of the Opera House Orchestra in Frankfort. Here he began composing symphonies and songs whose unusual effects won him the appellation of the ultramodern. Performance of his symphony *Mathis der Maler* by the Berlin Symphony Orchestra brought a ban on all his works from the German government. He subsequently took up his residence in New York. His other compositions include *Cardillac* and *Neues vom Tage* and the song cycles *Melancholie* and *Die junge Magd.*

Hindenburg (*hĭn'dĕn-bo͝orĸ*), **Paul von (1847-1934),** German soldier, was born in Posen. He was educated in the cadet corps and became a subaltern. In 1866, he served in the Austrian War and in the Franco-Prussian War, 1870–71, winning his first iron cross. In 1875 he entered the general staff and, in 1888, became head of a bureau of the war department. He retired from active service in 1911 with the rank of lieutenant general.

At the outbreak of World War I, in 1914, he was recalled and made commander in chief of the campaign in East Prussia against Russia. At Tannenberg, he won one of the greatest German victories against Russia. He was again decorated with the iron cross and made field marshal. In 1915, he commanded the campaign against Russia in Poland with notable success; in 1916, he was made chief of the imperial general staff, succeeding von Falkenhayn, and was intrusted with the direction of all armies of the empire with Ludendorff as his chief adviser. The German armies were defeated, and he retired in 1919.

Hindenburg's character, temperate in victory and steadfastly courageous in defeat, was a source of moral strength to the German people, by whom he was elected president of the republic in 1925. He defeated Hitler in the presidential election of 1932 but, by consenting to make Hitler chancellor in 1933, Hindenburg took a step which extinguished the republic. See *World War.*

Hindus, Maurice (1891-), American writer, was born at Bolshoye Bikovo, Russia. Brought by his mother to the United States in 1905, he was educated at Colgate and Harvard universities. He commenced writing for periodicals in 1917 and, in 1923, began annual trips to his native land to report objectively on changes produced by the Russian Revolution. These trips bore fruit in *Broken Earth, Humanity Uprooted, Red Bread,* and *Moscow Skies,* a series of books which were among the most revealing documents of the times on what occurred to individual lives in this great social upheaval. In *We Shall Live Again* and *To Sing with the Angels,* he turned his pen to fiction, his narratives being set against the background of the seething revolutionary movements of Europe.

Hinkle, Beatrice Moses (1874-1953), American psychiatrist, was born at San Francisco, Cal. Educated by private tutors, she was graduated from Cooper Medical College (Stanford University) in 1899. Earlier in that year had occurred the death of her husband, Walter S. Hinkle, whom she married in 1892. She was city physician of San Francisco for the next six years, the first woman to hold a public health position. In 1905, she went to New York and specialized in psychoanalysis. At Cornell Medical College, New York City, she opened in 1908 the first psychiatric clinic in America. She wrote *The Re-creating of the Individual.*

Hipparchus (*hĭ-pär'kŭs*), Greek astronomer, flourished between 160 and 125 B. C. He was born at Nicæa in Bithynia. His astronomical observations were made at Rhodes. He discovered the precession of the equinoxes and the eccentricity of the sun's path, determined the length of the solar year, and estimated the distances of the sun and the moon from the earth. He invented the astrolabe, founded the science of trigonometry, drew up a catalogue of 1080 stars, and fixed the position of places on the earth by giving their latitude and longitude.

Hippocrates (*hĭ-pŏk'rà-tēz*), (**c. 460 B. C.-c. 377 B. C.**), Greek physician, the most celebrated of antiquity, was born in the island of Cos. After traveling through different parts of Greece he began practice at Cos. Seventy-two works bear his name. His writings were first printed in a Latin translation in 1525. The first Greek impression appeared in 1526. He seems to have gathered up all that was sound in the history of medicine; was good in diagnosis and prognosis; and believed that the four fluids or humors of the body—blood, phlegm, yellow bile, and black bile—are the primary seats of disease. He was a man of great nobility of character and possessed high ideals of medical ethics. These have been perpetuated to the present time in the world-wide reverence of physicians for the "Hippocratic oath."

Hirohito (*hē-rô-hē-tô*), (**1901- **), emperor of Japan, was born at Tokyo. He acted as regent from 1921 to 1926, during which time his father, Yoshihito, the reigning emperor, was incapacitated. After the latter's death in 1926, Hirohito ascended the imperial throne. Under his rule, Japan entered on a career of expansion, beginning with the seizure of Manchuria in 1931 and culminating in Japan's entry into World War II in 1941. Following the surrender of Japan in 1945, he renounced war and his own divinity and promulgated a new constitution for Japan which became effective in 1947.

Hiroshige (*hē-rô-shē-gĕ*), **Ando (1797-1858),** Japanese landscape artist, was born of a Samurai family at Tokyo. At the age of 10, he attracted attention by his lifelike painting. At 15, he sought instruction from Toyokuni, who refused him; but he was received as a pupil by Toyohiro, upon whose death in 1828 he began an independent career. With his pictures of the Tokaido, the celebrated highway between Tokyo and Kyoto, he sprang into great fame, and his style was widely imitated.

In contrast with the designs of the Chinese, Hiroshige's method shows European influences, though his technique is Japanese throughout. His chief distinction is in rendering the mood of the landscape before him. Notable color prints illustrating his work are on exhibition in the Metropolitan Museum, New York.

Hitchcock, Alfred (1899-), motion picture and television director, was born in England. He studied art and engineering, and his talent in these fields is evident in the long list of suspenseful, technically excellent films that he has directed and written.

Hitchcock began his career in England. His first movie, *The Lodger,* based on the Jack the Ripper story by Mrs. Belloc Lowndes, established him as a brilliant director in 1926. Among the pictures that followed were *The Lady Vanishes,* the classic *The Thirty-Nine Steps* which starred Madeleine Carroll and Robert Donat, and *The Woman Alone* which was suggested by Joseph Conrad's novel *The Secret Agent.*

Alfred Hitchcock came to Hollywood in 1938 and has worked there since. He began his American career with *Rebecca,* which starred Joan Fontaine and Laurence Olivier and won an Academy Award in 1939. Despite the meticulous planning and preparation that he demands, Hitchcock's rate of production is high. Up until 1956, he had made forty-six films. Among the outstanding titles made during his American period have been *Foreign Correspondent, Spellbound,* and *Stage Fright.* Recently he began to produce a striking television dramatic series, *Alfred Hitchcock Presents,* which displays the same ingenious plotting and the same throat-catching surprises that distinguish his motion pictures.

Hitchcock, Edward (1793-1864), American geologist, was born at Deerfield, Mass. He was educated at Yale and, in 1821, was ordained to the Congregational ministry. He was pastor of the Congregational Church, Conway, Mass., 1821–25. From 1825 to 1845, he was professor of chemistry and natural history in Amherst College. From 1845 to 1854, he was president of Amherst College and professor of natural theology and geology. Subsequently he held the chair of geology until his death. In 1824, he published *The Geology of the Connecticut Valley.* In 1830, he was appointed state geologist, and as such made a thorough survey of the geology and mineralogical resources. This included also the botany and zoology of Massachusetts, of part of New York, and of Vermont. In 1850, he was appointed agricultural commissioner for his native state. He was the first to identify and study fossil footprints left in the Triassic sandstones by prehistoric animals.

Hitchcock, Lambert (1795-1852), American chairmaker, was born at Cheshire, Conn., where he learned the cabinetmaking trade. At the age of 23, he moved to a village in the township of Barkhampsted, Conn., and began to

manufacture the chairs which have immortalized his name. The Hitchcock chair superseded the Windsor chair in popularity and remained the favorite American chair for many years. It is a straight chair with a rush or cane seat or even a wooden one. The front legs and front rung are turned, the others are plain. The back legs extend above the seat to form the uprights of the back. These are joined by a turned top rail and by a wide curved horizontal back slat on which the principal decoration of the chair is centered. The chairs were generally painted black and the decorating was done with stencils in gold, silver, or bronze. Horns of plenty, baskets of fruit or flowers, and clusters of grapes were favorite designs. Hitchcock also made Boston rockers. Yankee peddlers sold thousands of Lambert Hitchcock's chairs. The old factory which he built more than a century ago at Hitchcocksville (now Riverton), Conn., is still standing.

Hitler, Adolf (**1889-1945**), dictator of Germany and leader of an international totalitarian revolution to supplant democratic governments, was born at Braunau, Austria. An early ambition to be an artist was frustrated first by his father's violent opposition and later by the unfavorable judgment of an art school to which he sought admission. After the death of his father in 1903 and of his mother, to whom he was deeply attached, in 1907, he worked as a common laborer, his jobs including carpentry, house painting, and paper hanging. During this period ideas and attitudes took shape in his mind which were destined to alter profoundly the course of modern history. They included a hatred of the Jews, of the financial interests, of international socialism, and of non-German admixture with the German race. In their positive aspect, these ideas were fused into a conviction of the superiority of the German people. In this period also he learned to utilize facts and arguments gleaned from an avid reading of literature to support the ideas which he wished to propagate.

In World War I, 1914–18, Hitler served in the German army as a private and later as corporal. His subsequent career falls into four parts—early abortive attempts to overthrow the German republic, his rise to power, his reorganization of Germany into a totalitarian state, and the period of conquests.

Early Career. In 1919 Hitler became one of the first members of a political organization which developed into the National Socialist (Nazi) party, of which he was made leader and chief propagandist. He joined forces with Ludendorff in an attempted revolution in 1923, the so-called "beer-hall putsch," but was captured and, being convicted of treason, served a prison term of 13 months. While in prison, he wrote *Mein Kampf* ("*My Struggle*"), a book which later became the bible of the Nazi revolutionary movement. Steeped in hatred for the Jews, capitalism, and Communism, this book, partly autobiographical in character, pictures a Germany reorganized as a "classless" society in which national efforts are focussed on acquisition of world power. With uncanny insight, the book analyzes the weaknesses of Germany's future foes and forecasts broadly the course which events later took.

Rise to Power. On his release from prison, Hitler devoted himself to building up the Nazi party, forming for the purpose semi-military organizations, such as the Brown Shirts, the Elite Guard, and Hitler Youth. He copied also the "cell" methods developed by the Communist party in Russia, the purpose of which is to restrict acquaintanceship of party members to those in one "cell," so that no one is in a position to betray any considerable number of members. By dint of his passionate, magnetic oratory and the enthusiastic following which he inspired, the party grew rapidly, electing 12 members to the Reichstag in 1928 and 230 in 1932. One of the new members was Hitler, who had become eligible through naturalization. President Hindenburg made him Chancellor on January 30, 1933. Four weeks later the Reichstag building was destroyed by fire, an event which Hitler seized upon as an occasion to arrest Communist deputies and suppress opposition parties. Elections held on March 5 gave the party an absolute majority, by means of which Hitler's cabinet was voted full legislative power for four years. The Reconstruction Act of 1934, giving the cabinet power to create new constitutional law, completed the edifice of his dictatorship. An incipient revolt against Hitler within the party in July 1934 was scotched by the assassination of 67 leading members.

Reorganization of Germany. With autocratic power at his disposal, Hitler proceeded to remake Germany after the fashion of his earlier dreams. His program included: inculcation of the view that Germans are a superior race; development of national power in keeping with such racial superiority; preservation of racial purity by forbidding intermarriage with Jews and imposing on Jews measures calculated to drive them from the country; breaking down all institutions which clashed with these purposes and building up new ones which fostered them. Organizations of youth were formed to teach "strength through joy," in which essential elements were "blood" (racial purity) and "earth" (closeness to nature). Although capitalism was tolerated, it was subject to strict regulation and heavy taxation. Through close party control, industry became a partnership between leaders (employers) and followers (employees). Religion, press, and education were fashioned into instruments to instil the ideal of national greatness. Hitler built for himself at Berchtesgaden, Obersalzberg, an impregnable retreat.

Period of Conquest. Hitler's first object in foreign relations was to erase the effects of the Treaty of Versailles. To this end he diverted a large proportion of the national income to building up armaments. He made an alliance with the totalitarian governments of Italy and Japan, ostensibly aimed against Communism. By assisting in the overthrow of Spain's democratic regime he secured a friendly totalitarian government there.

Before embarking on his larger conquests, Hitler prepared the way by a campaign of "propaganda" of unexampled thoroughness. Advantage was taken of internal conflicts of interest in foreign countries and parties with totalitarian aims were founded in nearly all nations. In this way he annexed Austria and Czechoslovakia in 1938. One of the most powerful propaganda weapons used was stirring up fear of Communism. Yet in 1939 Hitler negotiated a passive alliance with Russia, the chief Communist power. The stage was now prepared for World War II.

Poland was divided with Russia in 1939; Denmark and Norway were occupied in 1940. Belgium and the Netherlands were occupied in a few days and for the first time the fury of Hitler's war machine was let loose in an assault against the French and British armies. In ten weeks France had capitulated and the British army had withdrawn. An unprecedented aerial assault on England failed as preparation for an invasion. Turning south, Hitler's armies overran Yugoslavia and Greece in early 1941. In June, he declared war on Russia. After initial successes, the Germans were driven from Russia and the Balkans, and in 1944 Allied armies reconquered France and attacked the Reich itself. Disaffection appeared, especially in the army, and a plot to murder Hitler narrowly failed. He held out to the last in Berlin, where he allegedly committed suicide as the Russians entered the city, April 30, 1945.

Hittorf (*hĭt'ôrf*), **Johann Wilhelm** (**1824-1919**), German physicist, was born at Bonn. In 1852, he was called to the chair of chemistry and physics at Munster, which he filled with distinction for 50 years. His first important researches were in electrolysis, and his method of determining the mobility of ions was of the highest importance to physical chemistry. In 1869, while studying the passage of electricity through tubes containing a rarefied gas, he noticed the fluorescence produced by the cathode rays, and found that those rays could be deflected by a magnet, thus anticipating Crookes, who published his celebrated researches with vacuum tubes and, in 1878, gave to the rays so produced the name of radiant matter.

Hobbema (*hŏb'ĕ-mă*), **Meindert** (**1638-1709**), Dutch landscape painter, was born at Amsterdam. He was the friend and pupil of Ruysdael, and, until his marriage at the age of 30, after which he discontinued painting to become a city official, they often worked together. In his brief artistic career, devoted entirely to scenic painting, he produced some of the most highly prized landscapes of his century. He ranks second only to the more versatile Ruysdael among the great landscape artists of the Dutch school.

Hobbes (*hŏbz*), **John Oliver** (**1867-1906**), is the pen name of Mrs. Pearl Mary Teresa Craigie, née Richards, English novelist, born at Boston, Mass. She removed to England when very young; was educated at University College, London, and in Paris. In 1887, she married R. W. Craigie, from whom she secured a divorce in 1895. She published her first novel, *Some Emotions and a Moral*, in 1891 and won success by her brilliant, epigrammatic, and somewhat cynical style. She wrote the novels *A Study in Temptations*, *The School for Saints*, and *The Flute of Pan*. She wrote also the plays *Journeys End in Lovers' Meeting*, *The Ambassador*, and *A Repentance*.

Hobbes, Thomas (**1588-1679**), English philosopher, was born at Malmesbury. He was graduated at Oxford. In 1610 he went abroad with the Earl of Devonshire as his pupil and made a tour of France and Italy. Meantime he was occupied with classical, political, and philosophical studies, and prepared for publication his first work, a translation of Thucydides, which appeared in 1628. His first original work, *De Cive*, was printed in Paris in 1642. He published soon afterward two small treatises entitled *Humane Nature* and *De Corpore Politico*. After meeting of the Long Parliament, he lived in Paris for a time on account of his dread of the civil troubles. Then followed his *Leviathan*, embodying the famous "social compact" theory, and also his work entitled *Liberty and Necessity*.

Hobbes advanced the view that man originally lived in a state of anarchy, from which he emerged when individuals, through a "social compact," gave up their personal freedom to form the state. The state, usually

personified by a monarch, he held to be entitled to complete obedience. His influence on political thought was deep and lasting.

Hobby, Oveta Culp (**1905-**), was director of the Women's Army Corps in World War II, and was secretary (1953–55) of the newly formed Department of Health, Education and Welfare under President Eisenhower. She was born at Killeen, Texas. In private life she is the wife of William P. Hobby, publisher of the *Houston Post*, who was formerly governor of Texas.

Hochwalt, Monsignor Frederick G. (**1909-**), clergyman and educator, was born at Dayton, Ohio. He was educated at the University of Dayton, St. Gregory Seminary, and The Catholic University of America. Following several assignments as priest, he became director of the Department of Education of the National Catholic Welfare Conference. Since 1944 he has been secretary of the National Catholic Educational Association.

Hoe, Richard March (**1812-1886**), American inventor, was born in New York. He was the son of Robert Hoe (1784–1833), and, in 1827, began the practical study of of making printing presses. In 1833, he became the senior partner in the Hoe firm. He invented many improvements in the presses and also produced a steel saw of excellent quality. In company with his brothers, he took over, in 1841, the entire management of the business.

Hoe's first great invention, a rotary press, widely known as Hoe's lightning press, was brought out in 1846 and was extensively adopted by newspapers. Later he invented the web perfecting press, printing on both sides of the sheet, with an intricate apparatus for folding and cutting. These two great mechanical achievements revolutionized newspaper printing. Improvements were constantly added and the business developed by him and carried on by his sons and nephews grew to vast proportions.

Hoe, Robert (**1784-1833**), American inventor, was born in Leicestershire, England. He was apprenticed to a joiner; came to the United States in 1803; and worked for a time at his trade and later in partnership with his brothers-in-law in the manufacture of a hand printing press. In 1823, he became exclusive owner of the business, and constructed and introduced the original Hoe press. Hoe is considered the first American machinist to make use of the steam engine for motive power in his factory. The business founded by him was carried on with notable success by his sons and their descendents.

Hoe, Robert (**1839-1909**), American manufacturer and inventor, was born in New York. He was educated in the public schools and entered the printing press factory of R. Hoe and Company, founded by his grandfather, Robert. During his association with the firm, he developed the printing press from the "Hoe cylinder" of the 1846 patent to the later double-sextuple Hoe and invented presses of a greatly improved type for printing in colors. He engaged also in the manufacture of circular saws and saw bits, with large factories in New York and London. He was one of the founders of the Metropolitan Museum of Art and made collections of rare books, manuscripts, silverwork, and other objects of art, valued at several million dollars.

Hofer (*hō'fẽr*), **Andreas** (**1767-1810**), Tyrolese patriot, was born at Saint Leonard. Tyrol having been transferred by the Treaty of Pressburg in 1805 from Austria to Bavaria, Hofer went secretly with other Tyrolese in 1808 to Vienna, where a plan of insurrection was drawn up. Under Hofer's leadership the plan was successful, and the Bavarians were driven out in 1809.

The Austrian emperor, however, in an armistice the same year, surrendered Tyrol to Bavaria, which, with the aid of Napoleon, sent armies to occupy the country. Hofer defeated these armies and ruled Tyrol for several months in the name of the Austrian emperor. The emperor however, again surrendered Tyrol to Bavaria. The French and Bavarians once more poured into the country, and, after a brief struggle, Hofer was obliged to take refuge in concealment. After a lapse of two months, he was betrayed into the hands of the French, conveyed to Mantua, tried, condemned, and shot.

Hoff, Jacobus Henrik van't See *Van't Hoff*.

Hoffman, Malvina Cornell (**1887-**), American sculptor, was born in New York, N. Y. She was a pupil of Herbert Adams, Gutzon Borglum, and Auguste Rodin. Her sculpture, which depicts chiefly human figures, is remarkable for the powerful simplicity of its lines, yet without the sacrifice of carefully executed details. Among her works are "Modern Crusader," in the Metropolitan Museum, New York; "The Sacrifice," in the Cathedral of St. John the Divine, New York; "Pavlowa Gavotte," in the Stockholm Museum; "Bill," in the Luxembourg Gallery, Paris. In 1931–33, she made a trip around the world and executed 100 bronze statues representing the different racial types of mankind for the Field Museum, Chicago. She married S. B. Grimson in 1924. She wrote *Heads and Tales* and *Sculpture Inside and Out*.

Hoffman, Paul Gray (**1891-**), American business man, was born in Chicago, and attended the University of Chicago, leaving in 1909. In 1911 he entered the sales force of the Studebaker Corporation, of which he was vice president, 1928–33. He carried it through a receivership, and became its president in 1935. Meantime he engaged in various outside activities, including service in the artillery in World War I, and the chairmanship of the Committee for Economic Development. In 1948 President Truman appointed him administrator of the European Recovery Program from which he resigned in 1950 to become head of the Ford Foundation.

Hoffmann, Ernst Theodor Wilhelm (**1776-1822**), German writer, composer, critic, and caricaturist, was born in Königsberg. He entered the Prussian civil service, but his love of caricature interfered with his advancement and forced him into literature and music to eke out a living until the last years of his life. He was the high priest of German romanticism, with a sarcastic wit and an inexhaustible, but wild, imagination. His works include, besides several volumes of short stories, *Die Elixiere des Teufels* and *Lebensansichten des Katers Murr*, the latter partly autobiographical.

Hofmann, August Wilhelm von (**1818-1892**), German chemist, was born at Giessen. He became assistant to Liebig at Giessen, and when the Royal College of Chemistry was established in London in 1845, Hofmann was made superintendent. From 1856 to 1865, he was chemist to the British royal mint. In 1865, he went to Berlin as professor of chemistry. He was ennobled in 1888. His contributions to the scientific journals were mainly on organic chemistry. In the course of his researches, he obtained aniline from coal-tar products and made further discoveries which revolutionized the art of dyeing. He devoted much labor to the theory of chemical types. His *Introduction to Modern Chemistry* led to great reforms in the teaching of chemistry. He wrote *The Life-work of Liebig*, *Handbook of Organic Analysis*, and *Chemische Erinnerungen*.

Hofmann, Heinrich (**1824-1902**), German historical painter, was born in Darmstadt. After studying in Düsseldorf and at the Antwerp Academy, he resided in Italy, 1854–58. He finally settled, 1862, in Dresden, where he became professor of art in the Academy. Hofmann is most widely known by his idealized scenes from the life of Christ, especially his "Christ in the Temple," painted in 1882, and widely reproduced in engravings.

Hofmann, Josef Casimir (**1876-1957**), pianist, was born in Krakow, Poland. His father, a Kapellmeister and composer, began teaching him the piano in infancy and, at the age of 7, his talent attracted the attention of Rubinstein. At the age of 10, he came to the United States for a concert tour. Upon returning to Europe, he studied under Urban, Moszkowski, and Rubinstein, achieving marked distinction as a musical artist. He made many successful concert tours in America and Europe before locating in New York, where he wrote extensively on musical topics and composed a number of musical works. He was director in chief of the Curtis Institute of Music, Philadelphia, from 1927 to 1938, after which time he devoted himself chiefly to concert work.

Hogarth (*hō'gärth*), **William** (**1697-1764**), English painter, engraver, and pictorial satirist, was born at London. He served an apprenticeship to a silversmith; about 1720, began business for himself, first being employed in engraving coats of arms and designing plates for booksellers; and, in 1724, entered the art school of Sir James Thornhill. He made the illustrations for Gray's edition of Butler's *Hudibras*. He secretly married the daughter of Sir James Thornhill in 1729. In 1730, he began the painting of satirical pictures which made him famous, among them being "The Harlot's Progress," "A Midnight Modern Conversation," "A Rake's Progress," "The Distressed Poet," and his masterpiece, the famous "Marriage á la Mode." See *Painting*.

Hogben, Lancelot (**1895-**), English zoologist, was born at Southsea. Graduating at Cambridge University, he lectured in zoology at the Imperial College of Science, 1919–23, and then went to the University of Edinburgh to direct and lecture on animal breeding and experimental physiology. His brilliance as a popularizer of scientific knowledge combined with the freshness of his attack on biological problems brought him invitations from a number of universities. He taught at McGill University, Montreal, in 1925–27, at Cape Town University in 1927–30, and at the University of London in 1930–37. In the latter year he was made regius professor of natural history at Aberdeen University. In 1947 he became professor of medical statistics at the University of Birmingham. He was in Norway in 1940 when the Germans occupied the country, but he succeeded in escaping through Russia and Japan to the United States. His observations were published under the title *Author in Transit*. Other works include *Mathe-*

matics for the Million, Nature and Nurture, and *Science for the Citizen.* His more technical publications include *The Comparative Physiology of Internal Secretion* and medical memoirs.

Hokusai (*hō-kōō-sī*), **(1760-1849),** Japanese artist, was born at Tokyo and began his art career as a wood engraver. He then became a pupil of the famous designer Shunsho, who had no sympathy with Hokusai's pursuit of originality and gave him the unhappy dispatch. But Hokusai went on to become the top-ranking artist of the popular school (ukijoye). He became a book illustrator and at length an artist and teacher with a splendid reputation. His output was enormous. He is credited with producing no less than 30,000 pictures, mostly simple works of the contemporary life and scenes with which he was familiar. Perhaps the most famous are his *Magwa* or *Ten Thousand Sketches* in fifteen volumes, and his *Hundred Views of Mount Fuji.*

Holbein (*hōl'bīn*), **Hans** or **Johann (1497-1543),** called "the Younger," German painter, was born at Augsburg. He went to Basel with his brother Ambrosius, also a painter. About 1526, he contracted an intimacy with Erasmus, whose portrait he painted, and afterward visited England, where he spent most of his remaining years. Henry VIII made him court painter.

Holbein is distinguished as a historical and portrait painter and an engraver on wood. As an engraver, he is known chiefly by the celebrated series of woodcuts entitled "Dance of Death." Among his most important paintings are "Madonna of the Burgomaster Meyer," "The Ambassadors," "The Last Supper," "The Dead Christ," "The Nativity," and "The Adoration of the Magi." In portrait painting, he ranks among the world's greatest artists. His portraits are not only truthful and charming in workmanship, but they are also expressive records of character. With Albrecht Dürer, Holbein stands at the head of early German artists.

Holberg (*hōl'bĕrĸ*), **Ludvig, Baron (1684-1754),** Danish writer, was born at Bergen in Norway. He studied at the University of Copenhagen; became professor of metaphysics at Copenhagen in 1718; and maintained his connection with the university throughout the remainder of his life.

His first notable works were satirical poems, among them *Peder Paars,* in which he ridicules the pedantic stiffness and stupidity of contemporary life and thought. In 1721, the first Danish theater was opened at Copenhagen, and Holberg began to write comedies for it with great success. After 1724, he turned to history and wrote, among other books, a *History of Denmark, History of the Jews,* and *Comparative Biographies of Great Men and Women.* In 1741, he produced another classic, the romance *Niels Klim's Subterranean Journey.* He also published the serious reflective works *Moral Thoughts* and *Epistles* and his own *Autobiography.* See *Danish Literature.*

Holinshed (*hōl'ĭnz-hĕd; hōl'ĭn-shĕd*) **Raphael (d. 1580),** English chronicler, was born probably in Cheshire. He is noted as the author of a history of England, Scotland, and Ireland, which furnished Elizabethan dramatists with historical material for their plays. *Raphael Hollingeshed's Cronycle,* which was the completion of a work originally begun by Wolfe, was issued in 1577. From this work Shakespeare obtained much of the data for his great series of historical plays, and portions of *Macbeth, King Lear,* and *Cymbeline* can be traced to it.

Holland, John Philip (1844-1914), inventor, was born at Liscannor, Ireland, and was educated at Limerick. After teaching 10 years, he came to America and joined the Fenian movement. Seeking means of destroying the British navy, he turned his attention to the construction of submarines. In 1877, he built a clumsy wooden vessel which demonstrated his principles of submersibility and control. Following 20 years of ridicule and failure, he finally constructed, 1898, the successful submarine *Holland.* This was purchased by the United States, 1900, and became the type for many subsequent underwater craft. Although not the originator of the idea, Holland is justly regarded as the father of the modern submarine.

Holley, Alexander Lyman (1832-1882), American engineer, was born in Lakeville, Conn. He was graduated at Brown University, 1853 and, in 1856, became editor of *Railroad Advocate,* the name of which he changed to *The American Engineer.* In 1865, he introduced the Bessemer steel making process into the United States, erecting at Troy, N. Y., the first Bessemer steel plant in the country. In 1879, he became a lecturer at Columbia University on the manufacture of iron and steel. He secured numerous patents for improvements in the manufacture of steel, chiefly connected with the Bessemer process, the most important of which was for a detached converter shell.

Holmes, John Haynes (1879-), American preacher, was born in Philadelphia, Pa. Educated at Harvard University, he accepted the pastorate of a Unitarian Church in Dorchester, Mass., in 1904, and, in 1907, the Church of the Messiah, later called the Community Church of New York. In 1919, he and his pastorate severed their connection with Unitarianism.

By his sermons, broadcast by radio, Holmes became a leader of liberal religious opinion, opposing war and religious intolerance and supporting the cause of labor and civil liberties. His publications include *The Revolutionary Function of the Modern Church, Is Violence the Way Out?,* and *Rethinking Religion.*

Holmes, Oliver Wendell (1809-1894), American author, was born in Cambridge, Mass. He was graduated at Harvard in 1829; studied law for a period, but subsequently devoted himself to medicine and. after attendance in the hospitals of Europe for several years, received his degree in medicine in 1836. In 1838, he became professor of anatomy and physiology in Dartmouth College and, from 1847 to 1882, held the same chair at Harvard. He gained some reputation as an anatomist and was, besides, an able microscopist and a skillful auscultator; but his widest fame is as a poet, a wit, and a man of letters.

Holmes's wit and humor are transcendent; his poetry is the perfection of conception and finish; and all his literary efforts are of rare originality and excellence. He was also a fascinating and instructive lecturer, while his social qualities endeared him to a large and intellectual circle.

At 21, he wrote the well-known, vigorous verses "Old Ironsides." Then followed his Phi Beta Kappa poems *Poetry, Terpsichore, Urania,* and *Astræa,* all of which added to his reputation. In 1857–58, he contributed to the *Atlantic Monthly* his *Autocrat of the Breakfast Table,* a connected series of prose essays, *The Professor at the Breakfast Table, The Poet at the Breakfast Table,* and *Over the Teacups.* This brilliant series, which was in his happiest vein, was interspersed with poems and was fraught with humor, pathos, and practical wisdom.

Holmes's after-dinner poems and other short lyrics are not surpassed by any productions of their kind in the language. His various medical addresses, papers, and pamphlets are a part of our scientific literature. He established the fact that puerperal fever is contagious. His other writings include *Currents and Counter-Currents in Medical Science; Elsie Venner,* a romance; *Songs in Many Keys; Soundings from the Atlantic; The Guardian Angel;* and *Mechanism in Thought and Morals.* He was elected to the American Hall of Fame in 1910.

Holmes, Oliver Wendell (1841-1935), American jurist, son of Dr. O. W. Holmes, was born in Boston, Mass. He was graduated from Harvard, 1861, and from Harvard Law School, 1866. He served three years during the Civil War; was wounded at Ball's Bluff, 1861; at Antietam, 1862; and at Marye's Hill, Fredericksburg, 1863. After the war, he engaged in practice at Boston and was editor of the *American Law Review,* 1870–73. In 1882, he was made professor of law at Harvard and was made justice of the Massachusetts Supreme Court, becoming chief justice in 1899. In 1902, he was appointed associate justice of the United States Supreme Court, from which he resigned in 1932. His published works include an edition of Kent's *Commentaries,* his own valuable lectures entitled *The Common Law,* and a volume of *Speeches.*

Holyoake (*hōl'yōk; hōl'ĭ-ōk*), **George Jacob (1817-1906),** English reformer, was born at Birmingham. He taught mathematics for several years at the Mechanics' Institution in Birmingham; lectured on Robert Owen's socialist system; was secretary to Garibaldi's British contingent; edited the *Reasoner;* and promoted the parliamentary bill legalizing secular affirmations. He is known as the founder of secularism, or the doctrine that all forms of religion should be abandoned. He wrote *The Rochdale Pioneers, History of Coöperation in England,* and *Self-help a Hundred Years Ago.*

Home (*hūm*), **Alexander Frederick Douglas-Home, 14th Earl of (1903-),** British political leader, was born in London and was educated at Eton and Oxford. His government service has included secretary to the Prime Minister, secretary of state for Commonwealth Relations, also for Foreign Affairs, and Leader of the House of Lords. In 1963 he was appointed Prime Minister to succeed Harold Macmillan. In the close election of 1964, he was defeated by Harold Wilson.

Homer, Greek epic poet, is believed to have flourished about 900 B. C. Smyrna, Chios, Argos, Athens, Salamis, and other places claimed the honor of being his birthplace. Nothing is known of his life. The accounts representing him as a blind bard who begged his daily bread are purely legendary. The chief works attributed to Homer are the *Iliad* and the *Odyssey.* These two epics are the first works of extant European literature, and they still rank with the greatest.

The *Iliad* deals mainly with the consequences of the wrath of Achilles at the siege of Troy. This chief hero of the Greeks, wronged by Agamemnon, the Greek commander, withdrew from the fight. He refused to return in spite of the reverses suffered by the Greek army, until,

finally, his dearest friend Patroclus was slain by the Trojans. Then, eager for vengeance, he entered the battle and eventually succeeded in slaying Hector, the leader of the Trojans.

The *Odyssey* relates the adventures of the Greek hero Odysseus during a ten-year period of wandering homeward from Troy to Ithaca. The construction of the plot is perhaps superior to that of any other long poem in existence. For simplicity of thought, rapidity of action, and sustained nobility of tone, these two poems of Homer are unique in literature. His depiction of character is convincing, and his versification shows a rare mastery of the epic verse form.

The poems of Homer exerted an enormous influence over Greek education, literature, and culture. They were regarded as a basis of morality, a source book of knowledge, a textbook for oratory, and a standard of literary taste. They provided, also, an element of cultural unity among the numerous independent states of Greece. In modern times, these poems have served to throw much light on the earliest Ægean civilization.

It has been argued that Homer did not exist as an individual, but that each of the Homeric poems is a compilation of many isolated episodes composed by different and unknown poets. Their uniform excellence of style, however, and their unity of plot, particularly as exemplified in the *Odyssey*, imply a master artist second to none among the writers of epic poetry. See *Trojan War*.

Homer, Louise Dilworth (c.1872-1947), nee Beatty, American dramatic contralto, was born in Pittsburgh, Pa. She began musical study in Philadelphia. In 1894, she continued the study of singing with Wm. L. Whitney in Boston and of harmony with Sidney Homer, the composer, whom she married in 1895. She then studied two years with Madame Koenig in Paris and made her debut at Vichy as Leonora in *La Favorita* in 1898. In 1899, she appeared as Amneris in *Aida* at Covent Garden, London. In 1900, she appeared with great success at the Metropolitan Opera House, New York. She continued as a regular member of the company for many successive seasons and appeared also in Chicago, San Francisco, and Los Angeles opera companies. Her roles include Ortrud in *Lohengrin*, and Delila in *Samson and Delila*.

Homer, Winslow (1836-1910), American marine painter, was born at Boston. While young he worked at lithography in Boston and, in 1859, went to New York and became a student of art at the Academy of Design. In 1861, he went to the front as war artist for *Harper's Weekly*. He was elected to the National Academy in 1865 and exhibited several oil paintings with success. In 1867, he visited Europe; studied in Paris; and, upon returning, continued to illustrate for *Harper's* until 1875. In 1880, he turned his attention to marine painting and, in 1884, began his notable career as leading American painter of the ocean and of seafaring folk.

His paintings include "The Life Line," in the Elkins collection, Philadelphia; "The Fog Warning," "Lookout—All's Well," both in the Boston Museum; "The Maine Coast," "Northeaster," "Cannon Rock," in the Metropolitan Museum, New York; "On a Lee Shore," Providence Museum; and "Undertow," "Eight Bells," "The West Wind," and "A Summer Night," in the Luxembourgh, Paris. Homer is among the most characteristically national of American painters, excelling in composition, color, and fidelity to nature. He was elected a member of the American Academy of Arts and Letters in 1905.

Hood, John Bell (1831-1879), American general, was born in Owingsville, Ky. He was graduated from the United States Military Academy in 1853 and was appointed lieutenant of infantry in the same year. He was actively engaged on frontier duty until 1861, when he entered the Confederate army. He served in every position from that of first lieutenant to that of division commander with the rank of lieutenant general. He took a conspicuous part in the second battle of Bull Run, Antietam, Gettysburg, and Chickamauga, where he lost a leg. In 1864, he succeeded Johnston in command of the army resisting Sherman's invasion of Georgia. He was repulsed by the Federal forces in battle at Franklin, Tenn., 1864, and was decisively defeated at Nashville, December 15–16. After the war, he engaged in business in New Orleans.

Hood, Thomas (1799-1845), English poet and humorist, was born in London. In 1821, he was offered a post on the editorial staff of the *London Magazine*; he at once entered upon its duties and acquired an extensive literary acquaintance. His first separate publication was entitled *Odes and Addresses on Great People*. In 1826, he published *Whims and Oddities*, of which a second and third series appeared during the following two years. In 1830, he began the *Comic Annual* and continued it for nine years. He edited the *Gem* for one year, contributing to its pages his striking poem entitled "Eugene Aram's Dream." In 1834, he wrote the novel *Tylney Hall*. In 1838, he commenced the publication of *Hood's Own*, to which his portrait was attached. In 1844, he began *Hood's Magazine* and contributed to its pages until within a month of his death. His "Song of the Shirt" and "Bridge of Sighs" are among the most perfect poems of their kind in the English language.

Hooker, Joseph (1814-1879), American general, was born in Hadley, Mass. He was graduated at West Point in 1837, and fought in the Florida and Mexican wars. In 1853, he resigned and became a farmer in California.

When the Civil War began, he entered the Union army and soon became a major general. He fought under McClellan on the peninsula and afterward in northern Virginia and Maryland, receiving a wound at the battle of Antietam. His bravery in action brought him the nickname "Fighting Joe Hooker." In January 1863, he was made commander of the army of the Potomac, and, in May, he fought and lost the bloody battle of Chancellorsville. On account of growing dissatisfaction with his generalship, he resigned as ranking general, June 28, 1863, just before the battle of Gettysburg. He still served as major general and fought with great distinction under Grant at Chattanooga and under Sherman at Atlanta.

Hooker, Sir Joseph Dalton (1817-1911), English botanist, was born at Halesworth, Suffolk. He was graduated in medicine, but devoted his attention chiefly to botany. In 1839, he joined as botanist the antarctic expedition of the *Erebus* and *Terror*, commanded by Sir James Ross. When he returned, in 1843, he brought with him over 5000 species of plants, which were described and published under the title of *Flora Antarctica*. His *Himalayan Journals* and the *Rhododendrons of the Sikkim-Himalaya* were important additions to our knowledge of botany.

In 1871, he made an expedition to Morocco; ascended the Great Atlas, the summit of which had never before been reached by a European; and secured a valuable collection of plants. He was appointed assistant director at Kew Gardens in 1855 and, on the death of his father in 1865, succeeded him as director.

His greatest work, which he undertook in conjunction with George Bentham, is the *Genera Plantarum* and entitles him to rank among the greatest English botanists. He was an intimate friend of Darwin, whom he influenced to publish his paper on natural selection in 1858.

Hooker, Richard (c. 1553-1600), English theologian and writer, was born near Exeter. He was graduated from Oxford in 1574 and became a fellow of Corpus Christi College and deputy professor of Hebrew. The Archbishop of York promoted him to the mastership of the Temple in London, 1585. Here he entered into a controversy with Walter Travers, a Calvinist preacher who also officiated at the Temple.

Out of this controversy arose Hooker's *Laws of Ecclesiastical Polity*, a defense of the Anglican Church but on grounds so broad that the principles of natural and man-made law which he formulated underlay much of the political thought of later generations in England. In 1591, Hooker became rector of Boscombe, Wiltshire. From 1595 he was rector of Bishopsbourne, Kent.

Hooker, Thomas (c. 1586-1647), English clergyman and American colonist, was born at Markfield, Leicester. He became a fellow of Emmanuel College, Cambridge, and was for three years a Puritan lecturer at Chelmsford. In 1630, he retired to Holland; in 1633, he sailed for Massachusetts and received a charge at Cambridge. In 1636, he removed with his congregation to Connecticut and founded Hartford. He published many sermons and books, including the *Survey of the Summe of Church Discipline*, an influential work in the development of Congregationalism.

Hooton, Earnest Albert (1887-1954), anthropologist, was born in Clemansville, Wisc., the son of a Methodist minister. From 1930 to 1954 he was professor of anthropology at Harvard University. He began his anthropological studies as a Rhodes Scholar at Oxford University, continued as an instructor at Harvard and made numerous field investigations, one of the most important being the study of skeletal remains at the ruined pueblos of Pecos, New Mexico. Much of his research was in "social anthropology." In studying the biological inferiority of criminals and the insane he made observations and measurements of 17,000 persons from 10 states. Publications resulting from this study are *Crime and the Man* and *The American Criminal*. For several years he was editor of the *Harvard African Studies*. His principal books are *Apes, Men and Morons*; *Twilight of Man*; and *Why Men Behave Like Apes, and Vice Versa*.

Hoover, Herbert Clark (1874-1964), American mining engineer and statesman, was born at West Branch, Iowa. Graduating in mining engineering at Stanford University in 1895, he engaged in the practice of his profession in various parts of the United States, Australia, and China, taking part in the defense of Tientsin during the Boxer disturbances. In 1902, he located in London, where he became identified with several mine-operating companies.

With his wife, Lou Henry Hoover, he co-operated in translating Agricola's *De Re Metallica*.

On the outbreak of World War I, he was made chairman of the American Relief Commission in London. He was also made chairman of the Commission for Relief in Belgium, directing the work with marked efficiency. In 1917, he was appointed food administrator for the United States, and, after the Armistice, his services were extended to the destitute populations of different European countries. In March 1921, he became secretary of commerce. He expanded the work of the department, extending the helpfulness of its statistical service and co-operating in the elimination of waste through unnecessary diversity in manufactured articles. He directed relief operations on the occasion of the disastrous Mississippi flood in 1927.

In 1928, Hoover received the Republican nomination for the presidency. He was elected and took office in March 1929. Among his first acts was an order forbidding the lease of Federal oil lands. He supported the move for limitation of armaments. A special session of Congress was summoned by him in April 1929 for the purpose of enacting legislation in aid of agriculture. Its principal work, however, was to raise the tariff by passage of the Hawley-Smoot Act. Later the same year came a stock market panic and the beginning of the severest economic depression in American history. The organization of the Reconstruction Finance Corporation failed to reach the source of the trouble, and distress increased. Hoover was defeated for re-election by Franklin D. Roosevelt in 1932. In 1946 he was called upon by President Truman to inspect and report upon the measures being taken for the relief of world-wide famine conditions. He was chairman, 1947–49, of the commission on the organization of the executive branch of the government. In 1942 he wrote, with Hugh Gibson, *The Problems of Lasting Peace*, and in 1951 began the publication of his *Memoirs*.

Hoover, Herbert, Jr. (**1903-**), American petroleum expert and diplomat, was born in London. He followed the mining engineering career of his father, who was 31st president of the United States, and was educated at Stanford University and at Harvard. Until he became United States Under Secretary of State in 1954, Herbert Hoover, Jr., advised many South American countries on oil production, served on the faculties of the Harvard School of Business Administration and California Institute of Technology, and acted as consultant to the Secretary of State on worldwide oil problems. In 1956 he was chosen to receive the Hoover Medal for distinguished public service, an award named for his father and one of the engineering profession's most distinguished honors.

Hoover, John Edgar (**1895-**), American lawyer and criminologist, was born at Washington, D. C. Educated at George Washington University, he was employed by the Department of Justice in 1917 and two years later became special assistant to the attorney general. In 1921 he was assigned to the Federal Bureau of Investigation, which he directed from 1924.

Hoover's directorship spanned the time when Congress first authorized the Federal investigation of crimes of violence involving movements across state lines. By the application of a carefully thought out and vigorously applied system of detection, the crime of kidnapping was practically suppressed. The detection of espionage after the outbreak of World War II in 1939 afforded Hoover's bureau a still wider field. His trained staff of detectives inspired everywhere the respect of the underworld, winning the designation of "G Men" (Government Men).

Hope, Anthony. See *Hawkins, Sir Anthony Hope.*

Hopkins, Esek (**1718-1802**), first commodore of the American navy, was born at Scituate, R. I. At the age of twenty, he went to sea and, during the Seven Years' War between Great Britain and France, made a brilliant record as captain of a privateer. In 1775, he was chosen commander in chief of the navy by the Continental Congress. When he stepped on the deck of his flagship, the *Alfred*, early in January 1776, Lieutenant John Paul Jones ran up a yellow silk flag bearing the device of a pine tree and a rattlesnake together with the motto "Don't Tread on Me." This was the first flag raised on an American man-of-war. Soon afterward, Hopkins captured the British naval station in the Bahama Islands, obtaining nearly 100 cannon. In April 1776, his little fleet attacked the British war vessel *Glasgow*, but after an indecisive battle the *Glasgow* escaped. Hopkins was severely criticized and, in 1777, was relieved of his command.

Hopkins, Gerard Manley (**1844-1889**), English poet and priest, lived a full and varied intellectual life. Born in Essex, he was educated at Balliol College, Oxford, and by the Society of Jesus. Hopkins was a convert to Catholicism, one of the many who joined Newman in the High Church movement of his time. While Hopkins was a busy practicing priest, serving London, Liverpool, and elsewhere, he was also a remarkably original poet. He entrusted his works to his friend, the poet Robert Bridges, who had them published for the first time in 1918. Hopkins's intricate rhythms, his depth of feeling, and the rich imagery of his language caused a sensation in literary circles. His genius lives, not only in his own poetry, but also in the influence he exerted over such twentieth century poets as W. H. Auden and Cecil Day Lewis. Hopkins's most famous works are *The Wreck of the Deutschland* and *The Terrible Sonnets*. He has been the subject of many biographies.

Hopkins, Harry Lloyd (**1890-1946**), American social worker and government administrator, was born at Sioux City, Iowa. Graduating at Grinnell College, he was supervisor or director of various organizations for relieving distress, including the Association for Improving Condition of Poor, the Child Welfare Board, and, in 1933–41, New York Temporary Emergency Relief Administration. In the latter year President Roosevelt selected him to direct the relief activities of the Federal government, in which post he supervised the spending of more than 10 billion dollars, chiefly as payment for small-scale local projects. He was secretary of commerce, 1939-40, resigning to act as special adviser to President Roosevelt. In 1941 he was placed at the head of the lend-lease program.

Hopkins, Mark (**1802-1887**), American educator, was born at Stockbridge, Mass. He was graduated in 1824 from Williams College, where he became professor of moral philosophy in 1830. He held this chair throughout the remainder of his life. From 1836 to 1872 he was also president of the college, which he made well known throughout America. In 1857, he became president of the American Board of Commissioners for Foreign Missions.

Hopkins was one of the greatest American educators of his time and possessed remarkable ability to inspire and develop the best powers of the individual student. His reputation is attested by the widely current definition of a college: "a student at one end of a log and Mark Hopkins at the other." He is the author of *Evidences of Christianity, Law of Love and Love as a Law*, and *An Outline of Study of Man*. He was elected to the American Hall of Fame in 1915.

Hopkinson, Francis (**1737-1791**), American politician and author, was born in Philadelphia, Pa. He was a delegate to the Continental Congress from New Jersey and was one of the signers of the Declaration of Independence. He wrote *The Battle of the Kegs, The Pretty Story, The Political Catechism*, and other works in prose and verse. His son Joseph, judge of the United States district court, wrote "Hail Columbia." See *Battle of the Kegs.*

Horace, or **Quintus Horatius Flaccus** (**65 B. C.-8 B. C.**), Roman poet, was born at Venusia, Italy. Athens was at this time one of the chief educational centers of the world, and thither Horace repaired in his 19th year to complete his education by a course of philosophy and science under Greek masters. But the civil wars which followed the death of Julius Cæsar, in 44, interrupted him in his studies. The arrival of Brutus at Athens roused the patriotic feelings of the youthful Romans, and, along with others, Horace ardently embraced the cause of the republic. Though entirely inexperienced in war, he was promoted to the rank of military tribune, with the command of a legion, and in this character shared in the defeat at Philippi, 42 B. C.

After the Battle of Philippi, Horace returned to Rome, and, by acting as clerk in the quæstor's office, he contrived to live until he found means of making himself known to the poets Varius and Virgil. Virgil recommended him to the patronage of Mæcenas, the prime minister of the emperor Augustus. Horace was soon on terms of familiarity with Augustus and enjoyed his friendship and patronage during the remainder of his life. But the friendship of Mæcenas, who gave him an estate in the Sabine territory about 34 miles from Rome, made him financially independent.

Horace added Roman urbanity, a refined critical faculty, and a temperate philosophy to an unsurpassed gift for lyric poetry, and he ranks next to Virgil among the great Latin masters of verse. His works consist of two books of *Satires*, a book of *Epodes*, four books of *Odes*, two books of *Epistles*, and a treatise on the *Art of Poetry*.

Hornaday (*hôr'nā-dā*), **William Temple** (**1854-1937**), American naturalist, was born in Plainfield, Ind. He was educated at Iowa Agricultural College; studied zoology and museology in America and Europe; and, as collecting zoologist, visited Cuba, Florida, the West Indies, South America, India, Ceylon, and Malaysia, 1875-79. He was chief taxidermist of the United States National Museum, 1882-90, thereafter entering the real estate business in Buffalo, N. Y. He was director of the New York Zoological Park, 1896-1926, during which time he led in movements to preserve vanishing wild life, more particularly the bison. His *American Natural History* is a leading work in its field. He wrote also *Two Years in the Jungle, The Man Who Became a Savage, Camp-Fires in Canadian Rockies,*

Our Vanishing Wild Life, Wild Animal Interviews, and *Old-fashioned Verses.*

Horthy (*hôr'tē*) **de Nagybanya, Nicholas** (**1868-1957**), Hungarian statesman, was born at Kenderes, Szolnok County. A member of the nobility, he entered the Austro-Hungarian navy and, by reason of his distinguished conduct, rose to command of the fleet during World War I. When Bela Kun set up a communist government, Horthy led the counter revolutionary party, which triumphed with French and Rumanian aid. The communist party was exterminated.

In 1920, Horthy was elected regent of Hungary. The ex-king Charles tried twice to recover the throne, but Horthy prevented his success. Thereafter Charles was deposed and Horthy occupied the anomalous position of regent of a country having no king. In October 1944, attempting to make peace with the Allies, he was forced to resign and was taken as a prisoner to Germany. He was released in January 1946.

Horwich, Frances Rappaport (**Mrs. Harvey L. Horwich**) (**1908-**), American educator, was born at Ottawa, Ohio. She was educated at the University of Chicago, Columbia, and Northwestern. She has had a varied and distinguished career in the educational field, and has been the recipient of numerous awards and citations for her appearances since 1952 as Miss Frances on Ding Dong School, the NBC-TV Nursery School of the Air. She is the author of the series of *Ding Dong School Books, Miss Frances' All-Day-Long Book,* and *Have Fun with Your Children.*

Hosmer (*hŏz'mĕr*), **Harriet** (**1830-1908**), American sculptor, was born in Watertown, Mass. She early showed a talent for sculpture by modeling figures in clay. To prepare herself for her chosen career, she studied anatomy at the Medical School at Saint Louis. In 1852, she went to Rome, where she studied seven years with the English sculptor John Gibson. In his studio, she executed her "Daphne," "Œnone," "Beatrice Cenci," and "Medusa." Her most ambitious work is a colossal statue of "Zenobia in Chains." "The Sleeping Faun," exhibited at Paris in 1867, is one of her best works. Among her other works are a fountain in Central Park, New York, a statue of Queen Isabella in San Francisco, and "The Queen of Naples."

She was the first American woman to attain prominence as a sculptor. Like her teacher, Gibson, she was a classicist. Hawthorne describes her in his *Italian Notes* and refers to her again in his *Marble Faun.*

Houdini, Harry (**1874-1926**), is the stage name of Erich Weiss, American entertainer and magician, who was born at Appleton, Wis. He left home to earn his living at 12 years of age. At 16 he began formal stage exhibitions as a magician adopting the name Houdini from the French magician Robert Houdin. Not only was he one of the most spectacular of all magicians, specializing in escapes from handcuffs, strait jackets, and sealed chests under water, but probably the only one who, to a degree, explained the secret of some of his tricks, thereby incurring the hostility of many competitors. He made known also fraud which he discovered in the work of a number of spiritualistic mediums. His own feats of illusion, he declared, were due to the art of distracting attention and to his great physical strength. He left his unequalled collection of books on magic to the Library of Congress.

Houdon (*ōō'dôn'*), **Jean Antoine** (**c.1741-1828**), French sculptor, was born at Versailles and studied in Paris and Rome. He executed, among other works, numerous busts and statues of prominent persons, which placed him in the front rank of French sculptors. In 1785, he accompanied Franklin to the United States to prepare the model for the statue of Washington ordered by the state of Virginia and now in the Capitol at Richmond. He worked with great facility and skill in both marble and bronze, and produced a series of more than 200 portrait busts, which form a notable contribution to French sculpture. Among the best-known of these are busts of Diderot, Gluck, Rousseau, Molière, and Benjamin Franklin. His celebrated portrait statue of Voltaire in the Thêâtre Français is one of the finest in modern art. See *Sculpture: French Realism.*

House, Edward Mandell (**1858-1938**), American politician, was born at Houston, Texas. He was educated in the schools of New Haven, Conn., and at Cornell University, graduating in 1881. He never sought office, but, as a trusted adviser, he became influential in Democratic politics and often acted as a personal representative of President Wilson. In 1919, he was one of the American delegates to the Peace Conference at Versailles. House later visited Europe as a correspondent of the Philadelphia *Public Ledger.* He was coauthor with Charles Seymour of *What Really Happened at Paris.*

Housman, Alfred Edward (**1859-1936**), English scholar and poet, was educated at Oxford; and, from 1882 to 1892, was higher division clerk in the patent office, London. He became professor of Latin at London University in 1892 and, in 1911, resigned to accept a similar chair at Cambridge University. His keen scholarship was matched by a trenchant style in controversy which he exercised in the interests of common-sense views. He edited *Manlius, Juvenal,* and *Lucan.*

As a poet, Housman was equally celebrated and in a wider circle. A striking series of lyrics from his pen entitled *A Shropshire Lad* grew steadily in popularity. They are characterized by a romanticism in subject, finish and simplicity in style, melodiousness in language, and a haunting pessimism in thought. His volume *Last Poems* met with unexampled popularity.

Houston, Sam (**1793-1863**), American soldier, was born in Virginia. He enlisted in the War of 1812, was chosen ensign, and fought under Jackson with a courage that won his lasting friendship. In 1823, he became a member of Congress and, in 1827, governor of Tennessee. In 1829, he married the daughter of ex-Governor Allen. In the following April, he abandoned civilization; was adopted as a son by the chief of the Cherokee nation; and was formally admitted as a chief.

In 1832, Houston went to Washington and procured the removal of several United States Indian agents on charges of fraud. The Texan war offered a new field to his ambition, and he was made commander in chief. He fought the remarkable and decisive battle of San Jacinto, 1836, in which, at one blow, he annihilated the Mexican army and achieved the independence of Texas. The "hero of San Jacinto" was elected first president of Texas. He was re-elected in 1841 and, on the annexation of Texas to the United States in 1845, was sent to the United States Senate, where he remained until 1859, being then elected governor of Texas. He opposed secession; refused to take the oath to support the Confederacy; was deposed from the governorship in 1861; and retired to private life.

Hovenden (*hō'vĕn-dĕn*), **Thomas** (**1840-1895**), painter, was born in Dunmanway, Ireland. He studied art first in Cork. Coming to America in 1863, he studied in the National School of Design, New York, and was later a pupil of Cabanel in Paris for six years. While in France, he painted many pictures of life in Brittany and, after returning to America, made excellent studies of Negro life. His "Jerusalem the Golden" and "Last Moments of John Brown" are in the Metropolitan Museum, New York. His widely admired "Breaking Home Ties" portrays a country boy leaving home. He lost his life attempting to rescue a child from death by a moving train.

Howard, Bronson (**1842-1908**), American dramatist, was born at Detroit. He prepared to enter Yale University but took up journalism instead, devoting five years, 1867-72, to newspaper work in New York. In 1870, Augustin Daly produced Howard's first important play, *Saratoga. Aristocracy,* satirizing Anglomania in American society, the war drama *Shenandoah,* and the sentimental comedy *Old Love Letters* are considered his best plays. Among other well-known plays are *The Banker's Daughter, Young Mrs. Winthrop, One of Our Girls,* and *The Henrietta.* Howard was the only American dramatist of eminence previous to 1890. He was a member of the American Academy of Arts and Letters.

Howard, John (**1726-1790**), English philanthropist, was born near London. In 1756, after the Lisbon earthquake, he sailed for that city to relieve the sufferers and, on his voyage, was captured by a French privateer and imprisoned. When he was sheriff of Bedford in 1773, his attention was called to the condition of the prisons of the county. The sufferings of the prisoners aroused his sympathies, and he made inquiries into the treatment of prisoners over the whole kingdom, bringing to light an amount of misery and degradation of which previously his countrymen had had no conception. In 1774, he was questioned before a committee of the House of Commons, and many reforms were the result.

In 1775, Howard set out on an extended tour through France, the Netherlands, and Germany with the view of acquainting himself with the state of continental prisons. The philanthropic work thus entered upon engaged him wholly for the rest of his life, during which he traveled more than 50,000 miles and expended £30,000 of his own fortune.

Howard, Oliver Otis (**1830-1909**), American soldier, was born at Leeds, Me. He was graduated at Bowdoin College, 1850, and at West Point, 1854. He served in the Florida war and in many actions of the Civil War, losing an arm at the battle of Fair Oaks, 1862. He took a prominent part in the battle of Antietam and was engaged in the battle of Fredericksburg; commanded a corps at Chancellorsville and Gettysburg; fought under Grant in the battle of Chattanooga; and accompanied Sherman on his march to the sea. He was made brigadier general in the regular army, 1864. At the close of the Civil War he was placed at the head of the freedmen's bureau.

From 1869 to 1873, Howard was president of Howard University; was superintendent of West Point Military

Academy, 1881-82; and became commander of the Department of the East, 1888, retiring in 1894. In 1895, he founded Lincoln Memorial University, Cumberland Gap, Tenn. His publications include *Donald's School Days, Life of Zachary Taylor, Isabella of Castile, Fighting for Humanity, Our Wild Indians,* and *Autobiography.*

Howard, Roy Wilson (1883-1964), American newspaper editor and publisher, was born at Gano, Hamilton County, Ohio. After leaving high school at Indianapolis, he became a reporter and later an editor for various newspapers in Indianapolis, Saint Louis, and Cincinnati. He entered the employ of the United Press Association and became president in 1912. In 1921, he was made business director of all the Scripps-McRae, later Scripps-Howard, newspapers, of which he assumed the editorial direction along with Robert P. Scripps in 1925. Howard and Scripps acquired over 25 newspapers, which they fused into a chain under vigorous management. Howard organized the New York *World-Telegram* by a merger of properties in 1931 and assumed the editorship. From 1953 until his death, he was Chairman of the Executive Committee and Director of the Scripps-Howard chain of newspapers.

Howe, Elias (1819-1867), American inventor, was born at Spencer, Mass. He worked at Lowell and Boston as a mechanic. At the latter place, he developed, constructed, and, in 1846, patented the lock-stitch sewing machine. He made an unsuccessful visit to England to introduce his invention and, returning, in 1849 to Boston, found his patent had been infringed. Harassed by poverty, he then entered on a five years' war of litigation to protect his rights and was ultimately successful, in 1854. By his royalties, he in time obtained $200,000 per annum and amassed a fortune of $2,000,000. During the Civil War, he served as a private. He was elected to the American Hall of Fame in 1915. See *Sewing Machines.*

Howe, Julia Ward (1819-1910), American author, was born in New York. She received a private education and, in 1843, married the philanthropist Dr. Samuel Gridley Howe. With him she conducted the Boston *Commonwealth,* an antislavery paper, prior to the Civil War. After the slavery question was settled, she became active in woman suffrage, prison reform, and the cause of peace. She was a Unitarian preacher, lecturer, and writer. Her best-known poem, the "Battle Hymn of the Republic," was written in 1861. Her writings also include *Passion Flowers, A Trip to Cuba, The World's Own, Sex and Education, Memoir of S. G. Howe, Is Polite Society Polite? From Sunset Ridge,* and *Reminiscences.* She was the first woman to be elected a member of the American Academy of Arts and Letters.

Howe, Mark Antony De Wolfe (1864-1960), American biographer, was born at Bristol, R. I. After graduation at Lehigh and Harvard Universities, Howe entered literary work and served as editor of various magazines, including the *Atlantic Monthly.* Of his various biographies, chiefly of New England characters, that of Barrett Wendell was awarded a Pulitzer prize. Other works from his pen include *Causes and Their Champions, Songs of September,* and *Holmes of the Breakfast Table.* His ripe and fruitful scholarship was rewarded by his election to the American Academy of Arts and Letters in 1935.

Howe, Richard Howe, Earl (1726-1799), British admiral, left Eaton at 14 and went to the South Seas in the squadron under Anson. In 1755, during the Seven Years' War, his ship, the *Dunkirk,* captured the *Alcide.* He next served under Sir E. Hawke in the expedition against Rochefort. He was commodore of the squadron which sailed in 1758 for Saint Malo. In the same year, he took Cherbourg and also succeeded to the Irish title of viscount. He took part in the defeat of the fleet under Marquis de Conflans, capturing the *Hero.*

In 1776, he commanded an English fleet on the American coast and, in 1778, defended the American coast against a superior French naval force under D'Estaing. He then resigned in disagreement with British policies for prosecution of the war. He was made first lord of the admiralty in 1783 and received an earldom in 1788. When war with France broke out in 1793, he took the command of the channel fleet and gained a signal victory off Ushant.

Howe, Samuel Gridley (1801-1876), American philanthropist, was born in Boston. He was graduated from Brown University, 1821, and from Harvard Medical College, 1824. He organized the medical staff of the Greek army, 1824-27; returned to America to raise contributions; and, going back with supplies, formed a colony on the isthmus of Corinth. In 1831, he went to Paris to study the methods of educating the blind, and, becoming involved in the Polish insurrection, he was compelled to spend five weeks in a Prussian prison. On his return to Boston, he established schools for the blind and for idiots, and was the teacher of the famous Laura Bridgman, who was blind, deaf, and dumb. In 1851-53, he edited the antislavery *Commonwealth,* assisted by his wife, Julia Ward Howe. In 1867, he revisited Greece with supplies for the Cretans. He was the originator and served as chairman of the Massachusetts State Board of Charities, 1865-74.

Howe, Sir William (1729-1814), English general, served at Quebec under Wolfe and succeeded General Gage in command of the royal troops during the American Revolution. In 1775, he was made commander in chief of the English army in North America and had command at the battles of Bunker Hill, Long Island, White Plains, and Brandywine. Failing to crush the rebellion, he was superseded by Sir Henry Clinton in 1778.

Howells, William Dean (1837-1920), American novelist, was born at Martins Ferry, Ohio. His early education was gained largely in newspaper offices. In 1860, he published his first volume, *Poems of Two Friends.* He was United States consul at Venice, 1861-65, and wrote *Venetian Life,* a book of genuine charm, followed by *Italian Journeys.* From 1866 to 1881, he was editorially connected with the *Atlantic Monthly.* He contributed to *Harper's Magazine,* 1886-91, and became the writer of "Editor's Easy Chair" for *Harper's.* Besides much editorial and critical work and many poems, he published about 40 volumes of novels, essays, and sketches.

By his sincerity, his graceful, flexible style, and his high literary ideals, he became a leader of the realistic school and the foremost figure in contemporary American literature. Among his representative works are *The Rise of Silas Lapham, A Hazard of New Fortunes, A Modern Instance, The Quality of Mercy, Criticism and Fiction, My Literary Passions,* and *Years of My Youth,* an autobiography. His first novel, *Their Wedding Journey,* appeared in 1871, and he completed *The Leatherwood God* in his 80th year. He was elected the first member and became president of the American Academy of Arts and Letters.

Hoxie, Vinnie Ream (1847-1914), American sculptor, was born in Madison, Wis. She displayed precocious talent and studied under Bonnat in Paris and under Majoli at Rome. While she was still in her teens, she won in open competition a $30,000 commission for a life-size statue of Lincoln, now in the rotunda of the Capitol at Washington. Congress later employed her to execute the heroic statue of Farragut, now in Farragut Square, Washington. Her works include the ideal statues of "Miriam," "The West," "Sappho," and portrait busts of Lincoln and other distinguished Americans and Europeans. In 1911, she was selected sculptor for the statue of Sequoyah, to represent Oklahoma in Statuary Hall, Washington. In 1878, she married Gen. R. L. Hoxie.

Hrdlicka (*dlĭch'kà*), **Ales (1869-1943),** anthropologist, was born at Humpoletz, Bohemia. He came to New York City and studied at Eclectic College and Homeopathic College. He made special studies of the insane and accompanied anthropological expeditions in various parts of North America and in Siberia, Mongolia, Peru, Japan, China, and Hawaii. His investigations led him to advance the theory that most of the American Indians are of Asiatic origin. He was connected with the United States National museum in the years following 1903, becoming curator in 1910. His publications include *The Eskimo Brain, Ancient Man in North America, Tuberculosis among Indians,* and *The Old Americans.*

Hubbard, Bernard Rosenkranz (1888-1962), American explorer, was born at San Francisco, Cal. Educated at St. Ignatius College and University of Santa Clara, he became a member of the Society of Jesus and taught in various colleges in the United States and Europe. After becoming head of the department of geology in the University of Santa Clara, 1926, he led many explorations into Alaska, becoming known as the "glacier priest." Among his discoveries were the crater of Aniakchak, believed to be the largest in the world, and the sites of many stone-age villages. In pursuance of the latter researches he uncovered much evidence which he interpreted as a demonstration of the Asiatic origin of peoples inhabiting the American continents. He wrote *Cradle of the Storms* and produced the feature film "Aniakchak."

Hubbard, Elbert (1859-1915), American author, journalist, and lecturer, was born in Bloomington, Ill., and received a common-school education. He established and edited *The Philistine,* a periodical of shrewd philosophy, devoted in part to the exposition of his ideas of co-operation and social service and in part to trenchant criticism of fads and foibles. He became widely known also as a lecturer and as the originator of the Roycroft shop for artistic bookmaking and the revival of ancient handicrafts, which he conducted with notable success in accordance with his theory of work and service. Among his best-known writings are the long biographical series published as *Little Journeys, Time and Chance, Contemplations, Hollyhocks and Golden Glow, The Book of Business,* and numerous pamphlets, including the famous *Message to Garcia.* Died on the *Lusitania.*

Hubble, Edwin Powell (1889-1953), American astronomer, was born at Marshfield, Mo. Educated at Oxford and

Chicago universities, he began to practice law in 1913 but the next year turned to research work at Yerkes Observatory. He was appointed to the staff of Mount Wilson Observatory in 1919. There he conducted research based on observation of diffuse nebulæ which contributed substantially to a revised conception of the universe. Spiral nebulæ were shown to be star clouds similar to the Milky Way to which the sun belongs. Some of these nebulæ were found to be 500 million light years distant.

Huber (*ü'bâr'*), **François** (**1750-1831**), Swiss naturalist, was born in Geneva. He studied physics under Saussure, but began to lose his sight at the age of 15 and later became entirely blind. With ample means from his father and the devoted assistance of his wife, Marie Aimée Lullin, and his servant, François Burnens, he conducted a series of notable original researches on the life and habits of honeybees and laid the foundation of the scientific knowledge of their life history.

Among his notable discoveries were the aerial impregnation of the queen bee, the rivalry of the queens, the killing of the males by the workers, the use of antennæ, the origin of the propolis, and the ventilation of the hives. With the assistance of his son, he made researches on the origin of wax and the construction of cells. The results of his investigations were published in his *Nouvelles observations sur les abeilles*.

Huber, Hans (**1852-1921**), Swiss dramatic composer, was born at Schonewerd. He received his musical education at the Leipzig Conservatory; became a noted teacher of music; and, in 1896, was appointed director of the Music School at Basel. The number and excellence of his compositions, both instrumental and vocal, entitle him to rank as the leading composer of his day in Switzerland. His works include the operas *Gudrun*, *Weltfrühling*, and *Der Simplicius*; the beautiful orchestral works *Pandora* and *Nordseebilder*; three fine symphonies; and concertos for the violin and the piano.

Huc (*ük*; *hük*), **Evariste Régis** (**1813-1860**), Roman Catholic missionary, was born at Toulouse, France. In 1839, he joined the mission of the Lazarist fathers to China. In 1844, with Père Gabet and a single native convert, he set out for Tibet, and, in January 1846, he reached Lhasa. Scarcely had a mission been started there when an order for their expulsion was obtained by the Chinese resident, and they were conveyed back to Canton. Huc's health having broken down, he returned to France in 1852. He wrote *Souvenirs* of his great journey, *L'Empire chinois*, and *Le Christianisme en Chine*. His descriptions of the strange things encountered in Tibet were received with much incredulity, but travelers have since verified his statements.

Hucbald or **Hubaldus** (**c.840-c.930**), medieval writer of music, was born at Saint Amand near Tournai. He studied at Saint Germain d'Auxerre, where he made notable progess in the sciences and arts, especially music, and, in 872, became head master of the convent school at Saint Amand. Between 883 and 900, he visited several schools of music, including that of Reims, which he reformed and improved, returning later to Saint Amand, where he spent the remainder of his life.

Numerous musical writings of the period were attributed to him, but his authorship of the *Harmonica Institutio* is unchallenged. He was the leading theoretical writer on music of his century, and the beginnings of harmony are found in his diaphonic music, which consists of simultaneous progressions of two parts in parallel fifths, called by him the organum. The substitution of fourths for fifths by Guido d'Arezzo in the 11th century very soon resulted in the use of the other intervals, and, finally, in the development of the harmonic chord, which, together with measured rhythm, constitutes the chief advance of modern music over the purely melodic music of the Greeks and their successors in the middle ages.

Hudson, Henry (**?-1611**), English navigator, flourished in the early 17th century. In 1607, he sailed in search of a short route to China and India by way of the Northern Ocean, but was stopped by the ice off the coast of Greenland and was forced to return. In 1609, while in the service of the Dutch East India Company, he discovered the Hudson River, up which he sailed to the present site of Albany. On a fourth voyage, 1610, he discovered the strait and bay which are called Hudson after him. Finding his progress blocked by ice fields, he determined to spend the winter on the shores of the bay. Here he and his men suffered terribly from want of food, and he set out to return in 1611. The men mutinied and, getting possession of the ship, put Hudson, his son John, and seven sailors into an open boat and turned them adrift. Nothing was ever known of their fate.

Hudson, William Henry (**1841-1922**), English naturalist and writer, was born of English parents at Quilmes, Argentina, in which country he spent the early part of his life. He there acquired the knowledge and the love of nature which are admirably displayed in his *Naturalist in La Plata*, published in 1892. Other works treating of his travels and observations in South America include *The Purple Land* (Uruguay), *Idle Days in Patagonia*, an *Argentine Ornithology* (jointly with P. L. Sclater).

About 1890, he settled in London. Soon afterwards he began to study rural England with a rare and appreciative insight which is reflected in many charming books. He first became widely known to the literary world by his novel *Green Mansions*, published in 1904. While recognition of the originality of his work came late, at the time of his death he was regarded as one of the foremost of modern writers on natural history and was especially noted for the quality of his literary style. His "peculiar genius lay in setting forth nature and its minutest creatures with gentleness and understanding, not 'scientifically' and coldly." Besides the foregoing, his writings include *Birds in a Village*, *Adventures Among Birds*, *Nature in Downland*, *Hampshire Days*, *The Land's End*, *Afoot in England*, *A Shepherd's Life*, and *Far Away and Long Ago*.

Huggins (*hŭg'ĭnz*), **Sir William** (**1824-1910**), English astronomer and spectroscopist, was born in London. In 1852, he was elected a member of the British Microscopical Society, and for some years studied physiology with the microscope. But, having built an observatory near London in 1856, he began the study of the physical constitution of stars, planets, comets, and nebulæ. He introduced spectroscopic photography into astronomy; proved the existence of carbon in comets and of calcium in the chromosphere of the sun; and made many other valuable contributions to science.

Hugh Capet (*hū kā'pĕt*) (**939-996**), founder of the Capetian dynasty of French monarchs, was king of France, 987-996. As count of Paris, on the death of Louis V, last of the Carolingians, he usurped the throne and was confirmed in its possession by a confederacy of nobles.

The race of Capet has given 119 sovereigns to Europe: 36 kings to France, 22 to Portugal, 5 to Spain, 11 to Naples and Sicily, 3 to Hungary, and 3 to Navarre; 3 emperors to the Byzantine Empire; 17 dukes to Burgundy, 13 to Brittany, 2 to Lorraine, and 4 to Parma.

Hughes, Charles Evans (**1862-1948**), American lawyer and jurist, was born in Glens Falls, N. Y. He was graduated from Brown University, 1881, and from Columbia Law School with high honors in 1884. He was a teacher in Delaware Academy, Delhi, N. Y., 1881-82; was admitted to the New York bar, 1884; and practiced in New York, 1884-1906, with the exception of two years, 1891-93, when he was professor of law at Cornell University. In 1905, he was attorney for the committee appointed by the state legislature to investigate financial methods of great life insurance companies. His skill and ability in securing disclosures of these methods won him a national reputation and led to radical reforms.

Hughes was elected governor of New York in 1906 and was re-elected in 1908. After a notable contest with the legislature, he secured enactment of the direct primary, short ballot, antigambling, and other progressive laws. In 1910, he was appointed justice of the United States Supreme Court. He resigned in 1916 upon receiving the Republican nomination for president, but was defeated by Woodrow Wilson and resumed legal practice in New York. Serving as secretary of state from 1921 to 1925, he acted as chairman of the Washington Disarmament Conference in 1921-22. In 1928, he was appointed a judge in the World Court, but resigned in 1930 in order to accept appointment as chief justice of the United States Supreme Court. He presided over the Court during the administration of Roosevelt, when a series of precedents were established by the court greatly enlarging the authority of Congress. He retired in 1941.

Hughes, Langston (**1902-**), an American Negro writer who has divided his talent between the novel, poetry, and drama. He was born in Joplin, Mo., and saw the world from such vantages as merchant sailor, waiter, and dishwasher while he was learning his craft. Hughes's most powerful novels are *Not Without Laughter* (1930) and *The Ways of White Folks* (1934). He wrote an account of his life, *The Big Sea*, in 1940. A regular contributor of fiction, essays, and poems to magazines, Hughes also has to his credit the lyrics for the celebrated musical version of Elmer Rice's *Street Scene*, produced in New York in 1946, with a score by Kurt Weil. His other writings include *First Book of Rhythms* and *First Book of Jazz* (1954) and *First Book of the Caribbean* (1955).

Hughes, Sir Samuel (**1853-1921**), Canadian statesman, was born in Darlington, Ont. He was educated at Toronto University. In 1885, he purchased the Lindsay *Warder*, of which he was editor until 1897. He entered the militia at the age of 12; served in the South African War, 1899-1900; and attained the rank of major general in 1914. In 1892, Hughes was elected to the House of Commons and, in 1911, became minister of militia in the Borden cabinet. Upon the outbreak of World War I, he was active in organizing the Canadian military forces. In September-

October, 1914, he assembled and forwarded 33,000 troops to English ports. He continued the work of organization, securing a total exceeding 350,000 men previous to his resignation in November 1916.

Hughes, Thomas (1822-1896), English author, was born at Uffington. He attended Rugby under the celebrated Dr. Arnold; studied at Oxford; and was admitted to the bar in 1848. In 1857, he gave to the world *Tom Brown's School Days*. It was followed by *The Scouring of the White Horse*, *Tom Brown at Oxford*, and *Alfred the Great*.

Hughes pursued, meanwhile, the practice of law. He gained the confidence and good will of the working classes, introducing a trade union bill into Parliament in the course of his nine years, 1865-74, as member of the House of Commons. He assisted also in establishing a Workingman's College, London, and served as principal of it. He was instrumental in establishing a model colony at Rugby, Tenn., 1880.

Hughes, William Morris (1864-1952), Australian statesman and labor leader, was born in Wales. He was trained as an elementary school teacher and, in 1884, went to Australia. He affiliated himself with the Labor party and was elected to the legislature of New South Wales in 1894 and, in 1901, to the Federal legislature. He had taken a prominent part in the organization and leadership of labor unions, and, after an election favorable to his party in 1904, he was made minister of foreign affairs and later held other cabinet offices. During 1915-23, he was premier of Australia, in which capacity he became known as an enthusiastic imperialist. From 1934 he held various cabinet posts.

Hugo (*hū'gō*; F., *ü'gô'*), **Victor Marie (1802-1885),** French poet, novelist, and orator, was born at Besançon, France. As a child, he was taken in the train of his father, a French general, through the south of France and finally into Spain, where his education was begun at the Nobles' College, Madrid. Upon the advance of the English to free Spain from the French armies, he was taken to Paris. There he was taught by priests until General Lahorie undertook to tutor him in Old French and Latin. Hugo later entered the College of Louis-le-Grand, where, at 14, he wrote the tragedy *Irtamène*. In 1817, the French Academy mentioned honorably his poem "On the Advantages of Study."

Early Literary Career. Hugo married his cousin Adèle Foucher in October 1822. Soon his West Indian romance, *Bug Jargal*, appeared, followed, in 1826, by a book of *Odes and Ballads*. With the appearance of his tragedy *Cromwell* in 1827, Hugo became immediately the leader of the romantic movement in literature.

His two plays *Marion Delorme* and *Hernani* were suppressed by the censor. *Notre Dame de Paris*, written in 1831, the historical romance in which Hugo vied with Scott, was translated into many languages, and plays and operas were founded on it. *The King Takes His Pleasure* of 1832 is familiar in the opera *Rigoletto*.

In 1837, Louis Philippe made Hugo an officer of the Legion of Honor. *Ruy Blas* was acted successfully in 1838; three years later, the French Academy, having rejected Hugo several times, admitted him to membership.

Later Activities. To distract himself from the grief occasioned by the drowning of his daughter, Hugo plunged into politics. He was created a peer in 1845 and sat in the Constituent Assembly of France. When he was banished from the country by Louis Napoleon, Hugo betook himself to Brussels, London, and the Channel Islands. Meanwhile, he satirized the usurper in lampoons that were collected from 1853 to 1859 in *Castigations*. Refusing to avail himself of the amnesty of 1859, he remained in exile and soon began his greatest creations in fiction. In 1862, *Les Misérables*, the most celebrated of his novels, appeared; in 1866, *The Toilers of the Sea*; in 1869, *The Man Who Laughs*.

Upon his return to France in 1870, he again joined the Republican movement and was returned to the National Assembly. After the Commune, he fled to Brussels and Luxemburg. Poems written during the Franco-Prussian War and the siege of Paris and collected under the title *The Terrible Year* betray the long tried exile.

In 1874, his novel *Ninety-Three* pleased the public, and phases of a bounteously paternal mood appeared in his *Art of Being a Grandfather* of 1877. The same year, he published his graphic *History of a Crime*, which depicted the Republicans' side of the *coup d'état* of Louis Napoleon in 1851. The poetic romance *Torquemada*, published when Hugo was 80, proved that his pen had not lost its skill.

Rank Among Writers. Hugo's place in world literature is secure. No other author while living achieved such national popularity as his. In romance, he stood first, although George Sand and Balzac were his rivals; in lyrical poetry, also first, despite Lamartine and De Musset; in the drama, he had no close competitor among the writers then living. His range of character creation was very broad. He possessed the genius of emotion, though he was less richly endowed with the qualities that come through reflection. He gave to French rhythm a strength and variety it had never known, and he employed a prose style that was singularly effective. See *Les Misérables*, *Notre Dames de Paris*, *Quasimodo*.

Hull, Cordell (1871-1955), American politician and administrator, was born in Pickett County (then Overton County), Tenn. Having studied law at Cumberland University, he began practice in 1891. Two years later he was elected to the Tennessee legislature. After four years as a judge, 1903-07, he was sent to Congress as a Democratic representative. In 1931, he was elected United States senator, but resigned two years later to enter President Roosevelt's cabinet as Secretary of State. In this capacity he cultivated friendly relations and prosecuted vigorously a policy of exchanging tariff concessions as a basis for trade agreements. He served through most of World War II, flying to the Moscow conference in October 1943, but ill health forced his retirement in December 1944. He was awarded the Nobel peace prize for 1945.

Hull, Isaac (c. 1773-1843), American naval officer, was born in Derby, Conn. In 1812, he commanded the frigate *Constitution*, which was pursued by a British squadron for three days but escaped by skillful sailing. While cruising in the Gulf of St. Lawrence in the same year, he met the British frigate *Guerrière*, which surrendered after a bloody fight of half an hour. The *Guerrière* was so injured in the battle that she soon sank. The British ship lost 100 men; the *Constitution* lost but 14 men killed and wounded, and within an hour or so was ready for another fight. This was the first naval battle of the War of 1812, and Congress gave Captain Hull a gold medal.

Humboldt, Friedrich Heinrich Alexander, Baron von (1769-1859), German geographer and traveler, was born in Berlin. After studying at Frankfort on the Oder, Göttingen, and Freiberg, he became director general of the mines of Bayreuth and Anspach in 1792, which office he held for about four years. He had already made a considerable reputation as a writer on science when, in 1799, he set out with Bonpland for South America and occupied four years in the exploration of that continent and about a year more in investigating the natural history of Mexico. After his return to Europe in 1804, he passed a period of 20 years in Paris, publishing a monumental work of his travels.

In 1829, Humboldt made a scientific exploration of Central Asia and, during the 18 years following, was engaged in diplomatic affairs in behalf of the Prussian government. His chief works include *Journey to the Equinoctial Regions of the New Continent*, *General Physics and Geology*, *On the Geographical Distribution of Plants According to the Temperature and Altitude*, *Aspects of Nature*, and his masterpiece, *Kosmos—Essay of a Physical Description of the Universe*, begun in his 74th year.

Humboldt's influence upon modern science has been profound and far-reaching. He founded the modern science of physical geography and made contributions to geology and chemistry and magnetism.

Hume, David (1711-1776), Scotch philosopher and historian, was born in Edinburgh, Scotland. Law and commerce, to which he first turned, both proved uncongenial, and he ultimately devoted himself to a life of study and the cultivation of literature and philosophy.

The years 1734-37 he spent at La Flèche, France. Here Hume studied, and wrote *A Treatise of Human Nature*, which was published in Great Britain in 1739. It was a work of demolition. He separated ideas, or the impressions created by an external world, from the absolute existence of that world itself. He argued that the fact of self-consciousness is not more amenable to demonstration than our belief in the existence of an outer world. He contended it was not possible for man to prove the validity of these beliefs. He thus threw down a challenge to philosophers either to refute what he had said or seriously to fill up the blanks which he had discovered. To this impetus are due both Scotch and German schools of metaphysicians.

Hume now turned, for a time, to literary fields which brought him greater financial recompense. In 1741-42 appeared two volumes of *Essays*, whose enlightened treatment of morals and politics caused Hume to be called the father of the liberal and rational policy. In 1746, he became secretary to General Saint Clair, with whom he went to France and later to Turin and Vienna. He wrote his *Enquiry Concerning the Principles of Morals*, his *Political Discourses*, and his *Dialogues on Natural Religion*.

After an unsuccessful attempt to obtain the chair of logic at the University of Glasgow, Hume settled at Edinburgh and, in 1752, was elected librarian to the faculty of advocates. This post encouraged him to write the *History of England*, 1754-61, which long held its ground as the chief authority on the subject despite its strong partisan spirit of Toryism. In 1757, Hume brought out his *Natural History of Religion*, which was assailed by theologians.

As secretary and, later, as *chargé d'affaires* to the British embassy at Paris, 1763-66, Hume became familiar with the wits and *savants* of the Parisian circle. From 1767 to 1769, he held the office of British undersecretary of state. He then returned to Edinburgh, where he wrote his autobiography, *My Own Life*. Hume's great distinction is attributable to the fact that, by his acute investigation into the nature of man from the point of view of Locke's system, he gave to philosophical skepticism a strength and logical consistency which it never had before.

Humperdinck (*hōōm'pĕr-dĭngk*), **Engelbert** (**1854-1921**), German composer, was born in Siegburg, near Bonn. While studying at Cologne in preparation for the profession of architect, he became acquainted with Hiller, who induced him to study music instead. He studied at the Cologne Conservatory in 1874-76 and in Munich, 1876-79. He then went to Italy, where he formed an intimate friendship with Wagner, who made him practically a member of his family and employed him in preparing *Parsifal*. Upon the death of Wagner, he taught in the Conservatory at Barcelona, 1885-86. After spending some years in Cologne, he became an instructor in the Hoch Conservatory in Frankfort, and, in 1900, he was made director of the Meisterschule there.

Humperdinck's fame as a composer rests upon the success of his fairy operas *Hänsel und Gretel*, 1893, and *Die Königskinder*, written in 1896 but first produced at the Metropolitan Opera House in New York in 1910.

Humphrey, Hubert H. (**1911-**), political leader, was born at Wallace, S.D. Beyond the local high school, he attended the University of Minnesota, with time out for work and for taking a course at the Denver School of Pharmacy. In graduate study later at the University of Louisiana, he wrote a thesis on "The Philosophy of the New Deal." His entry into practical politics came in 1944, when he was state manager for the Roosevelt-Truman campaign. In 1945 he became mayor of Minneapolis, and in 1948 was elected U.S. senator from Minnesota. At the Democratic national convention in 1948, he proposed some bold liberal planks for the party's platform. He has been a senate leader in securing enactment of the Johnson legislative program. For many years he has been identified with liberal measures relating to labor, housing, and civil rights. He is author of *War On Poverty* (1964). In 1964 he was elected vice president on the Democratic ticket.

Huneker (*hŭn'ĕ-kĕr*), **James Gibbons** (**1860-1921**), American writer and musical critic, was born in Philadelphia, Pa. He studied music in Paris, 1878-80. Returning to the United States, he was associated for 10 years with Rafael Joseffy as teacher of piano at the National Conservatory, New York. He began writing musical criticisms for New York newspapers in 1891. He later became musical editor and, in 1902, dramatic editor of the New York *Sun*, achieving distinction for his advocacy of his artistic ideals. His writings include *Mezzo-tints in Modern Music*, *Chopin—The Man and His Music*, *Melomaniacs*, *Visionaries*, *Egoists—A Book of Supermen*, *Franz Liszt*, *The Pathos of Distance*, *Ivory Apes and Peacocks*, and many magazine articles.

Hunt, Helen. See *Jackson, Helen Hunt.*

Hunt, Herold Christian (**1902-**), school superintendent, was born in Northville, Michigan. He was graduated from the University of Michigan in 1923, and later received his doctorate in education from Teachers College, Columbia University. After several years' experience as a teacher, he became superintendent of schools successively in St. John's, Michigan, Kalamazoo, Michigan, New Rochelle, New York, and Kansas City, Missouri. Since then he has been professor of education in the School of Graduate Education at Harvard University. He was general superintendent of schools in Chicago, 1947-53. In 1956, President Eisenhower appointed him Under Secretary of Health, Education, and Welfare.

Hunt, James Henry Leigh (**1784-1859**), English poet and essayist, was born at Southgate, near London. He was educated at Christ's Hospital, where he was a schoolfellow of Coleridge and Charles Lamb. In 1813, as editor of the *Examiner*, he wrote some articles severely criticizing the prince regent, afterward George IV, and for these he was prosecuted by order of the government and sentenced to two years' imprisonment in the Surrey jail. While in jail, he wrote *The Descent of Liberty, a Masque*, *The Story of Rimini*, and *The Feast of the Poets*

In 1819, Hunt began a small periodical, called the *Indicator*, in which many of his essays appeared. In 1828, he published *Lord Byron and Some of His Contemporaries*, in which, having quarreled with his former friend Byron during a visit to Italy, he indulged in some severe animadversions upon the character of that poet. All his life was devoted to literature, and all his writings have a fascination of their own. Among his last works was his *Autobiography*.

Hunt, Richard Morris (**1828-1895**), American architect, brother of William Morris Hunt, the painter, was born at Brattleboro, Vt. He began to study architecture at the age of 15 in Geneva, Switzerland. At 20, he entered the Ecole des Beaux-Arts, Paris, the first American student there. After a period of travel in Europe, Egypt, and Asia, he became inspector of works on the Louvre. In 1855, he returned to America; was employed on the extension of the Capitol at Washington; and founded in New York the pioneer American studio of architecture.

Hunt designed the Lenox Library, the Tribune Building, and the original building for the Metropolitan Museum of Art, New York; The Naval Observatory at Washington; the Administration Building at the Columbian Exposition, Chicago; the Divinity Building at Yale; the pedestal of the statue of Liberty in New York harbor; the Yorktown monument; and many noted private houses, including the Vanderbilt country house "Biltmore" at Asheville, N.C.

Hunt, William Holman (**1827-1910**), English religious painter, was born in London. In 1845, he was admitted as a student to the Royal Academy, and he exhibited his "Flight of Madeline and Porphyro" in 1848. He shared a studio with D. G. Rossetti, and the two, along with Millais and a few others, inaugurated the "Pre-Raphaelite brotherhood," which aimed at detailed and uncompromising truth to nature. Among the first of his Pre-Raphaelite works was "Rienzi," in 1849. It was followed by "Valentine Rescuing Sylvia," "The Hireling Shepherd," "Claudio and Isabella," and "Strayed Sheep."

The result of several visits to Palestine appeared in "The Scapegoat"; "The Finding of Christ in the Temple," now in the Birmingham Art Gallery, for which he received £5000; "The Shadow of Death," in the corporation gallery, Manchester, for which he was paid £10,000; and "The Triumph of the Innocents." Among his latest works were "Isabella and the Pot of Basil" and "May Morning in Magdalen Tower." His widely known painting, "The Light of the World," is now at Kebel College Oxford.

Hunt, William Morris (**1824-1879**), American genre and portrait painter, was born in Brattleboro, Vt. He studied in Düsseldorf and under Couture in Paris, and became a friend and follower of J. F. Millet, but made the technique of the French school subsidiary to his own original ideas. He established and conducted an art school in Boston. Among his figure paintings are "The Farmers' Return," "Sheep Shearing at Barbizon," "The Fortune Teller," "The Bugle-Call," and "The Prodigal Son." See *Painting*.

Hunter, John (**1728-1793**), British surgeon, anatomist, and physiologist, was born at Glasgow, Scotland. He spent five years at the University of Edinburgh and, deciding to adopt the profession of medicine, went to London and studied at Chelsea Hospital. His progress in anatomy and surgery was so rapid that, in the second session, he was able to undertake the directing of the pupils in their dissections. After 10 years in the dissecting room, his health gave way.

In 1759, he applied for an appointment in the British army; he was immediately made staff surgeon and served in the Seven Years' War until the conclusion of peace in 1763. He then settled in London, where, in 1785, he built a museum. This museum became the place of meeting of the *lyceum medicum*, a society established by Hunter and Fordyce.

His famous operation for the cure of aneurism, that of simply tying the artery at a distance from the tumor and between it and the heart, led to important advances in surgery. He was an indefatigable student, made innumerable dissections and experiments, and was the greatest anatomist and the best operative surgeon of his day. He wrote *Natural History of the Human Teeth* and *Treatise on the Blood, Inflammation, and Gunshot Wounds*. In 1859, his remains were interred in Westminster Abbey.

Huntington, Anna Hyatt. See *Hyatt, Anna Vaughn.*

Huntington, Henry Edwards (**1850-1927**), American capitalist and art collector, was born at Oneonta, N. Y. He entered the hardware business in Oneonta and later removed to New York. He was a lumberman at Saint Albans, W. Va., from 1874 to 1880. Through opportunities offered by his uncle, Collis P. Huntington, builder and promoter of railroads, he entered railway work as superintendent of construction for the Chesapeake, Ohio & Southwestern railway, of which he became superintendent in 1884 and general manager in 1886.

He made one of the finest collections of rare books and pictures in existence, housing it in Pasadena, to which city, in 1922, he gave his estate there to be used as a public park. His other gifts include $8 million to endow research in American and English history. He purchased Gainsborough's "Blue Boy" at a great price and brought it to America.

Huntley, Chester R. (**1911-**), news broadcaster and commentator, was born at Cardwell, Mont. He was educated at Montana State College and the University of Washington. His earlier broadcasting experience was obtained at Seattle and Spokane, Wash., and at Los Angeles. A member of the NBC staff at New York City since 1955, he has had many roving assignments, often teamed with David Brinkley.

Hunyadi (*hōōn'yŏd-ĭ*), **Janos** (**c. 1387-1456**), Hungarian national hero, was born in Hunyad Transylvania As governor of Transylvania in 1442, he distinguished himself against the Turks, who at that time were the terror of the whole of Christendom. During the period of his rule, he was the shield of Hungary, not only against the Turks but also against other European powers. His support came from the peasants rather than from the nobles, who were hostile to him, partly because of his policy of maintaining a paid standing army. During the minority of Ladislaus V, he was elected regent of Hungary. Among his more notable deeds was the relief of Belgrade in 1456.

Hurok, Solomon (**1888-**), impressario, was born at Pogar, Russia and received his education in his native country. Since 1905 he has made his home in the United States, having become naturalized in 1914. Beginning as manager of weekly concerts at the New York Hippodrome, he has made a career of managing concerts and ballets

Huss, or **Hus** (*hŭs*; G., *hōōs*), **John** (**c. 1370-1415**), Bohemian religious reformer, was born at Husinetz, Germany. He studied at the University of Prague and was appointed dean of the philosophical faculty in 1401 and rector of the university in 1402. As a preacher, he was greatly esteemed both by the common people and by the students, while, as confessor to Queen Sophia, he obtained access to the court. At this time, he became acquainted with the writings of Wiclif, which influenced him deeply.

The works of Wiclif had recently been condemned by the pope, and Huss, accused of being a Wiclifite, was excommunicated. He denounced the indulgences granted by the pope, who desired by such means to make an effective crusade against Ladislaus, the excommunicated king of Naples. Huss was supported in his attack on indulgences by his friend Jerome.

The pope issued an interdict against Huss in 1412, but Huss appealed to a general council and to Christ, and wrote his *On the Church* as a reply to the pope. He went to a general council at Constance in 1414 under a safe-conduct from the king. His enemies secured his imprisonment as a heretic and, despite the guarantee of safe-conduct, he was burned at the stake. The popular indignation aroused by his death resulted in the so-called Hussite war.

Hutchins, Robert Maynard (**1899-**), American educator, was born at Brooklyn, N. Y. Graduating at Yale University in 1921, he taught for two years at Lake Placid School and was made secretary of Yale University in 1923, lecturer in the Yale Law School in 1925, and professor of law and dean of the Law School in 1927. In 1929, he was chosen president of the University of Chicago. He proceeded immediately to carry out there a new plan for informal study, which aimed at making the university an association of scholars and students rather than an institution for formal lecturing. He was chancellor from 1945 to 1951. Since then he has been associate director of the Ford Foundation. He wrote *Higher Learning in America*.

Hutchinson (*hŭch'ĭn-sŭn*), **Anne** (**c.1590-1643**), American religious leader, emigrated from Lincolnshire, England, to Boston, Mass., 1634. Living in a community prone to religious excitement, she claimed to be a medium of divine revelations and conducted meetings for women in which she expressed such antinomian doctrines as that the conscious judgment of each believer was a paramount authority in religion.

Great controversies arose, and a synod was called, in which her teachings were condemned and she was banished from the colony. She and her friends obtained from the chief of the Narragansetts liberty to reside in Rhode Island, where they set up a community on the principle that no one was to be "accounted a delinquent for doctrine." After the death of her husband, who shared her opinions, she removed to a Dutch settlement in the colony of New York, where, in 1643, she and her whole family of 15 persons were taken prisoners by the Indians and all but one daughter were barbarously murdered.

Hutchinson, Arthur Stuart Menteth (**1879-**), English novelist, was born at Gorakpur, India, of English parentage. He studied medicine at Saint Lawrence College, Thanet, Eng., but did not practice, devoting himself instead to literary and editorial work. His earlier novels include *The Happy Warrior* and *The Clean Heart*. By 1912, he had risen to the position of editor of the London *Daily Graphic*. After a period of war service with the British army in France, he wrote two novels which attained great popularity—*If Winter Comes* and *This Freedom*.

Hutchinson, Thomas (**1711-1780**), American magistrate and historian, was born in Boston. He was graduated at Harvard and began the practice of law. He was several times elected to the general court and, for three years, served as speaker. In 1760, he held at one time four offices, being judge of probate, councilor, chief justice, and lieutenant governor. In the time of the Stamp Act agitation, he favored the British government, as a result of which attitude his house was sacked and many valuable manuscripts relating to the history of Massachusetts were destroyed. In 1769, he became acting governor, serving in that capacity at the time of the Boston Massacre. His conduct further incensed the public, and he was driven from the country. In 1774, he returned to England and was pensioned by the government. He published *A Brief Statement of the Claims of the Colonies*.

Huxley, Aldous Leonard (**1894-1963**), English essayist and novelist, was born at Godalming. He was graduated from Oxford; was on the staff of the *Athenæum*, 1919-20, and of the *Westminster Gazette*, 1920-21; thereafter he devoted himself to authorship. His interests embraced science, psychology, literature, politics, and sociology, in each of which fields he showed a detailed knowledge, a daring penetration of thought and a gift for savage satire. Among his works are *Antic Hay*, *Point Counter Point*, *Brave New World*, *Eyeless in Gaza*, *After Many a Summer Dies the Swan*, and *Grey Eminence*.

Huxley, Julian Sorell (**1887-**), English zoologist, a grandson of Thomas Huxley and brother of Aldous Huxley. Educated at Oxford University, he taught there and, in 1912 came to the Rice Institute, Houston, Texas, where he lectured until 1916. After two years of service in World War I, he taught zoology at Oxford University and King's College, London. He was secretary of the zoological society of London, 1935-42. He served as first director general of UNESCO, 1946-48, and helped to produce that organization's monumental six-volume history of man's scientific and cultural achievements. He is recognized as one of the leading expositors of biological science in the English-speaking world. Among his numerous published works are *The Uniqueness of Man* (1941), *Evolution and Ethics* (1947), *New Wine in New Bottles* (1957), and *The Humanist Frame* (1961).

Huxley (*hŭks'lĭ*), **Thomas Henry** (**1825-1895**), English biologist and comparative anatomist, was born at Ealing. He was graduated at London University, 1845. In 1846, he entered the medical service of the royal navy and was appointed assistant surgeon on board the *Rattlesnake*. This vessel, commanded by Capt. Owen Stanley, was commissioned to survey the eastern shores of Australia. Imbued with a passion for natural history, Huxley devoted himself with zeal and intelligence to the study of the numerous marine animals collected from time to time during the survey and made them the subject of scientific papers, which he sent home, diffident as to their value.

In 1851, papers from his pen on other branches of the same subject were printed in the *Philosophical Transactions*, and, in the same year, Huxley was elected a fellow of the Royal Society. In 1854, he was appointed professor of natural history in the Royal School of Mines, a chair which he later made one of the most distinguished in the scientific world. In 1857, in conjunction with Dr. Tyndal, he wrote *Observations on Glaciers*, and, in 1858, this was followed by his important lecture *On the Theory of the Vertebrate Skull*. In 1872, he was made lord rector of Aberdeen University, and he was president of the Royal Society, 1881-85.

Huxley possessed the gift of exposition as well as remarkable powers of research. He was a forceful and luminous speaker, always clear and accurate, and exercised an incalculable influence as a teacher and popularizer of science. He was the foremost advocate in England of Darwin's theory of evolution, and his own researches form a substantial contribution to 19th-century knowledge.

Huygens (*hī'gĕnz*; Dutch, *hoi'gĕns*), or **Huyghens, Christian** (**1629-1695**), Dutch physicist and astronomer, was born at The Hague. He devoted himself to mathematics, improved the telescope, and devised new methods for grinding and constructing lenses. He also invented the first pendulum clock and, in 1659, discovered the ring of Saturn; developed a longitudinal wave theory of light; and first demonstrated polarization. He frequently visited England and was made a fellow of the Royal Society, 1663; at the invitation of Louis XIV, he lived for a number of years in Paris.

Huysmans (*hīs'mȧns*), **Cornelis** (**1648-1727**), Flemish landscape painter, was born in Antwerp. He studied in Antwerp and Brussels, and lived many years at Malines. Most of his pictures are brilliantly colored landscapes. In addition to landscapes, he painted large sacred pieces, among them "Christ on the Road to Emmaus" for the cathedral of Notre Dame of Malines. His "Italian Landscape" and "Landscape with Figures" are in the Metropolitan Museum of Art, New York.

Huysmans, Joris Karl (1848-1907), French novelist, was born in Paris. He lived an uneventful life, spending 30 years as a government employee and then lived on his pension. During the last 33 years of his life he wrote many novels which reflected his transition from extreme disillusionment to devout faith as a Catholic. One of his earlier works, *Marthe*, describes realistically the life of a prostitute. *La-bas* plumbs the depths of morbidity. In *En Route*, the author turns to religion, his later works *La Cathedrale* and *L'Oblat* evidencing his retreat to complete conversion. His other works include *En Menage*, *L'Art moderne*, and *A Rebours*.

Hyatt, Anna Vaughn (1876-), American sculptor, was born at Cambridge, Mass. She received her training in sculpture at the Art Students' League, New York City, and was a pupil of H. A. MacNeil and Gutzon Borglum. Her work consists chiefly of small bronze figures of animals. Among her larger sculptures is a colossal lion at Dayton, Ohio. Her equestrian statue "Joan of Arc," exhibited at the Paris Salon in 1910, stands in Riverside Park, New York. Her other works include "El Cid" in New York and Seville, Spain, and "Diana," in New Orleans and, in duplicate, in various other cities. See *Sculpture*.

Hyatt, John Wesley (1837-1920), American inventor, was born at Starkey, N. Y. He was educated in the common schools with one year at Eddytown Seminary. He began his career as a printer, but subsequently devoted his attention exclusively to invention. His first important achievement was a composition billiard ball, 1865. In 1869 he discovered a means of dissolving pyroxylin under pressure and, with his brother Isaac Smith Hyatt, invented celluloid and laid the foundation for the extensive celluloid industry.

His most important contribution to science was his purifying system for treating large bodies of water, devised in 1881 and since widely adopted. In 1892, he invented a roller-bearing, and in 1900 a lock-stitch sewing machine for belting. The list of his patented devices exceeds 200.

Hyde, Douglas (1860-1949), Irish scholar and writer. Educated at Trinity College, Dublin, he taught at the University of New Brunswick, Canada, in 1891-92, thereafter returning to Ireland, where he distinguished himself in the movement for an "Irish Ireland." He helped toward the establishment of the National University of Ireland with a chair in modern Irish, which he was the first to fill. He collected Irish love songs and folklore in the original Celtic and wrote in Irish the play *Twisting of the Rope*, which was produced in 1901 with the author in the principal role. He was a senator of the Irish Free State (later Eire) from 1922 to 1925. He was president of Eire from 1938 to 1945.

Hyndman (*hĭnd'măn*), **Henry Mayers (1842-1921),** English journalist and social reformer, was born in London. He was graduated from Trinity College, Cambridge, and, in 1866, became war correspondent for the *Pall Mall Gazette* to report the Italian war. In 1881, he founded the social democratic federation, which was the nucleus of the Socialist party in British politics. The chief labor and socialist leaders of the time worked with him, although his aristocratic manners caused frequent offense. He was one of the earliest supporters of Karl Marx's views in England. He was a vigorous opponent of the South African war, 1899-1900. Among his books are *England for All*, *Historical Basis of Socialism*, *A Commune for London*, *Commercial Crises of the 19th Century*, and *Marx Made Easy*.

Hypatia (*hī-pā'shĭ-ă*) **(c. 355 A.D. -c. 415 A.D.),** Greek philosopher, daughter of the Alexandrian astronomer Theon, was born in Alexandria. She was renowned for her knowledge of mathematics and of the Platonic philosophy, her teaching of which at Alexandria drew students from all the Hellenized regions of the East. She was celebrated also for both beauty and an ascetic austerity. She met a tragic fate. Being accused by the clergy of unduly influencing Orestes, prefect of Alexandria, against Saint Cyril, then archbishop there, she was attacked by a mob led by priests, dragged into a church, stripped of her clothing, and killed. This occurred when she was about 60 years of age. She is the heroine of Charles Kingsley's romance *Hypatia*.

Hyrcanus (*hĕr-kā'nŭs*), **John (?-105 B.C.),** Jewish high priest, flourished about 135 B. C. He succeeded his father, Simon Maccabæus, in the high priesthood as one of the Hasmonæan rulers of Judæa. He was at first compelled to pay tribute to Antiochus Sidetes, after whose defeat and death in 130 he re-established his independence, subdued Samaria, took several other cities from Syria, conquered the Idumæans, and formed an alliance with the Romans. He was long a Pharisee, but late in life became a Sadducee. His reign of 30 years closed the period of the later Jewish kingdom's independence.

Ibañez. See *Blasco Ibañez, Vicente.*

Iberville (*ē'bĕr'vēl'*), **Pierre le Moyne, Sieur d' (1661-1706),** French-Canadian commander, was born at Montreal, Canada, and became distinguished in the French service. In 1686, he joined the expedition of De Troye from Canada against the English forts on Hudson Bay and, in 1690, took part in the Indian and French massacre of the inhabitants of Schenectady. He captured forts Nelson and Bourbon on Hudson Bay in 1694 and 1697 respectively. In 1696, he destroyed Saint John's, Newfoundland, taking most of that province from the British.

Sailing from Brest in 1699 with two frigates, he reached the mouth of the Mississippi with his brother Bienville. He fortified Biloxi, the first post on the Mississippi, and, in 1700, ascended the river. In 1701, on account of the unhealthful climate, he transferred the colony from Louisiana to Mobile, and began the settlement of Alabama.

Ibrahim Pasha (*ĭb'rä-hēm' pä-shä'*) **(1789-1848),** Egyptian general, adopted son of Mehemet Ali, viceroy of Egypt, was born at Kavala, Rumelia. Mehemet Ali having conceived the design of adding Syria to his dominions, Ibrahim crossed the Egyptian border with an army in 1831, took Acre by storm, and quickly made himself master of the whole of Syria. When war broke out between Mehemet Ali and the sultan of Turkey in 1839, Ibrahim was again successful, totally routing the Turks in the great battle of Nisib. The interference of the great powers eventually compelled him to return to Egypt. In 1848, when the aged pasha had sunk into dotage, Ibrahim went to Istanbul and was installed viceroy of Egypt.

Ibsen (*ĭb'sĕn*; *ĭp'sĕn*), **Henrik (1828-1906),** Norwegian poet and dramatist, was born at Skien, Norway. He studied medicine, was a chemist's assistant at Grimstad, 1843-50, but soon devoted himself wholly to literature. His first drama, *Catilina*, was a failure; but, after a short period of study at Oslo and nearly two years of journalism, he became director of Ole Bull's Theater at Bergen, for which he wrote five romantic dramas.

In 1857, Ibsen became director of the National Theater in Oslo. His next dramas were *The Warriors in Helgeland*, *The Pretenders*, and *Love's Comedy*. The first two, reproducing the spirit of the old sagas, placed Ibsen in the foremost rank of Scandinavian dramatists; the last was a precursor of his satirical social dramas. In 1862, the National Theater became bankrupt, and Ibsen, enraged because Norway held aloof from the Danes in their struggle against the Germans, forsook his country. From 1864 to 1891, he lived in Rome, Dresden, and Munich. The Norwegian Parliament granted him a pension in 1866.

In 1866-67 appeared the dramatic poems *Brand* and *Peer Gynt*. There followed *Emperor* and *Galilean*, *The Pillars of Society*, *A Doll's House*, *Ghosts*, *An Enemy of the People*, *The Wild Duck*, *Rosmersholm*, *The Lady from the Sea*, *The Master Builder*, and *When We Dead Awaken*.

Ibsen's social dramas mark a new epoch in the development of dramatic art. In swiftness, certainty, and unity of action, in fascinating naturalness of dialogue, and in realistic illusion, these powerful plays are unexcelled in any literature and assure Ibsen a high place among world dramatists. See *Peer Gynt*.

Ikeda, Hayato (1899-), statesman, was born at Hiroshima, Japan. After studying at the Kyoto Imperial University, he entered upon a career of government service which included membership in the Yoshida and Ishi cabinets. A member of the Liberal Democratic Party, he was the Japanese delegate to sign the treaty of peace with the United States. Since 1960 he has been Japan's prime minister.

Indy (*ăN'dē'*), **Paul Marie Théodore Vincent d' (1851-1931),** French composer and pianist, was born in Paris. He received his first musical instruction from his mother, and continued study under Diémer and others. After serving in the army during the Franco-Prussian War, he renewed musical study under César Franck. In 1885, he became manager of the National Music Society, of which, upon Franck's death in 1890, he was made president. With Bordes and Guilmant, he established the Schola Cantorum, which became world famous. In 1906, he made a notable tour of the United States and conducted his own works with the Boston Symphony Orchestra.

In composition he became a leader of the new school developed by the pupils of Franck and ranks with Berlioz and Franck as one of the three foremost instrumental masters of modern France. His numerous compositions include symphonic poems, orchestral suites, chamber music, choruses, and works for the piano and organ. He wrote also biographies of César Franck and Beethoven.

Inge (*ĭnj*), **William Ralph (1860-1954),** English theologian, was born at Crayke, Yorkshire. He was educated at Eaton and at King's College, Cambridge. From 1884 to 1888, he was assistant master at Eaton and, from 1889 to 1904, he was fellow and tutor of Hertford College, Oxford. He was professor of divinity at Oxford from 1907 to 1911. From 1911 to 1934 he was dean of Saint Paul's, London. His sermons attracted wide attention by reason of the

originality of thought. They were characterized also by a pessimism which won him the sobriquet of "the gloomy dean." Among his writings are *Society in Rome under the Cæsars, Studies of English Mystics, Truth and Falsehood in Religion, Types of Christian Saintliness, Outspoken Essays, The Platonic Tradition, The Church in the World,* and *Our Present Discontents.*

Ingelow (*in'jē-lō*), **Jean** (**1820-1897**), English poet and novelist, was born at Boston, Lincolnshire. A great part of her poetry is of a devotional type, sweet and simple, and filled with beautiful thoughts. Among her noted works is the ballad *The High Tide on the Coast of Lincolnshire* and the larger poem *A Story of Doom.* Her works of fiction are *Off the Skelligs, Fated to Be Free, Sarah de Berenger, Don John, John Jerome, The Suspicious Jackdaw,* and *A Motto Changed.*

Ingersoll (*ing'gĕr-sŏl*), **Ralph** (**1900-**), American editor and publisher, was born at New Haven, Conn. Educated at Yale and Columbia universities, he worked as a mining engineer from 1921 to 1923, when he began reporting for the New York *American.* He was managing editor of the *New Yorker,* 1925-30, and then was associated with *Time* and *Fortune,* being publisher of these publications from 1937 to 1939. In 1940, he began publication of the New York daily, *P M,* a new departure in journalism in that it carried no advertising and departmentalized all news, which, it was claimed, was thus freed from the economic influence of advertisers. It suspended publication in 1948. Since that time he has been president of the R. J. Company, newspaper investments.

Ingersoll, Robert Green (**1833-1899**), American lawyer, orator, and writer, was born at Dresden, N. Y., the son of a Congregational minister of very broad views. He began the practice of law at Peoria, Ill., in 1857; became colonel of the 11th Illinois cavalry, 1862; was captured and exchanged, after which he resigned and retired to private life. In 1866, he was made attorney general of the state. He was a successful lawyer and a well-known orator, lecturer, and religious controversialist, being best known for his attacks upon the Bible. He published *The Gods, and Other Lectures; Some Mistakes of Moses;* and *Great Speeches.* Died at Dobbs Ferry, N. Y.

Ingres (*ăn'gr'*), **Jean Auguste Dominique** (**1780-1867**), French painter, was born at Montauban. He studied under David and, after taking the *grand prix* in 1801, worked in Rome, 1806-20. At Florence, where he spent four years, he painted "The Vow of Louis XIII." To this period belong his best portraits and his "Œdipus and the Sphinx," "Venus Anadyomene," "Virgil Reading the Æneid," and "Raphael and the Fornarina." His "Apotheosis of Homer," in the Louvre, is considered his finest epic painting. He became the leader of the classicists as opposed to the growing school of the romanticists under the leadership of Delacroix. See *Painting.*

Inman, Henry (**1801-1846**), American portrait painter, was born in Utica, N. Y. Besides making portraits of Chief Justice Marshall and many other distinguished Americans, he visited England and painted portraits of Wordsworth and Macaulay. In 1845, he began a series of historical paintings for the Capitol at Washington, but before completing them he died in New York.

Inness (*in'ĕs*), **George** (**1825-1894**), American painter was born at Newburgh, N. Y.; studied art in New York, France, and Italy. Because of his independent spirit, however, he was little influenced by his teachers and was practically self-taught. Inness is regarded as the foremost painter among American landscape artists, the acknowledged leader of the Hudson River group. His pictures are distinguished for their beauty of color, atmospheric charm, and poetic sentiment. He devoted a powerfully original and distinctly American mind to the creation of his paintings.

Most of Inness's paintings are privately owned, but leading galleries possess representative examples. The finest public exhibit is the Butler Collection, occupying an entire room at the Art Institute, Chicago. In this are "Catskill Mountains," "Home of the Heron," "The Storm," "Millpond," and "After a Summer Shower." The Metropolitan Museum, New York, contains several of his paintings, including "Peace and Plenty," "Autumn Oaks," and "Delaware Valley." In the National Gallery, Washington, are the well-known "Georgia Pines," "Niagara," and "September Afternoon." Inness is represented also in the art museums of Boston, Worcester, Brooklyn, Buffalo, Pittsburgh, Toledo, Saint Louis, and other cities and in many private collections. He died in Scotland.

Inness, George, Jr. (**1854-1926**), American painter of animals and landscapes, was born in Paris, France, son of the preceding. He was a pupil of his father in Rome, 1870-74; studied one year in Paris, 1875; afterward he lived in Boston and New York, where he occupied a studio with his father, 1878. He resided with his family in Montclair, N. J., after 1880, but had a studio in Paris, 1895-99, and exhibited annually at the Paris Salon. In 1913, he formed a connection with the *Century Magazine,* in which his work often appeared.

In the Metropolitan Museum, New York, are his "Shepherd and Sheep" and "First Snow at Cragsmoor." Among his animal pictures are "Surf Horse," "Mother of the Herd," and "Monarch of the Farm." His landscapes "Morning on the River" and "The Coming Storm" resemble his father's work in light and color. His writings include *Life and Letters of George Inness.*

Innocent III (**1161-1216**), pope, was born at Anagni, Italy, son of Count Trasimund, a Roman noble. He was educated at Paris, Rome, and Bologna, and was elected pope in 1198. He aimed to establish the supremacy of papal power in all European affairs; extended the territorial power of the Church; and made nearly all Christendom subject to its sway. He attempted the recovery of Palestine; promoted a crusade against the Albigenses; excommunicated Otto IV, emperor of Germany; put England under an interdict; and deposed King John.

Zealous for the purity as well as the supremacy of the Church, he countenanced every movement that contributed to enhance its influence and to fix firmly its beliefs as well as its forms of worship. He did much to reform and universalize Roman Christianity.

Inonu (*ē-nō-nōō'*), **Ismet** (**1884-**), Turkish general and statesman, was born at Izmir, Asia Minor. Entering the army at an early age, he rose rapidly and was a member of the general staff during the war with Bulgaria in 1913. During World War I he commanded an army corps against the Russians in 1915 and against the British in 1917.

He sided with Kemal when the latter revolted from the sultan, choosing to resist by arms the terms imposed by the allies in the Treaty of Sèvres. Under his leadership, the Turks defeated Greece at Inonu in 1922, and from this victory he received the name by which he was later known. He was premier of Turkey from 1923 to 1937, and was made president on Kemal's death in 1938. In World War II, he resisted all efforts to bring Turkey into the war.

Insull, Samuel (**1859-1938**), American public utility operator, was born in London, Eng., and was educated in English private schools. He came to America in 1881 as the private secretary of Thomas Edison, whose business affairs he managed for many years. In 1892, he was instrumental in organizing the Chicago Edison Company and the Commonwealth Electric Company, consolidated in 1907 as the Commonwealth Edison Company, which supplied the entire city of Chicago with its electricity. Through his rapidly expanding financial interests, Insull took a leading part in improving electric service and in modernizing electric systems through interconnection. The Chicago Opera Company was chiefly indebted to him for its financial backing. Financial difficulties in 1932 brought about the ruin of his fortunes, and he fled to Greece to escape prosecution for alleged misuse of funds. He was returned to the United States in 1934 for trial, and was acquitted.

Ireland, John (**1838-1918**), American Roman Catholic prelate, was born in Burnchurch, County Kilkenny, Ireland. He came to the United States in boyhood; was educated in the Cathedral School, Saint Paul; studied theology in France; and was ordained priest in 1861. He was chaplain of the 5th Minnesota regiment in the Civil War. Subsequently, he became rector of the Cathedral at Saint Paul and later coadjutor bishop. In 1884, he was made bishop and, in 1888, first archbishop of Saint Paul. He was especially active in establishing Roman Catholic colonies in the Northwest, in organizing total abstinence societies, and in establishing the Catholic University of America.

Irene (**c. 752-803**), Byzantine empress, once a poor orphan girl of Athens, Greece. Her beauty and talents drew the attention and the love of the emperor Leo IV, and he married her in 769. After his death, in 780, she ruled as regent during the minority of her son Constantine VI. When her son attained his majority, Irene dethroned him and deprived him of sight.

Confirmed in her title as empress in 792, she ruled in splendor for several years and is said to have aspired to a marriage between herself and Charlemagne. In 802, the patricians, upon whom she had always lavished favors, conspired against her and placed Nicephorus upon the throne. Thereupon she was banished to Lesbos, where she died in 803. Because of her zeal in restoring images and monasteries, the Greek Church counts her among its saints.

Irving, Sir Henry (**1838-1905**), is the stage name of John Henry Brodribb, English actor, born in Keinton-Mandeville, near Glastonbury. He acted at the Theater Royal, Edinburgh, 1856-59, and later for seven years at Manchester. He played in London in 1859, but attracted little notice until his appearance at Saint James's Theater in 1866. He soon established a connection with the Lyceum, of which he became manager in 1878. There he played his chief parts, in conjunction with Ellen Terry, producing

Hamlet, The Merchant of Venice, Faust, Macbeth, Henry VIII, The Bells, and other well-known plays.

Irving first came to the United States in 1883, and made his debut in New York as Mathias in *The Bells*. Subsequently, he made several tours in America. In 1895, he received the honor of knighthood, the first ever accorded an actor. He died in England, and was buried in Westminster Abbey.

Irving, Washington (**1783-1859**), American author, was born in New York City. He was the youngest son of William Irving, who had emigrated from Scotland and settled in New York as a merchant before the Revolution. Irving, at the age of 16, entered a law office; but he found greater profit from his father's well stocked library. In 1804, he traveled extensively in Europe; in 1806, he returned to New York and contributed a series of genial and humorous essays to a periodical called *Salmagundi*. In 1809, he wrote *A History of New York, from the Beginning of the World to the End of the Dutch Dynasty, by Diedrich Knickerbocker*, a burlesque chronicle written in so quiet a vein of humor that it has sometimes been taken for a veritable history.

Having no inclination for law, Irving engaged in commerce as a silent partner with his brothers, but devoted his time to literature. In 1813, he edited the *Analectic Magazine* in Philadelphia. In 1815, he visited England, where he was warmly welcomed by Campbell, whose biography he had formerly written, and was introduced by him to Walter Scott. In 1819, he published the *Sketch Book*, containing *The Legend of Sleepy Hollow* and *Rip Van Winkle*. He then went to Paris; in 1822, he wrote *Bracebridge Hall* and, in 1824, the *Tales of a Traveler*.

In 1826, at the invitation of Alexander H. Everett, American minister to Spain, Irving accompanied him to Madrid to translate documents connected with the life of Columbus. With these materials he wrote his *History of the Life and Voyages of Columbus, Voyages of the Companions of Columbus, The Conquest of Granada, The Alhambra*, and other works regarding Spain. He was United States minister to Spain, 1842-46.

Irving's *Life of Goldsmith* was published in 1849 and his great work, the *Life of Washington*, was published in 1855-59. The remarkable clearness and purity of his English and the genial spirit in which he handled his themes readily secured the attention of appreciative readers, and won for him a high place among early classic writers of America. He spent the last years of his life at Sunnyside, in his own "Sleepy Hollow," on the Hudson, near Tarrytown. He was elected to the American Hall of Fame, 1910. See *Rip Van Winkle*.

Irwin, Wallace (**1875-1959**), American author, was born at Oneida, N. Y. He studied at Leland Stanford University, and entered journalism. He was a special writer on the San Francisco *Examiner*, 1900; was editor of the San Francisco *News Letter*, 1901; and was editor of the *Overland Monthly*, 1902. In 1903, he was burlesque writer for the Republic Theater, San Francisco; in 1904-05, he was writer of topical verse for the New York *Globe*, and, in 1906-07, he was on the staff of *Collier's Weekly*. His numerous writings include *Chinatown Ballads, Letters of a Japanese Schoolboy, Mr. Togo—Maid of All Work, Pilgrims into Folly, Venus in the East, Suffering Husbands, Seed of the Sun, The Golden Bed*, and *Young Wife*.

Irwin, William Henry (**1873-1948**), best known as Will Irwin, American author and editor, was born at Oneida, New York and was graduated at Leland Stanford University in 1899. His editorial activities were connected chiefly with San Francisco and New York daily newspapers and with *McClure's Magazine* and *Collier's Weekly*. During World War I, he was a war correspondent for the London *Daily Mail* and several American newspapers. He acted on the commission for relief in Belgium and was decorated by the Belgian and the French government for his services. A few of the numerous works from his pen are *The City That Was, The Confessions of a Con Man, A Reporter in Armageddon* and *The Next War*. He edited *Letters to Kermit by Theodore Roosevelt*.

Isabella (**1451-1504**), queen of Castile, daughter of John II. In 1469 she married Ferdinand V, king of Aragon. On the death of her brother, Henry IV, in 1474, she took possession of the throne of Castile, to the exclusion of Joanna, the true inheritor of the crown. When a union of the kingdoms of Aragon and Castile took place, Ferdinand and Isabella together assumed the royal title of Spain. She was a woman of fine intellect and a wise, humane ruler, was always present during the transaction of state business, and her name was placed beside that of the king in state ordinances. She was a woman of piety, her devotion to the Church leading her to seek to introduce the Inquisition into Castile and to drive out the Jews. She proved also a stanch supporter of Columbus in his search for the western route to India, to finance which project she pledged her jewels.

Isidore (*ĭz'ĭ-dōr*) **of Seville, Saint** (**c.560-636**), Spanish ecclesiastic, was born at Cartagena, Spain. He was active in the great movement in the Western Church by which the doctrinal and moral system of Christianity was brought into harmony with the habits and institutions of those various races and nationalities which, by successive immigrations and wars, were eventually erected into the Hispano-Gothic kingdom. This kingdom exercised a powerful influence on what is called Latin Christianity.

The episcopate of Isidore, which began in 600, is notable for the half-ecclesiastical, half-civil councils of Seville in 619 and of Toledo in 633. The canons of these councils may be said to have largely formed the basis of the constitutional law of the Spanish kingdoms, both for church and for state, down to the great constitutional changes of the 15th century. Isidore wrote on science, art, history, and theology. Not the least of his accomplishments was the preservation of the remnants of Greek and Roman culture in Spain from the barbarians. A number of encyclopedic works from his pen were much quoted by later scholars and theologians.

Ismail Pasha (*ĭs'mā-ēl'pä-shä'*) (**1830-1895**) khedive of Egypt, was born at Cairo. He succeeded Said Pasha as viceroy of Egypt in 1863, promoted the Suez Canal project, and gained wealth by the cultivation of cotton during the American Civil War. The sultan settled the direct succession in his line in 1866, and his ambition afterward made him master of the upper Nile region. He rebuilt a large part of Cairo, greatly improved Alexandria, and constructed immense public works. Financial disaster coming in 1879, he abdicated in favor of his son, Mohammed Tewfik. After 1888, he lived in Istanbul, where he died.

Isocrates (*ī-sŏk'rä-tēz*) (**436 B.C.-338 B.C.**), Greek orator and teacher, was born in Athens. Among his teachers were Tisias, Gorgias, Theramenes, and Socrates. He was early attracted to the career of an orator and politician, but the possession of a weak voice induced him to abandon his ambition. He then devoted himself to speech writing and to the development of a system of rhetorical education.

He founded a school at Athens which advertised two-year and four-year courses. Its popularity is attested by the fact that it is said to have had, at one time, over 2000 students. The work avoided the more technical subjects and was designed to give the students a liberal education in political and social science. The list of his pupils contains the names of many men who later became famous. The discipline involved the writing of speeches for real or imaginary occasions. Many of Isocrates' own speeches were of this nature and may be regarded as among the earliest political pamphlets. They include the *Panegyricus, Areopagiticus*, the *Panathenaicus*, the *Archidamus*, and the *Antidosis*. His style exhibits a high degree of literary finish and a careful attention to melodious cadence.

Israëls (*ĕs'rä-ĕls'*), **Josef** (**1824-1911**), Dutch painter, was born at Gröningen of Jewish parents. He studied at Amsterdam under Kruseman and at Paris under Picot. His pictures of humble life, particularly of seafaring and fisher folk, won him foremost place among Dutch painters of his century. Like J. F. Millet, he saw in the struggles of the poor and the humble an opportunity to express his deep human sympathy. His works are widely known throughout the world and many are now in the United States.

Among the best-known of Israels' works are "The Cradle," "Shipwrecked Mariner," "Alone in the World," "Toilers of the Sea," "A Son of God's People," "Children of the Sea," and "When One Grows Old." "Expectation," "The Frugal Meal," "The Bashful Suitor," and "Waiting for Papa," in the Metropolitan Museum, New York, are typical examples of his work.

Ito (*ē'tō*), **Hirobumo, Prince** (**1841-1909**), Japanese statesman, was born in the feudal state of Choshu. After Admiral Perry's visit to Japan in 1854, Ito perceived the necessity of adopting Western ways in order to compete with the West. He visited the United States in 1871 for the purpose of examining the coinage system, and on his return to Japan was successful in establishing a mint at Osaka. He was a member of the Japanese cabinet for many years and was four times premier between 1886 and 1901. He was the chief founder of the constitution of Japan which was promulgated in 1889.

The fruit of Ito's modernization efforts appeared in the abrogation of disadvantageous treaties with Western powers in 1890, the Japanese victory over China in 1895, and the treaty of alliance with England in 1902. After the Russo-Japanese war in 1905, which assured Japan's place in the Orient, Ito was chief administrative official in Korea and, in 1909, was made president of the privy council in Japan. He was assassinated in 1909.

Ivan III (*ē-vän'*; *ī'vän*), **Vasilevitch** (**1440-1505**), ruler of Russia and regarded as the founder of the Russian empire. He was at first only Grand Duke of Moscow, but succeeded in shaking off entirely the yoke of the Tatars and in subjecting a number of the Russian principalities to his own sway. In 1472, he married Sophia, a niece of Constantine Palæologus, assumed the title of "ruler of all

Russia," and adopted the two-headed eagle of the Byzantine empire.

Ivan IV, Vasilevitch (1530-1584), first czar of Russia, called "the Terrible." He was made Grand Duke of Muscovy on the death of his father and took the government into his hands at the age of 14. Being maltreated by nobles who acquired power, he conceived a hatred for them and favored the merchant class. Having established his ascendancy at the age of 20, he summoned Russia's first general assembly and announced that he would thereafter devote himself to the public good.

In the next ten years Ivan did much for the advancement of his country in arts and commerce as well as for its extension by arms. He subdued Kazan and Astrakhan, and annexed Siberia. He concluded a commercial treaty with Queen Elizabeth of England after the English had discovered the way to Archangel by sea.

In 1560, upset by the loss of his wife and son and of the loyalty of a trusted adviser, Ivan isolated his court from the rest of the country. On unsupported accusations of disloyalty he destroyed Novgorod and massacred its citizens. In 1581, in a fit of ungovernable rage, he killed his oldest surviving son. Remorse at the enormity of the deed hastened his own death.

Ives (*īvz*), **Frederick Eugene (1856-1937),** American inventor, was born at Litchfield, Conn. He was educated in the public schools at Litchfield, Norfolk, and Newtown, Conn. While in charge of the photographic laboratory, Cornell University, 1874-78, he worked out the first practically successful process of orthochromatic photography. In 1886, he invented the process of half-tone photoengraving now universally employed. His experiments in color photography culminated in the three-color printing process, now the basis of an important industry.

His more recent inventions include glass sealed spectroscope gratings, the diffraction chromoscope, the universal colorimeter, and a process for producing motion pictures in natural colors.

Ives, Herbert Eugene (1882-1953), American inventor, son of Frederick E. Ives, was born at Philadelphia. Educated at the University of Pennsylvania and Johns Hopkins University, he was appointed to the United States Bureau of Standards as a physicist in 1908. Turning to the investigation of light, vision, and the measuring of lighting effects, he was employed by electric interests and, beginning in 1919, by the Bell Telephone Laboratories, New York. Here he worked on problems of television and gave, in 1927, the first public demonstration of a scene electrically reproduced for the eye over wire and radio.

Ixtlilxochitl (*êsh'tlĭl-shō'chêt'l*), **Fernando de Alva (c. 1568-1648),** Mexican antiquary. He was a descendant of the kings of Tezcuco, was interpreter of the native languages to several viceroys of Mexico, and a laborious collector of the ancient manuscripts and traditions of his country. Both Prescott and Lord Kingsborough made use of his writings in the compilations of their histories. Many of his valuable manuscripts are in the archives of Mexico.

Jacks, Lawrence Pearsall (1860-1955), English author and theologian, was born in Nottingham. He was educated at the University of London, Manchester College, Göttingen, and Harvard. He entered the Unitarian ministry and, in 1887, became assistant to Stopford A. Brooke. He became the editor of the *Hibbert Journal* at the time of its founding in 1902. From 1903 to 1931 he was professor of philosophy at Manchester College, Oxford. He published *Confessions of an Octogenarian* in 1942.

Jackson, Andrew (1767-1845), seventh president of the United States, was born in Waxhaw settlement, S. C., two years after his father had emigrated from northern Ireland. At the outbreak of the American Revolution, he and his brothers were summoned to the field. Though but 13 years old, he fought under Sumpter and remained with the army until the end of the war.

In 1784, he began the study of law and, in 1788, was appointed solicitor for the western district of North Carolina, now the state of Tennessee. In 1796, he was a member of the convention which modeled the constitution and organized the state of Tennessee, and was elected respectively representative, United States senator, judge of the State Supreme Court, and major general of state militia.

In 1813, at an outbreak of hostilities with the Creek Indians, he raised a volunteer force of 300 men and defeated them. Jackson's final victory on March 27, 1814, broke the power of the Indian race in North America. He was appointed general in the United States army and defended New Orleans against the attack of the British under General Pakenham, January 8, 1815. The result of this action gave General Jackson a great and enduring popularity. After Spain had ceded Florida to the United States, he was made governor of the territory.

Jackson was elected president of the United States by the Democratic party, 1828, and was re-elected by a still larger majority, 1832. His administration was marked by singular firmness against the rising power of the moneyed interests and in favor of the frontiersman and middleclass. He vetoed important measures against large majorities, destroyed the bank of the United States, and took the first steps toward a specie currency and an independent treasury. He retired with undiminished popularity after witnessing the election of his favorite, Martin Van Buren. His administration began the spoils system in American politics. He was elected to the American Hall of Fame in 1910. See *Spoils System, Jacksonian Democracy.*

Jackson, Charles Thomas (1805-1880), American scientist, was born at Plymouth, Mass. He was graduated from Harvard Medical College in 1829 and practiced in Boston. He was associated with the discovery of the anesthetic effects of ether about 1842. The French Academy of Science recognized him as co-discoverer of this anesthetic, along with Dr. W. T. G. Morton. Dr. Jackson published in 1861 a *Manual of Etherization, with a History of Its Discovery.*

Jackson, Helen Fiske Hunt (1831-1885), American author, was born in Amherst, Mass. Her maiden name was Helen Maria Fiske. She studied at Ipswich Female Seminary, and, in 1852, she married Major E. B. Hunt, who was accidentally killed in 1863. She afterwards married William S. Jackson and lived most of the latter part of her life at Colorado Springs. About 1870, she began to write verses over the signature "H. H.," which soon became familiar to magazine readers. She had always been interested in the welfare of the Indians, and her book *A Century of Dishonor* made her their champion. In 1883, Mrs. Jackson was made a commissioner by the government to look into the condition of the Mission Indians in California. Her last book, *Ramona,* which deals with Indian life, had a wide circulation. She died at San Francisco. See *Ramona.*

Jackson, Henry M. (1912-), political leader, was born at Everett, Wash. After graduation from the University of Washington Law School he became prosecuting attorney, then was elected representative from the 2nd District, serving from the 77th through the 82nd Congress. Since 1953 he has been U.S. senator from the state of Washington. His committee assignments have been mainly concerned with the armed services and atomic energy.

Jackson, Mahalia (1911-), singer, was born in New Orleans and was educated in the schools there. Having shown remarkable talent at an early age, she became a concert singer and recording artist. She is known especially for her rendition of spiritual songs.

Jackson, Robert Houghwout (1892-1954), American lawyer, was born at Spring Creek, Pa. Graduating from Union University, Albany, N. Y., he began practice at Jamestown, N. Y. Because of his ability as counsel, he was made an officer of local transportation companies, a bank, and a telephone company. In 1934, he began the second stage of his career, which lay with the Federal government. General counsel first for the Bureau of Internal Revenue, he was assistant to the attorney general, 1936-38, solicitor-general, 1938-39, and attorney general, 1940-41. In 1940, he was appointed Associate Justice of the United States Supreme Court. In 1945 he was appointed American prosecutor before the Nuremburg war crimes court.

Jackson, Sheldon (1834-1909), American missionary and educator, was born at Minaville, N. Y. He was graduated from Union College in 1855 and from Princeton Theological Seminary in 1858. He engaged in missionary work among the Indians, 1858-64, and organized mission schools in the Northwest from 1869 to 1877. He then began organizing educational work in Alaska, where he was general superintendent of schools until 1900.

Jackson conceived and carried out with government aid the plan of introducing Siberian reindeer for the use of the Eskimo in Alaska. A small herd with Lapp attendants was landed in northern Alaska in 1889. These with their increase and later additions amounted to 5000 in 1903. Stations were established, where the deer were bred and the Eskimos were trained in their care and use so that in 1940 there were over 600,000 reindeer in Alaska. Among Jackson's publications are the *First Annual Report on Education in Alaska* and *Alaska and Missions on the North Pacific Coast.*

Jackson, Thomas Jonathan (1824-1863), better known as "Stonewall Jackson," American general, was born at Clarksburg, W. Va. He was graduated at West Point Academy in 1846, and, after serving with distinction in the Mexican War, he became a professor in the Military Institute at Lexington, Va.

At the outbreak of the Civil War, he was appointed brigadier general in the Confederate service. At the battle of Bull Run, July 1861, his command "stood like a stone

wall"; hence the sobriquet. In September, he received the rank of major general; defeated General Banks at Front Royal, 1862; fought an indecisive battle with Frémont at Cross Keys; commanded a corps in the battles of Gaines's Mill and Malvern Hill; again defeated General Banks, at Cedar mountain; captured Harpers Ferry with 11,000 Federal prisoners; commanded a corps at Antietam; and was made lieutenant general for his services in contributing to the Federal defeat at Fredericksburg. In 1863, by a clever flank movement, he defeated the 11th corps of General Hooker's army at Chancellorsville. On the evening of his victory, he was fired on and fatally wounded by a patrol party of his own men, who mistook him and his staff for a detachment of Union cavalry. He was elected to the American Hall of Fame in 1955.

Jacobi (*jä-kō'bĭ*; Ger., *yä-kō'bē*), **Abraham (1830-1919)**, physician, was born at Hartum, Germany. He studied at the universities of Greifswald, Göttingen, and Bonn. He became identified with the German revolutionary movement and was held in detention at Berlin and Cologne, 1851-53, on a charge of high treason. He later settled in practice in New York and was professor of diseases of children at New York Medical College, 1860-65, and at New York University, 1865-70. He held a similar chair at the college of physicians and surgeons, Columbia University, for many years. In 1873, he married Mary Putnam, who was a distinguished physician and a pioneer in the movement for the medical education of women in America. He was an editor of *American Journal of Obstetrics and Diseases of Women and Children*, 1868-71, and wrote *Dentition and Its Derangements, The Raising and Education of Abandoned Children in Europe, Infant Diet, Diphtheria*, and, *Intestinal Diseases*.

Jacquard (*zhä'kär'*), **Joseph Marie (1752-1834)**, French inventor, was born at Lyons. He attempted to establish a manufactory for weaving figured fabrics; planned several ingenious improvements in machinery; and brought to perfection the so-called Jacquard loom, an apparatus for figured weaving. Jacquard also invented a machine for weaving nets. For this invention, he received a gold medal in 1804 from the inspectors of Paris. He resided for many years at Lyons, where, for some time, he encountered much opposition from a prejudice against machinery. He received the cross of the Legion of Honor. In 1840, a statue was erected to his memory at Lyons.

Jacque (*zhăk*), **Charles Emile (1813-1894)**, French painter and etcher, was born in Paris. He studied engraving in Antwerp and in London, where he made wood engravings illustrating Shakespeare's works. Upon his return to France, he became a member of the Barbizon group and won great distinction as a sheep painter, paralleling Troyon's success as a cattle painter. His pictures, though small, display fine power of conception, strong, conscientious execution, and marked mastery of sky effects. He became an intimate friend of Millet, under whose influence his work showed continuous improvement. Among his many paintings in the Louvre is his well-known "Flock of Sheep." His work is represented by numerous examples in the Metropolitan Museum, New York, and in other American collections.

Jahn (*yän*), **Friedrich Ludwig (1778-1852)**, known as the "father of gymnastics," was born at Lanz, Germany. In 1811, he started the first gymnasium in Berlin. His system, which was designed to revive patriotism, attracted the Prussian youth, and the training and inspiration thus obtained contributed in no small degree to the subsequent victories of Germany over the Napoleonic armies. In this struggle, Jahn received the command of a volunteer corps. After the peace of 1815, he resumed his teaching and published *Die Deutsche Turnkunst*.

But the gymnasiums began to witness political gatherings too liberal to please the Prussian government, and they were closed in 1818. Jahn was arrested in 1819 and suffered five years' imprisonment. He was elected to the Frankfort National Assembly in 1848.

James, Frank Cyril (1903-), Anglo-American economist and educator, was born in London, England. A graduate of the London School of Economics, he was a clerk in Barclay's Bank, London, until 1923, when he came to the United States and began to teach at the University of Pennsylvania, becoming professor of economics there in 1935. In 1939, he was made professor of political economy at McGill University and the next year was appointed principal of the University. He had acted as economic adviser to the First National Bank, Chicago, and to a number of other banks or associations. Among his published works are *The Economics of Money, Credit and Banking*; *The Road to Revival*; *The Growth of Chicago Banks*; and, in collaboration, *Economic Problems in a Changing World*.

James, Henry (1843-1916), American author, brother of William James, the psychologist, was born in New York. He was educated in France and Switzerland and at Harvard Law School. He began his literary career as a contributor to periodicals in 1866. European society held a fascination for him, which induced him to take up his permanent residence in England. Nearly all his novels have their settings in England or the continent. His characters are typically people of leisure interested in problems of conduct, and James's conscientious and objective delineation of the psychology of such people made him a novelists' novelist rather than a popular writer.

His writings include *A Passionate Pilgrim, Roderick Hudson, The American, The Europeans, Daisy Miller, An International Episode, Diary of a Man of Fifty, The Portrait of a Lady, Tales of Three Cities, The Bostonians, The Aspern Papers, A London Life, The Tragic Muse, The Two Magics, The Soft Side, The Lesson of Balzac, Julia Bride, Finer Grain*, and *Small Boys and Others*. He was a member of the American Academy of Arts and Letters.

James, Marquis (1891-1955), American biographer, was born at Springfield, Mo. He attended Phillips University for a year. From the age of 18, he worked as reporter or editor on a number of mid-western newspapers until 1916, when he became rewrite man for the New York *Tribune*. After World War I, in which he served, he directed publicity for the American Legion and edited its journal until 1932. In 1929, he wrote *The Raven, A Biography of Sam Houston*, which marked him as a biographer combining scholarship with forceful writing. Both this book and *Andrew Jackson—Portrait of a President*, written in 1937, received Pulitzer prize awards as the best biographies of the year. His other works include *A History of the American Legion* and *They Had Their Hour*. Between 1942 and 1954 he wrote several corporation histories in which he used the biographical methods to trace the evolution and interpret the character of some large business organizations. The first of these, *Biography of a Business* (Insurance), was followed by *The Metropolitan Life Insurance Company, The Texas Story* (Oil), and *Biography of a Bank*.

James, William (1842-1910), American psychologist and philosopher, was born in New York. He was educated privately and at Lawrence Scientific School and Harvard Medical School. He was appointed to the faculty of Harvard University as an instructor in comparative anatomy and physiology in 1872, but most of his many years of teaching there were spent as professor of philosophy. Upon the publication of his *Principles of Psychology* in 1890, he became the most influential American psychologist. With this work, psychology became a laboratory science rather than a mental philosophy.

Turning his attention to religion, James brought to the subject a new method; an investigation of religious experiences to discover what could be learned from them as an aid to living.

In philosophy, James made pragmatism a subject of world-wide discussion. Philosophers of every school were obliged to define their attitude to this theory which, taking its origin from a formulation of the logic of science, held that the truth or falsity of any proposition is to be determined by the success or failure of action based upon it.

His writings include *The Will to Believe, and Other Essays in Popular Philosophy*; *Talks to Teachers on Psychology, and to Students on Some of Life's Ideals*; *The Varieties of Religious Experience*; *Pragmatism*; *A Pluralistic Universe*; *The Meaning of Truth*; *Some Problems of Philosophy*; and *Essays on Radical Empiricism*.

James I of England and **VI of Scotland (1566-1625)**, the only son of Mary Queen of Scots and Henry Stuart, Lord Darnley, was born in Edinburgh. When his mother was forced to resign the crown, James was proclaimed king of Scotland, 1567. The training of his childhood was under the care of the Earl of Mar. His tutor was the scholar George Buchanan. In 1578, the Earl of Morton, then regent, was driven from power, and James assumed full control. The new government was unpopular, and Morton was once more made regent, but was at length condemned and executed as one of the murderers of Lord Darnley.

In the winter of 1589, James went to Denmark, where he married Princess Anne, daughter of Frederick II, king of that country. By the death of Elizabeth in 1603, James succeeded to the throne of England. He governed through his favorites Carr and Buckingham, both of them unpopular; and England's prestige as a power, which had been gained under Elizabeth, went into eclipse. The anger of the Roman Catholics toward him because of his severities led to the famous gunpowder plot. One of the most noteworthy achievements in his reign was the production of the so-called King James version of the Bible. The king's learning contrasted with his weakness of character later prompted the application to him of the celebrated descriptive phrase "the wisest fool in Christendom."

James II of England and **VII of Scotland (1633-1701)**, son of Charles I and Henrietta Maria. In 1648, during the Civil war, he made his escape to France. For some time, he served in the French army under Turenne; but, when peace was made with Cromwell, he was obliged

to leave both the army and the territory of Louis XIV. He then entered the military service of Spain. At the Restoration, he was made lord high admiral of England. On the death of Charles II, 1685, James succeeded to the crown without opposition.

On becoming king, he promised to maintain the Church of England and to respect the liberties of the people. Nevertheless, his government was arbitrary and tyrannical; he persecuted the covenanters; subordinated English interests to French; permitted the "bloody assize"; suspended the Test Act; violated the rights of the universities; gave Church offices to Roman Catholics; and, by these and many other acts of despotism, aroused his subjects to attempt his deposition. Leading statesmen invited William of Orange to assume the throne, and James fled to France; his invasion of Ireland in 1689 ended in his defeat by William at the battle of the Boyne, 1690. He again retired to France, and lived at Saint Germain until his death.

James IV of Scotland (**1473-1513**), son of James III and Margaret of Denmark, became king in 1488. He exhibited great energy and good sense in the management of public affairs, in vindicating the law and punishing crime, in encouraging shipbuilding, and in developing the agriculture and the manufactures of the country. In 1503, the king married Margaret, daughter of Henry VII of England, an alliance which led to the union of the two crowns just 100 years later. Henry VIII came to the English throne in 1509, and ensuing disputes led James to invade England with an army. He was met by the Earl of Surrey, and, in the battle which took place at Flodden, 1513, the king and many of his nobles were killed.

Jameson, Sir Leander Starr (**1853-1917**), British physician, soldier, and statesman, was born at Edinburgh. He studied medicine at Edinburgh and London, and began practice at Kimberley, South Africa, in 1878. He engaged in pioneer work with Cecil Rhodes and, in 1891, was made administrator of Rhodesia, where he won enormous popularity.

During the troubles at Johannesburg in 1895, between the Uitlanders and the Boer government, Jameson, by order of Rhodes, led a military force to support the Uitlanders. At Doornkoop, they were overpowered by a force of Boers and were compelled to surrender, January 2, 1896. Handed over to the British authorities, Jameson was in May condemned in London to 15 months' imprisonment, but was released in December. In 1900, he was elected to the legislative assembly of Cape Colony and was premier from 1904 to 1908. See *Jameson Raid*.

Jameson, (Margaret) Storm (**1897-**), English novelist, was born at Whitby. After being graduated from Leeds University, she began work as a writer of advertising copy, but soon devoted most of her time to critical writing and serious fiction. She married Guy Chapman. Her first novel, *The Pitiful Wife*, published in 1924, marked her as a writer of impressive power. Her later works were weighted with a sense of the social, economic, and political problems which went into the making of World War II. They include *Farewell to Youth*, *Women against Men*, *Europe to Let*, and *Cousin Honoré*. Her more recent writings include *The Green Man* (1952) and *The Hidden River* (1955).

Jansen (*jăn'sĕn*; Dan., *yän'sĕn*), **Cornelis** (**1585-1638**), sometimes known by the Latinized name of Jansenius, Dutch religious leader, was born at Acquoi, near Leerdam in the Netherlands. He studied at Utrecht, Louvain, and Paris; filled a chair at Bayonne; and, in 1630, became professor of theology at Louvain. In 1636, he was made Bishop of Ypres and shortly afterward completed his great work, the *Augustinus*, which sought to prove that the teaching of Saint Augustine on grace, free will, and predestination was directly opposed to the teaching of the Jesuit schools.

The school of Jansenism, which derived its theological doctrines from Jansen, repudiated the Catholic dogma of the freedom of the will, maintaining that divine grace is irresistible and that Christ died for all. The circulation of the *Augustinus* was prohibited by a decree of the Inquisition in 1641, and, in the following year, it was condemned by Urban VIII in the bull *In eminenti*.

Jastrow (*yăs'trō*), **Joseph** (**1863-1944**), American educator, was born at Warsaw, Poland, and was brought in 1866 to the United States. He was graduated at the University of Pennsylvania and at Johns Hopkins University. He was in charge of the psychological section of the World's Columbian Exposition in 1893. In 1903, he became professor of psychology at the University of Wisconsin. He resigned in 1927 to lecture at the New School for Social Research in New York, serving until 1933. As a psychologist, he stressed applications to common life. He wrote *Fact and Fable in Psychology*, *The Subconscious*, *Character and Temperament*, *The Betrayal of Intelligence*, and *The Story of Human Error*.

Jaures (*zhō'rĕs'*), **Auguste Marie Joseph Jean** (**1859-1914**), French socialist leader, was born at Castres. Graduating after a brilliant scholastic career at the Ecole Normale Superieure in Paris, he became lecturer at the University of Toulouse. He was elected to Parliament in 1885.

In 1893, as a supporter of the working class, he managed to unite the more militant branches of the Socialist party in France and was its undisputed leader during the remainder of his life. Profoundly disturbed by the threat to the Socialist ideal implicit in the gathering war clouds in early 1914, he sought to create a world-wide solidarity of the working classes to avoid war. On the eve of mobilization of the French army, he was assassinated.

Javits, Jacob (**1904-**), political leader, was born in New York City. A graduate of New York University, he was admitted to the bar in 1927. In World War II he served in both European and Pacific operations. He was representative from the 21st District in the 80-83rd and 85th Congresses and has been U.S. senator from New York since 1957.

Jay, John (**1745-1829**), American statesman and jurist, was born in New York City. He was admitted to the bar in 1768. In 1774, as a member of the First Continental Congress, he formed one of the committee of three which drew up the celebrated address to the people of Great Britain. He assisted in framing the New York State constitution; in 1777, was appointed chief justice of New York; and, in the following year, became president of the provincial congress of New York. He next took part in negotiating the treaty of peace entered into at Paris, 1783, between Great Britain and the United States. On his return, he was appointed secretary for foreign affairs and, in 1789, became chief justice of the United States Supreme Court. In 1794, he went on a special mission to England, where he concluded a treaty which met with violent opposition from the Anti-federalist party. He was governor of New York State, 1795-1801.

Jeans, Sir James Hopwood (**1877-1946**), English mathematician and astronomer, was born in London. Educated at Cambridge University, he later taught there and at Princeton University. From 1919 to 1929, he was secretary of the Royal Society and, in 1923, was a research associate at the Mount Wilson Observatory. From 1934, he served as professor of astronomy in the Royal Institution, London.

His brilliant applications of mathematics to atomic physics and astronomy placed him in the front rank of modern mathematicians. He proved that Laplace's theory of the origin of heavenly bodies was incorrect and laid the mathematical foundation for the gaseous-tidal theory elaborated by Chamberlain and Moulton. Among his works are *Radiation and the Quantum Theory*, *Astronomy and Cosmogony*, *The Stars in Their Courses*, and *Science and Music*.

Jebb, Sir Richard Claverhouse (**1841-1905**), British Hellenic scholar, was born at Dundee, Scotland. He was graduated from Trinity College, Cambridge, and was elected fellow. He took a prominent part in organizing intercollegiate classical lectures and was secretary to the newly founded Cambridge Philological Society. In 1869, he became public orator of Cambridge University; in 1875, was made professor of Greek at Glasgow; and, in 1889, was appointed regius professor of Greek at Cambridge. In 1891, he was elected member of Parliament for Cambridge University. His books include *The Attic Orators*, *Primer of Greek Literature*, *Modern Greece*, *Richard Bentley*, *Introduction to Homer*, *Erasmus*, *Influence of Classical Greek Poetry*, and an edition of Bacchylides' works and of the *Character* of Theophrastus. His greatest work is his translation of Sophocles.

Jeejeebhoy (*jē'jēb-hoi'*), **Sir Jamsetjee** (**1783-1859**), Indian merchant and philanthropist, was born in Bombay. At an early age, he manifested great mercantile ability, traveling extensively throughout maritime Asia and visiting Egypt, Syria, and England. At the end of his 20th year in business, he had made a vast fortune for those days and was everywhere acknowledged the leading merchant of the East.

Remembering his own early struggles with poverty, he then began a career of philanthropy throughout India, extending his benevolences to Mohammedans, Hindus, Christians, and Parsis alike. While his known benefactions exceeded $1,000,000, the amount is far less notable than the circumstances and the spirit in which it was given. He was the first native British subject in India to receive the honor of knighthood and a baronetcy.

Jeffers, Robinson (**1887-1962**), American poet, was born in Pittsburgh, Pa. He attended school in France, Switzerland, and Germany, later being graduated from Occidental College, Los Angeles. Receiving a legacy at the age of 25, he took up his residence at Hermosa Beach, Calif., removing later to Carmel, Calif., and devoted himself to the writing of poetry. His themes generally are tragic and his poetry explores searchingly the more unusual

forms of passion. For this reason his work did not appeal to a large audience, but to many critics he appeared to be the most impressive poet whom America had produced. His first volume of verse, *Flagons and Apples*, was published in 1912. It was followed by *Californians*, *Tamar and Other Poems*, *The Women at Point Sur*, *Thurso's Landing*, *Give Your Heart to the Hawks*, and *Such Counsel You Gave Me*. Among his other works are *Medea* (1946), *The Double Axe* (1948), and *Hungerfield and Other Poems* (1954).

Jefferson, Thomas (**1743-1826**), American statesman and third president of the United States, was born at Shadwell, Virginia. At the age of five, he was sent to an elementary school. Four years later, he commenced the study of Latin, Greek, and French, and, in 1760, entered an advanced class at William and Mary College. In 1767, he was admitted to the bar, and he continued the practice of law until the Revolution closed the Courts of Justice.

While he was a student at law, Jefferson heard, in the Virginia House of Delegates, the famous speech of Patrick Henry against the Stamp Act. Animated by the spirit of that great orator, he thereafter stood forth as a champion of independence. In 1769, he was chosen by the people of his county to represent them in the legislature of the province. In January 1772, he married Mrs. Martha Skelton. She brought him a large dowry in lands and slaves about equal in value to his own estate, which was named Monticello, but liberality and generous living left Jefferson insolvent at his death.

Declaration of Independence. In the spring of 1773, he was appointed by the House of Burgesses a member of the "committee of correspondence and inquiry for the dissemination of intelligence between the colonies," the plan of which he had aided in devising. Illness prevented Jefferson from attending the first convention of deputies, in 1774, but he was present at the second convention, in March 1775. This convention then elected delegates to the Continental Congress, where Jefferson took his seat in June. Early in June 1776, a committee to draw up a Declaration of Independence was appointed with Jefferson for its chairman. The instrument itself was written by Jefferson and was adopted, with certain amendments, on July 4, 1776. This Declaration remains his noblest monument.

Political Activities. Jefferson then devoted himself to carrying out radical changes in the laws of his native state. He took his seat in the Virginia house in October 1776, and, on June 1, 1779, he was elected by the legislature to succeed Patrick Henry as governor of Virginia. In 1782, Congress appointed him one of the commissioners to arrange the treaty of peace. He was elected a delegate to Congress in 1783, and, in the next year, he wrote notes on the establishment of a coinage for the United States.

In 1785, Jefferson succeeded Benjamin Franklin as minister at the French court, and he remained at Paris until the latter part of 1789. Soon after his return to the United States, he entered the cabinet of President Washington in March 1790 as secretary of state. Jefferson was democratic by nature and training, strongly opposed to the English political system, a friend to the Revolutionary cause in France, and an unyielding advocate of state sovereignty and decentralization. In nearly all measures he was opposed by Alexander Hamilton, then secretary of the treasury. On December 31, 1793, Jefferson resigned from the cabinet and retired to Monticello.

Presidency. In 1796, Jefferson was supported for the presidency; but John Adams received the highest number of votes, and Jefferson then became vice president. In 1800, he was again nominated for the presidency and was elected. He entered upon the duties of office March 4, 1801. His inaugural address was a lucid and forcible production, explaining his ideas on good government and tending to conciliate all parties. Majorities in both houses of the Seventh Congress enabled the president to carry through many measures not otherwise practicable, and the foreign relations of the United States were managed with consummate skill. The most important event of his administration was the purchase of Louisiana from Napoleon in 1803 for 15 million dollars.

Jefferson was re-elected president in 1804. After the expiration of his second term, March 1809, he retired to Monticello and became interested in the establishment of a system of education for Virginia. Through his instrumentality, the University of Virginia was founded in 1818 and was chartered in the following year with him as its first rector.

Influence. His whole life was consecrated to the improvement and happiness of his fellow men, and he always evinced an intense enthusiasm for knowledge and liberty. As the author of the Declaration of Independence, of the statute of religious freedom in the constitution of Virginia, and as a founder of the Democratic party, Jefferson perhaps exerted a greater influence on the institutions of the United States than any other American except Washington and Alexander Hamilton. See *Declaration of Independence*, *Monticello*.

Jeffreys, George, Baron (**1648-1689**), English judge, was born at Acton, Wales. Admitted to the bar in 1668, he rose rapidly, and became, in 1671, common sergeant of the city of London. Hitherto nominally a Puritan, he now began to intrigue for court favor, was made solicitor to the duke of York, was knighted in 1677, and became recorder of London in 1678. He was made chief justice of Chester and king's sergeant in 1680, baronet in 1681, and chief justice of King's Bench Court, 1683.

In state trials, he proved subservient to the crown, thus earning the favor of King James II, who raised him to the peerage in 1685. He was unfair in his rulings in the trial of Algernon Sidney and he condemned Sir Thomas Armstrong to death without trial. Among his earliest trials were those of Titus Oates and Richard Baxter. Later, he was sent to try the followers of Monmouth. Of these, he hanged 320, transported more than 800 to the American plantations, and maimed or fined many others in what came to be known as the "bloody assizes." On the flight of King James, Jeffreys tried to follow his example, but was caught at Wapping, disguised as a sailor, and sent to the Tower, where he died.

Jellicoe (*jĕl'ĭ-kō*), **John Rushworth, Lord** (**1859-1935**), British admiral, was educated at Rottingdean and entered the navy in 1872. He served in the bombardment of Alexandria and in the battle of Telel Kebir in 1882. In 1893, as commander, he was wrecked on the ill-fated *Victoria*. From 1898 to 1901, he commanded the naval brigade in China and was seriously wounded when serving as chief of staff to Admiral Seymour in the Peking relief expedition during the Boxer rebellion. He was promoted rear admiral in 1907, commanded the Atlantic fleet, 1910-11, and in 1912 became second sea lord of the admiralty. At the outbreak of World War I, in 1914, he was made commander in chief of the home fleet, and, in 1915, he became admiral.

On May 31, 1916, Jellicoe commanded the grand fleet in the naval battle of Jutland, inflicting such damage on the German fleet that it risked no further engagements during the war. He received the thanks of Parliament together with a grant of £50,000. In 1918, he was created Viscount Jellicoe of Scapa; in 1920-24, he served as governor-general of New Zealand. See *Jutland, Battle of*.

Jelliffe (*jĕl'ĭf*), **Smith Ely** (**1866-1945**), American physician, was born in New York. He was graduated at the Brooklyn Polytechnic Institute in 1886 and at the medical department of Columbia University, 1889. He then studied in Europe and, in 1903, became visiting neurologist to the City Hospital, New York. From 1907 to 1912, he was professor of mental diseases at Fordham University. From 1911 to 1917, he was adjunct professor of diseases of the mind and the nervous system at the Postgraduate Hospital and Medical School, New York.

He became widely known as a specialist in mental and nervous diseases, and wrote, translated, or edited many works on medical subjects. Among his writings are *Essentials of Vegetable Pharmacognosy*, *Morphology and Histology of Plants* and *Outlines of Pharmacognosy*. He revised *Butler's Materia Medica* and *Shaw on Nervous Diseases*. He translated and edited Dubois' *Psychoneuroses*, Payot's *Education of the Will*, Dejerine's *Psychoneuroses and Psychotherapy*, Rank's *Myth of the Birth of the Hero*, and also edited the sections on *Hysteria*, *Tetany*, and *Migraine* in Osler's *System of Medicine*. He was coeditor of *Diseases of the Nervous System*, *Technique of Psychoanalysis*, and *Modern Treatment of Nervous and Mental Diseases*.

Jenks, Jeremiah Whipple (**1856-1929**), American economist and educator, was born in Saint Clair, Mich. He was graduated from the University of Michigan in 1878 and, in 1885, received the degree of doctor of philosophy from the University of Halle. He studied law, was admitted to the Michigan bar, and, after teaching various subjects in Mt. Morris College, Knox College, and Indiana University, was professor of political economy, Cornell University, 1891-1912, when he was called to the chair of economics and finance, New York University. In 1917, he was made research professor of government and public administration and also director of the division of Oriental commerce and politics at New York University.

Jenks served as government expert in many investigations of trusts, industrial combinations, labor conditions, currency problems, and internal taxation. In 1912, he was appointed financial adviser to the Chinese republic. His publications include *The Trust Problem*, *Industrial Combinations in Europe*, *The Making of a Nation*, and *Business and the Government*.

Jenner (*jĕn'ĕr*), **Edward** (**1749-1823**), English physician, discoverer of vaccination, was born at Berkeley in Gloucestershire. He was apprenticed to a surgeon at Sodbury, and, in 1770, went to London to study under John Hunter. In 1773, he settled at Berkeley, where he acquired a large practice. In 1775, he began to investigate the truth of the traditions respecting cowpox. As a result, he became convinced that a person who has had cowpox is immune

against smallpox. From this, he was led to hope that he would be able "to propagate cowpox from one human being to another, until he had disseminated the practice over all the globe, to the total extinction of smallpox."

Many investigations delayed the actual discovery of the prophylactic power of vaccination, and the crowning experiment was made on May 14, 1796. This experiment was followed by many others. In 1798, Jenner published his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ.* The practice met with violent opposition for a year, when upward of 70 of the principal physicians and surgeons in London signed a declaration of their entire confidence in it.

Jenner's discovery was soon made known throughout the civilized world. Honors were conferred upon him, and he was elected an honorary member of nearly all the learned societies of Europe. Parliament voted him, in 1802, a grant of 10,000 pounds and, in 1807, a second grant of 20,000 pounds.

Jerome (*jê-rōm'*; *jĕr'ôm*), **Saint,** or **Sophronius Eusebius Hieronymus** (**c. 340-420**), was born at Stridon, Dalmatia. He studied Greek and Latin, rhetoric, and philosophy under Ælius Donatus at Rome. He began his theological studies in Trier, but, in the year 370, he settled in Aquileia with his friend Rufinus. In 374, he retired to the desert of Chalcis, where he spent four years in penitential exercises and in study, especially of the Hebrew language.

In 379, Jerome was ordained a priest at Antioch, and, in 380-381, visited Constantinople (now Istanbul), where he formed a friendship with Saint Gregory Nazianzus. He went in 382 to Rome, where he resided until 385, in close association with Pope Damascus, and where, although already engaged in his great work of the revision of the Latin version of the Bible, he attained great popularity and influence by his sanctity, learning, and eloquence.

Many pious persons placed themselves under Jerome's spiritual direction, the most remarkable of whom were Lady Paula and her daughter Eustochium. These ladies followed Jerome to Palestine, where he permanently fixed his residence at Bethlehem in 386. Here Lady Paula founded three convents and a monastery, the latter governed by Jerome himself. The remaining 35 years of his life were spent in the Holy Land, where he engaged in study and writing and in theological controversies with Rufinus and with the Pelagians. He is universally regarded as one of the most learned and eloquent of the Latin fathers.

Jerome, Jerome Klapka (**1858-1927**), English humorist, writer and lecturer, was born at Walsall, Staffordshire. He became a clerk, a schoolmaster, and then an actor. Finally, he devoted himself to writing and entered journalism. He was editor, with Robert Barr, of the *Idler* from 1892 to 1897, and, from 1893 to 1897, was editor of *To-Day.* His numerous writings include *On the Stage and Off, Idle Thoughts of an Idle Fellow, Three Men in a Boat, Susan in Search of a Husband, Passing of the Third Floor Back,* and *All Roads Lead to Calvary.*

Jerome of Prague (**c. 1360-1416**), was born at Prague. He studied at Oxford, became a convert there to Wiclif's doctrines, and zealously taught them after his return home in 1407. The king of Poland employed him to reorganize the University of Krakow in 1410; the king of Hungary invited him to preach before him at Budapest. Jerome entered with his whole soul into the anti-papal movement carried on by his friend John Huss. When Huss was arrested at Constance, Jerome hastened to his side to defend him, but, being refused a safe-conduct, he endeavored to return to Prague. He was arrested in Hirschau in 1415 and was brought back to Constance. He recanted, but withdrew his recantation, was condemned, and burned at the stake.

Jerrold (*jĕr'ŭld*), **Douglas William** (**1803-1857**), English humorist and author, was born at London. In the main, he was self-educated. He served as a midshipman in the royal navy from 1813 to 1815 and, about 1821, produced a successful comedy. He is remembered chiefly for his contributions to *Punch,* with which he was connected from 1841 until his death. His best play is *Black-eyed Susan,* published in 1829. His novels include *St. Giles and St. James* and *The Chronicles of Clovernook.* The most popular of his works, however, is *Mrs. Caudle's Curtain Lectures,* being a collection of contributions to *Punch.* From 1852 to 1857, he edited *Lloyd's Weekly.* He was considered one of the most brilliant wits of his time.

Jessup, Philip C. (**1897-**), jurist, educator, and diplomat, was born in New York City. A graduate of Hamilton College and a student of law at Columbia and Yale, he did not enter law practice immediately, but worked as assistant bank cashier at Utica, New York. Then he became an assistant solicitor in the State Department and, by logical transition, a lecturer on international law. In 1929 he served as assistant to Elihu Root at the conference of jurists at the Permanent Court of International Justice at Geneva. He is professor of international law and diplomacy at Columbia, but since 1947 he has represented the United States on the U. N. Committee on International Law, and acted as deputy for Warren Austin of the U. N. Security Council. A more recent assignment has been that of roving ambassador for the U. S. State Department. In addition to *Elihu Root,* a biography, he has written *International Security; Neutrality, Its History, Economics and Law; The International Problem of Governing Mankind;* and *A Modern Law of Nations—An Introduction.*

Jessup, Walter Albert (**1877-1944**), American educator, was born at Richmond, Ind. He was graduated at Earlham College in 1903 and received the degree of doctor of philosophy at Columbia University in 1911. Devoting himself to teaching, he was superintendent of schools at Westville, Ind., from 1900 to 1907 and at Madison, Ind., from 1907 to 1909. In 1911, he became dean of the School of Education in the University of Indiana. He was dean of the College of Education in the State University of Iowa, 1913-1916; president of the University, 1916-1934, when he was made president of the Carnegie Foundation for the Advancement of Teaching. He served as member of the survey commissions of the Cleveland and Los Angeles public school systems and of a survey to evaluate secondary education. His writings include *Social Factors Affecting Supervision of Special Subjects* and, in collaboration, *The Supervision of Arithmetic.*

Jewett, Sarah Orne (**1849-1909**), American novelist, was born at South Berwick, Me. She was educated at Berwick Academy, devoted herself to writing, and, in 1869, became a contributor to the *Atlantic Monthly.* Her work is noteworthy for its simplicity and naturalness, and for its accurate and sympathetic portrayal of New England character. Her writings include *Deephaven, Play Days, Old Friends and New, Country By-Ways, A Country Doctor, The Life of Nancy, The Country of the Pointed Firs, The Queen's Twin,* and *The Tory Lover.*

Jiménez (*hê-mā'nāth*), **Juan Ramón** (**1881-1958**), Spanish poet, was born in Moguer, Huelva Province, Spain, the son of wealthy parents engaged in the wine business who later met with financial ruin. He was educated at the Jesuit school of Puerto de Santa Maria near Cadiz. He took up painting at the age of 15, but suffered a nervous breakdown, and after his recovery turned to literature. His first poems, published in 1898, were *Almas de Violeta* (*Violet Souls*) and *Ninfas* (*Nymphs*). His best-known work is *Platero y Yo* (*Silver and I*) written in 1914. It consists of a series of conversations with a donkey named Silver as they roam the roads of southern Spain.

Señor Jiménez left Spain in 1936 during the Spanish Civil War. He resided for a while in the United States, and in 1951 went to Puerto Rico as visiting professor in the College of Humanities at the University of Puerto Rico. He was living there in 1956 when he received word that he had been awarded the Nobel prize for literature. His Spanish wife, Zenobia, who was also a writer, was born in New York.

Joachim (*yō'ä-kĭm*), **Joseph** (**1831-1907**), Hungarian violinist, was born in Kittsee, near Pressburg. He manifested such talent at the age of five that his father placed him for instruction under the concert master at Budapest, where he made his first public appearance at the age of seven. He entered the Vienna Conservatory in 1841, and, in 1843, when only 12 years of age, appeared with distinction at a concert of Madame Viardot-Garcia in Leipzig. He visited England in 1844, playing with marked success.

Following the advice of Mendelssohn, Joachim then continued to study for some years at Leipzig. From 1849 to 1854, he was concert master at Weimar. He then became concert conductor at Hanover, where he married Amalie Weiss, a noted contralto. He was one of the great violinists of the 19th century and excelled especially in quartet playing. He composed much valuable music for the violin, including the widely known *Hungarian Concerto in D-minor.*

Joan of Arc (*jōn ŭv ärk'*; *jô-ăn'*), or **Jeanne d'Arc, Saint** (**1412-1431**), the maid of Orleans, French national heroine, was born of poor but devout parents, in the village of Domremy, 1412. Her religious faith was ardent almost from her cradle. During the unhappy time of national degradation in which she lived, a prophecy was current in Lorraine that the kingdom lost by a woman—Queen Isabella —should be saved by a virgin, and no doubt this, together with her visions, helped to define her mission in the brooding and enthusiastic mind of the young peasant girl.

Joan put on male dress and a suit of white armor and mounted a black charger, bearing a banner of her own device. Her sword was one that she divined would be found buried behind the altar in the church of Sainte Catherine de Fierbois. Thus equipped she put herself at the head of an army of 6000 men, dictated a letter to the English, and advanced to aid Dunois in the relief of Orleans.

Her arrival fired the fainting hearts of the French with a new enthusiasm, and, on April 29, 1429, she threw herself into the city, where, after ten days of fighting, the English were compelled to raise the siege and retreat. At once the face of the war was changed, the French spirit again awoke, and within a week the enemy were swept from the principal positions on the Loire. But all thoughts of self were lost in devotion to her mission, and now, with resistless enthusiasm, she urged on the weak-hearted Dauphin to his coronation.

On May 24, 1430, with a handful of men, Joan forced her way into Compiegne, which was then besieged by the forces of Burgundy. She was left behind by her men, taken prisoner, and, six months later, was sold to the English by John of Luxemburg. She was carried to Rouen, the headquarters of the English, confined in chains, and at length brought before the Inquisition. She was charged with witchcraft, with cutting off her hair, and with wearing men's clothes. Her trial was long and was disgraced by shameful brutality. Having been condemned to death, she was burned at the stake.

In 1909, Joan was beatified and, in 1920, she was canonized by Benedict XV. Schiller's drama *Die Jungfrau von Orleans* is the noblest of many literary tributes to her character. Among noteworthy recent lives of Saint Joan of Arc are those of Anatole France, Andrew Lang, and Samuel L. Clemens.

Joffre (*zhô'fr'*) **Joseph Jacques Césaire (1852-1931)**, French general, was born at Rivesaltes, Pyrenees. He was educated at the College of Perpignan and, in 1868, began to study military engineering at the Ecole Polytechnique. He entered active service in an artillery battery in the Franco-Prussian War, at the close of which he returned to the Ecole Polytechnique. In 1874, he was made captain and assisted in planning the defenses of Pontarlier. After serving with distinction in various parts of the world, he became professor in the higher war school for France, was made brigadier general, and in 1911 was appointed chief of the general staff.

At the outbreak of World War I, in 1914, Joffre became commander in chief of the French army and soon after of the entire Allied armies in France. His first great success was the victory of the Marne, which stopped the German advance and saved Paris from investment. For this he was hailed as "the savior of France," was made field marshal, and was awarded the grand cross of the Legion of Honor.

In 1917, he yielded the command of the armies in the field to General Nivelle and was made adviser of the general staff. In April of the same year, he became a member of the French high commission to confer with the United States in regard to the conduct of the war, in connection with which he made a memorable visit to the United States. Joffre was the first French general since 1870 to be created a marshal of France. See *World War I.*

John (1167-1216), king of England, surnamed Lackland, was the youngest son of Henry II, and the successor, in 1199, of Richard I, his brother. He waged several wars against Philip II of France, who espoused the cause of Arthur, the son of Geoffrey, John's deceased elder brother and the rightful heir to the throne. In 1203, he murdered his nephew Arthur at Rouen, and imprisoned Arthur's sister Eleanor, known as the damsel of Brittany, in Bristol castle.

In 1207, Pope Innocent III appointed Stephen Langton to the archbishopric of Canterbury, but John refused to sanction the nomination; whereupon the pontiff laid England under an interdict in 1208, excommunicated John, absolved the people from their allegiance to the king in 1212, and authorized Philip of France to dethrone him. Terrified at this, John yielded to the pope, and swore that he would hold his kingdom as the pope's vassal, paying an annual tribute.

In 1215, on the demand of his barons, who were headed by Stephen Langton, now Archbishop of Canterbury, he signed the *Magna Charta.* Though John thus accepted the charter, yet he had no intention of being bound by it. He actually procured from the pope a bull annulling the charter, and introduced foreign soldiers to fight against the barons, who immediately offered the throne to Louis, son of Philip of France, an offer which was readily accepted but which led to no result. During his reign, the English lost nearly all their French possessions, even Normandy falling to the crown of France. See *Magna Charta.*

John XXIII, Pope. See *Roncalli, Angelo.*

John III, Sobieski (c. 1624-1696), king of Poland. He took part in fighting against the Cossacks and against the Swedes and other invaders, and was foremost in saving the country from ruin. He received the chief command of the army in 1668. In 1672, he defeated the Turks and Tartars, and, in 1673, he again routed the Turks at Khotin. King Michael died in 1673 and Sobieski, present with a large army, was elected his successor in 1674.

In 1683, John went to the rescue of Vienna, which was besieged by an army of 275,000 Turks. The Poles, numbering about one-tenth as many, were joined by a somewhat larger body of German troops. Scarcely had they arrived before Vienna when Sobieski gave the signal for attack, and, after a short struggle, the Turks were completely routed. Sobieski, after a triumphal entry into Vienna, pursued the enemy into Hungary, which was soon restored to the emperor. The last years of his life were embittered by civil as well as by domestic troubles.

John of Austria, or **Don Juan de Austria (c 1547-1578)**, natural son of the emperor Charles V, was born at Regensburg. He was early taken to Spain, and, after the death of his father, was acknowledged by his half brother Philip II. In 1570, he was sent with an army against the Moors in Granada, whom he completely expelled from the country. In 1571, with the fleets of Spain, of the Pope, and of Venice, he defeated the Turks in the great sea fight of Lepanto.

In 1573, John took Tunis, and conceived the scheme of forming a kingdom for himself. But Philip, jealous of this design, sent him to Milan, and, in 1576, made him viceroy to the Netherlands. In the Netherlands, he sought to win the favor of the people by mildness. For a time, he was hard pressed by William the Silent, but, with the help of Parma's troops, he won, in 1578, the victory of Gembloux. But Philip now feared he might make himself king of the Netherlands, and Don Juan's death at Namur was not without suspicion of poison.

John of Salisbury (c. 1118-1180), English schoolman, was born at Old Sarum. He studied at Paris and Chartres, and from 1150 lived at Canterbury, meanwhile often visiting Italy as emissary to the Pope from Thomas a Becket, whom he served as secretary. From 1164 to 1170 he took refuge at Reims along with Becket. In 1176, he became bishop of Chartres. He was highly reputed not only as a scholar, but as a poet and orator. His Latin works include over 300 letters, the *Policraticus,* and the *Metalogicus.*

Johnson, Andrew (1808-1875), 17th president of the United States, was born at Raleigh, N. C. He was self-educated, a tailor by trade, and made his entry into politics in 1840 as a presidential elector in Tennessee for Van Buren, the Democratic candidate. In 1841, he was elected to the state senate of Tennessee and, in 1843, became a member of Congress, where for ten years he supported the policy of the Democratic party. In 1853, he was elected governor of Tennessee and he was re-elected in 1855. In 1857, he was elected to the United States Senate, in which he advocated the Union policy of the Republican party.

On the occupation of Nashville by the Federals in 1862, he was appointed by President Lincoln military governor of Tennessee. In this office he gave such satisfaction to the North that in 1864 he was nominated and elected by the Republican party for the office of vice president on the ticket with President Lincoln, who was elected for a second term. On April 14, 1865, by the assassination of President Lincoln, he succeeded to the presidency. Some indiscreet and violent speeches turned the tide against him, and in the Congressional elections his opponents triumphed by increased majorities. His vetoes were generally nullified by the two-thirds vote of both houses.

In 1867, Johnson suspended Stanton, secretary of war, who was reinstated by the Senate the following year. An attempt to gain possession of the war department during this quarrel led, in 1868, to the impeachment of the president, but the two-thirds vote necessary to convict lacked one vote. The Constitutional right of the president, for which Johnson contended, was upheld by decision of the Supreme Court in 1926. Johnson's term of office expired in 1869. He was elected United States Senator in 1875 and died the same year.

Johnson, Eastman (1824-1906), American artist, was born in Lovell, Me. He studied in the Royal Academy at Düsseldorf, at The Hague, and in Paris. Among his best-known pictures are "The Savoyard," "The Card Players," "Spanish Woman," "Old Stage Coach," "Milton Dictating to His Daughters," "Old Kentucky Home" in the New York Public Library, "Corn Husking at Nantucket" in the Metropolitan Museum, New York, "Boyhood of Abraham Lincoln" in the University of Michigan, and numerous portraits of eminent Americans, including Daniel Webster, J. Q. Adams, Grover Cleveland, and Benjamin Harrison.

Johnson, Emory Richard (1864-1950), American economist and educator, was born at Waupun, Wis. He was educated at the University of Wisconsin and at the University of Pennsylvania, where in 1896 he was made professor of transportation and commerce. During 1919-33, he was dean of the Wharton School of Finance and Commerce.

He was expert on transportation for the United States Industrial Commission, 1899, and was a member of the United States Isthmian Canal Commission.

His extensive writings include *Inland Waterways* and *Government Regulation of Transportation.*

Harris & Ewing

LYNDON B. JOHNSON

Mr. Johnson became the 36th President of the United States following the assassination of John F. Kennedy, November 22, 1963.

Harris & Ewing

UNITED STATES SUPREME COURT

Back row, Standing: Asso. Justices BYRON WHITE, WM. J. BRENNAN, Jr., POTTER STEWART, ARTHUR GOLDBERG.
Front row, Seated: Asso. Justices: TOM CLARK, HUGO L. BLACK, CHIEF JUSTICE EARL WARREN, WM. O. DOUGLAS, JOHN M. HARLAND.

Johnson, George (1889-1944), clergyman and educator, was born at Toledo, Ohio. He studied at St. John's University, Toledo, St. Bernard's Seminary at Rochester, and the North American College at Rome. From 1919 to 1921 he was Diocesan superintendent of schools at Toledo; he then joined the faculty of the Catholic University of America. As editor of the *National Catholic Educational Review* and as a speaker before groups of students and teachers, he exerted a powerful influence on the educational thinking of his time. For several years he was director of the Department of Education of the National Catholic Welfare Conference and of the Commission on American Citizenship. He was co-author, with Dr. Robert J. Slavin, of *Better Men for Better Times*. During an address at Trinity College on June 5, 1944, he collapsed and died.

Johnson, Hiram Warren (1866-1945), American political leader, was born at Sacramento, California. From the practice of law there and in San Francisco, he entered politics and, in 1911, was elected governor of California on a platform calling for removal of corporate influences from government. In 1912 he was vice-presidential candidate on the Progressive ticket headed by Theodore Roosevelt. He was later re-elected governor but resigned, in 1917, to become a member of the United States Senate, where he spent the major part of his long political career.

Johnson, John H. (1918-), publisher, was born at Arkansas City, Arkansas. After graduation from the DuSable High School at Chicago, he studied at the University of Chicago and Northwestern University. As founder and president of the Johnson Publishing Co., he has been the successful publisher of the magazines *Ebony* and *Negro Digest*.

Johnson, Lyndon B. (1908-), political leader, was born near Stonewall, Texas. After graduation from the Southwest Texas Teachers College, he taught for two years in the public schools of Houston, then went to Washington as secretary to Congressman Richard M. Kleburg. While holding this position he studied law at Georgetown College. He served as state director of the National Youth Administration, then, in 1937, he was elected to fill the unexpired term of Congressman James F. Buchanan. Except for interim service in the U. S. Navy (1941-42), he continued to serve in the House of Representatives until he became senator, in 1949. He was a member of the Senate Armed Services Committee. As Democratic minority leader and subsequently majority, he exerted a powerful influence on legislation. In 1960 he was elected vice president of the United States. At the request of President Kennedy he sat in on cabinet meetings. His special assignments included a diplomatic mission to the Far East and direct supervision of the NASA Space Program as official representative of the administration. He was in the motorcade at Dallas, Texas, November 22, 1963, when President Kennedy was assassinated and was sworn in as his successor while at the Airport there before leaving for Washington. He was elected in 1964.

Johnson, Martin Elmer (1844-1937), American motion picture explorer, was born at Rockford, Ill. After a public school education, he began extensive travels and circled the earth six times. His wife, Osa Leighty, whom he married in 1910, accompanied him. In 1929, he completed a five-year project of making motion picture records of the vanishing wild life of Africa for the American Museum of Natural History. In 1929 he returned to Africa to study the pygmy life in the Belgian Congo. While on a lecture tour in 1937 he was killed in a plane crash near Los Angeles. His wife later wrote of their work in *I Married Adventure*.

Johnson, Reverdy (1796-1876), American lawyer and politician, was born at Annapolis, Md. He was educated at Saint John's College, Annapolis, studied law with his father, and was admitted to the bar in 1815. From 1845 to 1849 he sat in the United States Senate as a Whig. He was attorney general in President Taylor's cabinet.

Johnson, Richard Mentor (1781-1850), American legislator, was born at Bryants Station, Ky. He was educated at Transylvania University, studied law, and began practice. In the War of 1812, he raised two regiments of riflemen and served under General Harrison in the Canadian campaign. According to tradition, he shot and killed Tecumseh at the battle of the Thames, October 5, 1813. In 1819, he was elected to the Senate, where he served until 1829. He was candidate for vice president on the ticket with Van Buren and was finally chosen vice president for the term 1837-41 after the election had been thrown into the Senate.

Johnson, Robert Underwood (1853-1937), American editor and poet, was born in Washington, D. C. He was graduated from Earlham College in 1871 and joined the staff of the *Century Magazine* in 1873. He was made associate editor in 1881, and was editor, succeeding R. W. Gilder, from 1909 to 1913. Aside from his literary works, he became known for his activities in behalf of the international copyright. With C. C. Buel he edited *Battles and Leaders of the Civil War*.

Johnson, Dr. Samuel (1709-1784), English writer and lexicographer, was born at Lichfield, where his father was a bookseller. He was educated partly at Lichfield and partly at Stourbridge, and entered Pembroke College, Oxford, 1728. Here he remained for three years, but, owing to lack of money, was compelled to leave the University without a degree.

In 1731, his father died, greatly involved in debt; and, in order to earn a living, Johnson became usher in a school in Market Bosworth, Leicestershire. He was next employed in Birmingham in translating for a bookseller. Here, in 1735, he married the widow of a Birmingham mercer, 20 years his senior, who brought him a fortune of £600. Relying upon this capital, he opened a classical boarding school, but procured only three pupils, one of whom was the celebrated David Garrick.

Disappointed in this enterprise, he started in company with Garrick for London. In 1737, they reached the metropolis, where Johnson was employed by Cave, the founder and proprietor of the *Gentleman's Magazine*. In 1738, his poem *London*, an imitation of the third satire of Juvenal, was published and attracted some notice. From 1740 to 1743, he wrote the Parliamentary debates for the *Gentleman's Magazine*.

In 1747, Johnson issued the prospectus of his *English Dictionary*, for which he was to receive £1575. In 1750, he commenced his amusing periodical, *The Rambler*, and, in 1755, his great *Dictionary* appeared. On the death of his mother, in 1759, Johnson wrote the story of *Rasselas* to pay her funeral expenses. In 1762, a pension of £300 per annum was granted to him by the king, and subsequently he received the title of doctor of laws from the Universities of Dublin and Oxford. In 1781, he published *Lives of the Poets*. Boswell's *Life of Johnson*, regarded as one of the greatest of all biographies, appeared in 1791. See *Rasselas*.

Johnston, Albert Sidney (1803-1862), American general, was born in Washington, Mason County, Ky. He was graduated at West Point, 1826. In 1837, he superseded General Houston as commander in chief of the Texan army. He next became Texan war secretary, and served as a colonel of American regulars during the Mexican War. In 1857, he commanded the expedition sent against the Mormons in Utah. Upon the outbreak of the Civil War, in 1861, he was made military commander of the department of Kentucky and Tennessee by the Confederate government. After the surrender of Fort Donelson, he formed a junction with the army of General Beauregard and fell in the battle of Shiloh.

Johnston, Joseph Eggleston (1807-1891), American soldier, was born at Farmville, Va. He was graduated at West Point in the same class with Robert E. Lee, 1829. Entering the army, he served in the Black Hawk War and in the Seminole War. In the Mexican War he won promotion for distinguished conduct at Cerro Gordo and Chapultepec. On the outbreak of the Civil War, he joined the army of the Confederacy as brigadier general, and became one of its most distinguished commanders. With Beauregard he won the battle of Manassas, called also the first battle of Bull Run, in 1861. In 1862, he commanded against McClellan in the peninsular campaign and was severely wounded at Fair Oaks.

After Bragg's defeat at Chattanooga in November 1863, Johnston was made commander of the entire army of the Southwest. He skillfully opposed Sherman at Dalton, Resaca, and Kenesaw Mountain. During the defense of Atlanta he was superseded by Hood but was later selected by Lee to concentrate all available forces against Sherman. After learning of the surrender at Appomattox, he capitulated to Sherman at Durhams Station, N. C., April 26, 1865.

After the war Johnston engaged in railway, express, and insurance management, was elected to Congress in 1876, and, in 1885, was made United States Railway Commissioner by President Cleveland.

Jókai (*yō'kō-ē*), **Maurus (1825-1904),** Hungarian novelist, was born at Komorn, Hungary. He published his first book in 1845 and took part, as a journalist, in the revolution of 1848. In 1863, he entered the Hungarian Parliament, and during his long career there was one of the principal supporters of Koloman Tisza, 1875-90. His novels include *Timar's Two Worlds, Black Diamonds, The Romance of the Coming Century, Pretty Michal, The Lion of Janina, A Christian but a Roman, The Baron's Sons,* and *Tales from Jókai*. His works are written in brilliant style and afford an intimate view of the political and social life of Hungary during the 19th century.

Joliet (*jō'lĭ-ĕt;* Fr. *zhō'lyā'*), **Louis (1645-1700),** French-Canadian explorer, was born at Quebec. He studied for the priesthood at the Jesuit College, Quebec. He abandoned

his intention, however, and spent some years as an Indian trader, thus getting a knowledge of the languages and the geography of the West. With Marquette he was selected to explore the western country and to push through to the Mississippi. They started West in May 1673, reaching the Mississippi at the mouth of the Wisconsin in June. They floated down the Mississippi, passing the mouths of the Missouri and the Ohio, and going far enough to be sure that the river flows into the Gulf of Mexico. Joliet upset his canoe on his way back, losing all his maps and papers, so that the only accurate report of the expedition was Marquette's. Joliet was given the seigniory of Anticosti Island in 1680, and, in 1697, that of Joliette.

Joliot, Frédéric (1900-1958), French physicist, was born in Paris. With his wife, Irène Curie (1897-1956), and her parents, Pierre and Marie Curie, discoverers of radium, he belonged to a group of four related persons who attained to the highest distinction in the science of radioactivity. Joliot studied at the Paris Radium Institute under Marie Curie, where he met her daughter, Irène, and married her in 1930. Working together, Joliot and his wife discovered a new and more effective way of transforming one element into others through displacement of the component parts of atoms. For this work they received jointly the Nobel prize in chemistry for 1935.

Jolly (*yōl'lē*), **Philipp von (1809-1884),** German physicist, was born at Mannheim. He was educated at the Universities of Heidelberg, Vienna, and Berlin. He became an instructor at the University of Heidelberg in 1834, and was made professor in 1839. In 1854, he was called to the chair of physics in the University of Munich. He invented many valuable scientific instruments, including the air thermometer, the Jolly, or spring, balance for specific-gravity determinations, the copper eudiometer, and the mercury air pump. He investigated osmosis, the expansion of gases, and the mass and density of the earth.

Jomini (*zhō'mē'nē'*), **Henri, Baron (1779-1869),** soldier and military writer, was born at Payerne, Switzerland. When very young he entered the Swiss guard of Louis XVI, but, when it was disbanded, he returned to his own country and, before he was 20 years old, was made head of the war department. In 1803, he went to Paris and became aide-de-camp to Ney, who recommended him to the emperor. In 1809, he quarreled with Ney in Spain and went back to Switzerland.

In 1812, Jomini was invited by Napoleon to join the campaign against Russia and was appointed historian of the grand army. When the cause of Napoleon was almost lost, he went over to the allies in resentment at an affront. Napoleon bore him no ill-will for this course, saying, "He was not a Frenchman, and there was no love of country to retain him." He is known chiefly by his works on military history and the art of war.

Jones, Sir Harold Spencer (1890-1960), eminent English astronomer and author of several popular books which discuss the possibility of life on other worlds, was born in Kensington, London. He was a brilliant scholar at Cambridge. Sir Harold served a distinguished career as English Astronomer Royal at the Royal Observatory at Greenwich from 1933 until his retirement in 1955. He was knighted in 1943. He was a member of an imposing list of international scientific associations and is the author of *Worlds Without End* (1935) and *Life on Other Worlds* (1940).

Jones, Henry Arthur (1851-1929), English dramatic author, was born at Grandborough. He attended Winslow School, but was thrown on his own resources at 13. Later he engaged in business and became a commercial traveler. Becoming interested in the drama, he produced his first play, *Only 'Round the Corner*, in 1878, and, in 1882, in collaboration with Henry Herman, the widely known melodrama *The Silver King*, which continued to be played at intervals for a quarter of a century.

His play entitled *Saints and Sinners*, which appeared in 1884, was warmly praised by Matthew Arnold. This was the first of a series of more than 50 social dramas, which have been widely successful in the English-speaking world. Among his many plays are *The Middleman, Judah, The Dancing Girl, The Tempter, The Physician, The Liars, The Hypocrites, The Evangelist, Mary Goes First, Cock o' the Walk,* and *The Pacifists.*

Jones, Howard Mumford (1892-), editor and critic, was born at Saginaw, Mich. and was educated chiefly at the universities of Wisconsin and Chicago. After teaching comparative literature at the University of Texas, he served as professor of English successively at the universities of North Carolina, Michigan, and Harvard. Since 1960 he has been Lawrence Lowell professor of humanities at Harvard. In addition to numerous writings and teachings within the field of literature, he has written several books on broadly cultural themes. Among these are *American Humanism* (1957), *Reflections on Learning* (1958), and *One Great Society* (1959). He was chairman of the American Council of Learned Societies, 1955–59.

Jones, Inigo (1573-1652), English architect, was born in London. In his youth his talent for drawing attracted the notice of the earls of Arundel and Pembroke; the latter enabled him to visit Italy to study landscape painting. At Venice his attention was drawn to the works of Palladio. These awoke in him a passion for architecture, to which his attention was thenceforward wholly directed. In 1620, he was named one of the commissioners for repairing Saint Paul's Cathedral, and, in 1622, he completed the banqueting house at Whitehall. He introduced a new monumental style of design into English architecture, and was long considered the foremost architect of England. He wrote a book on *Stonehenge.*

Jones, John Paul (1747-1792), American naval commander, was born in Kirkcudbrightshire, Scotland. His original name was John Paul. He became a sailor, was for a short time engaged in the slave trade, and afterward settled in Virginia, assuming the name of Jones. He ardently embraced the cause of the American colonies. When Congress, in 1775, resolved to fit out a naval force, he offered his services. Visiting the British coast in a brig of 18 guns, he performed some remarkably bold exploits, and took advantage of his familiarity with the scenes of his boyhood to make a hostile visit to the shores of the Solway firth.

In 1779, Jones was appointed to the command of a squadron of five vessels, three American and two French, and again visited the British coasts, causing great alarm and taking some prizes. Off Flamborough he fell in with a fleet of 41 British merchantmen, convoyed by the 40-gun *Serapis* and the 20-gun *Countess of Scarborough.* Jones lashed his *Bon Homme Richard* to the *Serapis* and after three hours of desperate fighting, compelled her surrender, after which, his own ship sinking, he transferred his crew to the *Serapis.*

In 1788, he accepted an appointment in the Russian service and took an active part in the Turkish war, but soon left the service. He died at Paris. After a long search instituted by General Horace Porter, American ambassador to France, his burial place was discovered, 1905, in the old Saint Louis cemetery in Paris. In 1906, his body was conveyed by a United States squadron to Annapolis, Md., where it was buried with naval honors. He was elected to the American Hall of Fame in 1925.

Jones, Robert Edmond (1887-1954), American stage designer, was born at Milton, N. H. Graduating from Harvard University in 1910, he began designing scenery for theaters in New York City. His work was marked by bold originality and proved highly influential in the art of stage design in America. Among the well known productions for which he conceived and executed the settings were Shakespeare's *Richard III, Macbeth,* and *Hamlet,* O'Neill's *Desire under the Elms,* and John Alden Carpenter's *Birthday of the Infanta* for the Chicago Opera Association. With Kenneth MacGowan, he wrote *Continental Stagecraft* and *Drawings for the Theatre.* He began designing for color films in 1933, one of his first being *Becky Sharp.*

Jones, Thomas H. (1893-), sculptor, was born at Buffalo, New York. After studying at the Albright School at Buffalo, he received further instruction at the Museum School in Boston, the Carnegie Institute of Technology, and the American Academy in Rome. Besides teaching he has executed many well-known works of sculpture, including particularly the Port Chester, N. Y. War Memorial, a bust of General Grant, and the Tomb of the Unknown Soldier at Arlington, Virginia.

Jones, Wesley Livsey (1863-1932), American politician, was born at Bethany, Ill. He was graduated at Southern Illinois College in 1886, studied law, and was admitted to the bar. In 1889, he went to the Territory of Washington, shortly before its admission as a state. He settled at North Yakima and, in 1890, began the practice of law. In 1917, he removed to Seattle. He was a speaker in Illinois in the Blaine campaign of 1884 and in the Harrison campaign of 1888. After his removal to the Pacific Northwest, he participated actively in public affairs. He was member of Congress from 1899 to 1909, when he was chosen United States senator for the state of Washington. He was re-elected for terms extending from 1915 to 1933.

Jones, Sir William (1746-1794), English Oriental scholar, was born at London and was educated at Oxford University. In 1783, he was made a judge of the supreme court in India, where he had opportunity to translate extensively from Hindu and Mohammedan literature. He founded the royal Asiatic Society and did more perhaps than any other English scholar to make known Oriental culture to the Western world. On his death, the East India Company erected a monument to his memory in Saint Paul's Cathedral.

Jonson, Benjamin, or **Ben (c. 1573-1637),** English dramatist, was born probably at Westminster, and was educated at Westminster School. After serving in the English army against Spain in the Netherlands, he returned to

England in 1592 and devoted himself to writing. The first piece that brought him into prominence was *Every Man in His Humor*, produced in 1598. The best of his subsequent productions are *Volpone, or the Fox; The Silent Woman;* and *The Alchemist*. He also composed two tragedies, *Sejanus* and *Catiline*. His *Masques*, written for the courts of James and Charles, are very graceful. In his dramas he sought to adapt the spirit of ancient comedy to a setting of contemporary life. Jonson was the intimate friend of many of the poets of the time, including Shakespeare. His tombstone in Westminster Abbey bears the inscription, "O rare Ben Jonson." See *Alchemist, The*.

Jordaens (*yôr'dăns*), **Jakob** (**1593-1678**), Flemish painter, was born at Antwerp. He ranks next to Van Dyck among the pupils of Rubens. He excelled in humorous scenes of Flemish life; also painted scriptural and mythological subjects. Among his works are "Jupiter and Mercury," "The Adoration of the Shepherds," and many other religious and mythological paintings. In the Metropolitan Museum, New York, are his "Holy Family" and "The Philosophers."

Jordan, David Starr (**1851-1931**), American zoologist and educator, was born at Gainesville, N. Y. He was educated at Cornell University, Indiana Medical College and Butler University. In 1879, he became professor of zoology in the University of Indiana, of which he was president, 1885-91. From 1891 to 1913, he was president of Stanford University, of which he was chancellor from 1913 to 1916.

In zoology he specialized in the study of fishes and became prominent as an ichthyologist. For many years he was assistant to the United States Fish Commission. In 1903-04, he conducted the salmon investigation in Alaska and, in 1906-09, was International Fish Commissioner for the United States and Canada. His extensive zoological writings include *A Guide to the Study of Fishes, Footnotes to Evolution*, and *Animal Life*.

In 1910, he was made director of the World Peace Foundation and became active in opposing the war system of the world. Among his writings in this connection are *War and the Breed, War and Waste, World Peace and the College Man*, and *Ways to Lasting Peace*. He wrote also *The Stability of the Truth, The Religion of a Sensible American, Democracy and World Relations, Eric's Book of Beasts* (for children), and *The Days of a Man* (autobiography).

Joseph II (**1741-1790**), emperor of Germany, son of Francis I and Maria Theresa. In 1764, he was elected king of the Romans, and, after his father's death in 1765, emperor of Germany; but until his mother's death his power was limited to the command of the army and the direction of foreign affairs. He acquired Galacia, Lodomeria, and Zips, at the first partition of Poland in 1772. In 1780, he appropriated a great part of Passau and Salzburg.

As soon as he found himself in full possession of the government of Austria, he declared himself independent of the pope, and prohibited the publication of any new papal bulls without his approval. He suppressed 700 convents, reduced the number of the regular clergy from 63,000 to 27,000, prohibited papal dispensations as to marriage, and, in 1781, published the edict of toleration for Protestants and Greeks. He also abolished serfdom, reorganized taxation, and curtailed the feudal privileges of the nobles.

Josephine, Marie Josèphe Rose Tascher de la Pagerie (**1763-1814**), first empress of the French, was born in Martinique. She married first the Vicomte de Beauharnais, by whom she became mother of Eugene Beauharnais and of Hortense, mother of Napoleon III. Her husband perished during the reign of terror, and she married, in 1796, Napoleon Bonaparte, the newly appointed commander in chief of the army in Italy. Sharing her husband's fortunes, she became in time the occupant of an imperial throne, which she adorned by her beauty, grace, and womanly virtues. But, she failed to produce an heir to the new monarchy, Napoleon divorced her, and she retired into privacy at her château of Malmaison.

Josephus (*jō-sē'fŭs*), **Flavius** (**37 A. D.-c. 100**), Jewish historian of priestly descent, was born at Jerusalem. He took part in the revolt of the Jews against the Romans, 66-73, and served as one of the Jewish generals. He was taken prisoner by Vespasian, by whom, however, and by Vespasian's successors, Titus and Comitian, he was treated with great favor. As a dependent of the Flavian family, he assumed the name of Flavius. His *Antiquities of the Jews* gives an account of Jewish history from the creation of the world to 66 A. D. A passage in this work relating to Jesus Christ is now believed to be spurious. His other works are a *History of the Jewish War* and an *Autobiography*.

Joule (*joul*), **James Prescott** (**1818-1889**), English physicist, was born at Salford. He was a pupil of Dalton and devoted his time to physical and chemical research. He made discoveries in connection with the production of heat by voltaic electricity, demonstrated the equivalence of heat and energy, and established on experimental grounds the doctrine of the conservation of energy. The electrical unit of work, the joule, is named for him.

Jowett (*jou'ĕt*), **Benjamin** (**1817-1893**), English classical scholar, was born at Camberwell. He was a fellow and tutor of Baliol College, Oxford, and was elected master in 1870. In 1882, he was appointed vice chancellor of the University. He wrote *On the Interpretation of Scripture*, a commentary on certain epistles of Saint Paul; but he achieved his greatest literary successes by his translation of Plato's *Dialogues*, the *History* of Thucydides, and the *Politics* of Aristotle.

Jowett, John Henry (**1864-1923**), English clergyman, was born in Halifax, England. He was educated at the Universities of Edinburgh and Oxford and entered the Congregational ministry. From 1890 to 1895, he was pastor at Newcastle on Tyne and from 1895 to 1911 at Birmingham. In 1911, he became pastor of the Fifth Avenue Presbyterian Church of New York City, serving until 1918, when he returned to England and was minister of Westminster chapel until 1922. He was one of the best known preachers of his day. The materials from many of his sermons appeared in his books, which include *Thirsting for the Springs, The High Calling, Our Blessed Dead, Things That Matter Most*, and *The Friend on the Road*.

Joyce, James (**1882-1941**), Irish novelist and poet, was born at Dublin. Educated at University College, Dublin, he published, in 1907, *Chamber Music*, a small volume of poems, many of which have been set to music. *Dubliners*, tales of personalities in Dublin, and *A Portrait of the Artist as a Young Man*, an autobiographical novel, revealed Joyce as a writer of the first order.

Leaving Ireland, he resided in Italy, Switzerland, and France, devoting seven years to the production of *Ulysses*, published in 1922. This novel, a stream-of-consciousness, psychological study of a man and his wife during one day of life, produced a sensation in the literary world. Couched in expressive but often difficult language forms and complicated by the author's erudition, it expressed the thoughts of the characters with a freedom of inhibition unexampled in English literature. Its influence on other authors was widely felt. He wrote also the play *Exiles*, the volume of verse *Pomes Penyeach*, and *Finnegans Wake*, a novel.

Juárez (*hwä'rās*), **Benito Pablo** (**1806-1872**), Mexican politician, was born in Oaxaca, of Indian parents. He became an advocate, and was governor of his native state, 1847-52. Exiled by Santa Ana in 1853, he returned two years later, and, in 1857, was elected president of the Supreme Court. In 1858, he assumed the office of chief executive, but was compelled to retire to Vera Cruz, whence he issued decrees abolishing religious orders and confiscating church property. In 1861, he entered the capital and was elected president for four years.

In 1862, Napoleon III, the emperor of France, declared war against Juárez, who retreated to the northern frontier. By the aid of French troops, Maximilian, archduke of Austria, was installed as emperor of Mexico. Following the complete withdrawal of the French forces at the demand of the United States, Maximilian, in 1867, was captured and shot. Juárez immediately re-entered Mexico City. He was again chosen president and, in 1871, was re-elected.

Judd, Charles Hubbard (**1873-1946**), American psychologist and educator, was born at Bareilly, British India, and came to America in 1879. He was graduated from Wesleyan University in 1894 and received the degree of doctor of philosophy from the University of Leipzig in 1896. After serving as instructor in philosophy at Wesleyan University, 1896-98, he was professor of psychology successively at New York University, at the University of Cincinnati, and at Yale University. In 1909, he became professor of education at the University of Chicago, and was made director of its School of Education. He served until 1938, then becoming consultant for the National Youth Administration and the War Department.

His writings on psychology and education include *Genetic Psychology for Teachers, Psychology—General Introduction, Psychology of High School Subjects, Measuring the Work of the Public Schools, Introduction to the Scientific Study of Education, Evolution of a Democratic School System*, and *Education and Social Progress*.

Judd, Orange (**1822-1892**), American agricultural journalist, was born at Niagara Falls, N. Y. He was graduated at Wesleyan University in 1847. From 1853 to 1883, he was editor of the *American Agriculturist*. From 1855 to 1863, he edited the agricultural department of the New York *Times*. In 1883, he assumed editorship of the *Prairie Farmer* and, in 1888, became editor of the *Orange Judd Farmer*. By his efforts and financial support, he secured in 1875 the establishment of the first State Agricultural Experiment Station. This was located in the Orange Judd Hall of Natural Sciences, which he had previously presented to Wesleyan University at Middletown, Conn. He

ranks among the pioneer promoters of scientific agriculture, upon the progress of which he exercised an extensive influence.

Judson, Adoniram (1788-1850), pioneer American Baptist missionary, was born at Malden, Mass. He was graduated at Brown University in 1807 and at Andover Theological Seminary in 1810. Becoming inspired with missionary zeal, he sailed with his wife for India in 1812. He settled soon afterward at Rangoon and began to preach and to write in Burmese, translating parts of the New Testament into Burmese. During the Burmese War, he was imprisoned at Ava , 1824-26. Subsequently, he labored in various towns of British Burma and among the Karens with remarkable success. During 37 years of missionary service, he translated the Bible and other valuable works into Burmese and compiled a Burmese-English dictionary and also a Pali grammar.

Dr. Judson was thrice married. In 1812, he married Ann Hasseltine (1789-1826), who shared with great fortitude her husband's pioneer hardships in Burma. In 1834, he married Sarah Hall Boardman (1803-45), widow of George Dana Boardman. She translated a hymn book and part of the *Pilgrim's Progress* into Burmese and aided in translating the New Testament into Peguan. In 1846, he married Emily Chubbock (1817-54), who became known as a writer under the pen name Fanny Forester.

Julian (*jōōl'yăn*; *jōō'lĭ-ăn*), or **Julianus Flavius Claudius** (**c. 331 A. D. -363 A. D.**), surnamed the Apostate, Roman emperor, was born in Istanbul. He was a nephew of Constantine the Great and was educated in the tenets of Christianity; but, at an early age, he renounced that religion in favor of Neoplatonism. In 355, he received the title of Cæsar and was sent to Gaul, where he won several victories over the Germans. In 361, the troops in Gaul revolted from Constantius and declared for Julian, who soon afterward made a triumphal entry into Istanbul. He publicly declared himself a pagan, but the mildness of his edict of toleration surprised Christians and non-Christians alike. However, he selected most of his officers from the old Roman religion and compelled the Christians to aid in restoring the heathen temples. He was a prolific writer and composed in Greek a large number of orations, letters, satires, and poems. He was killed in an expedition against the Persians.

Julius II (1443-1513), otherwise known as Giuliano della Rovere, pope, was born in Italy, and became pope in 1503. He restored the papal states to the Church by force of arms, defeating Rimini, Venice, and other cities. Later, in alliance with Venice, he drove a French army out of Italy. Julius abolished simony (sale of spiritual benefits) in the college of cardinals. He was known also as a patron of artists; those receiving commissions from him included Michelangelo and Raphael. He laid the cornerstone of St. Peters at Rome. Henry VIII of England obtained from him sanction for his marriage with Catherine of Aragon by annulment of a former marriage.

Jung (*yŏŏng*), **Carl Gustav (1875-1961)**, Swiss psychologist and psychiatrist, was one of the early followers of Freud, with whom he worked until differences of opinion concerning the theory of libido or human driving force caused a break. Freud's conception of libido was that it was derived from the sex instinct, but Jung considered it as nonsexual energy deriving from a general primal urge to live. He divided people into two classes, introverts and extroverts, and gave the name "complex" to the groups of ideas that exert a dominating influence upon the personality. His numerous publications include *Psychology of the Unconscious* (1916) and *Psychological Types* (1923). In addition to many articles which have appeared from time to time he published three important works as in 1953. These are *Psychology and Alchemy, Two Essays on Analytical Psychology*, and *The Transference and Other Papers on the Analytical Process.*

Jusserand (*zhü'sˊ-răNˊ*), **Jean Adrien Antoine Jules (1855-1932)**, French diplomat and man of letters, was born at Lyon. He was educated at Lyons and Paris, and entered the foreign office in 1876. He was councilor of the French embassy at London from 1887 to 1890 and minister to Denmark from 1898 to 1902, when he was appointed French ambassador to the United States. In this last-named office he served with distinction for more than 20 years, being a close friend of each president who served in the period. His writings include *Les Anglais au moyen âge, Shakespeare en France*, and *With Americans of Past and Present Days.*

Jussieu (*zhü'syû'*) **Antoine Laurent de (1748-1836)**, French botanist, was born at Lyons. At the age of 17, he began his botanical studies under his uncle Bernard, and four years later was nominated assistant to Lemonnier, the professor of botany in the Jardin du Roi. He reformed the arrangement of the gardens and collections of plants under his charge, and applied to them his own and his uncle's ideas of botanical classification based on the nature rather than adventitious characteristics of the plants.

For 30 years he continued to develop his views; and, when his *Genera Plantarum* was completed in 1789, the natural system was finally established as the true basis of botany. In 1793, he became professor of botany in the newly organized Jardin des Plantes, where he continued to teach until 1826.

Justin (c. 100 A. D.-c. 165 A. D.), surnamed the Martyr, was born at Shechem in Samaria. He was first a Stoic and then a Platonist. Later, after his conversion to Christianity, he wandered about, arguing for the truth of the new faith. At Rome between 150 and 160, he wrote the *Apologia* of Christianity addressed to the emperor. He is said to have been martyred.

Justinian the Great (483 A. D.-565), Roman emperor, was born in the village of Tauresium. His reign, which extended from 527 over a period of 38 years, was the most brilliant in the history of the Eastern Empire. Justinian had the fortune or the skill to select the ablest generals of the last days of Roman military ascendancy. He constructed or renewed and strengthened the vast line of fortifications along the eastern and southeastern frontier of his empire. These works of defense and the construction of many public buildings involved an enormous expenditure. In consequence, the fiscal administration of Justinian pressed heavily on the public resources; but it is admitted to have been ably and uprightly conducted.

It is, however, as a legislator and jurist that Justinian gained widest renown. Immediately on his accession, he compiled a code, now known as the *Code of Justinian*, which comprised all the constitutions and laws of his predecessors. The authoritative commentaries of the jurists were next harmonized and published under the title *Digesta* or *Pandectæ*. The code was republished in 534 with the addition of Justinian's own constitution. His third great legal undertaking was the composition of a systematic treatise on the laws for the guidance of students and lawyers, published under the title of *Institutiones*.

Juvenal, or **Juvenalis, Decimus Junius (c. 60 A. D.-140 A. D.)**, Latin poet and satirist, was born in Aquinum. He was a friend of Martial and contemporary of Statius and Quintilian. He practiced at Rome as an advocate. His satires, 16 in number, are characterized by a burning moral indignation at the vices and follies which they depict. Juvenal may be regarded as a type of the older Roman moralist, in distinction to an urbane satirist like Horace, who aimed to amuse by the depiction of human frailties.

Kafka, Franz (1883-1924), Austrian novelist, was born in Prague. His semi-surrealistic works caused great excitement in intellectual circles after his death, and have enjoyed considerable popular success. Kafka, trained as a lawyer, was a painstaking writer; his care is reflected in his limpid, exact style. In his most famous novels, *The Trial* and *The Castle*, both published posthumously in the mid-20's, he portrays the awful nakedness of soul of harried modern humanity, and, in eerie settings, points up many of the anomalies of civilization. His diaries have been published, and biographies have been written about him. Kafka died in Vienna.

Kahn (*kän*), **Julius (1861-1924)**, American lawyer and politician, was born at Kuppenheim, Germany, and, at the age of five, was taken to California. He was educated in the public schools of San Francisco and entered the theatrical profession. During his career on the stage, he played with Edwin Booth, Joseph Jefferson, Clara Morris, and other noted actors. In 1890, he returned to San Francisco and took up the study of law; in 1892, he was elected to the state legislature; and, in 1894, he was admitted to the bar. In 1898, he was elected to Congress as a Republican. With the exception of one term, 1903-05, he was continuously re-elected. Following the declaration of war against Germany in 1917, Kahn was the leader in the House of Representatives in securing the passage of the Selective Draft Act. In 1919, he became chairman of the House Committee on Military Affairs.

Kahn, Otto Hermann (1867-1934), American financier, was born at Mannheim, Germany. His father was a German refugee to the United States following the revolution of 1848 and became an American citizen, but later returned to Germany. Otto Kahn was educated at Mannheim, spent a year in the German army, and then entered a banking house. In 1888, he entered the London branch of a German bank and became a British citizen.

In 1893, he joined the house of Speyer and Company in New York City. After two years' service, followed by travel in Europe, he entered the firm of Kuhn, Loeb, and Company, bankers, of New York. In 1917, he became an American citizen again. He served as chairman of the board of directors of the Metropolitan Opera Company and of the French Theater of New York.

During World War I, he took an active part in persuading the Germans in the United States that Germany

should be resisted. His writings include *Our Economic Problems* and *Two Years of Faulty Taxation.*

Kaiser, Henry J. (**1882-**), American construction expert, was born at Canajoharie, N. Y. After sixteen years of road construction, 1914-30, he took up the building of dams. In 1933 he became the head of the Six Companies, Inc., who built the Hoover and Parker Dams. He began shipbuilding in 1941, using new methods to expedite construction. After the war he became interested in housing and in aluminum and automobile manufacture.

Kalakaua (*kä'lä-kou'ä*), **David** (**1836-1891**), seventh king of the Hawaiians, 1874-91, was born in Honolulu, of royal descent. He received an English education in the Royal School at Honolulu and in 1860 visited California. In 1874, on the death of Lunalilo, who appointed no successor, he became king after a contest with the partisans of the Queen Dowager Emma.

Kalb (*kälb*), **Johann, Baron de** (**1721-1780**), general in the American Revolution, was born in Bavaria. After studying the art of war in the French army, he accompanied Lafayette to America in 1777. He was then appointed a major general by Congress, served in the field in New Jersey and Maryland, and was second in command to General Gates. He was mortally wounded in the battle of Camden.

Kaltenborn, Hans von (**1878-**), American journalist and radio commentator, was born at Milwaukee, Wis. He was associated with his father in a building material business and was a newspaper reporter prior to 1905, when, at the age of 27, he entered Harvard University. After graduation, he was on the staff of the Brooklyn *Eagle*, 1910-30, rising to the position of associate editor. In 1922, he began broadcasting news, in which he showed himself so effective that the National Broadcasting Company engaged him as news analyst.

During the diplomatic crisis of Munich in 1938, Kaltenborn was largely responsible for bringing to world-wide audiences an illuminating and impartial explanation of the most important historical event ever to be reported and analyzed in this way. His broad grasp of history likewise made of particular value his comments on events of World War II that began in 1939. He wrote *We Look at the World, Kaltenborn Edits the News,* and *I Broadcast the Crisis.* A comprehensive review of his long career as radio and television reporter is contained in his autobiographical work *Fifty Fabulous Years* (1950).

Kandinsky, Vasily (**1866-1944**), Russian painter, was born in Moscow but received most of his training in Paris and Munich. In 1912, with Franz Marc, he founded a group of "expressionist" painters in Munich. After he had helped to reorganize the arts in Russia following the Revolution, he returned to Germany and joined the "Bauhaus" movement. He is author of *The Art of Spiritual Harmony* (translated 1914).

Kant (*känt*; G., *känt*), **Immanuel** (**1724-1804**), German philosopher and founder of so-called critical philosophy, was born in Königsberg, Prussia. In 1740, he entered the University of Königsberg, where he studied mathematics, theology, and science with great thoroughness, but gave comparatively little attention to history and poetry. In 1755, he received from the university the degree of doctor of philosophy and published an essay on *Natural History and Theory of the Heavens.*

Kant now settled as a *docent* at the university and delivered lectures on logic, metaphysics, natural philosophy, and mathematics. In 1770, he obtained the chair of mathematics. He soon exchanged this for the professorship of metaphysics and logic, which he held until 1797.

Works. Kant's inaugural dissertation, *Form and Principles of the Sensible and Intelligible World,* contains germs of his philosophical system. Not until 1781, however, did his scheme of a transcendental philosophy appear in the form of the *Critique of Pure Reason.* The negative results of the system of pure reason prepared the way for more positive work, *Foundation of the Metaphysics of Ethics* in 1785 and *Metaphysical Elements of Natural Science* in 1786. In 1787, he developed more fully the principles of the metaphysics of the natural sciences and supplemented many positions in his other treatises.

Besides his larger works and essays, Kant wrote many minor treatises, sufficient to have made a literary reputation for most men. He was a zealous advocate of freedom and sympathized with the American colonies and the French people in their revolution and struggles for liberty. He acted always from a keen and paramount sense of duty. His habits were severely simple, and he was well known for his benevolence.

Manner of Life. Kant spent his entire life in Königsberg, engaged in his professorial duties and the evolution of his great philosophical works. He lived in retirement under strict, self-imposed rules for health and study, never having traveled, it is said, more than sixty miles outside of his native city.

Philosophy. Kant's chief contribution to philosophy is the conception of knowledge as the result of the interaction of two factors,—one supplied by the outer world, the other by the structure of the human mind. Against the materialist and the skeptic, he proved that the mind has its *a priori* principles of knowledge. In opposition to the dogmatist, he maintained that the sphere of the supersensible, though a reality, is not disclosed to positive thought. He declared that empiricism is right in so far as it asserts that the matter of our ideals is drawn from without, but wrong in so far as it implies that their form can also be found there. He is allied with the principle of the traditional moralists in ascribing an absolute validity to certain moral ideas by which life should be guided.

Kantor, MacKinlay (**1904-**), American writer, was born at Webster City, Iowa, where he began his writing career as a reporter with the Webster City *Daily News* (1922-24). He later worked for other Iowa newspapers. His first novel, *Diversy,* published in 1928, has been followed by many others, including *Long Remember* (1934), his story of the Gettysburg campaign, and *The Voice of Bugle Ann* (1935). His Civil War novel, *Andersonville* (1955), was an outstanding success.

Kaplan, Joseph (**1902-**), American physicist and chairman of the United States Committee for the IGY, was born in Hungary but grew up in America. He studied at Johns Hopkins and Princeton universities, then became a teacher of physics and meteorology at the University of California in Los Angeles. During World War II he was engaged in geophysical research for the government. He was founder of the Institute of Geophysics and is co-author of *Physics and Medicine of the Upper Atmosphere* and *Across the Space Frontier.*

Kappel, Frederick R. (**1902-**), engineer and business leader, was born at Albert Lea, Minn. After graduation from the University of Minnesota, he was employed by the Northwestern Bell Telephone Co., for which he eventually became director of operations. He was president of the American Telephone and Telegraph Company from 1956 to 1961, when he was made chairman of the board and chief executive officer.

Karsh, Yousuf (**1908-**), Canadian photographer whose portraitures of the world's most eminent people have made him famous, was born in Armenia. He studied art in Boston, moved to Canada and began his photographic career in Ottawa in 1932. Karsh is adept at portraying character. He has photographed Winston Churchill, Thomas Mann, Albert Schweitzer, Albert Einstein, Jan Sibelius, George Bernard Shaw, and many other notables. His photographs are masterful in their detail, artistically lighted, and show, with a startling sense of discovery on the part of the viewer, the individual inner strengths of his subjects.

Katsura (*kä'tsōō-rä*), **Taro, Prince** (**1847-1913**), Japanese statesman, three times premier of Japan, was born in the province of Choshu. During the restoration era, in 1867, he distinguished himself in the civil war. He studied military science in Germany, and, for some time, he was military attaché in Berlin. On his return home, he was gazetted major general, was appointed vice minister of the war office, under General Oyama, and took a prominent part in the modernization of the Japanese army. In 1898, he was appointed war minister, and held that post until the downfall of the Yamagata cabinet in 1900. He was premier of Japan from 1901 until 1906, covering the period of the war with Russia.

Kauffer, Edward McKnight (**1890-1954**), Anglo-American poster artist and illustrator, was born at Great Falls, Mont. Beginning as a scene painter for theaters, he studied art in Chicago, Paris, and Munich, and settled in London in 1914. There he made posters for the London underground railway, the striking character of which brought him wide recognition as leader in the art of the poster. His work is represented in English and Italian galleries and in the Corcoran Art Gallery, Washington. He illustrated many books, including *Don Quixote,* Burton's *Anatomy of Melancholy,* and Arnold Bennett's *Venus Rising from the Sea.*

Kaufman, George S. (**1889-1961**), American playwright, noted for his comic invention, was born in Pittsburgh, Pa. He was a newspaperman in Washington, D.C., and New York, and was drama critic on both the New York *Times* and the old New York *Tribune.* The list of plays which Kaufman wrote, co-wrote, or "doctored" is imposing. His reputation as a "play doctor" is legendary, as is his reputation as a member of the famous "Algonquin Round Table," meetings that brought together such wits as Alexander Woollcott, Dorothy Parker, and *New Yorker* editor Harold Ross. Kaufman, creator of scores of Broadway hits, is best known for such productions as *Beggar on Horseback, Strike Up the Band, Of Thee I Sing, Dinner at Eight,* the hilarious *You Can't Take It With You, The Man Who Came to Dinner,* and, more recently, *The Solid Gold Cadillac* and *Silk Stockings.* Kaufman was also a gifted director.

Kean, Charles John (**1811-1868**), British actor, son of Edmund Kean, was born at Waterford, Ireland. He was

educated at Eaton. He made his debut at Drury Lane, 1827, but did not establish his reputation until 1838, when he appeared as Hamlet, Richard III, and Sir Giles Overreach. In 1842, he married Miss Ellen Tree, a celebrated actress. From 1850 to 1859, he was manager of the Princess's Theater, London. In 1865, he played in the United States.

Kean, Edmund (**1787-1833**), English actor, son of Ann Carey, a strolling actress, was born in London. At an early age he played children's parts. He himself at 16 turned "stroller," and, after ten years in the provinces, made his first appearance at Drury Lane as Shylock in 1814. He at once took rank as the first actor of the day. A period of great success followed both in England and the United States; but by breach of contracts and dissipation he gradually forfeited public approval. His most celebrated roles were Richard III, Shylock, Hamlet, Iago, Othello, and Luke in *Riches*.

Keane, John Joseph (**1839-1918**), American churchman, was born in Ballyshannon, Ireland. He came to the United States in 1846 and was educated at Saint Charles's College and at Saint Mary's Seminary, Baltimore, Md. Ordained priest in 1866, he was assistant pastor of Saint Patrick's Church, Washington, D. C., from 1866 to 1878, when he was made bishop of Richmond, Va. He was the first rector of the Catholic University of America at Washington, which he had helped to found, serving from 1886 to 1897. He was then elevated to archiepiscopal dignity, with the title of Archbishop of Damascus, and went to Rome. Returning in 1900, he was transferred to the see of Dubuque, Iowa.

Kearny (*kär'nĭ*), **Philip** (**1815-1862**), American soldier, was born in New York. He was attached to the staff of General Scott, 1841-44, and distinguished himself in the Mexican War. He then served as a volunteer in the French army in the war against Austria, and was present at the battles of Magenta and Solferino. He commanded the cavalry of the army of the Potomac in the peninsula campaign during the Civil War, in which he won an enviable reputation for courage and gallantry. He took an active part in the second battle of Bull Run, and was killed at Chantilly, Va., while reconnoitering in front of his command.

Keats, John (**1795-1821**), English poet, was born in London. He was apprenticed to a surgeon at Edmondton, near London. From his boyhood he exhibited a taste for poetry. In 1817, he published a volume of juvenile poems, having already made several contributions to the London *Examiner*, then under the editorship of Leigh Hunt.

In 1818 appeared his *Endymion*, a poetic romance founded in part on the model of Fletcher's *Faithful Shepherdess*. This work was severely criticized in the *Quarterly Review* and in *Blackwood's Magazine* as of the "Cockney school" of poetry. His later poems avoided faults present in this work.

In 1820, Keats published his *Eve of St. Agnes*, his odes to *The Nightingale* and *The Grecian Urn*, and the fragments of *Hyperion*, taken, like *Endymion*, from mythological sources and written in an airy strain of classic imagery. His poetry stands alone in English literature for its sensuous imagery and haunting melodiousness of language. He was attacked by tuberculosis in 1820 and in 1821 went to Italy, where he died. Like Spenser, Keats was a poet's poet and his work profoundly influenced 19th-century poetry in England.

Keble (*kē'b'l*), **John** (**1792-1866**), English clergyman and poet. His early education was directed by his father. At the age of 15 he entered Corpus Christi College, Oxford, where he won several prizes and otherwise distinguished himself. In 1827, he published his volume of sacred poetry entitled the *Christian Year*, which attained a very large circulation and exerted an enormous influence. He was one of the leading spirits in what was known as the "tractarian movement" in the English Church, and for several years was actively engaged with Pusey, Newman, and others in issuing *Tracts for the Times*.

Kefauver (*kē'fô-vĕr*), **Estes** (**1903-1963**), lawyer and politician, was born in Madisonville, Tennessee. After he was graduated from the University of Tennessee in 1924 and Yale Law School in 1927, he practised law in Chattanooga. He was a Congressman from Tennessee from 1939 to 1949, when he became United States Senator for the term expiring in 1955. As chairman of the Senate Committee to Investigate Crime, he won nation-wide recognition in 1951 for his sensational disclosures. In 1952 he made an impressive showing in the presidential primaries for the Democratic nomination for president, but lost to Adlai E. Stevenson at the convention. He was re-elected to the U.S. Senate in 1954. At the National Convention held in Chicago in August, 1956, he was nominated for the vice-presidency as running mate for Mr. Stevenson, who was chosen to head the ticket. In 1961-62, he headed a committee to investigate the manufacture and pricing of drugs.

Keitel, Wilhelm (**1882-1946**), German military leader. He was a commander of artillery in World War I. After Hitler came to power, Keitel was made major general. He took an active part in the reoccupation of the Rhineland in 1936. In 1938, after a "purge" of the more conservative army leaders, Keitel was made commander in chief. In this capacity, he led the German army into Austria and Czechoslovakia in 1938 and conquered Poland in 1939, and France in 1940, employing the technique of the *Blitzkrieg*, "lightning war." He signed the terms of surrender at Berlin, May 8, 1945. He was afterwards tried as a war criminal, and sentenced to death.

Kellar, Harry (**1849-1922**), entertainer and magician, was born in Erie, Pa. He was educated at Painesville, Ohio, 1866. When a young man, he was assistant to the "Fakir of Ava," the magician. He joined Davenport Brothers, spirit mediums, as business manager in 1867. With other illusionists he traveled in Mexico, South America, Africa, Australia, and Oriental countries. After 1884 he performed in American cities. He was perhaps the most widely known illusionist of his time. He published *A Magician's Tour Up and Down and Round About the Earth* and *Kellar's Variety Entertainments*.

Keller, Helen Adams (**1880-**), American writer and lecturer, was born at Tuscumbia, Ala. By severe illness, at the age of 19 months, she was deprived of both sight and hearing. Until she was seven, no serious attempt was made toward her education. She was then placed in charge of Miss Anne Mansfield Sullivan, of the Perkins Institute for the Blind, Boston, who came to her home. As a result of Miss Sullivan's teaching, she learned the deaf and dumb language by touch; she also learned to read by the Braille system and to write by using a special typewriter. At the age of ten, under the instruction of Miss Sarah Fuller, of the Horace Mann School, New York, she learned to speak.

In 1892, Miss Keller went to Boston and, at 16, entered a preparatory school. She was accompanied to all classes by Miss Sullivan, who repeated the lectures and discussions by touch. In 1900, Miss Keller entered Radcliffe College, and, with the continued aid of her devoted teacher, she graduated with honors in 1904. She used textbooks printed in Braille and wrote examinations on her own typewriter. After graduation she became well known as a writer and lecturer on educational possibilities for the blind. The motion picture play *Deliverance* was based on her autobiography, *The Story of My Life*. She wrote also *Out of the Dark*, *Peace at Eventide*, and *Helen Keller's Journal*.

Keller, James G. (**1900-**), American clergyman, was born at Oakland, Calif., and was ordained priest in the Roman Catholic Church in 1925. He is known as the founder in 1945 and the director since then of the Christophers. His many books include *You Can Change the World* (1948), *Three Minutes a Day* (1949), *One Moment, Please* (1950), and *Stop, Look and Listen* (1954).

Kelley, Edgar Stillman (**1857-1944**), American composer, was born at Sparta, Wis. He studied music in Chicago, 1874-76, and at Stuttgart, where he was graduated from the Conservatory in 1880. Later he taught in San Francisco and contributed musical criticism to the *Examiner*. In 1896, he became a teacher in the New York College of Music, and was engaged as lecturer on music in university extension work. He resided in Berlin from 1902 to 1900, and, upon his return, became professor of composition at the Cincinnati Conservatory. Among his compositions are the comic opera *Puritania*; incidental music to *Ben Hur*, *Prometheus Bound*, and *Macbeth*; the symphonic poem *The Pit and the Pendulum;* the orchestral suite *Aladdin*, on Chinese themes; and the *New England Symphony*. He published *Chopin the Composer* and *The History of Musical Instruments*.

Kellogg, Frank Billings (**1856-1937**), American lawyer, was born at Potsdam, N. Y. He removed to Minnesota with his parents in 1865; studied law; and, in 1877, was admitted to the bar. He was special counsel for United States in the cases against the paper trust and the Standard Oil Trust. He was also special counsel for the Interstate Commerce Commission in the investigation of the Harriman railroads and for the United States in the action to dissolve the Union Pacific and Southern Pacific merger. He was elected United States senator for the term, 1917-23, and soon thereafter was appointed United States ambassador to England, serving until 1925. He was Secretary of State, 1925-28. His principal achievement in this office was the negotiation of the Paris Pact, a multilateral treaty renouncing war as an instrument of national policy. In 1929, he was awarded the Nobel peace award and, 1930-35, he served as judge in the International Court of Justice at The Hague.

Kelly, James Edward (**1855-1933**), American sculptor, was born at New York. He studied wood engraving and became an illustrator, principally for magazines. After 1881 he devoted his time exclusively to sculpture and became known as "the sculptor of American history." His first piece of sculpture was "Sheridan's Ride," 1878. Forty

generals, including Grant, Sherman, Sheridan, and Hancock, gave him sittings for a series of bronzes. His work includes also "Monmouth Battle Monument"; "Call to Arms," Troy, N. Y.; "General John Buford at Gettysburg"; "Battle of Harlem Heights" memorial at Columbia University; "Destruction of the Bridge at Princeton"; equestrian figures of General Sherman and Colonel Roosevelt at San Juan Hill; busts from life, of Admiral Dewey and of Roosevelt as colonel of the Rough Riders; and the bronze work "Leatherstocking and the Last of the Mohicans."

Kelly, Mervin J. (**1894-**), engineer and research scientist, was born at Princeton, Mo. He studied at the Missouri School of Mines and at the universities of Kentucky and Chicago. As a physicist, he joined the research staff of the Western Electric Company and later worked in the Bell Telephone Laboratories. In his research he has given special attention to tube development and electronics. In addition to serving as adviser to the U.S. Bureau of Standards and other government departments, he has been special consultant to the National Aeronautics and Space Administration.

Kelvin, William Thompson, Baron (**1824-1907**), British physicist and mathematician, was born at Belfast, Ireland. He early distinguished himself at Glasgow University in mathematics and the classics. In 1841, he went to Cambridge University, where he received his bachelor's degree and was elected a fellow in 1845. He then went to Paris, studied for a time under the famous Regnault, and there, as at Cambridge, made valuable original contributions to science.

In 1846, Lord Kelvin was appointed professor of natural philosophy in Glasgow University. Here he carried forward investigations into thermodynamics, electrostatics and the theory of magnetism, contact electricity, thermoelectricity, the mechanical energies of the solar system, the action of the tides, and the size and motion of atoms. Popular attention was directed to his scientific attainments by his connection with the more practical problems of ocean telegraphy. Lord Kelvin was electrical engineer to the Atlantic Cable Company in 1857-58 and again in 1865-66. After the construction of the Atlantic cable, his most popular achievement was the invention of a mariner's compass that was free from the magnetic action of the iron of the ship.

Theory of the Earth's Age. As early as 1842, Lord Kelvin had published, in a paper which appeared in the Cambridge and Dublin *Mathematical Journal*, the germ of his theories about the age of the earth. He announced that the age of the earth as a habitable planet, far from being unlimited, could not possibly exceed 400 million years and was more probably within 20 million. The resulting controversy among biologists and geologists has lasted until the present day.

Electrical Measurement. In 1851, Lord Kelvin, impelled by the characteristic precision of his scientific spirit and by the need which he perceived for exact measurement in telegraphy, had already adopted the so-called C. G. S., or absolute, system of measurement, based on the centimeter, the gram, and the second. Its general acceptance also was more directly due to him than to any other man. The unit of electric energy known as the kilowatt hour was first defined by him, and much of his attention was devoted also to the production of commercial instruments for the measurement of the electric current.

Later Work. Lord Kelvin's later work included many valuable investigations in molecular physics. The lectures that he delivered at Johns Hopkins University in 1884 on his first visit to America ranged from the most recondite problems of optics to speculations on molecular dynamics and were both a criticism and a protest regarding the ultimate dynamics of physical nature.

His chief publications were: a *Treatise on Natural Philosophy*, which he wrote in conjunction with Professor Tait and issued in 1867; *Mathematical and Physical Papers*, published 1882-90; *Popular Lectures and Addresses*, 1889-94; *Molecular Tactics of a Crystal*, 1894; and *Baltimore Lectures*, delivered in 1884, in the later revision of which he practically abandoned his famous vortex theory of atoms.

The genius of Lord Kelvin, as one of the greatest scientific intellects of the latter half of the 19th century, displayed a threefold ability; power to construct valuable theories, ingenuity in their application, and the capacity to secure their general usefulness by the invention of appropriate instruments.

Kemal Pasha. See *Mustapha Kemal Pasha.*

Kemble, Charles (**1775-1854**), English actor, was born at Brecknock, South Wales, younger brother of John Philip Kemble. He received his education at Douai, France, and, on his return to England, he devoted himself to the stage. In 1794, he made his first appearance at Drury Lane, London, in the character of Malcolm in *Macbeth*. He gained wide fame for his impersonations of such characters as Romeo, Falconbridge, Charles Surface, Cassio, and Benedick. He also gave readings from Shakespeare with notable success. In 1832, he visited the United States, accompanied by his daughter Frances Anne Kemble and met with an enthusiastic reception.

Kemble, Frances Anne (**1809-1893**), (Fanny Kemble); English actress and Shakespearean reader, was born in London, daughter of Charles Kemble. She was educated chiefly in France. In 1829, she made her debut on the stage as Juliet at Covent Garden, London. By her attractive personality she soon won great popularity playing such roles as Portia, Beatrice, Lady Teazle, and Julia.

In 1832, she came to the United States with her father and met with noted success. In 1834, she married Pierce Butler, an American and retired from the stage to her husband's plantation in Georgia. They were divorced in 1849. Returning to the stage, she appeared as a Shakespearean reader, attracting large audiences in Boston and in other cities. In 1877, she returned to England, where she was a prominent figure in the social life of London.

Besides several plays and a volume of poems, she wrote *A Journal of a Residence in America*, *Notes on Some of Shakespeare's Plays*, *Far Away and Long Ago*, and *Further Records*. Her grandson Owen Wister became a well-known American novelist.

Kemble, John Philip (**1757-1823**), English actor, was born at Prescott, Lancashire. His father intended him for the Catholic priesthood, and sent him to a seminary at Sedgley Park, Staffordshire, and to the English College at Douai. His first appearance as an actor was at Wolverhampton in 1776. The success of his sister, Mrs. Siddons, gave him his opportunity, and, in 1783, he played Hamlet at Drury Lane, arousing the keenest interest. For many years he continued to play leading tragic characters at Drury Lane, and, in 1788, he became Sheridan's manager. In 1803, he purchased a share in Covent Garden Theater, became manager, and made his first appearance there as Hamlet in the same year. As a tragedian, Kemble had no superior in his time. He retired in 1817.

Kempis, Thomas à (**c. 1380-1471**), German devotional writer, was so called from Kempen, a town in the Prussian Rhine provinces, where he was born. He was educated at Deventer, and, in 1400, entered the monastery of Mount Saint Agnes, near Zwolle. Here he took the vows in 1406. He entered into priest's orders in 1413 and was chosen subprior in 1425, to which office he was re-elected in 1448. His whole life appears to have been spent in the seclusion of this convent.

For sanctity and ascetic learning, Thomas à Kempis stood very high among his contemporaries. His historical reputation rests almost entirely on his writings, which consist of sermons, ascetical treatises, pious biographies, letters and hymns. Of these, the celebrated *Imitation of Christ* is a work that in the regard of many ranks second only to the Bible. It has been translated into many languages.

Kendall, William Mitchell (**1856-1941**), American architect, was born at Jamaica Plain, Mass. He studied architecture at the Massachusetts Institute of Technology and in Italy and France. Returning to America, he joined the firm of McKim, Mead and White. The long list of well-known structures designed by him includes the Plymouth Rock portico, the Tennessee War Memorial at Nashville, the Harvard School of Business, the Arlington Memorial Bridge at Washington, D. C., and the building for the American Academy of Arts and Letters, to which body he was elected in 1929.

Kennedy, Charles Rann (**1871-1950**), dramatic writer, was born at Derby, England. At 13 he became an office boy and largely educated himself. Later, he became an actor, press agent, and theatrical business manager. Removing to America, he settled in New York, where he made his first appearance on the American stage in 1903. From 1905, he devoted himself chiefly to writing dramas. These deal mainly with social problems and are characterized by deep ethical purpose. Among his plays are *The Servant in the House*, *The Terrible Meek*, *The Necessary Evil*, *The Army with Banners*, *Flaming Ministers*, and *Face of God*.

Kennedy, John Fitzgerald (**1917-1963**), American statesman, was born at Brookline, Mass., a son of Joseph P. Kennedy, former U. S. ambassador to the Court of St. James's. Young Kennedy's studies at Harvard University were interrupted temporarily by a different kind of educational experience when, in 1938, he became his father's secretary in London. Having returned to Harvard, he was graduated *cum laude* in 1940. A thesis he wrote for the university was the basis for a book, *Why England Slept*, reporting observations and impressions he had received in London. Upon the outbreak of World War II, he enlisted in the U. S. Navy. During his service as lieutenant in the southwest Pacific, his ship was rammed and sunk, and he was credited with saving the lives of three members of the crew, whom he towed to safety. He was subsequently

hospitalized. For his exploit he was awarded the Navy and Marine Corps Medal and the Purple Heart.

After peace was declared, he became a newspaper correspondent for the International News Service. His principal assignments were the British elections, the UN Conference at San Francisco, and the Potsdam Conference. In 1946 he was elected to Congress from the 11th Mass. district. He served for three terms, then, in 1953, he was elected U. S. senator. His book, *Profiles in Courage*, published in 1956, won a Pulitzer prize. In 1960 he was elected president of the United States. During a visit to Dallas, Texas, on November 22, 1963, he was riding in a motorcade through streets lined with cheering crowds when he was struck by an assassin's bullet fired from a building along the route of the procession. He died almost immediately and was succeeded by Vice President Lyndon B. Johnson, who was also in Dallas at the time when this great national tragedy occurred.

Kennedy, Robert F. (**1925-**), lawyer and public official, brother of President John F. Kennedy, was born at Boston. He served in the U.S. Navy, 1944–46. Following graduation from Harvard he studied law and soon joined the staff of the U.S. Department of Justice. He was chief counsel for the U.S. Senate permanent sub-committee on investigations and was particularly active in the McClellan committee's investigation of labor-management relations. He became U.S. Attorney General in 1961, serving until 1964 when he campaigned successfully for the office of U.S. senator from New York.

Kensett (*kĕn'sĕt*), **John Frederick** (**1818-1872**), American landscape painter, was born at Cheshire, Conn. In early life he became an engraver but devoted his leisure to the study of painting. In 1840, he began a period of five years' study in England. After two years' work in Italy he exhibited his view on the "Arno" and the "Shrine" in New York in 1848.

Kent, James (**1763-1847**), American lawyer and jurist, was born in Philippi, N. Y. He was graduated at Yale in 1781, was admitted to the bar in 1785, and soon became noted for his legal learning. He was several times elected to the New York legislature, and, in 1793, became professor of law in Columbia College. Afterward he was chosen to many important offices, becoming chief justice of New York in 1804, and chancellor, or judge of the court of chancery, in 1814. His decisions in hundreds of law cases are still often cited; but he is best known for his *Commentaries on American Law*, which were published from 1826 to 1830 and are now in common use by American lawyers as well as by many in other countries. He was elected to the American Hall of Fame, 1900.

Kent, Rockwell (**1882-**), American painter and illustrator, was born at Tarrytown Heights, N. Y. He studied and practiced architecture but turned later to the pictorial arts. Among his paintings are "Deer Season" in the Chicago Art Institute, "Annie McGinley" in the Carnegie Institute at Pittsburgh, "Marine" in the New York Metropolitan Museum of Art, and "Mother and Child" and "Lone Woman" in the Brooklyn Institute of Arts and Sciences. He wrote *Wilderness*, *Voyaging*, *Salamina*, and *It's Me, O Lord* (1955).

Kepler, or **von Kappel, Johann** (**1571-1630**), German astronomer, was born at Weil der Stadt, Württemberg, Germany. As a child, he was of a sickly constitution and of marked precocity. From the University of Tübingen he received his bachelor's degree in 1588 and his master's degree in 1591.

Though he knew little of the subject, Kepler was unwillingly made to accept the class in astronomy at Graz in 1594. Forced into this branch of learning, he bent all his energy to ascertaining the size, motions, and orbits of the planets. In 1596, he published his *Cosmographical Mystery*, a book filled with fanciful hypotheses. He was saved from continued extravagance of this kind by his connection with the celebrated astronomer Tycho Brahe at Prague.

After an unfortunate marriage in 1597, pecuniary difficulties and religious persecution soon obliged Kepler to escape to Hungary. In 1600, he became the assistant of Tycho Brahe. Their first joint work was the computation of the *Rudolphine Tables*, named for Rudolph II, who was to defray the expense of their publication. Upon the death of Tycho in 1601, Kepler succeeded him as principal mathematician to the emperor. In 1606, he published a *Supplement to Vitellio*, in which he treated the optical part of astronomy. His *Dioptrics* of 1611 definitely founded the science of optics.

The work on which Kepler's fame chiefly rests is his *New Astronomy, or Commentaries on the Motions of Mars*, published in 1609. He proved that Mars moves in an elliptical orbit, in one of the foci of which is the sun. He also ascertained that the radius vector, or the line joining the planet and the sun, passes over equal areas in equal times. These two great principles he extended to all the planets in the solar system. His third great law, that the squares of the periodic times of the planets vary as the cubes of their distances, he discovered in 1618. It was announced in *The Harmonies of the World*, which he dedicated to James I of England in 1619. These three laws were the basis of Newton's discoveries, by which the nature of the planetary system was finally made intelligible. Kepler became professor of mathematics at Lienz, Austria, in 1612. In 1615, he was summoned to the diet at Ratisbon to give his opinion on the reformation of the calendar. He worked incessantly to complete the astronomical *Rudolphine Tables*, and, in 1627, they at length appeared.

Kern, Jerome (**1885-1945**), American composer, was born in New York of German-Czech descent. He studied music in New York and Europe. He wished above everything to compose for the theater. His first hit was the song "They Didn't Believe Me" from *The Girl from Utah* (1914). His most successful music was written for Oscar Hammerstein II's dramatization of Edna Ferber's novel *Show Boat* (1927), which included the songs "Why Do I Love You?" and "Ol' Man River." Other popular tunes by Kern were "Look for the Silver Lining" (*Sally*, 1920), "Don't Ever Leave Me" (*Sweet Adeline*, 1929), "I've Told Every Little Star" (*Music in the Air*, 1932), "Smoke Gets in Your Eyes" (*Roberta*, 1933), and "All the Things You Are" (*Very Warm for May*, 1939).

Kettering, Charles Franklin (**1876-1958**), engineer, was born on a farm near Loudonville, Ohio. A graduate of Ohio State University, he is also a product of experimental workshops. He has made many contributions to industry as a research engineer for the National Cash Register Company, inventor of the electric starter for automobiles, head of the Dayton Engineering Laboratories Company, president of General Motors Research Corporation, and vice president of General Motors Corporation. His practical approach to engineering problems is indicated by one of his favorite rules "Formulas should always follow facts."

Key (*kī*), **Ellen Karolina Sofia** (**1849-1926**), Swedish writer, was born at Sundsholm, Smaland, of Scottish and English descent. In her 20th year, she became secretary to her father, who was a member of the Riksdag.

An ardent feminist, she held advanced views on sexual ethics which subjected her to severe criticism but early won the admiration of such thinkers as Maeterlinck, Brandes, and Havelock Ellis. Causes for which she worked included measures for child welfare and enlarged opportunities for women. Among her works are *The Century of the Child*, *Love and Ethics*, *The Morality of Woman*, *The Younger Generation*, and *Life-Lines*.

Key (*kē*), **Francis Scott** (**1780-1843**), American poet, author of "The Star-Spangled Banner," was born in Maryland. He was educated at Saint John's College, Annapolis, Md. He was a lawyer of note, and for many years was district attorney of the District of Columbia. Being detained by the British during the bombardment of Fort McHenry, September 13, 1814, his feelings found vent in the verses which have become the American National Anthem. They were printed on his return to Baltimore.

Keynes (*kānz*) **of Tilton, John Maynard Keynes, Baron** (**1883-1946**), English economist, was born at Cambridge. He was educated at Eton and at King's College, Cambridge. Entering the civil service, he served in the India office and later was attached to the treasury, of which he became acting principal clerk, 1917–19. He was chief representative of the British Treasury at the Peace Conference at Versailles, but resigned in protest over the reparations clauses. These he considered unworkable on the ground that the recipients would not accept goods. His ideas on the relationship between unemployment and the use of money were well received in America.

In addition to his best-known work, *Economic Consequences of the Peace*, his publications include *A Treatise on the Use of Money*, *The General Theory of Unemployment, Interest and Money*, and *How to Pay for the War*.

Keyserling (*kī'zĕr-lĭng*), **Hermann Alexander** (**1880-1946**), German philosopher, was born at Koenno, Estonia, of a noble family, through which he inherited the title of count. He studied sciences, philosophy, and literature in the principal European universities and, in 1907, began a long period of travel in Europe, Asia, and America, the fruit of which was his *Travel Diary of a Philosopher*. In 1919, his estates were confiscated by the Estonian government. He later opened at Darmstadt, Germany, a center for the creative study of philosophy, known as the school of wisdom. He married a granddaughter of Bismarck.

Khrushchev (*krōōsh'chŏf'*), **Nikita S.** (**1894-**), Soviet leader, was born in south central Russia, and as a boy worked as a shepherd and later as a coal miner in the Ukraine. He served with the Red forces in the revolution of 1917, and became a Communist party member in 1918. After training in one of the schools established by Lenin, he was a party organizer in the Ukraine. He was transferred to Moscow in 1929, where he attended the Industrial Academy. In 1935 he became party boss in Moscow.

Following Stalin's death, he succeeded Georgi M. Malenkov as first secretary of the Communist party. Khrushchev is credited with engineering Malenkov's resignation as premier in 1955, and replacing him with Nikolai Bulganin. This appointment foreshadowed further changes as Khrushchev gained firmer control. Among the former Stalin associates he deposed from party and government leadership were Molotov, Kaganovich, and even the popular military hero, Marshal Zhukov. Bulganin followed in 1958. Khrushchev then became Premier and was "retired" in 1964.

Kierkegaard (*kir'kĕ-gôr*), **Sören Aaby** (**1813-1855**), Danish philosopher and religious writer, was born at Copenhagen. He was opposed to all orthodox religion, contending that religion was a personal matter which the individual had to discover for himself. He believed that pessimism was commonly experienced by persons seriously contemplating the problems of existence, but despair could be overcome, or at least relieved, by absolute faith in God. This doctrine of Christian existentialism has revived interest lately in his teachings. Among Kierkegaard's principal works are *Either-Or* (1843) and *Stages on Life's Way* (1845).

Killian, James R., Jr. (**1904-**), American educator, was born at Blacksburg, S. C. He was graduated in 1926 from the Massachusetts Institute of Technology, where he majored in business and engineering administration. He immediately joined the staff of the institute's scientific publication, *The Technology Review*, of which he was managing editor from 1927 to 1930 and editor from 1930 to 1939. In the latter year he became assistant to Dr. Karl I. Compton, president of the institution, and was then successively executive vice-president, vice-president, and finally, in 1948, president. In 1957 he was appointed by President Eisenhower as his personal science adviser.

Kilmer, Joyce (**1886-1918**), American poet, was born at New Brunswick, N. J. He was educated at Rutgers College and at Columbia University, graduating from the latter in 1908. After a year of teaching, he took up editorial work and journalism in New York City. He was a leader among the younger poets of America. His works in verse include *Summer of Love*, *Trees and Other Poems*, and *Main Street and Other Poems*. His best known poem is "Trees," which has been set to music and has become a classic song. Soon after the entrance of the United States into World War I in 1917, he became a private in the 165th infantry regiment of the national army. He was killed at the battle of the Ourc, in France.

Kilpatrick, William Heard (**1871-**), American educator, was born at White Plains, Ga. Educated at Mercer College and at Johns Hopkins and Columbia Universities, he taught mathematics at Mercer College from 1897 to 1906. From 1909, he lectured at Teachers College, Columbia University, becoming in 1918 professor of the philosophy of education. He retired in 1938. Among his published works are *Education for a Changing Civilization*, *How We Learn*, and *Education and the Social Crisis*.

King, Clarence (**1842-1901**), American geologist, was born at Newport, R. I. He was graduated from Yale in 1862. From 1863 to 1866, he was a member of the California Geological Survey directed by Professor J. D. Whitney. In this exploration he discovered Mount Whitney, the highest mountain in California, and, with J. T. Gardiner, made the first survey of the Yosemite Valley. In 1866, he originated and secured government sanction for the "survey of the fortieth parallel" across the Rocky Mountains. His volume on the *Systematic Geology* of this region was published in 1878. In 1879-1881 he organized and became the first director of the United States Geological Survey. Later, as a mining engineer, he investigated the Comstock lode and the Eureka and Leadville districts, making important contributions to economic geology. Among his writings are *Mountaineering in the Sierras* and *The Age of the Earth*.

King, Ernest Joseph (**1878-1956**), American naval officer, was born at Lorain, Ohio. He was graduated from Annapolis in 1901, and advanced to the rank of rear admiral in 1933. He served in World War I and soon became interested in the development of naval air power. In 1941, as admiral, he was placed in command of the Atlantic fleet. After Pearl Harbor he was transferred to the Pacific and was made commander in chief of the United States fleet. Under his command, the fleet recovered from the crippling blow at Pearl Harbor, won a decisive victory at Midway, and took the offensive in the Southwest Pacific. He was made admiral of the fleet in 1944. He retired in 1945.

King, Martin Luther, Jr. (**1929-**), clergyman, was born at Atlanta, Ga. He was educated at Morehouse College, Crozer Theological Seminary, and Boston University, with special studies also at Harvard and the University of Pennsylvania. In addition to serving as pastor of the Dexter Ave. Baptist Church in Montgomery, Ala., he has been active as writer, speaker, and organizer in connection with movements for the advancement of Negro citizens, such as the Southern Christian Leadership Conference. He is the author of *Stride Toward Freedom* (1958) and *Why We Can't Wait* (1964). He was awarded the Nobel Peace Prize in 1964.

King, Rufus (**1755-1827**), American statesman, was born at Scarboro, Me. A graduate of Harvard College, he studied law, and in 1783 represented Newburyport in the Massachusetts legislature. From 1784 to 1786 he was a delegate to the Continental Congress. In 1787 he was a member of the Constitutional Convention at Philadelphia and the next year moved to New York. In 1796, King was appointed minister to England and remained there for seven years. In 1813, he was elected United States senator and served until the expiration of his second term in 1825. In 1825-26 he was again minister to England.

King, William Lyon Mackenzie (**1874-1950**), Canadian statesman and economist, was born at Kitchener, Ont. a grandson of William Lyon Mackenzie. He was graduated from the University of Toronto, 1895, studying later at the University of Chicago and at Harvard University. Becoming deputy minister of labor for Canada in 1900, he served with distinction on many commissions relating to labor and immigration. He was elected member of Parliament as a Liberal in 1908; was minister of labor from 1909 to 1911; and, in 1919, was chosen leader of the Liberal party. On its victory in 1921, he became prime minister. An election in 1925, left King without a clear majority, but he retained office for some months with the help of the Progressive party. A general election in 1926 returned him to power, which he retained until 1930. He was again elected in 1935 and 1940. In the latter year he negotiated with President Roosevelt an understanding for the joint defense of Canada in the event of its being menaced from abroad. His publications include *The Secret of Heroism* and *Industry and Humanity*.

Kingsley, Charles (**1819-1875**), English clergyman and author, was born in Devonshire. He was educated at King's College, London, and at Cambridge University. In 1842, he became curate and, two years later, rector, of Eversley. In 1848, he published *The Saint's Tragedy, or the True Story of Elizabeth of Hungary*, an admirable illustration of medieval piety. His opinions on the social anarchy of modern times are to be found in his *Alton Locke, Tailor and Poet*, a novel of extraordinary power. This was followed in 1849 by *Yeast, a Problem*, in which he handles the condition of the English agricultural laborer.

In 1853 appeared *Hypatia, or New Foes with an Old Face*, a most vigorous and brilliant delineation of Christianity. Two years later, Kingsley published *Westward Ho!*, probably the greatest of his works. In 1860, he was appointed professor of modern history at Cambridge. After resigning his chair he was made canon of Chester in 1869, canon of Westminster in 1873, and chaplain-in-ordinary to Queen Victoria. See *Hypatia*, *Yeast*.

Kingsley, Mary Henrietta (**1862-1900**), English traveler and author, niece of Charles Kingsley, was born in Islington, London. She went to Cambridge, where she studied sociology, but was most attracted to natural history. In 1893, she went to West Africa to investigate native folklore and religions and to study biology.

In 1894, she made a second trip to explore the lower Niger region and to study its flora. She traveled through the Niger Coast Protectorate, Cameroon, and Gabun, often with only native attendants. The results of these two journeys were published in her interesting *Travels in West Africa* and *West African Studies*.

Kipling, Joseph Rudyard (**1865-1936**), English short story writer, novelist, and poet, was born in Bombay, India. He was educated in United Service College, North Devon, England. He was assistant editor of *Civil and Military Gazette* and *Pioneer* in India, 1882-89. His stories of Indian life, written in his early twenties, won world-wide reputation. These were followed by novels, tales, sketches, and poems, which stamped him as one of the most original, versatile, and effective writers of his time. They characteristically glorified British imperialism.

Kipling traveled extensively in Japan, China, Africa, Australasia, and America. In 1892, he married Caroline Starr Balestier, daughter of H. Wolcott Balestier, of New York, and lived in Vermont, where he built a home with his own hands. He settled in England in 1896. In 1907, he was awarded the Nobel prize for literature. He was made rector of Saint Andrews University in 1923.

Among his writings are *Plain Tales from the Hills*, *The Light That Failed*, *Barrack-room Ballads*, *The Jungle Book*, *Captains Courageous*, *Just So Stories*, *The Five Nations*, *Puck of Pook's Hill*, *Fringes of the Fleet*, *Sea Warfare*, *Letters of Travel*, and *Something of Myself*. He was buried in Westminster Abbey.

Kirk, Grayson Louis (**1903-**), educator, was born in Jeffersonville, Ohio. After he was graduated from Miami University (Ohio) in 1925, he continued his studies at Clark University, and also the University of Wisconsin,

where he taught government from 1929 to 1940. He then joined the faculty of Columbia University, teaching government and later international relations until 1953, when he was made president of the university.

Kitchener of Khartum, Horatio Herbert, Earl (1850-1916), British general, was born at Ballylongford, Ireland. He was educated at the Royal Military Academy at Woolwich and, in 1871, entered the British army. In 1882, he began service in Egypt, and in the action at Handub, in 1888, he led the Egyptian troops against Osman Digna, He was appointed Sirdar in 1888. In 1896, he commanded at the taking of Dongola; in 1898, he was in command of an English and Egyptian army near Omdurman, opposite the site of Khartum, and gained a notable victory. On his return to England, he was raised to the peerage and received a grant of £30,000.

During the Boer War, he was chief of the staff of the forces in South Africa, 1899-1900, and was commander in chief, 1900-02. In recognition of his services in bringing the war to a successful conclusion, he was promoted to lieutenant general and general, created viscount, and given a grant of £50,000. At the outbreak of World War I, in 1914, he was created earl, became British secretary of state for war, and devoted his organizing ability to the formation of an army. While en route to Russia, he was drowned by the sinking of the cruiser *Hampshire*.

Klaproth (*kläp'rôt*), **Martin Heinrich (1743-1817)**, German chemist, was born at Wernigerode. In early life he followed the profession of an apothecary, first as an assistant in pharmacies at Hanover, Berlin, and Danzig, and later as proprietor of a pharmacy in Berlin. He became the leading chemist of his time in Germany, and, in 1810, was selected professor of chemistry for the then newly established University of Berlin. His exact and thorough work did much to improve analytic chemistry. He was the first to discover and to characterize uranium, zirconium, and titanium as elements. He also distinguished the compounds of tellurium, strontium, cerium, and chromium.

Kleist (*klist*), **Bernd Heinrich Wilhelm von (1777-1811)**, German poet, dramatist, and novelist, was born in Frankfort on the Oder. With scanty education he entered the Prussian army at 15 and served seven years. After two restless years of study and clerical work, he visited Paris and then settled in Switzerland, becoming acquainted there with Zschokke and Wieland, son of the poet. In 1802, he returned to Germany, visiting Goethe, Schiller, and Wieland in Weimar. After some years of wandering, he settled in Berlin.

During a period of national disgrace, literary stagnation, and personal unrest, he produced dramas of great literary merit and still greater promise, all left unrealized by his untimely death. Kleist's dramas are still popular on the stage. *Der Zerbrochene Krug*, "The Broken Pitcher," is considered by many the best one-act comedy in German, and *Michael Kohlhaas* is one of the best German stories of the time. *Prinz Friedrich von Homberg* and *Die Hermannsschlacht* are regarded as his finest tragedies.

Klopstock (*klôp'shtôk*), **Friedrich Gottlieb (1724-1803)**, German poet, was born at Quedlinburg, Prussia. Incited by Virgil's *Æneid* and Milton's *Paradise Lost*, he resolved to write a great epic, and as a student at Jena, in 1745, he began *The Messiah*. In 1746, he went to Leipzig, where the first three cantos of *The Messiah* appeared in 1748. He settled in Hamburg in 1771 with a sinecure appointment and with pensions from the king of Denmark and the margrave of Baden. The last cantos of *The Messiah* were published in 1773. Regarded in his own time as a great religious poet, he helped to inaugurate the golden age of German literature. Odes, tragedies, biblical dramas, and hymns make up the greater part of his poetry. Of these his odes alone possess interest now. *The Messiah* was translated into both English verse and prose.

Knight, Charles (1791-1873), English publisher and author, was born at Windsor. Among his first publications was *The Etonian*, a periodical supported by the Eton boys. In 1823, he started *Knight's Quarterly Magazine*, and continued it for some time in London. The whole of his career was devoted to the publishing of popular literature, in which field he was the pioneer. Among the works which he published or edited are the *Penny Magazine*, which at one time enjoyed a circulation of nearly 200,000 copies weekly; the *British Almanac* and *Companion to the Almanac; Penny Cyclopædia*; *Library of Entertaining Knowledge*; and *History of England*.

Knopf, Alfred A. (1892-), publisher, was born in New York City and was educated at Columbia University. For approximately fifty years he was president of the firm of Alfred A. Knopf, Inc., which he founded in 1915. In 1957 he became Chairman of the Board. In 1960 his firm merged with Random House.

Knowland, William Fife (1908-), American politician and publisher, was born at Alameda, Calif. After he was graduated from the University of California in 1929, he joined the staff of the *Oakland Tribune*, a California newspaper published by his father. In 1945, while he was still in the army overseas, Governor Earl Warren of California appointed him United States senator to fill the vacancy caused by the death of Hiram W. Johnson. Following the death of Robert A. Taft in 1953, he became the Republican majority leader of the Senate, and, after the elections of 1954, the minority leader. Known for his strong attitude in matters of foreign policy, he sometimes found himself at odds with the international views of the Republican administration.

Knowles, James Sheridan (1784-1862), British dramatist, was born at Cork in 1784. He was the son of James Knowles, lexicographer and teacher of elocution. After serving in the militia and studying medicine, he appeared on the stage first at Bath and then at Dublin with indifferent success, and subsequently taught elocution in Belfast and in Glasgow. His plays, however, were highly successful, *Caius Gracchus* was first performed at Belfast in 1815. *Virginius*, his most effective drama, had been a success in Glasgow before Macready in 1820 produced it at Covent Garden with phenomenal popularity. Besides *William Tell*, in which Macready achieved one of his greatest triumphs, Knowles wrote also *The Hunchback*, *The Love Chase*, and *The Wife*. In 1845, he left the stage, joined the Baptist Church, and became an eloquent preacher.

Knox, Henry (1750-1806), American general, was born at Boston, Mass. He became a thriving bookseller in Boston, his store being a favorite resort of cultivated people. He was also an officer in a military company, and, when the Revolution broke out, he escaped from the city with his wife, who hid his sword in the folds of her dress. He took part in the battle of Bunker Hill. By his skill in planning fortifications and by his knowledge of artillery, he soon attracted the attention of Washington, and throughout the war he commanded the artillery in various battles. After the capture of Yorktown, Congress made him a major general, and, from 1785 to 1795, he was secretary of war.

Knox, John (c. 1505-1572), Scottish religious reformer, was born at Giffordgate, in Haddingtonshire. He became a priest and notary in the diocese of Saint Andrews before he had attained the age of 25. Having studied the writings of Saint Augustine and Saint Jerome, he renounced Catholicism about 1543 and openly preached the Protestant faith.

Engaged with other reformers in defending Saint Andrews against the French, Knox was taken prisoner and sent to the galleys. After a detention of 19 months, he returned to England, and was appointed chaplain to Edward VI; but he declined to accept a bishopric at the hands of that monarch on account of his objection to the common prayer and to Episcopacy. In the reign of Mary, he retired to Frankfort, and thence to Geneva, where he became acquainted with Calvin. A brief visit to Scotland to counsel the Protestant nobles led to their making a "covenant" to uphold the religion. Scottish Protestants were thereafter known as Covenanters.

Having returned to his own country in 1559, Knox denounced the priesthood, and especially the Mass and image worship, and declaimed against the queen of Scots, whom he called Jezebel. The queen sent for him and sought to influence him, but in vain. His preaching was so powerful that many of the cathedrals and parish churches were demolished by the excited populace as a result of his vigorous invectives. The Scottish Parliament decreed the end of papal rule in the country, and a confession of faith was drawn up by Knox and approved by Parliament in 1560. Knox thus became the founder of the Presbyterian Church.

Knox, Philander Chase (1853-1921), American lawyer and statesman, was born at Brownsville, Pa. He was graduated at Mount Union College, Ohio, 1872, studied law, and was admitted to the bar in 1875. He was attorney general of the United States from 1901 to 1904, United States senator from 1904 to 1909, and was secretary of state from 1909 to 1913. His policy of furthering American investments in Latin America through aid of the State department became known as dollar diplomacy.

Knox, Monsignor Ronald (1888-1957), clergyman, was born in Leicestershire, England, the son of an Anglican clergyman. A convert to Catholicism he became well known as a writer and translator. In addition to his major work, a translation of the Bible from the Vulgate into English, he published an edition of Virgil's *Aeneid*, a book of essays, *Trials of a Translator*, and other works.

Knox, (William) Franklin (1874-1944), American publisher and politician, was born in Boston, Mass. A graduate of Alma College, Alma, Mich., he got a job as reporter on the Grand Rapids *Herald*, rising in two years to be circulation manager. He then became publisher of various

small newspapers and, in 1927, of the Boston *American* and *Advertiser*. He was in addition general manager of the Hearst newspapers until 1931, when he purchased the Chicago *Daily News*.

Knox served in the Spanish-American War as one of Theodore Roosevelt's Rough Riders. During World War I, he was advanced to the rank of colonel. He was active also in politics in the Republican party, and, in 1936, was candidate for vice presidency of the United States on the unsuccessful ticket with Alfred Landon. When the European war took a turn in 1940 critical for American interests, Knox was one of the strongest supporters of a rapid increase in American defense facilities and of aid for Great Britain. His views and his energetic character commended him to President Roosevelt for the post of secretary of the navy. Accepting the offer despite political differences, Knox carried through plans for the manifold expansion of America's naval power and laid the basis for victory in World War II.

Knudsen, William Signius (**1879-1948**), American industrialist, was born in a village of Denmark. Coming to America at the age of 20, he worked as a laborer in shipyards, car shops, and mills in New York and Buffalo, N.Y., rising to the status of superintendent. He was made vice president of the Chevrolet Motor Co. in 1922, from which post he advanced ultimately to president of the General Motors Corporation. In 1940, he was made director general of the office of production management and, from 1942 to 1945, he was lieutenant general and director of production in the war department.

Koch (*kôĸ*), **Robert** (**1843-1910**), German physician and bacteriologist, was born at Klausthal, Prussia. He studied medicine at Göttingen, receiving his doctor's degree in 1866. His first substantial achievement was the result of the penetration, skill, and thoroughness of his researches on the contagion of splenic fever in cattle. This gained for him a seat on the imperial board of health in 1880. In 1882, he announced his discovery of the tubercle bacillus before the physiological society of Berlin. In 1883, he was made a privy councilor, and was placed in charge of the German expedition sent to Egypt and India to investigate the causes of cholera.

This journey resulted in the discovery of the comma bacillus or cholera germ, in 1884. He was rewarded with a gift of 100,000 marks by the government, and imperial titles and honors were bestowed upon him. In 1885, he was appointed a professor in the University of Berlin, the chair of hygiene having been created for him. He subsequently returned to the investigation of tubercular diseases. In 1905, he was awarded the Nobel prize for medicine.

Kocher (*kôĸ'ĕr*), **Emil Theodor** (**1841-1917**), Swiss surgeon, was born at Bern. He was educated in medicine and surgery at Bern, Berlin, Paris, and London. After 1866, he was connected with the University of Bern, becoming professor of surgery in 1872. He specialized in operative surgery on the thyroid gland and was the first to investigate and describe cachexia thyreopriva. His researches include transplanting the thyroid gland, a study of cancer of the thyroid, a study of the blood in exophthalmic goiter, and the prevention of cretinism. He received the Nobel prize for medicine in 1909. His *Text Book of Operative Surgery*, translated into English, is a standard work. His other writings include *Die antiseptische Wundbehandlung*, *Vorlesungen über chirurgische Infektionskrankheiten*, and *Encyklopädie der Chirurgie*.

Kolbe (*kôl'bĕ*), **Adolph Wilhelm Hermann** (**1818-1884**), German chemist, was born near Göttingen. He studied chemistry under Wöhler and became assistant to Bunsen and to Playfair. He was professor of chemistry at Marburg, 1851-65, and at Leipzig, 1865-84. In the field of organic chemistry Kolbe studied the decomposition of organic acids by electrolysis, and, in association with Lautermann, he discovered in 1860 a method of making salicylic acid by a combination of carbolic and carbonic acids. This achievement led the way to the artificial production of many organic compounds.

Koo, Vi Kuyuin Wellington (**1887-**), Chinese diplomatist, was born in China; was educated at Columbia University; and became a councilor in the Chinese foreign office. He was appointed Chinese minister to Washington in 1915; represented China at the Peace Conference in Paris and in the League of Nations at Geneva; and, in 1920, was made Chinese minister to Great Britain. He was a delegate for China at the Washington Disarmament Conference in 1921-22. After the rise of Chiang Kai-shek's government he was ambassador to France, 1936-40, to Great Britain, 1941-46, and to the United States, 1946.

Körner (*kûr'nĕr*), **Karl Theodor** (**1791-1813**), German lyric poet, was born at Dresden. He studied at Freiberg, Leipzig, and Berlin and settled at Vienna in 1811. He was dramatist to a Vienna theater and wrote *Der Grüne Domino*, *Der Nachtwächter*, and other light comedies besides some tragedies, of which *Zriny* was the most successful. The uprising of the German nation against Napoleon inspired him with patriotic ardor, and, in 1813, joining Lützow's corps, he distinguished himself by his valor and encouraged his comrades by fiery patriotic songs. These were published in 1814 under the title of *Leier und Schwert*. The most famous, *Das Schwertlied*, was hastily composed during a pause in battle only a few hours before the author fell at Gadebusch near Schwerin.

Korngold (*kôrn'gôlt*), **Erich Wolfgang** (**1897-1957**), Austrian musical composer, was born at Brünn. His father, a music critic, encouraged his son's precocious talent for composition. In his 12th year he wrote a two-act musical pantomime entitled *The Snowman*, which was produced at the Vienna imperial opera. He later composed piano and orchestral works of remarkable fertility, originality, and technical excellence. In 1915, his *Sinfonietta* was produced by the Chicago Orchestra and by the New York Philharmonic Orchestra. He composed piano sonatas; *Fairy Pictures* for the piano; a trio for piano, violin, and cello; and an opera, *Die Kathrin*.

Kosciusko (*kŏs'i-ŭs'kō*), **Tadeusz** (**1746-1817**), Polish general and patriot, was born in Minsk, West Russia. He became a captain in the Polish army; came to America and served in the Revolutionary War; and returned to Poland in 1786 with the rank of general. At the second partition of Poland, Kosciusko resigned his command of the Polish army and retired to Leipzig; but he returned in 1794 and put himself at the head of the national movement in Krakow and afterward in Warsaw. With 20,000 regular troops and 40,000 poorly armed peasants, he resisted for months the united Russian and Prussian armies of 150,000 men. Overpowered by superior numbers in the battle of Maciejowice, 1794, he was captured and kept a prisoner until after the accession of the emperor Paul.

When Napoleon, in 1806, formed a plan for the restoration of Poland, Kosciusko felt himself restrained from taking an active part by his promise to the emperor Paul. In 1814, he wrote to the emperor Alexander, entreating him to grant an amnesty to the Poles in foreign countries and to make himself constitutional king of Poland. In 1817, he released from servitude the peasants on his own estate in Poland. He died in consequence of a fall from his horse.

Kossuth (*kŏsh'ōōt*; *kŏ-sōōth'*), **Louis** (**1802-1894**), Hungarian patriot, orator, and leader, was born at Monok, Hungary. In 1832, he commenced his political career as editor of a Liberal paper. In 1847, he was sent by the county of Pest as deputy to the Hungarian diet. To his speeches must in part be ascribed not only the Hungarian revolution but the insurrection in Vienna in 1848. On the dissolution of the ministry in 1848, he found himself at the head of the committee of national defense, and he prosecuted with extraordinary energy the measures necessary for carrying on the war. To put an end to all the hopes and schemes of the moderate party, he induced the National Assembly at Debreczen, in 1849, to declare the independence of Hungary. He was then appointed provisional governor of Hungary, but abandoned his position and fled into Turkey, where he was made a prisoner.

In 1851, Kossuth was liberated and sailed in an American frigate to England. Later in the same year, he landed in the United States. Everywhere he met with a most enthusiastic reception. He returned in 1852 to England, and there he chiefly resided until the Italian war broke out against Austria, when he organized a Hungarian legion in Italy. Later he lived in Turin.

Kostelanetz, André (**1901-**), Russian-American conductor, was born at Petrograd, where at the age of twenty he was appointed assistant conductor at the Imperial Opera. He and his family came to the United States in 1922, where he made his debut as conductor in 1924. Not long afterward, he was made permanent conductor of the Columbia Broadcasting System. Millions of records of his original arrangements of popular and classical music have been sold. He has been guest conductor of leading American symphony orchestras, often with his wife Lily Pons as soloist.

Kosygin (*kō-sē' jĭn*), **Alexei** (**1904-**), Soviet political leader, was born at Leningrad and was educated there in the Textile Institute and the Co-operative Technical School. He joined the Communist party in 1927. After serving as director of textile mills at Leningrad, he became People's Commissar of the Textile Industry. Later he was minister of finance and chairman of the State Planning Commission. Following the "retirement" of Nikita Khrushchev in 1964 he became premier, sharing control of the government with First Secretary Leonid Brezhnev.

Koussevitzky (*kōō'sĕ-vĭts'kĭ*), **Serge** (**1874-1951**), Russian-American conductor, received his musical education in Moscow. He began as a double bass player, and in 1905 married the daughter of a wealthy Russian. Asked by his father-in-law what he would like for a wedding present, he answered, "A symphony orchestra." With the money given to him, he founded an orchestra of 75 players. For several years he and the orchestra traveled down the Volga in steamboats, bringing music to places where a symphony orchestra had never been heard. After the Russian revolu-

tion he fled to Paris, where for a number of years he organized and conducted the Concerts Koussevitzky. In 1924 he was appointed conductor of the Boston Symphony Orchestra, a position he held for twenty-five years. He was the organizer of the Berkshire Music Center, where each summer at "Tanglewood," an estate at Lenox, Mass., symphonic festivals are held.

Kreisler (*krīs'lĕr*), **Fritz (1875-1962)**, Austrian violinist, was born in Vienna. He entered the Vienna Conservatory at the age of seven; won the gold medal for violin playing at ten; and then went to the Paris Conservatory, where he studied violin under Massart and composition under Delibes. At the end of two years, he won the gold medal. In 1888, he began concert tours, appearing with Moritz Rosenthal in the United States in 1889. He then studied art and medicine, and served a year in the army.

In the period of his retirement from the concert hall, he completely changed his musical ideals from those of a marvelous technician of the Paganini type to those of an interpretative artist of the foremost rank. When, in 1899, he again appeared in Berlin, it was as one of the greatest masters of the violin. He was wounded at Lemberg in 1914, while serving with the Austrian army. He later described his experiences in *Four Weeks in the Trenches—The War Story of a Violinist.* Kreisler became an American citizen in 1943. In 1952 he presented to the Congressional Library a valuable violin made by Josef Guarnerius del Gesu in 1737.

Kreuger, Ivar (1880-1932), Swedish engineer, industrialist, and financial pirate, was born at Kalmar, Sweden. At 19 he was graduated from Stockholm Technical College and, in 1900, came to the United States, where he was engaged in the construction of the Flatiron Building and other large structures in New York. In 1907, he returned to Sweden and, with Paul Toll, organized the firm of Kreuger and Toll for the construction of large, modern buildings. This firm entered the match business in 1913. During World War I, it secured control of the Swedish match industry. In 1922, Kreuger secured a monopoly of the match business in Poland in return for a loan to the Polish government. This was the first of numerous match monopolies obtained in return for government loans, by the help of which Kreuger and Toll's subsidiaries, numbering over 200, succeeded in obtaining over 75 per cent of the entire match business of the world.

In 1932, Kreuger committed suicide in Paris. The fact then transpired that, by accounting manipulations, convincing misrepresentations, and actual forgery, including that on a pseudo-issue of Italian government bonds, he had grossly deceived the principal bankers and investors of the entire world regarding the value of his companies. It is estimated that the trust reposed in him cost investors a total loss of over 500 million dollars.

Kronenberger, Louis (1904-), editor and critic, was born at Cincinnati and was educated in the local schools and at the University of Cincinnati. Following editorial work with publishers Boni & Liveright and Knopf, he joined the staff of *Fortune* and became dramatic critic for *Time.* He has lectured on the drama at Harvard, Princeton, Oxford, and other universities. He has edited several anthologies including *Best Plays* and *The Viking Portable Reader's Companion.* His reputation as essayist, already well established, has been enhanced by his latest book, *The Cart and the Horse* (1964).

Kropotkin (*krō-pŏt'kĕn*), **Peter Alexéievitch, Prince (1842-1921)**, Russian revolutionist and writer, was born at Moscow. At 15, he entered the corps of pages at Leningrad. After five years' service and exploration in Siberia, he returned to Leningrad in 1867 to study mathematics at the university while acting as secretary to the Russian Geographical Society. In 1871, he explored the glacial deposits of Finland and Sweden. In 1872, while on a visit to Belgium and Switzerland, he associated himself with the most extreme section of the International Working Men's Association. In 1874, after his return to Russia, he was arrested, but, in 1876, escaped to England. He was condemned at Lyons, in 1883, to five years' imprisonment for anarchism, but was released in 1886 and returned to England. His publications include *In Russian and French Prisons*; *The State, Its Part in History*; *Modern Science and Anarchism*; *Ideals and Realities in Russian Literature*; *The Conquest of Bread*; and *Terror in Russia.*

Kruger (*krū'gĕr*), **Stephanus Johannes Paulus, (1825-1904)** Boer statesman, was born in Colesberg in Cape Colony. With his family, he "trekked" to Natal, the Orange River Free State, and the Transvaal, and won such a reputation for cleverness, coolness, and courage that, in the war against England in 1881, he was appointed head of the provisional government. In 1883, he was elected president of the Transvaal, or South African Republic, and held that office as long as the Republic stood. "Oom Paul," as he was often called, was the soul of the policy that resulted in the Boer War of 1899-1902, in the prosecution of which he showed consummate resolution and energy. After the tide had fairly turned against the Boers, he went to Europe to seek alliances against Britain. He made his headquarters at Utrecht and thence issued *The Memoirs of Paul Kruger.* See *Boers.*

Krupp (*krōōp*), **Alfred (1812-1887)**, German ironmaster, was born at Essen, Prussia. He succeeded his father, Friedrich Krupp, who had founded a small iron forge at Essen in 1810. Krupp established the first Bessemer steelworks and the first forging hammer erected in Germany and was foremost in the technical development of the German iron and steel industry. The first steel gun manufactured by him, in 1847, was a 3-pounder muzzle-loader; in 1880, at the Düsseldorf Exhibition, he showed the first 100-ton steel gun. He acquired large mines and collieries and greatly extended his works at Essen. He supplied artillery to almost every European nation and was the recipient of many foreign orders and decorations.

Kundt (*kōōnt*), **August Adolf Eduard Eberhard (1839-1894)**, German physicist, was born at Schwerin. In 1866, he became instructor at the University of Berlin; in 1868, was made professor of physics at Zurich; and later taught at Würtzburg, at Strasbourg, and at the University of Berlin, where he succeeded Helmholz in the chair of experimental physics. He made notable researches on sound, discovering a method, named after him, of determining the velocity of sound in gases. He made elaborate investigations also on the dispersion of light, on the conduction of heat and the friction of gases, the electrical properties of crystals, the rotation of the plane of polarization in gases, and the optical characteristics of metals.

Kuroki (*kōō'rō-kē*), **Tamesada, Count (1844-1923)**, Japanese general, was born at Satsuma. He was a colonel on the Imperialist side during the Satsuma rebellion of 1877, distinguished himself in the war with China in 1895; and was promoted to the rank of general in 1903. He commanded the first army in the Russo-Japanese War, 1904-05, and was victorious at Yalu, Kiulienling, Liaoyang, Mukden, and Shaho. In 1906, he became inspector general of the Japanese army, and he subsequently made a tour of the United States. For his military services, he was made baron after the war with China and count after the war with Russia.

Kuropatkin (*kōō'rŏ-pät'kĭn*), **Alexei Nikolayevitch (1848-1921)**, Russian general, was born in the government of Pskov. After receiving an excellent education in the Russian military schools, he entered the army and distinguished himself in the war against the Bokharans. He served in the Russo-Turkish War; was governor of Transcaspia, 1890-98; and commander in chief of the Russian army for the period of the Russo-Japanese War. After his failure in this campaign, he was succeeded by General Linievitch, and, at his own request, was appointed to command the first Manchurian army. He commanded a Russian army group for a period of World War I and, in 1916, was made governor of Turkestan. He retired the next year and taught in a village school.

Kutuzov (*kōō-tōō'zôf*), **Mikhail, (1745-1813)**, prince of Smolensk, Russian field marshal, was born at Leningrad. He early entered the Russian army; distinguished himself in the Turkish wars; and, in 1787, was appointed governor general of the Crimea. After various other services, he was appointed, in 1805, to the command of the first army corps against the French. In that year, he was victorious over Marshal Mortier at Durrenstein. At Austerlitz, he was second in command of the allied army, of which Emperor Alexander was commander in chief. In 1811-12, he commanded the Russian army in the war against the Turks. Notwithstanding his advanced age, he succeeded Barclay de Tolly in 1812 as commander in chief of the army against the French and obtained a great victory over Davout and Ney at Smolensk.

Kyne, Peter Bernard (1880-1957), American author, was born at San Francisco. Educated in the public schools, he was successively a clerk, a lumber broker, and a newspaper man. He was captain of the 144th Field Artillery in World War I. Among his best-known works are *Cappy Ricks, The Valley of the Giants, The Pride of Palomar, Tide of Empire, Island of Desire, Comrades of the Storm,* and *Soldiers, Sailors and Dogs.*

Labouchere (*lăb'ōō-shâr'*), **Henry du Pré (1831-1912)**, British radical politician and editor, was born in London. He was educated at Eton, and, for a short time, attended Cambridge. After several years in the diplomatic service, he entered politics. From 1880 to 1905, he was a Radical member of the House of Commons, with Charles Bradlaugh as his colleague.

He began his journalistic career on the London *Daily News*, just before the Franco-Prussian War. He wrote *Letters of a Besieged Resident*, and sent them from Paris to the *Daily News* by balloon post during the siege. In 1876, he founded the London *Truth*, as a rival society paper to the London *World.* For many years it had a remarkable record in the exposure of various frauds.

In Parliament, where he was familiarly known as "Labby," he was the recognized jester of the House. Nevertheless, his pungent and frequently cynical speeches reflected

highly independent democratic convictions. He vigorously urged the abolition of the House of Lords. After 1903, he lived chiefly in Italy. He left a fortune valued at about ten million dollars.

Lacordaire (*là'kôr'dâr'*), **Jean Baptiste Henri, (1802-1861),** French preacher, was born at Recey sur Ource. He went to Paris to continue his legal studies, but in 1824 gave up law for theology. He was ordained priest in 1827 and became chaplain to the College Henri IV. He assisted Lamennais and Montalembert in editing *L'Avenir*, in which he taught that the people were supreme in civil life and the pope was supreme in religion. This combination of liberalism and Catholicism was denounced by the pope, and *L'Avenir* was given up.

In 1834, Lacordaire gave to students a series of "conferences" or lectures which attracted great attention and led the way to conferences in Notre Dame, Paris, in 1835-36. These had an immense appeal because they provided a bridge between religion and revolutionary zeal. In 1839, he entered the Dominican order, and, from 1843 to 1850, he continued his conferences at Notre Dame.

La Farge (*là färzh'*), **Christopher Grant (1862-1938),** American architect, son of John La Farge, the painter, was born at Newport, R. I. He studied at Massachusetts Institute of Technology and, in 1882, entered the office of H. H. Richardson in Boston. In 1883, he formed a partnership with G. L. Heins, practicing with him in Minneapolis and in New York from 1886 to 1910, when he became member of the firm La Farge and Morris. In collaboration with his partner he produced the designs for the Protestant Episcopal Cathedral of Saint John the Divine, New York, one of the most elaborate religious edifices in the New World. The firm designed many other churches, libraries, and mausoleums erected in various parts of the United States; also the buildings for the New York Zoological Park and the stations for the New York subway. In 1918, he served as assistant general manager of the United States Housing Corporation.

La Farge, John (1835-1910), American mural painter, was born in New York. He studied with Couture in Paris and with William Morris Hunt in Boston. In 1876, he was employed to execute the mural decorations of Trinity Church, Boston, and, in 1878, began glass painting and window designing. During an extended tour in 1886, he made many water color studies of native life and scenes in Japan and in the Pacific Islands. In 1887, he painted his fine altar piece in the Church of the Ascension, New York.

La Farge was a pioneer in mural painting and exercised great influence upon American art, particularly in the making of stained glass. In recognition of distinguished achievements, he was chosen, in 1904, one of the seven original members of the American Academy of Arts and Letters. Among his best paintings are "Christ and Nicodemus," Trinity Church, Boston; "The Three Kings," Boston Art Museum; "The Muse of Painting," Metropolitan Museum, New York; and "The Arrival of the Magi," Church of the Incarnation, New York.

His writings include *Considerations on Painting, Great Masters, The Higher Life in Art*, and *Reminiscences of the South Seas*. See *Painting*.

Lafayette (*là'fâ-yĕt'*), **Marie Jean Paul Roch Yves Gilbert Motier, Marquis de (1757-1834),** French general and statesman, descended from an ancient family of Auvergne, was born in the Castle of Chavagnac, now in the department of upper Loire. He became a soldier at an early age, and, in 1777, came to America to take part with the colonists in the war for independence.

The friendship of Washington exercised a great influence over the development of his mind and the formation of his opinions. The declaration of war between France and Britain gave him opportunity to aid the new republic in America and, following 1779, in France, where he was received with honor by the court and with enthusiasm by the people. He again came to America and was intrusted by Congress with the defense of Virginia, where he rendered important services.

Lafayette had imbibed liberal principles, and, on his second return to France, eagerly sought to promote a thorough reform in his native country. He was called to the assembly of notables in 1787, and was one of those who most earnestly urged the summoning of the States-General. He took part also in the movements which converted the assembly of the states into the National Assembly of 1789. He was very active in the proceedings of the assembly, and, being appointed to the chief command of the armed citizens, laid the foundation of the national guard and gave it the tricolor cockade.

The extreme French Republicans soon came to dislike Lafayette because he advocated a constitutional kingdom, and the court party, especially the queen, were displeased because of his zeal for the new order of things. After the adoption of the constitution of 1790, he retired to his estate of Lagrange until he received the command of the army of Ardennes, with which he won the first victories at Philippeville, Maubeuge, and Florennes. Nevertheless, the calumnies of the Jacobins rendered him exceedingly unpopular and he was accused of treason, but acquitted.

After several vain efforts to maintain the cause of national liberty, Lafayette left Paris for Flanders. He was taken prisoner by the Austrians and remained at Olmütz until Bonaparte obtained his liberation in 1797; but he took no part in public affairs during the ascendancy of Bonaparte. He sat in the Chamber of Deputies from 1818 to 1824 and from 1825 to 1830. In 1824, he revisited America by invitation of Congress, which voted him a grant of $200,000 and a township of land.

La Follette (*là fŏl'ĕt*), **Robert Marion, (1855-1925),** American lawyer and legislator, was born at Primrose, Wis. He was graduated at the University of Wisconsin in 1879; studied law; was admitted to the bar; and, in 1880, became district attorney of Dane County. He was a member of Congress from 1885 to 1891, and took a prominent part in framing the McKinley Bill. He was governor of Wisconsin from 1901 to 1905 and led the successful movement to nominate all candidates by direct vote. In 1905, he was elected United States senator and was re-elected in 1911, 1917, and 1923.

La Follette made important contributions toward railway regulation and other public reforms and came to be regarded as one of the ablest debaters in the United States Senate. In 1909, he established a weekly periodical known as *La Follette's Magazine*.

In March 1917, during the closing days of the 64th Congress, he led a historic filibuster against authorizing President Wilson to arm merchant ships against German submarines. After the entrance of the United States into World War I, he became a pronounced and conspicuous pacifist. To him chiefly was due the investigation disclosing the Teapot Dome lease irregularities of 1924. Later in the same year he was nominated for the presidency by the Progressive party and received nearly 5 million votes in the ensuing election. His writings include an *Autobiography*.

La Follette, Robert Marion Jr. (1895-1953), American politician, was born at Madison, Wis., a son of the preceding. After acting as private secretary to his father for six years, he was appointed in 1925 as United States Senator to succeed his father, who had died in that year. He was elected in 1928, 1934, and 1940 as a Progressive, and attracted attention as a leader of a liberal group within the Senate. In 1936, he was made head of a committee charged with investigating violations of civil rights and in that capacity prosecuted a thorough-going inquiry into industrial espionage. In 1946 he was chairman of a committee which prepared an act simplifying and strengthening the organization and procedure of Congress.

La Fontaine (*là'fôN'tân'*), **Henri (1854-1943),** Belgian jurist, the son of a banker, was born in Brussels. He was educated for the law at the University of Brussels. In 1889, he became secretary of the Belgian Peace Society; in 1892, head of the International Peace Bureau. He was made professor of international law in the University of Brussels in 1893. He served also from 1894 and 1936 in the Belgian Senate. In 1907, he was chosen president of the Interparliamentary Peace Congress at Bern. In recognition of his efforts to promote international peace, he was awarded, in 1913, the Nobel peace prize. He later represented Belgium at the League of Nations.

La Fontaine, Jean de (1621-1695), French poet and fabulist, was born at Chateau Thierry in Champagne. He early devoted himself to the study of the old writers and to verse making. In 1654, he published a verse translation of the *Eunuchus* of Terence and then went to Paris, where Fouquet awarded him a pension of 1000 francs for a piece of verse quarterly. His *Contes et nouvelles en vers* appeared in 1665, his *Fables* in 1668, and his *Amours de Psyché et de Cupidon* in 1669. The subjects of the *Contes* are taken from Boccaccio, Ariosto, Machiavelli, Rabelais, and other fabliau writers and the stories are retold with inimitable skill and wit. The *Fables*, or animal stories, are remarkable in that they appeal alike to children for their vividness, to students of literature for their skillful narrative, and to persons of mature experience for their subtle reflections on life.

Lagerlöf (*là'gĕr-lûf*), **(Ottilia Lovisa) Selma (1858-1940),** Swedish story-writer, was born at Marbacka, Vermland. In 1891, she produced her first book, *Gösta Berling's Saga*, which won immediate and notable success. Subsequent study in Italy resulted in *Miracles of Anti-Christ*; after a year's travel in Greece, Egypt, and Palestine, she finished her *Jerusalem* in 1902. In 1907, she completed *Nils Holgersson's Wonderful Journey through Sweden*, a children's classic in Swedish literature, now widely known in English as *The Wonderful Adventures of Nils*. For these successes the Swedish Academy awarded her its gold medal and Upsala University conferred upon her the degree of doctor of letters. In 1909, she received the Nobel prize for literature, and, in 1914, she was elected to the Swedish Academy—the first woman so honored. Her writings in-

clude also *Christ Legends, From a Swedish Homestead, Invisible Links, The Girl from the Marsh Croft, Further Adventures of Nils, Liljecrona's Home, The Legend of the Sacred Image, Matilda Wrede, Dunungen, The Emperor of Portugallia,* and *Men and Trolls.*

Lagrange (*lə'gränsh'*), **Joseph Louis, Count (1736-1813),** French mathematician, was born at Turin, Italy, of French parentage. He was educated in the college of his native city and, at the age of 19, became professor of mathematics in the Royal School of Artillery there. In 1764, he won a prize offered by the French Academy of Sciences for a *Theory of the Librations of the Moon.* In 1766, he was appointed by Frederick the Great to succeed Euler as director of the Berlin Academy of Sciences, a post which he held for 20 years. He then settled in Paris, where he remained during the Revolution. Afterward, he was patronized by Napoleon, who made him a count and a senator. He developed the theory of differential equations and was to a considerable degree responsible for the adoption of the decimal system in France. His most noted work was *Analytical Mechanics.*

La Guardia, Fiorello Henry (1882-1947), American politician, was born of Italian parentage in New York City. After serving at consulates in various European countries, 1901-06, and as interpreter at Ellis Island Immigration Station, 1907-10, he obtained a law degree at New York University and began the practice of law.

He served in the House of Representatives as a Republican in 1917-21 and 1923-32, where he sponsored legislation limiting labor injunctions and initiated an investigation into banking practices which led to new regulation of banks and security exchanges. Defeated for re-election in 1932, he was elected the next year as Mayor of New York City, on an anti-Tammany ticket. His re-election for a second four year term in 1937 was the first instance in the City's history of a "reform" administration surviving one term of the mayoralty. In 1940 he became head of the American members of the United States-Canada Defense Commission. He was director general of UNRRA, 1946. He wrote *The Making of an Insurgent,* an uncompleted autobiography.

Lalande (*lə'länd'*), **Joseph Jérôme Le-Français de (1732-1807),** French astronomer, was born at Bourg. He devoted himself to mathematics and astronomy with such success that, in 1751, the French Academy sent him to Berlin to determine the moon's parallax. He returned in 1752, was subsequently made astronomer royal, and, in 1762, professor of astronomy in the Collége de France. In 1795, he became director of the Paris Observatory. He constructed planetary tables which made possible important predictions. He also mapped 50,000 stars. His chief work is his *Treatise on Astronomy.*

Lamarck (*lə'märk'*), **Jean Baptiste Pierre Antoine de Monet de (1744-1829),** French naturalist and pre-Darwinian evolutionist, was born at Bazentin. At 16, he joined the French army in Germany. Stationed as an officer at Monaco, he became interested in the Mediterranean flora. After an injury, he resigned and held a post in a Paris bank, meanwhile pursuing the study of botany. In 1778, he published his *Flora of France.* In 1779, he became a member of the French Academy and keeper of the royal garden, afterward the nucleus of Jardin des Plantes, and here he lectured for 25 years on invertebrate zoology.

About 1801, Lamarck began to think about the origin of species, expressing his conclusions in his famous *Zoological Philosophy,* published in 1809. His *Treatise on Invertebrate Animals* appeared between 1815 and 1822. He sought to explain their transformations and thus account for the evolution of the animal world. While his views concerning the effects of use and disuse and upon the inheritance of acquired characters are not now considered tenable by most naturalists, he was the first to make a clear statement of the doctrine of evolution. He thus prepared the way for the now widely accepted theory of descent. See *Evolution, Organic.*

Lamb, Charles (1775-1834), English essayist and poet, the son of a clerk to one of the benchers of the Inner Temple, was born in London. He was educated at Christ's Hospital, where he was the schoolfellow and friend of Samuel Taylor Coleridge. From 1792 to 1825, he was a clerk in the accountant's office of the East India Company, retiring on a pension. During most of these years, and indeed up to the close of his life, he devoted himself, in a spirit of noble self-sacrifice, to the care of his sister Mary, who suffered from recurrent mania as a result of which she had killed her mother.

Lamb's earliest literary efforts were in verse. In 1807, he published, in conjunction with his sister, a series of *Tales from Shakespeare* and, in 1808, two volumes of *Specimens of English Dramatic Poets who lived about the time of Shakespeare,* with short but felicitous notes. On the establishment of the *London Magazine* in 1820, he began a series of essays, signed *Elia,* which are the chief foundation of his literary fame. Part of their charm consists of their fantastic humor and restrained pathos.

Lamont, Thomas William (1870-1948), American banker, was born at Claverack, N. Y. Graduating at Harvard in 1892, he was a reporter for the New York *Tribune* for a year and then entered banking. He was an officer of the Bankers Trust Co. and later of the first National Bank prior to 1911, in which year he was made a partner in the firm of J. P. Morgan and Co., becoming chairman in 1943. Lamont was usually the spokesman for this firm in its relations with the public. He served as financial adviser to the United States government at the Paris Peace Conference in 1919 and took an active part in the work of various conferences on German reparations.

Lancaster, Joseph (1778-1838), English educator, was born in London. At an early age, he served as a seaman, but motives of philanthropy impelled him to teach the children of the poor. When only 20 years of age and utterly untrained, he had 1000 pupils under his supervision. He was, however, enabled to accomplish remarkable results by his adoption and improvement of the monitorial system previously developed by Dr. Andrew Bell at Madras, later known as the Lancastrian system.

Following this system, pupils as they advance in their work become, under the direction of the master, instructors or monitors of those in the grades below. For a time this plan was very popular in England, the Netherlands, France, and Germany. Lancaster personally introduced his system into America, where it was adopted in New York, Philadelphia, Baltimore, and other cities. While long outgrown where originally established, the Lancastrian system has been used with success in Mexico and in South American countries.

Landis, James McCauley (1899-1964), American jurist and administrator was born of American parents in Tokyo, Japan. Educated at Princeton and Harvard universities, he was law clerk to Supreme Court Justice Brandeis in 1925. He then taught at Harvard until 1933, when he was appointed to the Federal Trade Commission and, a year later, to the Securities and Exchange Commission. Here he served with marked ability in the new and complex field of finance regulation until 1937, when he accepted the deanship of the Harvard Law School. He served on a number of important special assignments and as special examiner for the Department of Labor in 1939 to determine the deportability of Harry Bridges, labor leader, as a Communist. In 1942-43, he headed the Office of Civilian Defense and then was sent on an economic mission to the Middle East. He was chairman of the Civil Aeronautics Board, 1946-47. He wrote *Cases in Labor Law* and *The Administrative Process.*

Landis, Kenesaw Mountain (1866-1944), American jurist, was born at Millville, Ohio. Graduating at the Union College of Law, Chicago, he practiced in Chicago until 1905, when he was appointed federal district judge. His most celebrated decision was in an antitrust case in which he assessed a fine of 29 million dollars against the Standard Oil Company of Indiana. The decision was reversed, however, on appeal. In 1920, he was made arbiter of all disputes arising in the major baseball leagues, the various clubs agreeing to accept his decisions in lieu of litigation. He resigned his judgeship in 1922.

Landor, Walter Savage (1775-1864), English poet and prose writer, was born at Warwick. He studied at Oxford, where he won high reputation as a scholar. In 1808, he raised a body of men at his own expense and joined the Spanish patriots to fight against Napoleon, returning after the disaster of Cintra. In 1798, he wrote a poem called *Gebir,* which was followed by *Count Julian, Idyllia Heroica,* and *Imaginary Conversations of Literary Men and Statesmen.* He was a thorough classical scholar, and his Greek and Roman characters speak as we should expect the ancient heroes to have spoken. He is greater as a prose writer than as a poet; but, according to Emerson, nature meant him rather for action than for literature. "He has," says Emerson, "an English appetite for action and heroes."

Landseer, Sir Edwin Henry (1802-1873), English animal painter, was born in London. He was trained in sketching by his father and studied at the Royal Academy schools. His first notable work was "Fighting Dogs," exhibited in 1819. This was followed by the "Dogs of St. Gothard," the popularity of which was very great. For more than 30 years every London exhibition contained new successes from his brush. In 1831, he was elected a royal academician, and, in 1850, was knighted.

Among Landseer's most noted pictures are "High Life," "Low Life," "A Jack in Office," "The Old Shepherd's Chief Mourner," "A Random Shot," "A Distinguished Member of the Humane Society," "Dignity and Impudence," and "The Monarch of the Glen." He painted animals, especially the dog, in their relation to man and endowed them with human sentiments. This is the secret of the great popularity of his pictures.

Landsteiner, Karl (1868-1943), pathologist, was born in Vienna, Austria, and was graduated from the University of Vienna in 1891. He was professor of pathology at that institution from 1909 to 1919. Coming to the United States, he was made a member of the Rockefeller Institute, New York, in 1922. Landsteiner discovered that human beings are divisible into four groups on the basis of the nature of their blood. This fact is of great importance in connection with blood transfusions since a transfusion must be from a subject having the same type of blood as the patient if serious results are to be avoided. For this discovery he was awarded the Nobel prize for medicine in 1930. He conducted valuable researches also on syphilis, infantile paralysis, and the chemistry of immunity. His study of the blood of primates showed that there is a closer relation between the blood of man and of the ape than between the blood of the ape and the monkey.

Lane, Franklin Knight (1864-1921), American public official, was born near Charlotteton, P. E. I., Canada. He removed to California in early childhood and was educated at the University of California. At first he engaged in journalism and became editor of the Tacoma *Daily News*. He then studied law, was admitted to the bar in 1889, and practiced in San Francisco, where he was corporation counsel from 1897 to 1902. In 1905, he was appointed member of the Interstate Commerce Commission, of which he later became chairman.

In 1913, Lane entered President Wilson's cabinet as Secretary of the Interior. In this capacity he advocated conservation of coal lands. He gave special attention to the Indians, maintaining that perpetual tutelage is wrong. He also urged a policy of Americanization for the foreign population. In 1920, he resigned from the cabinet. In 1922 were published *The Letters of Franklin Lane*, edited by his wife, Anne Wintermute Lane, and by Louise Herrick Wall.

Lanfranc (*lăn'frăngk*) **(c. 1005-1089),** Italian churchman, was born at Pavia. His life story falls into two parts. From 1042 to 1066, he ruled a monastery at Bec, near Rouen, conducting a school which was famous throughout Europe; from 1070 until his death, he was archbishop of Canterbury and gave to the Church of England the form it largely retained until the Reformation.

Having conducted a Cathedral School for three years at Avranches, Lanfranc went to Bec and there taught logic and theology. His students came from all parts of Europe and many were leaders of the Church later. He wrote a defense of transubstantiation which became the classic statement of the doctrine during the middle ages. Lanfranc incurred a sentence of exile from William of Normandy for opposing William's uncanonical marriage with Mathilda in 1053. Becoming reconciled with William, however, he secured the pope's approval both of the marriage and of William's conquest of England in 1066.

William repaid his services by having him made Archbishop of Canterbury in 1070. He established the primacy of this see over that of York, laid down rules of celibacy for the English clergy, and secured church courts separate from those of the state. He replaced Saxon churchmen with Normans in important positions.

Lange, Christian (1869-1938), Norwegian pacifist. He became professor of history at the Norwegian Nobel Institute and secretary to the Nobel committee in the *Storthing*, or Norwegian Parliament. In 1907, he was the Norwegian representative to the Second Peace Conference at The Hague. He represented Norway in the League of Nations Assembly, and, in 1921, severely criticized the League Council for its inaction in regard to disarmament. His writings include many works, pamphlets, and articles for the promotion of peace among the nations. In 1921, jointly with his compatriot Hjalmar Branting, he was awarded the Nobel prize for peace.

Langland, William (c. 1332-?), English poet, was born probably near Malvern. He spent most of his life in London in poverty, a clerk and singer of masses for the dead in churches. The allegorical poem *The Vision of Piers Plowman*, attributed to him, contains much vigorous satire on the abuses of the church and the state and is one of the earliest and most eloquent cries from an oppressed people. Nothing is known of Langland except the supposed evidence in the text of the poem itself. Some consider it the work of several writers and regard Langland as a mythical author. See *Piers Plowman*.

Langley, Samuel Pierpont (1834-1906), American astronomer and physicist, was born at Roxbury, Mass. He was educated at Boston Latin School, studied in Europe, and worked for a time as architect and civil engineer. In 1865, he became assistant in astronomy at Harvard; in 1867, he was made director of the Allegheny Observatory; and, in 1887, was appointed secretary of the Smithsonian Institution. He made important solar observations, invented the bolometer, and established at Washington the Astrophysical Observatory and the Zoological Park.

Langley also made valuable researches in the dynamics of the air and developed the principles upon which successful airplanes were later constructed. In 1896, a motor-driven airplane, designed and built by him, made the first sustained flight on record, but his further experiments were not so successful. Congress voted him $5000 with which to carry out his plans, but criticism, ridicule, and the lack of proper support caused him to abandon his experiments when, as it appears now, he was on the verge of success. The correctness of his design of apparatus and of the fundamental principles upon which it was constructed are now recognized by aeronautical engineers. In proof of this, Glenn Curtiss, in 1914, after installing a more powerful engine in Langley's machine of 1903, made a successful flight with it. His writings include *The New Astronomy, Experiments in Aero-Dynamics*, and *Internal Work of the Wind*.

Langmuir, Irving (1881-1957), American chemist, was born at Brooklyn, N. Y. He was graduated from the Columbia School of Mines in 1903 and, in 1906, received the degree of doctor of philosophy from the University of Göttingen. He was instructor in chemistry in Stevens Institute of Technology from 1906 to 1909, when he became research chemist in the research laboratory of the General Electric Company at Schenectady, N. Y.

In this post he was engaged in the development of gas-filled tungsten lamps, electron discharge apparatus, condensation high vacuum pumps, and atomic hydrogen welding. During World War I, he experimented on devices for submarine detection. For his researches on chemical reactions at low pressures, he was awarded, in 1915, the Nichols medal. In 1932, he received the Nobel prize for chemistry, by which recognition was given to his founding of surface chemistry, referring to molecular phenomena taking place when a minute amount of one liquid is brought into contact with the surface of another liquid.

Lanier (*lă-nēr'*), **Sidney (1842-1881),** American poet, was born at Macon, Ga. He was graduated at Oglethorpe College, Ga., in 1860. During the Civil War, he served in the Confederate army. He then studied law and from 1868 to 1872 practiced in company with his father at Macon. His passionate devotion to music as well as to literature impelled him to give up the law. In 1873, he settled in Baltimore, where he joined an orchestra and delivered lectures on English literature. He formed a helpful friendship with Bayard Taylor, won recognition by his writings, and, in 1879, was appointed lecturer on English literature at Johns Hopkins University. His two most notable books are his *Science of English Verse* and *Poems*. Of his poems, "Corn" and "The Marshes of Glynn" are typical, realizing to a remarkable degree Lanier's conviction that poetry is language conjoined with music. He was elected to the American Hall of Fame in 1945.

Lankester (*lăng'kĕs-tĕr*), **Sir Edwin Ray (1847-1929),** English zoologist, was born in London. He was educated at Downing College, Cambridge, and at Christ Church, Oxford. He was professor of zoology, University College, London, 1874-90; professor of comparative anatomy, Oxford, 1891-98; and director of the natural history departments of the British Museum, 1898-1907. He became known particularly for showing the relation between extinct species of animals and those still existing. Among his numerous publications are *Comparative Longevity, Degeneration, The Advancement of Science, The Diversions of a Naturalist, Extinct Animals, The Kingdom of Man*, and *Secrets of Earth and Sea*. He also edited an extensive *Treatise on Zoology*.

Lansing, Robert (1861-1928), American administrator and lawyer, was born at Watertown, N. Y. He was graduated from Amherst College in 1886, was admitted to the bar in 1889, and practiced law at Watertown until 1907. He acted as counsel or representative for the United States in a number of arbitration proceedings, including those over the Alaskan boundary in 1903.

Lansing was made counselor for the Department of State in 1914 and, from June 1915 to February 1920, was Secretary of State in President Wilson's cabinet. He was a member of the American commission to the Peace Conference at Versailles, 1918-19. President Wilson asked for his resignation in 1920 on learning that, during the president's illness, Lansing had several times convened the cabinet. During 1923-25, Lansing was counsel for Chile in the Tacna-Arica Controversy. His writings include *The Peace Negotiations, The Big Four and Others of the Peace Conference*, and *Notes on Sovereignty*.

Lao Tzu (*lä'ô tsû'*) **(c. 604 B.C.-?),** Chinese sage, was a contemporary of Confucius. He spent much of his life as librarian to an emperor. He is the reputed founder of Taoism, one of the principal religions of China, which emphasized the importance of simplicity and the desirability of being free from the tyranny of passion and interests outside oneself. The basis of the religion is found in Lao Tzu's work *Tao Te King*, one of the sacred books of China.

Lapérouse (*là'pā'rōōz'*), **Jean François de Galaup, Count de (1741-1788)**, French navigator, was born near Albia. He entered the navy in 1756, fought against the English, and was made captain in 1780. In 1785, supplied with two well equipped ships and accompanied by scientists, he was placed in command of an expedition of general discovery. After exploring the west coast of the Americas from Cape Horn to Mount Saint Elias, he crossed the Pacific, discovered Necker Island northwest of the Hawaiian group, and found the passage between Sakhalin and Yezo, now called Lapérouse Strait. From the coast of Kamchatka he sent Lesseps, his interpreter, across Siberia to France with the records of the expedition. Turning south he landed at the Navigator Islands, touched at Tasmania, and was last seen at Botany Bay early in 1788. In 1828, a French expedition found that Lapérouse and his entire party had perished in shipwreck in the New Hebrides.

Laplace (*là'plăs'*), **Pierre Simon, Marquis de (1749-1827)**, French mathematician and astronomer, was born at Beaumont en Auge, Normandy. At 18 he went to Paris, where he attracted the notice of D'Alembert, through whose influence he was appointed professor in the Military School and admitted to the Academy of Sciences. He rapidly rose to distinction and became one of the foremost scientists of France. He was the author of the nebular hypothesis, and with Lagrange did much to verify Newton's theory. Next to Newton's *Principia*, Laplace's *Mécanique céleste* and supplements to it constitute one of the world's most valued contributions to science.

LaRochefoucauld (*là rôsh'fōō'kō'*), **François, Duc de (1613-1680)**, French moralist, was born at Paris. At an early age he joined the army and after some years of service became engaged in intrigues against Richelieu at the instance of the queen. He joined the Fronde and was wounded at the siege of Paris. In 1652, again wounded, he retired to the country. On Mazarin's death in 1661 he repaired to the court of Louis XIV. His celebrated *Réflexions ou sentences et maximes morales* appeared in 1665. For epigrammatic force, brevity, clearness, and finish of style these maxims, some 700 in number, have never been surpassed.

LaSalle (*là-săl'*), **René Robert Cavelier, Sieur de (1643-1687)**, French navigator and explorer, was born in Rouen. He came to America in 1666, and became a trader in furs and the possessor of a tract of land in Canada. After a voyage of exploration from Lake Erie to Lake Superior, he made his way down the Mississippi, being the first European to travel from the upper waters of this river to its mouth. He took possession of the land around the Gulf of Mexico, called it Louisiana in honor of the French king, and went to France to get men and means to colonize it.

LaSalle succeeded in sailing from France with four vessels. But quarrels arose between him and Beaujeu, the commander of the fleet, resulting in the return of the latter, with a part of the people, to France. With the remainder LaSalle kept on his way, but failed again to find the Mississippi, and wandered from place to place until nearly all his followers were dead. At last, giving up hope of reaching the land he was seeking, he set out for Canada with a small company in 1687. On the way two of the men shot him.

Laski, Harold Joseph (1893-1950), English economist, was born at Manchester. After he was graduated from Oxford University, he lectured at McGill University, Montreal, in 1914-16, and at Harvard University for the next four years. Returning then to England, he joined the faculty of the London School of Economics and was made professor of political science at the University of London in 1926. His interests, taking a socialistic bent, were set forth in numerous vigorously written works characterized by a realistic grasp of economic behavior. These include *Authority in the Modern State*, *Democracy in Crisis*, *The State in Theory and Practice*, and *The Rise of European Liberalism*.

Lassalle (*là'săl'*), **Ferdinand (1825-1864)**, founder of socialism in Germany, was born of Jewish parents in Breslau. He attended the universities of Breslau and Berlin, became a disciple of Hegel, took part in the revolution of 1848, and was sent to prison for six months. In 1861, his *System of Acquired Rights* started an agitation of labor against capital and he was again thrown into prison. On his release he founded an association to secure universal suffrage and other reforms. While he added little to the socialistic teachings of Marx, yet by his eloquence and fascinating personality he established modern socialism as a political force. He was killed in a duel, the result of a love affair.

Lassus (*lăs'sŭs*), **Orlandus di (c. 1532-1594)**, composer of Church music, was born at Mons, Belgium. When a choir boy in Mons he is said to have been taken by the viceroy of Sicily to Milan, where he remained some years. In 1557, he went to Munich and was organist in the court chapel from 1563 until his death. He was the forerunner of Palestrina, devoting his talents chiefly to the composition of sacred music in contrapuntal style. He was one of the most prolific composers in the history of music, the number of his known works exceeding 2000. The *Penitential Psalms of David* ranks as his finest work, and his influence on the development of Church music is second only to that of Palestrina.

Lathrop, Julia Clifford (1858-1932), American humanitarian, was born at Rockford, Ill. She was educated at Rockford College and Vassar College, from the latter of which she was graduated in 1880. Devoting herself to various reform movements, she made a special study of child welfare and of the care of the insane. From 1893 to 1909, she was a member of the Illinois State Board of Charities. Beginning with 1899, she spent much time as a voluntary resident of Hull House, Chicago, studying various civic and social problems. She was the first chief of the Children's Bureau in the Department of Labor, Washington, being appointed by President Wilson in 1912 and reappointed by President Harding. She worked with the Child Welfare Committee of the League of Nations. Her writings include numerous reports and articles on child welfare and the care of the insane.

Latimer, Hugh (c. 1490-1555), English bishop and martyr, was born at Thurcaston. He was educated at the University of Cambridge. In early life he was a zealous Catholic, but, being converted to Protestantism, he became an equally zealous champion of the Reformation and, in 1535, was made bishop of Worcester by Henry VIII. On the passing of the "Act of the Six Articles," he resigned the bishopric and was punished therefor by being imprisoned during the remainder of Henry's reign. The accession of Edward VI set Latimer at liberty and he began preaching anew, but refused to resume the miter. Shortly after Mary's ascent to the throne he was again imprisoned. In 1555, he was brought to the stake where he died with unshaken courage. Ridley was his fellow martyr.

Latrobe (*là-trōb'*), **Benjamin Henry (1764-1820)**, American architect and engineer, was born in Yorkshire, England. He studied architecture and, in 1789, was made surveyor of the public offices of London. In 1796, he came to the United States, was made engineer of the James River and Appomattox Canal, and superintended the building of the penitentiary in Richmond. He designed the Bank of Pennsylvania, the old Academy of Art, and the Bank of the United States, in Philadelphia. In 1803, he was made surveyor of public buildings in Washington, and advised concerning the plans of the Capitol, which he was engaged to rebuild after it was burned by the British in 1814. Latrobe was largely instrumental in introducing Greek forms into American architecture.

Lauder (*lô'dĕr*), **Sir Harry MacLennan (1870-1950)**, Scottish singer, was born at Portobello, near Edinburgh. When a boy, he was employed in a flax-spinning mill at Arbroath, and later he worked in the coal mines. He finally took to the variety stage, and became immensely popular for his Scottish songs, written and composed by himself and sung in character. His many tours throughout Great Britain, the United States, Australia, and New Zealand netted him a large fortune. During World War I he organized the "Harry Lauder Million Pound Fund for Maimed Men, Scottish Soldiers and Sailors."

Although Lauder was generally regarded as a comedian, his songs and characterizations include not only rollicking humor but also the tenderest tributes to home, love, and country. Among his numerous songs are "Roamin' in the Gloamin'," "Wee Hoose amang the Heather," "She's the Lass for Me," and "The Laddies Who Fought and Won." He wrote also *Harry Lauder at Home and on Tour*, *Harry Lauder's Logic*, *A Minstrel in France*, *Roamin' in the Gloamin'*, and a Scottish comedy.

Laughton, Charles (1899-1962), actor, producer, lecturer, and interpreter of the Bible and Shakespeare, was born in England. He served in the British army in France in World War I and was wounded shortly before the Armistice. While employed unwillingly at his father's work of hotel-keeping, he began serious preparation for a stage career. Prophetic of his later accomplishments was his winning of the Bancroft gold medal at the Royal Academy of Dramatic Art in London for reciting one of Falstaff's scenes from *The Merry Wives of Windsor*. As an actor on stage and screen, he was known especially for his performance of Henry VIII, Captain Bligh in *Mutiny on the Bounty*, Barrett in *The Barretts of Wimpole Street*, and Javert in *Les Miserables*. He was an American citizen and lived in California.

Laurier (*lô'rĭ-ā'*), **Sir Wilfrid (1841-1919)**, Canadian statesman, first French Canadian premier of the Dominion, was born in Saint Lin, Quebec. He was educated for the bar at L'Assomption College and at McGill University, and rose rapidly in his profession. In 1871, he was elected as a Liberal to the Quebec provincial assembly, and, in 1874, he was elected to the Federal Assembly. His high personal character, his loyalty and attachment to the connection of Canada with Great Britain, together with the great

oratorical powers which earned for him the title "silver-tongued Laurier," soon gave him high rank in the Liberal party.

On the retirement of Blake in 1887, Laurier was chosen leader of the Liberal party, and, at the general election of 1896, he led his followers to victory. In 1900, he again secured the approval both of the Dominion and of the British Empire by the prompt dispatch of Canadian troops to aid the mother country in South Africa, and led his party to another triumph at the polls. He was returned to power in 1904 and again in 1908 but was defeated in the elections of 1911 on the issue of reciprocity with the United States.

Laurier's premiership was notable for transcontinental railway building, development of agriculture, expansion of trade, and promotion of close relationship with Great Britain, while constantly increasing Canadian initiative. He also labored zealously to establish good relations between the two races in Canada and between Canada and the United States.

Lausche, Frank J. (**1895-**), American statesman, was born at Cleveland, Ohio. After he was graduated from the John Marshall Law School in 1920, he practiced law in Cleveland until 1932. He then served as judge of the Municipal Court (1932-35) and judge of the Common Pleas Court (1935-41) and was mayor of Cleveland from 1941 to 1944. A Democrat in politics, Lausche was governor of Ohio in 1945 and 1946 and 1949-57. In 1956 he was elected to the United States Senate.

Laval, Pierre (**1883-1945**), French statesman, was born at Chateldon. Elected as a Socialist to the Chamber of Deputies in 1914, he served in the army during World War I, returning to the legislature in 1924. He left the Socialist party and, in 1925, held his first cabinet post, the Ministry of Public Works. He was prime minister, 1931-32, leading a conservative government. He blocked a proposed customs union between Germany and Austria and agreed to the settlement which in the event, ended German reparations payments. Imports were restricted in a vain attempt to ward off the effects of the world-wide economic depression.

In the period preceding the outbreak of war with Germany in 1939 he was an advocate of appeasement to Hitler, whose rise appeared to him to be a bulwark against radical tendencies in society. His policy thus prepared for his selection as vice premier in the emergency government of Pétain which negotiated surrender of a large part of France to Germany in 1940. Pétain dismissed him because of his pro-German policy, but was forced to hand over authority to him in 1942. When France was liberated in 1944, he retired to Germany and later to Spain. From there he was returned and was subsequently tried and executed.

Lavedan (*läv'dăN'*), **Henri Léon Emile** (**1859-1940**), French dramatist and novelist, was born at Orleans. He was educated at Orleans and later studied law at Paris. Lavedan is at his best in character portrayal, the finest examples of which are found in *The Prince d'Aurec*, his best-known play, in *The Latest Fad*, and in *The Marquis de Priola*. He wrote some 15 plays, of which *The Duel* and *Sire* have been presented in the United States by Otis Skinner. Lavedan was elected to the French Academy in 1898.

Laveran (*läv'răN'*), **Charles Louis Alphonse** (**1845-1922**), French physician, was born in Paris. He was educated in military medicine at Strasbourg and, in 1873, became professor at Val de Grace. In 1878, he went to Algeria to study malarial fevers, returning in 1883 to Val de Grace, where he was professor of military hygiene until 1894. He then entered the medical service of the army and later became head physican at the Lille Hospital and a member of the French Academy of Medicine. In a treatise on fevers, published in 1884, he announced the important discovery of the blood parasite of malaria, for which service he was awarded the Bréant prize. In 1907, he received the Nobel prize for medicine.

Lavoisier (*läˈvwäˈzyā'*), **Antoine Laurent** (**1743-1794**), French chemist and one of the founders of modern chemistry, was born at Paris, France. He was carefully educated at the Collège Mazarin. In 1766, he received the prize offered by the French Academy of Sciences for the best and cheapest means of lighting city streets, and, two years later, he was admitted to the Academy. In 1769, he was appointed farmer-general of revenue.

Lavoisier's entire scientific career is marked by his use of the experimental, inductive method. From mineralogy he turned his attention to chemistry about 1770. After four years, he published *Physical and Chemical Essays*, in which he described his own theory of combustion, the destined center of modern chemistry. It had been believed that bodies decomposed upon combustion and that a substance termed phlogiston was released from them. Lavoisier determined by precise, unwearied experimentation that, in all cases of combustion, the one real combustible substance receives an addition, and that the matter with which it combines is, in all instances, "vital air," termed today oxygen.

In 1776, Turgot, then minister of finance, engaged Lavoisier to superintend the manufacture of gunpowder for the government. In 1778, Lavoisier announced the great discovery "that the respirable portion of the atmosphere is the constituent principle of acids," which he named oxygen. Plenteous riches afforded Lavoisier unlimited instrumental aid, and he generously extended similar advantages to others. His house soon became a point of general resort for the philosophers of Europe and brought into communication men engaged in many different branches of science.

With Lavoisier's *Method of Chemical Nomenclature*, published in 1787, phraseology in the chemical sciences assumed precision. He synthesized his scientific views into a connected system, which appeared in 1789 under the title *Elementary Treatise on Chemistry*. He then began researches looking toward the application of pneumatic chemistry to the science of medicine.

Lavoisier also served the government in various capacities. He improved the methods of agriculture on scientific principles; took an active part in the preparation of the metric system; and formed a plan for simplifying the collection of taxes. After the Revolution, this connection with the government was the occasion of his indictment in 1794 before the Revolutionary tribunal. Condemned to the guillotine, he was executed on May 8, 1794.

Law, Andrew Bonar (**1858-1923**), British statesman, was born in New Brunswick, Canada. Taken to Scotland as a boy, he later acquired there a substantial fortune as an iron merchant. Entering politics at the age of 40, he rose to be leader of the Unionist party in the House of Commons by 1911. He was a member of the cabinets of both Asquith and Lloyd George during World War I and, on the retirement of Lloyd George in 1922 as head of the coalition government, became prime minister. He resigned a few months later owing to failing health.

Lawrence, Abbott (**1792-1855**), American merchant and philanthropist, was born at Groton, Mass. In partnership with his brother Amos, he acquired a large fortune, a part of which was invested in the cotton factories of Lowell and Lawrence. He was member of Congress, 1835-37 and 1839-40. In 1842, he was chosen one of the commissioners to settle the northeast boundary question with Great Britain. He founded the Lawrence Scientific School at Harvard University.

Lawrence, David (**1888-**), American journalist, was born at Philadelphia, Pa. After he was graduated from Princeton in 1910, he joined the Washington staff of the Associated Press. From 1916 to 1919, he was Washington correspondent of the New York *Evening Post*, and from 1919 to 1933 president of the Consolidated Press Association. He was founder and editor of *The United States Daily* (1926-33), *United States News* (1933-48), and *World Report* (1946-48). Since 1948 he has been president and editor of the weekly publication *United States News and World Report*. His dispatches on national and international affairs are syndicated to more than 250 newspapers. He has written a number of books, including *Nine Honest Men* and *Diary of a Washington Correspondent*.

Lawrence, David Herbert (**1885-1930**), English novelist, was born at Eastwood and was educated at the University of Nottingham. His early books, *The White Peacock* and *Sons and Lovers*, gave evidence of great force and originality as well as a rare artistry in diction. A growing preoccupation with the mysteries of sex is evident in *Women in Love*, *The Lost Girl*, and *Lady Chatterley's Lover*. Lawrence was essentially a mystic and a poet, and the wizardry of a transcendent beauty plays over his descriptive passages, notably in his *Sea and Sardinia*, *Mornings in Mexico*, and *England, My England!*

Lawrence, Ernest Orlando (**1901-1958**), American physicist, was born at Canton, S. D. Educated at the universities of South Dakota, Minnesota, Chicago, and Yale, he taught at Yale University from 1925 to 1928. He then joined the staff of the University of California, becoming director of its radiation laboratory in 1936. His researches into the structure of atoms, the transmutation of atoms, and applications of radiation to medicine brought him the award of the Nobel prize in physics for 1939 and the Fermi award in 1957. He was made professor of physics at the University of California in 1930.

Lawrence, James (**1781-1813**), American naval officer, was born at Burlington, N. J. In the war with Tripoli, 1804, he served under Commodore Decatur. By brave conduct, he rose successively to the command of the *Argus*, the *Vixen*, the *Wasp*, and the *Hornet*. In 1813, after a short engagement, he captured the British brig-of-war *Peacock* and afterward was made commander of the frigate *Chesapeake*. In June 1813, he met the British frigate *Shannon* just out of Boston, and, after a hard fight, he was mortally wounded and his ship was captured. Here he uttered the

words, "Don't give up the ship!", which became a motto in the navy.

Lawrence, Sir Thomas (1769-1830), English portrait painter, was born in Bristol. He succeeded Sir Joshua Reynolds in 1792 as first painter to King George III. From 1820 until his death, he was president of the Royal Academy. He painted portraits of nearly all the monarchs and other notable personages of Europe. His pictures are distinguished by thoroughly refined taste and great technical perfection. See *Painting*.

Lawrence, Thomas Edward (1888-1935), British adventurer and scholar, was born in Wales. Graduating at Oxford University in 1910, he made a tour of Syria on foot, learning the Arabic language and becoming familiar with Arab habits. He then assisted in archeological explorations in Iraq until 1914, when he joined the British intelligence service in the Near East. When Turkey entered World War I as an ally of Germany, Lawrence was sent to stir up the Arabs to revolt against Turkey. By the confidence he inspired in the chieftains and the success he achieved in harassing or openly attacking the Turkish forces, Lawrence became a legendary figure. He entered Jerusalem ahead of Allenby in the final Turkish defeat. At the Versailles Peace Conference he sought vainly to obtain independence for the Arabs. Failing, he refused knighthood from the king and went into retirement to write his memoirs, which were published later as *The Seven Pillars to Wisdom*. To avoid publicity, he enlisted under the name of T. Shaw as a mechanic in the air force. He was killed in a motorcycle accident, in which he avoided running over a child.

Layard (*lā'ärd*), **Sir Austen Henry (1817-1894),** English archeologist and diplomat, was born in Paris. He spent his boyhood in Italy and developed a taste for travel. Journeying along the Tigris in 1840, he was struck with the ruins of Nimrud, the supposed site of Nineveh. In 1845-47, he carried on excavations there, finding the remains of ancient buildings. Many large stone slabs covered with bas-reliefs and cuneiform inscriptions together with gigantic winged human-headed bulls and lions, were unearthed and sent by Layard to the British Museum, London. In 1852, he became a member of Parliament; in 1869, he was made British ambassador to Spain; and, from 1877 to 1880, he was ambassador to Turkey.

Lea (*lē*), **Henry Charles (1825-1909),** American author and ecclesiastical historian, was born at Philadelphia. He received a private education and engaged in the publishing business from 1843 to 1880. He then retired and engaged in literary and historical research, rising to foremost rank among modern Church historians. His collection of books and manuscripts, the finest of its kind in the world, was bequeathed to the University of Pennsylvania. In recognition of his distinguished work, he was, in 1908, made member of the American Academy of Arts and Letters.

Lea's historical works include *Superstition and Force*, *A History of the Inquisition of the Middle Ages*, and *The Inquisition of the Spanish Dependencies*.

Leacock, Stephen Butler (1869-1944), Canadian humorist and economist, was born at Swanmoor, England. He was educated at the University of Toronto and the University of Chicago. He taught in Upper Canada College and in the University of Chicago prior to 1904, when he became head of the department of economics at McGill University, Montreal. His publications include *Elements of Political Science*, biographies of Charles Dickens and Mark Twain, *Too Much College*, and *How to Write*. His humorous works, characterized by grotesque and surprising exaggeration, include *Behind the Beyond*, *Moonbeams from the Larger Lunacy*, and *College Days*.

Leahy, William Daniel (1875-1959), American naval officer, was born at Hampton, Iowa. He was graduated from Annapolis and was promoted through grades to rear admiral in 1930. He was made admiral in 1936 and became chief of naval operations in 1937. Retiring in 1939, he was made governor of Puerto Rico and later was sent as ambassador to the French government at Vichy. In 1942 he was made chief of staff to the commander in chief. In 1944 he was promoted to admiral of the fleet.

Leakey, Louis S. (1903-), anthropologist, was born at Kabete, Kenya. An Oxford graduate, he has given special attention to paleontology. He has been secretary and later president of the Pan-African Congress on Prehistory. His recent investigations, resulting in the discovery of *Zinjanthropus*, earliest known specimen of the human species, is considered epoch-making. He has written many accounts of the stone age culture, the Kikuyu language, and the Pleistocene period in Africa. His book *Adam's Ancestors*, which first appeared in 1934, was revised in 1953.

Lebrun (*lē-brŭn'*), **Albert (1871-1950),** president of France, was born near Mercy-le-Haut, Lorraine. An engineer by training, he was elected to the Chamber of Deputies in 1900 and to the Senate in 1920, serving in several ministries. He became president of France in 1932 and remained in office until the Third Republic was overthrown in 1940. In October, 1944, he formally resigned.

Lebrun, Charles (1619-1690), French historical painter, was born in Paris. For 40 years he exercised a dominating influence in French art, being considered the founder of the French school of painting. He was director of the Gobelins Tapestry Works, and was employed in the decoration of Versailles. Many of his works are in the Louvre.

Lecky (*lĕk'ĭ*), **William Edward Hartpole (1838-1903),** British historian and philosopher, was born near Dublin, Ireland. He was graduated at Trinity College, Dublin, in 1859. In 1861, he published anonymously *The Leaders of Public Opinion in Ireland*, four brilliant essays on Swift, Flood, Grattan, and O'Connell. In 1865, his *Rationalism in Europe* created a marked impression on the literary world for its erudition and profundity. This was followed by other historical works which gained him literary eminence. Among his chief works are *History of European Morals*, *History of England in the 18th Century*, *The Political Value of History*, and *Democracy and Liberty*.

Le Conte (*lē kŏnt'*), **Joseph (1823-1901),** American geologist and physicist, was born in Liberty County, Ga. He was graduated at Franklin College, University of Georgia, in 1841 and at the New York College of Physicians and Surgeons in 1845, and practiced his profession at Macon, Ga. In 1850, he went to Harvard, where he studied under Agassiz. He subsequently held several professorships and, in 1869, became professor of geology and natural history in the University of California. He developed the theory that mountains are formed by lateral pressure as the earth shrinks. He did much to popularize the study of this science in America. Among his chief works are *Religion and Science*, *Elements of Geology*, *Sight*, *A Compend of Geology*, and *Evolution*.

Le Corbusier (1887-), architect, painter, and city planner, was born Charles-Edouard Jeanneret-Gris in the French-speaking part of Switzerland. In partnership with a cousin, Pierre Jeanneret, he experimented with ribbon windows, exterior spiral staircases, extensive use of glass and concrete, asymmetrical façades and other new kinds of construction. Le Corbusier thinks of a house as a functional unit and of a city as an efficient group of buildings utilizing the materials of city planning, "which are sky, space, trees, steel and cement, in this order." His book, *Towards a New Architecture*, contains many ideas which were new at the time concerning uses of concrete. Other works by him are *Urbanisme* (The City of Tomorrow) and *New Worlds of Space*.

Lee, Henry (1756-1818), American general, familiarly known as "Light Horse Harry," was born in Virginia. He was one of the most daring, vigilant, and successful cavalry officers on the side of the colonists. "Lee's legion" was probably the most effective and courageous body of troops raised in America. In the famous retreat of Greene before Lord Cornwallis, it formed the rear guard, the post of honor, and covered itself with glory. At the battles of Guilford Courthouse and Eutaw Springs, Lee particularly signalized himself. After the war, he was sent to Congress as a delegate from Virginia. He advocated the adoption of a federal constitution, and, in 1792, was chosen governor of Virginia. When Washington died, Lee was chosen by Congress to write a eulogy of him; in it occur the famous words, "First in war, first in peace, and first in the hearts of his countrymen."

Lee, Richard Henry (1732-1794), American patriot and signer of the Declaration of Independence, was born in Virginia, and was educated in England. He returned to America in 1752, and, at the age of 25, was chosen a delegate to the House of Burgesses, where he soon distinguished himself by his powers in debate. In 1766, he was appointed to draft an address to the king and a memorial to the House of Lords, which are among the best state papers of the period.

Lee's efforts in resisting the various encroachments of the British government were indefatigable, and, in 1774, he attended the first Continental Congress at Philadelphia as a delegate from Virginia. The memorial of Congress to the people of British America and the second address of Congress to the people of Great Britain were from his pen. In June 1776, he introduced the measure that declared the colonies free and independent states and supported it by a speech of the most brilliant eloquence. He was a member of the convention which adopted the present Constitution of the United States and was one of the first senators under it. In 1792, he retired from public life.

Lee, Robert Edward (1807-1870), American general, son of Henry Lee, was born in Westmoreland County, Va. At 18, he entered West Point, was graduated second in his class in 1829, and received a commission in the corps of engineers. During the Mexican War, he was repeatedly promoted for distinguished services, first at Cerro Gordo,

again at Churubusco, and finally at Chapultepec. From 1852 to 1855, he was superintendent of the United States Military Academy and greatly improved its efficiency. His next service was as cavalry officer on the Texan border, 1855-59. At the John Brown raid he was ordered to Harpers Ferry to capture the insurgents. He was in command in Texas in 1860, but was recalled to Washington in March 1861, when seven states had formed the Southern Confederacy.

In April 1861, Colonel Lee sent in his resignation, and, within two days, he was made commander in chief of the military forces of Virginia. At Richmond he superintended the defense of the city until the autumn, when he was sent to oppose General Rosecrans in West Virginia. In the spring of 1862, he was working at the coast defenses of Georgia and South Carolina, but on McClellan's advance was summoned to Richmond. General J. E. Johnston, chief in command, was wounded at Seven Pines in May and Lee was put in command of the army around Richmond. In the Seven Days' battles around Richmond, he defeated McClellan's purpose.

His successes against McClellan in the peninsular campaign led Lee to invade Maryland. This advance was checked by McClellan at the battle of Antietam in September 1862. Lee then withdrew to Virginia, followed somewhat later by the Union forces. Defeating Burnside's larger army at Fredericksburg in December 1862 and outgeneraling Hooker's superior forces at Chancellorsville in May 1863, Lee once more determined to invade the North. Attacking the Union army under General Meade at Gettysburg, Pa., in a terrific three days' battle, in July 1863, Lee was decisively defeated, but conducted his shaken army safely back to Virginia. Here he devoted himself mainly to defensive operations until attacked, in May 1864, by Grant's superior armies. Temporarily staying the Union advance in the desperate conflicts of the Wilderness, Spottsylvania, and Cold Harbor. Lee was at length forced into the defenses of Richmond. Here he withstood siege until April 1865, when he was compelled to abandon the Confederate capital. He made an attempt to join forces with General J. E. Johnston in North Carolina but failed. On April 9, 1865, Lee surrendered his army to General Grant at Appomattox Courthouse, Virginia, and the war was practically ended.

Lee frankly accepted the result, and, although deprived of his former property at Arlington on the Potomac, he declined proffers of pecuniary aid and accepted the presidency of Washington College, now Washington and Lee University, at Lexington, Va., at whose head he remained until his death. He was buried in the college chapel, his tomb being marked by a recumbent effigy; elected to the American Hall of Fame, 1900. See *Civil War, American*.

Leeuwenhoek (*lā'vĕn-hōōk*), **Antony van** (**1632-1723**) Dutch microscopist and naturalist, was born at Delft. Although without technical education, he was possessed of funds which enabled him to devote himself to the manufacture of lenses and to the study of the minute structure of plants and animals by means of the microscopes which he constructed. The excellent quality of his lenses and his own remarkable powers of observation enabled him to make many interesting discoveries.

In 1674, he discovered and described the red corpuscles of the blood, which he noted were circular in man but oval in frogs and fishes. In 1677, he described and illustrated spermatozoa though the actual discovery is credited to his pupil, Ludwig Hamm. In 1680, he detected in yeast what are now known as yeast plants. By revealing the true life history of various low forms of animal life, he did much to disprove Aristotle's doctrine that these could be generated spontaneously.

Le Gallienne (*lē găl'ĭ-ĕn'*), **Eva** (**1899-**), American actress, producer and manager, was born in London, England, the daughter of Richard Le Gallienne. She made her London debut at the Prince of Wales Theater in *The Laughter of Fools*, 1915, and her New York debut in 1916 in *The Melody of Youth*. Ten years later she founded the Civil Repertory Theater in New York. She acted with great distinction in Molnar's *Liliom*, Schnitzler's *Call of Life*, and Ibsen's *Master Builder*. Among plays which she produced and acted in were *The Cherry Orchard, Peter Pan, Twelfth Night, Romeo and Juliet*, and *Alice in Wonderland*.

Le Gallienne, Richard (**1866-1947**), poet and essayist, was born in Liverpool, England. He was educated at Liverpool, entered business, but, after seven years, abandoned it for literary pursuits. He became literary critic for the *Star* and for a time lived in London. In 1902, he took up his residence in New York. Among his numerous writings are *My Ladies' Sonnets, Volumes in Folio, The Book-Bills of Narcissus, The Religion of a Literary Man, The Quest of the Golden Girl, If I Were God, Little Dinners with the Sphinx, Vanishing Roads and Other Essays, Love Letters of the King, Omar Repentant, From a Paris Garret*, and *Modern Book of English Verse*.

Léger, Alexis St. Léger (**1887-**), French poet, was born on an island near Guadeloupe. He entered the French foreign service in 1914, was stationed at Peiping 1917-21, and served as expert on Asia at the Washington Conference of 1922. Having served for ten years under Aristide Briand, he became general secretary of the ministry of foreign affairs in 1933. He escaped to America after the fall of France in 1940 and, through Archibald MacLeish, he obtained employment at the Library of Congress. Since then he has continued to live in the United States, although his French citizenship, which had been revoked by the Vichy government, was restored after the liberation of France. Among his writings are *Eloges, Anabase, Exil*, and *Vents*. Most of his poems have been translated into English. In 1960 he was awarded the Nobel Prize for literature. His pseudonym is St. John Perse. He does not identify himself with any particular school, but has been called a follower of Rimbaud.

Leibnitz (*līp'nĭts*), **Gottfried Wilhelm von** (**1646-1716**), German philosopher and mathematician, was born at Leipzig. He learned Greek and Latin at the School of Saint Ncholas and, at the age of 15, he entered the University of Leipzig, where he devoted himself to philosophy, literature, jurisprudence, and mathematics. He received his bachelor's degree in 1663, when he presented a thesis *On the Principle of Individuation*. In 1666, he published his *Treatise on the Art of Combination* and received his degree as doctor of laws at Altdorf University. These works laid the foundation for a theory he later developed, that the ultimate elements of the universe are monads, or centers of force, ranging in complexity from the simplest to the highest, which is God.

Leibnitz became councilor of state at Frankfort in 1667, and later was appointed to the bench of the upper court of appeals there. His time was divided between philosophical jurisprudence, theology, mathematics, and physics. In 1672, he submitted to Louis XIV the essay *Egyptian Project*, containing a plan for the invasion of Egypt. In Paris, Leibnitz became associated with that critical period of mathematical research which, dating from the geometry of Descartes, was to culminate four years later in his own discovery of the infinitesimal calculus. Public business took him in 1673 to London, where he made the acquaintance of the founders of the Royal Society, among them, Newton.

Leibnitz entered the service of the Duke of Brunswick at Hanover and, in 1676, was made privy councilor and librarian. He rearranged and enriched the famous Wolfenbüttel library, and he took an active part in negotiations for Church union between Protestants and Catholics, as is evidenced by his *System of Theology*. Leibnitz was the chief organizer and first president, in 1700, of the Academy of Sciences at Berlin. He originated projects for the establishment of similar bodies at Dresden, Vienna, and Leningrad.

In 1704, Leibnitz wrote an examination of Locke's philosophy. Six years later he published, in French, *Theodicy*, which seeks to prove that this is the best of all possible worlds. The fragment *Monadology*, in which he developed his system of metaphysics, belongs to the year 1714. A controversy with Newton concerning the discovery of the differential calculus embittered his later years, though there is little doubt that Newton's method of fluxions and Leibnitz's method of infinitesimals were independent and original discoveries.

Leibnitz is one of the most extraordinary examples of universal scholarship in intellectual history. He was eminent in languages, history, divinity, philosophy, political studies, experimental science, mechanical science, and even belles-lettres. He was perhaps the first among modern philosophers to read the literature of opinion in an eclectic spirit and to recognize the mutual relations of the different systems.

Leighton (*lā'tŭn*), **Frederick, Lord** (**1830-1896**), English historical painter, was born at Scarborough. His early years were spent in the study of art under eminent masters in Rome, Florence, Frankfort, Paris, and Brussels. His famous picture "Cimabue's Madonna Carried in Triumph through the Streets of Florence" was first exhibited at the Royal Academy in 1855 and was at once purchased by the queen. Among his chief paintings are "Ariadne," "Hercules Wrestling with Death," "Captive Andromache," "The Harvest Moon," "Helen of Troy," "Romeo and Juliet," "Bath of Psyche," and "Wedded." His "Lachrymae," "Lucia," and "An Odalisque" are in the Metropolitan Museum, New York. In 1878, he became president of the Royal Academy, was made a baronet in 1886, and was raised to the peerage in 1896, a few days before his death.

Lemaître (*lē-mâ'tr'*), **François Elie Jules** (**1853-1914**), French critic and dramatist, was born at Vennecy. He began his active life as a teacher at Havre in 1875, became professor at Grenoble in 1883, and, at 31, went to Paris, where he became a dramatic critic. His *Impressions of the Theater* and *Contemporaries* contain his widely known articles on criticism. His first drama, *The Woman Who Revolted*, appeared in 1889, after which he wrote several social dramas of a high order, the best of which are *The*

Pardon and *The Studio Assistant*. In 1895, he was elected to the French Academy.

Lemnitzer, Lyman L. (**1899-**), military leader, was born at Honesdale, Pa. His West Point training was supplemented by studies of coast artillery, tactics, and other subjects. He was on the staff of General Eisenhower in Europe, and in Korea he commanded the 11th Airborne and 7th Infantry divisions. He became chairman of the Joint Chiefs of Staff in 1960, and in 1962 he was made commander of NATO forces, succeeding General Norstad.

Lenbach (*lĕn'bäĸ*), **Franz von** (**1836-1904**), German portrait painter, was born at Schrobenhausen. He studied art at the Polytechnic School in Augsburg and under Graefle and Piloty at Munich. Between 1863 and 1868, he spent much time in Italy, where he made numerous copies of old masterpieces.

Lenbach then devoted himself exclusively to portraiture. His long series of portraits includes the greatest Germans of his generation and constitutes a pictorial epic of his age and country. His widely known portraits of Bismarck, Moltke, William I, Liszt, Helmholtz, Wagner, and Mommsen are examples of his individual style.

Lenin (*lyĕ'nĕn*), **Nicolai** (**1870-1924**), Russian revolutionary leader and statesman, was born at Ulyanovsk. His true name was Vladimir Ilich Ulianof. His elder brother was hanged for the attempted assassination of the czar, an event which was a determining factor in his life. Lenin studied law at Kazan and Leningrad, where he became familiar with the works of Karl Marx. In 1895, he organized the union for the liberation of the working class. He was arrested, imprisoned for a year, and spent 1907–10 as an exile in Siberia. There he met and married Nadezhda Konstant Skrupskaya. He also wrote *The Development of Capitalism in Russia*.

Years of Wandering. In 1900, Lenin went to Switzerland, where he began editing *The Spark* (*Iskra*). Its purpose was to create an underground party, whose members would lead the working classes of Russia in overthrowing the Russian government. The Social Democratic party accepted in 1903 this program of the dictatorship of the proletariat, but a split occurred between the opportunists, or Mensheviks, and the direct action group, or Bolsheviks, the latter being led by Lenin.

Lenin returned to Russia in 1905 to take advantage of an uprising against the government, but the revolt was quickly suppressed. When World War I broke out in 1914, Lenin began working for an international revolution rather than only a Russian one. The czar was deposed in 1917. Immediately Lenin took train to Russia, the German government cooperating on the theory that his influence would weaken Russia. His party, changing its name from Social Democratic to Communist, promised to divide up the landed estates for the peasants, thus winning their support. On Oct. 27, 1917, Lenin proclaimed the dictatorship of the proletariat and seized the government. Industry and trade were nationalized. A new economic system began to be created.

Rule over Russia. Meanwhile Lenin was surrounded by armed foes. Germany exacted from Russia much territory by the treaty of Brest-Litovsk, which Lenin signed in the expectation that a revolution would shortly follow in Germany. This expectation failed, despite Germany's defeat, and the Allies supported civil revolts against the new government. Lenin then turned his full attention to industrializing the country, although he was obliged to countenance private trade for a while under a so-called "new economic policy." His health began to fail in 1922 and for a year before his death he was paralyzed and unable to speak.

Lenin combined to a rare degree intellectual vigor and fearless resolution. Appreciating art and literature, he subordinated their enjoyment to the ideal of making them universally accessible. The success of his party was due to his powerful opposition alike to those who favored compromise with the capitalist class and those who favored anarchic but ineffective violence.

His embalmed body is housed in a magnificent monument on the Red Square, Moscow. Visible to the public, it is reverenced as the remains of the founder of Soviet Russia. See *Bolsheviki*.

Leo XIII (**1810-1903**), pope, Giocchino Pecci, son of Count Lodovico Pecci, was born at Carpineto, in the Papal States. He was educated at the Collegio Romano and the Accademia dei Nobili, and, in 1837, was appointed a domestic prelate by Gregory XVI. He was made archbishop of Diamietta *in partibus* and, in 1843, was sent to Belgium as nuncio. In 1846, he was nominated archbishop of Perugia and, in 1853, was created a cardinal by Pius IX.

Upon the death of Pius IX in 1878, he was elected to the papacy under the title of Leo XIII. He followed a policy of friendly relations with, and support for, all governments outside Italy where they represented social order. Italy he regarded as the despoiler of the papal states. While opposing revolutionary socialism, he issued a famous encyclical, *rerum novarum*, in 1891 supporting rights of the laboring classes. This encyclical was hailed as setting the papacy free from the claims of capitalism and won its author the name of the "working man's pope." He held that the Church should be supreme in all civil matters, condemned modern philosophical systems, and attributed moral and political disorders to atheism.

In 1883, he opened the archives of the Vatican for historical investigations, and made himself known as a poet, chiefly in the Latin tongue.

Leoncavallo (*lā'ŏn-kä-väl'lō*), **Ruggiero** (**1858-1919**), Italian composer was born at Naples. He received his musical education at the Conservatory of Music in his native city. He was an admirer of Wagner and his compositions reflect German influence. The world-wide success of his short opera *I Pagliacci*, produced in 1892, indicated where his talents as a composer lay. Among his other operas are *Chatterton*, *Zaza*, *Maia*, *Malbruk*, and *La Reginetta delle Rose*. Like Wagner, he wrote his own librettos. Besides operas, his compositions include a symphony, a ballet, and songs. See *I Pagliacci*.

Leonidas I (*lē-ŏn-ī'dăs*), king of Sparta, succeeded his half brother, Cleomenes I, about 490 B. C. When the Persian monarch Xerxes approached with an immense army, Leonidas opposed him at the narrow pass of Thermopylæ, 480 B. C., with a force of 300 Spartans and more than 5000 auxiliaries. The treachery of one of his men having made it impossible to bar any longer the progress of the foe, Leonidas and his little band threw themselves on the swarming myriads, and met a heroic death.

Leopold III (**1901-**), king of Belgium, was born at Brussels. He succeeded to the throne in 1934 after the death of his father Albert I, who was killed in a fall from a mountain. In his reign Belgium took steps to abandon the policy of depending largely on a French alliance for her defense and set about constructing large scale fortifications on her borders.

The German army invaded Belgium in 1940. Leopold called on the British and French for aid and fought for several days, until he was forced to surrender. During the remainder of the war, he was a prisoner in Germany. After the war, the Belgian parliament, appointing his brother Charles as regent, refused to allow him to return. Leopold was recalled in 1950, but agreed to delegate his powers to his son, who, in 1951, became King Badouin I.

Lesage (*lē-säzh'*), **Alain René** (**1668-1747**), French novelist and dramatist, was born at Sarzeau, Brittany, and studied at the Jesuit College at Vannes. He was called to the bar in Paris, 1692, practiced law for a short time, and then adopted the profession of letters. In 1707, he rose at once into popularity by his comedy of *Crispin the Rival of his Master* and by his romance of *Le diable boiteux*. The comedy of *Turcaret*, in 1709, added to his fame, which subsequently was rendered imperishable by his *Gil Blas*. Among his other novels are *The Adventures of Guzman d'Alfarache*, *The Adventures of the Chevalier Beauchesne*, *The History of Estévanille Gonzales*, and *The Bachelor of Salamanca*. See *Gil Blas*.

Lesseps (*lĕ'sĕps'*), **Ferdinand, Viscount de** (**1805-1894**), French engineer and diplomat, was born at Versailles. He held various consular offices. When in Egypt in 1854 he proposed to the viceroy the cutting of the Suez Canal. The concession was granted, the financial assistance of the Egyptian government was secured, and, after much delay, diplomatic obstructions were removed. De Lesseps began actual work in 1859 and completed the canal in 1869.

After this achievement he entertained other great projects, such as a Central Asian Railroad and the conversion of a part of the Sahara into an inland sea. In 1881, he began the construction of the Panama Canal, subsequently taken over and completed by the United States.

Lessing, Gotthold Ephraim (**1729-1781**), German dramatist and critic, was born at Kamenz, Germany. His father, a Lutheran pastor, intended him for the ministry, and, accordingly, at the age of 17, he entered the University of Leipzig. Although he was withdrawn on account of his taste for general literature and his fondness for the theater, he later went to Berlin and completed his academic education at Wittenberg, receiving his master's degree in 1752.

After graduation, Lessing became a man of letters, took up his residence in Berlin, and there wrote several essays and criticisms. With Moses Mendelssohn, he wrote *Pope as a Metaphysician*; in a literary journal, *The Library of the Beautiful Sciences*, and in his *Letters on Literature*, he co-operated with Mendelssohn in creating a school of criticism in Germany. In addition to several dramas of minor importance, he wrote in 1755 the prose tragedy *Miss Sara Sampson*, which won extraordinary favor and was translated into other languages.

In 1760, Lessing lived at Breslau as secretary to the commandant, and, among his military acquaintances, he planned the spirited drama *Minna von Barnhelm*. Returning to Berlin, he completed his *Laokoön*. This essay, like his other philosophical speculations, is merely a collection

of hints, not the exposition of a system; but the principles here established went further toward founding a theory of literature and art than any other work on æsthetics.

For some years, Lessing then led an uncomfortable and shifting life. In Hamburg, he wrote a masterly criticism on celebrated plays, called the *Hamburg Dramaturgy*. In 1770, he was appointed librarian of the celebrated library at Wolfenbüttel, near Brunswick. Here he spent his last eleven years and completed *Emilia Galotti*. Shortly after taking up work at Wolfenbüttel, he married the widow of a Hamburg merchant. Upon her death and that of their child, Lessing was prostrated by grief. After a heated theological controversy, in which he appeared as the champion of toleration, he gave his confession of faith in poetical and dramatic form in *Nathan the Wise*.

Lessing polished his mother tongue and made it classic. He never resigned his freedom of thought nor compromised its dignity. His interests and influence were extended through theology, æsthetics, drama, poetry, criticism, and philology. He died impoverished.

Leutze (*loit'sē*), **Emanuel (1816-1868)**, German American historical painter, was born at Gmund in Württemberg. He was brought up in America, studied art and resided at Düsseldorf, 1841-59, then returned to the United States. Among his works are "Washington Crossing the Delaware," "Washington at Monmouth," "Washington at Princeton," "Landing of the Norsemen," "Cromwell and His Daughter," "Cromwell's Visit to Milton," "Lafayette in Prison," and "News from Lexington."

Leverrier (*lĕ-vĕ-ryā'*), **Urbain Jean Joseph (1811-1877)**, French astronomer, was born at Saint Lo, Normandy. Appointed professor of astronomy in the Ecole Polytechnique, Paris, in 1837, he continued the work of Laplace in celestial mechanics. His *Tables de Mercure* appeared in 1843. At the suggestion of Arago, he attacked the problem of the unexplained motions of Uranus and solved it by making the calculations by which the planet Neptune was discovered. In 1854, he became director of the Paris Observatory, a post which he held, except during three years, until his death.

Lewes (*lūˈĭs*), **George Henry (1817-1878)**, English philosopher and critic, was born at London. He was educated at various schools, and, after entering upon a business career, decided to devote himself to literature. In 1838, he went to Germany and remained there nearly two years, studying the life, language, and literature of the country. On his return to London, he became a miscellaneous writer. He was editor of the *Leader* from 1850 to 1854 and of the *Fortnightly*, which he himself founded, in 1865-66. In 1854, he set aside an early and unhappy marriage and lived with Mary Ann Evans (George Eliot) until his death.

Lewes's many-sidedness of mind made him one of the best critics and biographers. As a popularizer of philosophy and science he had few superiors. His works include *The Spanish Dramas, Comte's Philosophy of the Sciences, Life and Works of Goethe, Physiology of Common Life, Studies in Animal Life, Aristotle, On Actors and the Art of Acting*, and *Problems of Life and Mind*.

Lewis, Isaac Newton (1858-1931), American soldier and inventor, was born at New Salem, Pa. After his graduation at the United States Military Academy in 1884, he held various army commands. A report made by him in 1900 led to the rearmament of the United States field artillery. About the time of his retirement from active service in 1913, he obtained a patent for the so-called Lewis machine gun, which was extensively used during World War I. He refused about $1,000,000 in royalties on his guns made for the United States government after the country entered the war. Among the devices patented by him was the first successful range finder.

Lewis, John Llewellyn (1880-), American labor leader, was born at Lucas, Iowa. After a public school education and an early life spent in mule driving and mining, Lewis began labor union work and became legislative representative of the United Mine Workers in 1909. By 1917, he had become vice president, and was elected president in 1920. He piloted the affairs of this union through 13 years of defeat and dissension, then in 1933 took advantage of a governmental policy fostering collective bargaining to build it into the country's strongest union.

Convinced that labor's future lay in the organization of all wage earners and that this could be accomplished only by bringing all those of one industry into one so-called industrial union, he broke in 1935 with leaders of the American Federation of Labor, who favored continuance of a craft union policy, involving a separate organization for each type of work. Taking with him other large unions, he threw his energy in organizing workers in mass production industries and preparing the way for the entry of organized labor into the political arena as a separate party.

The new movement was organized in 1937 as the Congress of Industrial Organization with Lewis as its first president. Lewis broke with other leaders of the body in 1940 by supporting the Repubican candidate. He resigned after Roosevelt's re-election. During World War II, he adroitly defied governmental policies in securing wage increases for miners by means of strikes.

Lewis, Meriwether (1774-1809), American explorer, was born near Charlottesville, Va. He was a volunteer at the time of the Whisky insurrection of 1794, an ensign in the regular army in 1795, and a captain in 1800. Shortly afterward he became President Jefferson's private secretary. During 1803-06, he was engaged with Captain William Clark in an expedition to the Pacific Ocean, the results of which were important to geographical science and highly valuable in the settlement of the West. In 1807, he was made governor of the territory of Louisiana. He planned to publish an account of his great journey but met his death mysteriously in a pioneer cabin in Tennessee when en route to Washington. His memoir by Jefferson was published, together with Biddle and Allen's *Narrative of the Lewis and Clark Expedition*, in 1814.

Lewis, Sinclair (1885-1951), American novelist, was born at Sauk Center, Minn. He was graduated at Yale in 1907 and engaged in editorial work, contributing also short stories to periodicals. In 1914, he published the novel entitled *Our Mr. Wrenn*, which was followed by *The Trail of the Hawk, The Innocents*, and *Free Air*. In 1920, his *Main Street*, depicting life in a small Middle-Western town, attracted wide attention, as did also his *Babbitt*, a story of a self-made business man, which appeared in 1922. His later works include *Arrowsmith*, awarded the Pulitzer prize for 1925, *Elmer Gantry*, a satire on the professional evangelist, *Dodsworth*, a study of a retired manufacturer, and *It Can't Happen Here*, an imaginary picture of the United States in the grip of a dictatorship. Lewis received in 1930 the first award of a Nobel prize in literature given to an American. In 1938 he was elected to the American Academy of Arts and Letters. He was essentially a satirist of the middle class while at the same time sympathetic with its ideals. He assisted in the dramatization of several of his works. His later novels include *Work of Art, Prodigal Parents, Bethel Merriday*, and *Gideon Planish*.

Ley (*lī*), **Robert (1880-1945)**, German administrator, was born at Niederbreitenbach. Educated as a chemist at Jena, Bonn, and Münster universities, he served in the air force in World War I and was a prisoner in France, 1917-20, having been severely wounded. He was employed as an industrial chemist from 1921 to 1928 and then entered politics. Joining the Nazi party in 1932, he was made by Hitler head of the "labor front," a governmental organization which took over all trade unions. The principle of loyalty to employers, or leaders, was substituted for self-organization. The slogan "strength through joy" was used to promote morale of employees, but wages were limited. He committed suicide in prison.

Libby, Willard (1908-), American chemist, was born at Grand Valley, Colorado. He was educated at the University of California, where he also taught for several years. During World War II he was chemist for the Columbia University War Research division; then he became professor of chemistry in the Institute for Nuclear Studies at the University of Chicago. In 1954 President Eisenhower appointed him as a member of the A.E.C. His famous "atomic clock" technique for determining the age of prehistoric materials is described in his book, *Radiocarbon Dating*.

Lie (*lē*). **Trygve (1896-)**, Norwegian politican, was born at Oslo. After being graduated in law from the University of Oslo, 1919, he was legal advisor to Norwegian trade unions, and became a member of the Norwegian government in 1935. After occupying several cabinet positions, he became minister of foreign affairs in 1941. He served in the government-in-exile in England, and in the coalition and labor governments after the liberation of Norway. In January 1946 he was chosen first secretary-general of the United Nations. In 1950 his term was extended three years. He resigned in 1953 and was succeeded by Dag Hammarskjold.

Liebig (*lēˈbĭĸ*), **Justus, Baron von (1803-1873)**, German chemist, was born in Darmstadt. He studied at Bonn and Erlangen; then went to Paris, and attracted the attention of Humboldt by a paper on the fulminates. In 1824, he was appointed professor at Giessen, where he established a laboratory noted for researches in organic chemistry and for the application of chemistry to agriculture and food. He disproved the prevalent notion that plants derive their nourishment from humus. In 1852, he became professor of chemistry at Munich. He is regarded as the founder of agricultural chemistry. Among his chief works are *Organic Chemistry in its Application to Agriculture and Physiology, The Natural Law of Husbandry*, and *Dictionary of Chemistry*.

Lieurance, Thurlow (1878-1963), American composer, was born at Oskaloosa, Iowa. He attended school in Kansas, and studied music at Cincinnati. He spent 20 years among Indians and based his music on their themes. Among his best known pieces are "By the Waters of Minnetonka," and the musical "Drama of the Yellowstone." He wrote *Songs of North American Indians* and *Forgotten Trails*.

Lilienthal, David Eli (1899-), American lawyer and administrator, was born at Morton, Ill. Educated at DePauw and Harvard universities, he practiced law in Chicago. In 1933 he was made a director of the Tennessee Valley Authority, formed for the purpose of developing low cost electric power, and directing its use for public advantage. Lilienthal's task of power development and sale involved five years of litigation on constitutional questions. He then negotiated the purchase of many large distribution networks to sell the power, developed at the Authority's dams. By selling to municipalities and distributing through them he lowered the cost of electricity in the area. In 1946 he was made chairman of the U. S. Atomic Energy Commission. Resigned, 1949.

Lillie, Beatrice (1898-), brilliant comedienne of stage and television, was born in Toronto, Canada, and made her theatrical debut in London in 1914. A small woman with a mobile and perenially youthful face, she can convey both elegance and absurdity at the same time. One of her most famous and funny numbers is "There Are Fairies At The Bottom Of My Garden," a piece that gives her full opportunity to display her genius for droll mimicry. Beatrice Lillie appeared first in vaudeville. She came to New York in 1924 with Andre Charlot's *Revue*. Her talent has enlivened, and often completely carried, such productions as *Big Top, The Seven Lively Arts, Better Late, Inside U. S. A.*, and many television shows. A road tour, *An Evening With Beatrice Lillie*, endeared her to a host of American theatergoers. During World War II, she worked tirelessly to entertain the armed forces, and was honored for it by both the American and English governments. In private life, Beatrice Lillie is Lady Peel.

Lily, William (c. 1468-1522), English grammarian and schoolmaster, was born at Odiham. After graduation at Oxford, he traveled in the East to increase his knowledge of the Greek language, and studied several years in Rhodes, Rome, and Venice. Upon his return to London, about 1509, he engaged in private teaching and, in 1512, was appointed by Dean Colet first head master of St. Paul's School, where he became one of the most noted exponents of the "new learning." With Grocyn and Linacre, he ranks among the earliest English classical scholars of the Renaissance period. He was probably the first teacher of Greek in London. His fame rests on his *Latin Grammar*.

Linacre (*lĭn'ā-kēr*), **Thomas (c. 1460-1524),** English humanist and physician, was born at Canterbury. He was educated at Oxford, where he became fellow of All Souls College in 1484. Following a period of study in Italy, devoted to Latin, Greek, natural philosophy, and medicine, he was appointed professor of medicine at Oxford and became physician to the court, serving Henry VII and Henry VIII. After a time he gave up practicing and studied for the Church. In 1509, he was made rector of Mersham and, in 1519, became precentor in York Cathedral.

With Latimer and Grocyn, Linacre was among the earliest teachers of Greek at Oxford, where Sir Thomas More and Erasmus were among his pupils. While his permanent fame rests upon his classical scholarship, he rendered notable service to the study of medicine by his translations of Galen's treatises. In 1518, he assisted in founding the College of Physicians, of which he became president.

Lincoln, Abraham (1809-1865), American statesman and 16th president of the United States, was born February 12, 1809, near Nolin Creek and Hodgenville, Kentucky, where his grandfather had settled after leaving his former home in Virginia. His family was descended from Samuel Lincoln, who emigrated from Norfolk, England, and settled at Hingham, Mass., in 1637. Abraham's father, Thomas, was a carpenter and farmer; his mother, Nancy Hanks, was a woman of humble birth but of keen intellect and considerable force of character.

Education and Early Life. Lincoln was born in a log cabin on Sinking Spring farm, a tract of 348 acres which his father had acquired in 1808 for $200. His school attendance was very limited, amounting probably in all to less than one year. Nevertheless, in his early years, he read and became intimately familiar with the Bible, Shakespeare, Æsop's *Fables*, *Robinson Crusoe*, *Pilgrim's Progress*, a history of the United States, and Weems's *Washington*. He developed also great physical strength, became a powerful wrestler, runner, and lifter of weights, and grew to be 6 feet, 4 inches in height.

When Lincoln was in his eighth year, his father removed to southern Indiana, settling near the present village of Gentryville. Here, in a rude frontier cabin, at first scarcely more comfortable than a shed, the boy grew to manhood, knowing only the primitive manners, conversation, and ambitions of a sparsely settled backwoods community. About two years after coming to Indiana, Lincoln's mother died. A year later, his father married Mrs. Sarah Bush Johnston, a thrifty widow, who exerted a great influence over her stepson. Schools were scarce and poor, but Lincoln's mother had taught him to read and his stepmother urged him to study.

When Lincoln was 21 years of age, he went with his father to settle in Illinois, where he performed the various tasks of a pioneer, such as clearing the bush and splitting rails. In 1831, he took a flatboat to New Orleans, on which occasion he had an opportunity of observing the nature of slavery. The following year, he was chosen captain of a volunteer company for service in the Black Hawk War. The company saw no fighting.

After an unsuccessful candidacy for the state legislature, he formed a partnership for operating a small store. Its failure and the flight of his partner left Lincoln with a debt, which he scrupulously discharged in the course of the next 17 years. In 1832, he began to study law by himself; the following year, he received an appointment as postmaster; and, in 1834, he was elected to the legislature of Illinois.

Political Life. Lincoln was re-elected to the legislature in 1836 on a platform favoring privileges of government for all who bore the burdens of government, "by no means excluding females." When the legislature proposed to pass a resolution deprecating antislavery agitation, he presented a protest, averring that the Federal government, while not interfering with the individual states, might, in the event of a popular approval, abolish slavery in the District of Columbia. In this manner, Lincoln first placed on record his antislavery views, which, by their moderation, bespoke his careful statesmanship.

In 1837, Lincoln was admitted to the bar. When Springfield was made the capital of Illinois in 1839, he went there and continued practicing law until his election to the presidency. In 1844, he was elected to Congress, but, at the end of his term, declined to be a candidate for re-election.

The slavery issue became acute in 1854, when Stephen A. Douglas offered a bill in Congress proposing to establish a territorial government in Nebraska. Lincoln opposed the extension of slavery in the territory and delivered a strong antislavery speech at the state convention in Bloomington, 1856, when the Republican party in Illinois was organized.

In 1858, in a speech accepting the Republican nomination for United States senator, Lincoln said: " 'A house divided against itself cannot stand.' I believe this government cannot endure permanently half slave and half free. I do not expect the Union to be dissolved, I do not expect the house to fall, but I do expect it will cease to be divided." This became famous as the "house-divided-against-self speech."

During the ensuing campaign, Lincoln met Douglas, his Democratic opponent, in a series of memorable debates on slavery. The struggle over the whole question was at its height. Public interest had been intensified by the Dred Scott decision, so that the debate drew the attention of the whole country. Douglas's continual assumptions of superiority and sneers at his antagonist's early poverty and occupations were met with humorous retorts, with sharp exposures of sophistry, and with masterly arguments stated with great clearness and force.

With all the resources of an experienced debater, Douglas endeavored to defend an intermediate position that would satisfy both the supporters and the opponents of slavery. But Lincoln finally compelled Douglas to take ground against the Dred Scott decision and forced him to make other admissions, which later led to disruption in the Democratic party and destroyed Douglas's hopes of the presidency. Yet Douglas won temporarily. Receiving a scant majority in the legislature, he was elected by that body to the Senate. But Lincoln, though defeated, had received the greatest number of popular votes and was now a figure of national importance. Two years later, the Republican party in its national convention at Chicago, 1860, nominated him as presidential candidate.

Presidency. Lincoln was elected, but before his inauguration, seven states had formally seceded from the Union and inaugurated a president of their own. There was danger that seven other states would follow, four of which ultimately did. Within six weeks of Lincoln's inauguration, the Civil War broke out with the capture of Fort Sumter by the Confederate forces.

The earlier operations of the war were unfavorable to the Northern forces, but Lincoln shrank from no act which he judged necessary for the preservation of the Union. Following the battle of Antietam, September 1862, he issued a proclamation stating that on January 1 following, as an act justified by military necessity, he would declare all slaves in states or parts of states then in rebellion thenceforth free. On January 1, 1863, he issued the formal Emancipation Proclamation.

This measure at once tended to deprive the South of an advantage it enjoyed and consolidated the antislavery element in the North in favor of the war. The crisis of the war was passed with the battle of Gettysburg, the field of which was dedicated as a National Cemetery on November 19, 1863. At this dedication, Lincoln delivered his Gettysburg speech, which ranks among the most famous orations of all literature.

Lincoln was re-elected president in 1864. He insisted upon three things: (1) restoration of the national authority throughout all the states; (2) no receding from the position of the national executive on the subject of slavery; (3) no cessation of hostilities short of an end of the war and the disbanding of the forces hostile to the government. Ultimate success crowned his labors, and the war ended.

Death. On the evening of April 14, 1865, Lincoln visited Ford's Theater, Washington, and during the performance he was shot by John Wilkes Booth, an obscure actor. He died the next day, on April 15, 1865. His body was laid to rest in Oak Ridge Cemetery near Springfield, Illinois. His unique position among the presidents of the United States is signalized in the beautiful Lincoln Memorial Building at Washington, D. C. A second national memorial to him is Abraham Lincoln National Park near Hodgenville, Ky. The feature of this 110-acre park is a building of classic style which covers the log cabin in which the president was born. Lincoln was elected to the American Hall of Fame in 1900.

Lind, Jenny (1820-1887), (Madame Otto Goldschmidt), Swedish singer, was born in Stockholm. At the age of nine years her wonderful voice was discovered by an actress, who secured her admission to the Stockholm Conservatory of Music. In 1838, she made her operatic debut as Agathe in *Der Freischütz*. Jenny Lind began in 1844 a series of tours in Continental Europe, England, and America, singing with unparalleled success and becoming popularly known as "the Swedish nightingale." In 1849, she withdrew from the operatic stage and devoted herself exclusively to concert singing. At Boston, in 1852, she was married to Otto Goldschmidt, a musical conductor and composer, and, after a few years' residence at Dresden, settled permanently in London. Her last public appearance was at Düsseldorf in 1870.

Lindbergh, Anne Morrow (1906-), American writer, aviator, and explorer, has had a remarkably varied and adventurous career. She was born in New Jersey, daughter of Dwight Morrow, a banker who served as an outstanding U. S. ambassador to Mexico. She gave early evidence of a brilliant and sensitive intellect at Smith College. She married Charles Lindbergh in 1929, and accompanied him on a series of hazardous, trail-blazing flights, during which she acted as navigator and co-pilot. For this work, she has won many high aviation awards never before given to women. Among Anne Morrow's books are *North to the Orient*, an exciting description of aerial adventure; *The Steep Ascent*; and *Gift from the Sea*. Her prose is marked by a lyric beauty and simplicity.

Lindbergh, Charles Augustus (1902-), American aviator, was born in Detroit, Mich., of Swedish-Irish descent. He was taken as a child to Little Falls, Minn., from which state his father was elected to Congress in 1907. He entered the University of Wisconsin in 1921, but left the next year to learn aviation.

After a period of flying in the Army and as chief pilot on the Chicago-St. Louis air mail route, he became famous almost overnight by a daring transatlantic flight in 1927. Setting out on May 20 from Roosevelt Field, near New York City, he flew unattended to Le Bourget, near Paris, a distance of 3610 miles in 33 hours, 29½ minutes. This was the first non-stop flight between the United States and Europe and the first solo transatlantic flight. The flight was made in the plane, *Spirit of St. Louis*, built at San Diego according to his own specifications. The success of the trip was due in large measure to his careful planning as well as to the skill and courage with which he carried it through. His achievement was greeted by world-wide acclaim. He was made a colonel in the U. S. officers reserve corps.

In 1927-28, he made a good-will flight to Mexico City and the capitals of Central American countries, two South American countries, and the West Indies, covering a total of 9390 miles. He received the Woodrow Wilson peace award for 1928, amounting to $25,000, and a Congressional medal. He accepted the general managership of Transcontinental Air Transport, Inc., and was appointed technical adviser on aeronautics to the U. S. Department of Commerce. In 1929, he married Anne, the daughter of Dwight Morrow. Their infant son was kidnapped and murdered in 1932. Thereafter he lived in England for several years. Prior to World War II, he inspected the air power of leading European countries and warned of German superiority. He publicly advocated in 1940 American isolation from Europe, thereby incurring considerable unpopularity. In 1954 he was made a brigadier general in the Air Force Reserve.

Among other scientific inventions, Lindbergh devised, with Dr. Alexis Carrel, the "robot heart," a machine in which organs may be kept alive after being taken from the body.

Lindenthal (*lĭn'dĕn-tăl*), **Gustav (1850-1935),** American bridge builder, was born in Brünn, Austria. He was educated in his native city and at Vienna and came to America in 1874, where he was first employed in the construction of buildings for the Centennial Exhibition held at Philadelphia in 1876. From the following year, he was engaged in the designing of bridges, including many of the largest in America. In 1902-03, he was commissioner of bridges in New York City. He planned Little Hell Gate Bridge, in East River, which, when completed in 1917 at a cost of 15 million dollars, had the longest steel arch in the world. He was engineer also for the Washington Memorial Bridge, New York, which has a suspension span of 3500 feet over the Hudson River.

Lindsay, Nicholas Vachel (1879-1931), American poet, was born at Springfield, Ill. After being graduated from the Springfield High School in 1897, he attended Hiram College, Ohio, 1897-1900, and studied art in Chicago and New York. He also made long tours afoot, somewhat in the manner of the medieval troubadors, paying his way by reciting and selling his poems. In the summer of 1912 he walked from Illinois to New Mexico, distributing his poems and speaking in behalf of the "gospel of beauty." His poems include "General William Booth Enters Heaven," "The Congo," and "The Chinese Nightingale," all remarkable for their rhythm and phonetic effects. He wrote also *Johnny Appleseed, The Art of the Moving Picture*, and *The Litany of Washington Street*.

Lindsey, Benjamin Barr (1869-1943), American jurist and reformer, was born in Jackson, Tenn. He was educated in the public schools, studied law, and was admitted to the bar. In 1894, he began the practice of law in Denver, Colo. He was largely instrumental in having established the juvenile court there, which served as a model for many in other states. He presided over it from 1901 to 1927, securing meanwhile many changes in the law relating to juvenile offenders, including the practice of punishing adults who contribute to juvenile delinquency. *The Companionate Marriage*, published by him in 1927, aroused much controversy and gave wide currency to that phrase. His other publications include *The Beast, Children in Bondage, The Revolt of Modern Youth*, and the autobiographical *Dangerous Life*.

Linnæus (*lĭ-nē'ŭs*), **Carolus (1707-1778),** Swedish botanist and naturalist, was born at Rashult, Sweden. This name is a Latinized form of Carl von Linné.

In 1727, he studied medicine and botany at the University of Lund; the next year, he transferred to the University of Upsala. There, in 1730, the famous Dr. Anders Celsius made him assistant curator of the botanic gardens.

Career and Chief Works. Linnæus obtained his medical degree from the University of Harderwijk, the Netherlands, in 1735. To this year belongs his *System of Nature*, which contains his classification of animals. While in the Netherlands, Linnæus became botanical director and naturalist at the countryseat of George Clifford. In 1736, he inspected the gardens of England at the expense of Clifford and published his *Elements of Botany*.

In 1737, Linnæus visited France and finished his *Genera of Plants*, in which he developed fully his theory of the sexual system of plants. In the following year, he returned to Sweden and established himself as a physician in Stockholm. In 1739, he married Sara Moræus and, in 1741, became professor of medicine at the University of Upsala. Within twelve months, he was transferred to the chair of botany at Upsala and found himself in the long coveted situation of director of the Botanic Gardens. These he laid out on a new plan. Within six years, to the original 50 exotic plants he had added 1100 new specimens, besides examples of the species in Sweden itself. His collections became unrivaled.

The efforts of Linnæus extended the fame of the university, increased the number of students, and won for him the appointment of rector. To this period of activity belong *his Botanical Science* and *Species of Plants*, published in 1751 and 1753 respectively. The latter laid the foundation for the modern system of plant nomenclature.

Honors. Gustavus III, the Swedish sovereign, exalted Linnæus by creating him a knight of the Polar Star in 1753 and, in 1761, issued a patent of nobility in his honor. In 1773, he was appointed to assist in making a new translation of the Bible into Swedish.

Place in History of Science. Linnæus found biology a chaos, but he left it a cosmos. His grounds for classification have not always proved adequate, but he bears the credit of first enunciating the true principles of classifying plants. To him is due also the credit of establishing the binomial name to indicate genus and species, a contribution which immensely advanced the study of systematic botany and zoology. He imbued his pupils with his own intense acquisitiveness and enthusiasm, trained them to close and accurate observation, and then dispatched them to various parts of the globe, where they furthered his influence as the reformer of botany and one of the world's greatest promoters of natural history studies.

Lin Yutang (1895-), Chinese essayist, was born in Fulkien Province. After being graduated from St. John's College, Shanghai, he left China and obtained degrees at Harvard, Jena, and Leipzig universities. He lectured at Peking National University and then participated for a time in the Chinese revolutionary government. Taking up residence in the United States, he began writing books, chiefly in English, on popular philosophy which met with wide favor. Their attraction lay in the common sense way in which he criticized many Western habits and his engaging suggestions for the greater enjoyment of life. His position was unique also as an interpreter of China in terms understandable to English-speaking readers. In 1954-55 he was head of Nanyang University for free Chinese in Singapore. His publications include *Letters of a Chinese Amazon, The Importance of Living, Wisdom of Confucius, Moment in Peking,* and *The Vigil of a Nation.*

Lippi (*lēp'pē*), **Fra Filippo (1406-1469),** Italian painter, was born in Florence. His parents died in his early childhood and he was placed in a Carmelite Monastery in Florence, where he remained until 1432. He studied the works of Masaccio in a neighboring chapel and, about 1430, executed some paintings at the monastery. In 1456, he was made prior of Santa Margherita at Prato, where, according to Vasari, he first met the beautiful Lucrezia Buti, mother of his son Filippino Lippi (1460-1504), also a famous painter.

In skill Fra Filippo was superior to any of his predecessors, blending the idealism of Fra Angelico with the realism of Masaccio. His paintings are noted for dignity of composition, pleasing human faces, and fine golden color. Among his best works are the frescoes in the cathedral at Prato and the "Coronation of the Virgin" now in the Academy at Florence.

Lippmann (*lēp'män'*), **Gabriel (1845-1921),** French physicist, was born at Hallerich in Luxemburg. He was educated at the Ecole Normale in Paris and studied physics and chemistry in Germany. In 1883, he became professor in the University of Paris and director of the Physical Laboratory in the Sorbonne. He made important discoveries in electricity and in color photography and enunciated the principle of the conservation of electricity. In 1891, he discovered a process of photographing in colors by the interferential method. He received, in 1908, the Nobel prize for physics. His publications include *Course in Thermodynamics, Electrical Unities,* and *Teaching Mathematics.*

Lippmann, Walter (1889-), American political philosopher and columnist, was born in New York City and was educated at Harvard (1909), where he was also a graduate student in philosophy. He was a captain in the U.S. Army Military Intelligence in World War I and was an aide with the American Peace Delegation at Paris in 1918-19. He obtained his early experience in journalism as associate editor of *The New Republic* and was for a time editor of the old *New York World.* He first attracted national attention with the publication of *A Preface to Politics* (1913). It was followed at intervals by comparable works, including *Public Opinion* (1922), *A Preface to Morals* (1929), *The Good Society* (1937), and *The Public Philosophy* (1955). His numerous briefer discussions of politics and international affairs have usually appeared first as magazine articles in *The Atlantic, Harper's,* or *The Yale Review,* and especially as "columnist" contributions to *The New York Herald-Tribune* and to many other newspapers.

Lipton, Sir Thomas Johnstone (1850-1931), British merchant and yachtsman, of Irish parentage, was born in Glasgow. He began life as a retail merchant, acquired extensive tea, coffee, cocoa, and rubber estates in India and Ceylon, and accumulated a large fortune. He became president of the Lipton Company and also acquired large interests in business enterprises in the United States and Canada. He organized Lipton, Limited, the largest commercial establishment in the United Kingdom, controlling more than 400 stores and capitalized at 200 million dollars. An enthusiastic yachtsman, he challenged for the America cup a number of times but failed to capture it. He founded the Alexandra Trust Fund for providing the poor with cheap, wholesome meals.

Lister, Joseph, Baron (1827-1912), English surgeon, was born at Upton. He was graduated at London University in 1847 and received his degree in medicine in 1852. He was successively lecturer on surgery, Edinburgh, professor of surgery, Glasgow, professor of clinical surgery, Edinburgh, professor of clinical surgery, King's College Hospital, London, and surgeon extraordinary to Queen Victoria. He introduced the antiseptic system, which revolutionized modern surgery. He received many foreign honors, was made a baronet in 1883, and a peer in 1897.

Liszt (*list*), **Franz (1811-1886),** Hungarian pianist and composer, was born at Raiding, near Odenburg. He made his first appearance at a concert in his ninth year. Later, he studied under Czerny and Salieri at Vienna, and, from 1839 to 1847, he traveled throughout Europe as a virtuoso. In 1849, he became conductor of the Court Theater at Weimar. Here, in 1850, he conducted the first performance of Wagner's *Lohengrin.* In 1865, he took minor orders and was subsequently known as the Abbé Liszt.

In 1875, Liszt was made president of the Hungarian Academy of Music at Budapest and divided the remaing years of his life among that city, Weimar, and Rome. One of his two daughters married Richard Wagner, his lifelong friend. Though Liszt's fame as a pianist overshadows his name as a composer, yet he was the creator of the symphonic poem, and his *Hungarian Rhapsodies* for the piano are unrivaled.

Littleton, Sir Thomas (1402-1481), English jurist and legal writer, was born in Worcestershire. He was recorder of Coventry in 1450, king's sergeant in 1455, judge of common pleas in 1466, and knight of the bath in 1475. His reputation rests on his treatise *The Tenures,* written in law French and translated into English about 1500. Coke commented on this text in his celebrated *Coke upon Littleton,* published in 1628. With or without commentary, *The Tenures* constituted a part of legal education for more than three centuries, and it is still cited as authoritative on the feudal law of real estate.

Littre (*lē'trā'*), **Maximilien Paul Emile (1801-1881)** French philosopher and lexicographer, was born in Paris. He studied at the Lycée Louis-le-Grand, then was graduated in medicine, and finally turned to phology. His translation of Hippocrates procured, in 1839, his election to the Academy of Inscriptions. His *La poésie homerique et l'ancienne poésie française* was an attempt to render the first book of the *Iliad* in the style of the Trouvères. In 1854, he became editor of the *Journal des Savants.* His *Dictionnaire de la langue française,* one of the greatest modern French dictionaries, appeared, 1863-72. In 1871, Gambetta appointed him professor of history and geography at the Ecole Polytechnique, Paris. He was one of the foremost linguists of the 19th century.

Litvinov, Maxim Maximovitch (1876-1951), Russian statesman, was born at Bialystok, Poland. His true name was Moysheev Vallakh. While a volunteer in the army, he became interested in Marxism and, after joining a revolutionary party, was imprisoned for over a year. He escaped and carried on revolutionary work mainly from abroad until the Russian Revolution in 1917. The Soviet government appointed him its diplomatic agent in England and later made him commissar for foreign affairs.

Litvinov worked consistently for disarmament at European conferences. At the London Economic Conference of 1933, he negotiated a treaty of non-aggression with Poland, Rumania, Turkey, Iran, Afghanistan, Estonia, and Latvia, which was noteworthy as the first treaty to define aggression. He secured recognition of the Soviet Republic by the United States and its acceptance into the League of Nations. His dismissal in 1939 presaged a reversal of Russian policy, culminating in a semi-alliance with Germany. When war broke out with Germany in 1941, he was recalled from retirement. He was ambassador to the United States from 1941 to 1943; was recalled to serve as deputy minister of foreign affairs; and "released" from this position in August 1946.

Livingston, Edward (1764-1836), American jurist and statesman was born at Clermont, N. Y. He was graduated at Princeton in 1781, studied law, and, in 1785, was admitted to the bar. He was a member of Congress from 1795 to 1801, when he became Federal attorney and mayor of New York. In the second war with England he was aide-de-camp and secretary to General Jackson, 1814-15.

In 1821, Livingston was commissioned by the legislature to prepare a code of civil procedure for Louisiana. While never adopted by the state, his code was published as *A System of Penal Law* and gave him great fame throughout America and Europe. He was again member of Congress, 1823-29, was United States senator from Louisiana, 1829-31, and secretary of state, 1831-33. While serving as minister to France, 1833-35, he supported the demand of the United States government for $5,000,000 indemnity on account of French spoliations and succeeded in securing its payment.

Livingstone (*liv'ing-stŭn*), **David (1813-1873),** African explorer and missionary, was born at Blantyre, in Lanarkshire, Scotland. During childhood and youth he worked in a cotton mill, but educated himself by private study and by attending night schools. In 1840, he was sent to southern Africa by the London Missionary Society. He resided for several years near the Limpopo, discovered Lake Ngami in 1849, and penetrated to the Makololo country in 1851.

In 1853-54, he crossed Africa from the Zambezi to the Congo and, in 1854-56, made his way from Loanda to Quilimane, following the course of the Zambezi and discovering the Victoria falls. He returned to England, 1856, and published *Missionary Travels,* 1857. Proceeding anew to Africa as consul at Kilimane in 1858, he explored the country north of the Zambezi from 1856 to 1864, dis-

covering lakes Shirwa and Nyasa. In 1865, he published *The Zambesi and Its Tributaries*, a narrative of the discoveries. He undertook in 1866 his third expedition and spent the remainder of his life endeavoring to ascertain whether the Zambezi joins the Nile or is a tributary of the Congo.

In 1871, after suffering great privations, Livingstone was found at Ujiji by H. M. Stanley's relief party. He continued his explorations, endeavoring to solve the Nile-Congo problem, but, exhausted by continued hardships, died on the shore of Lake Bangweolo. In 1874 his body was taken to England and buried in Westminster Abbey.

Livy (*liv'i*), or **Titus Livius** (**59 B.C.-17 A.D.**), Roman historian, was born at Patavium (Padua), in the north of Italy. *The Annals of the Roman People*, as Livy styles his history, begins with the foundation of the city and ends with the death of Drusus, the younger brother of the emperor Tiberius, 9 B. C. It was written partly at Rome and partly at Naples, under the patronage of the emperor Augustus. The work consisted originally of 142 books, but only 35 have come down to us, and some of these are in a very imperfect state. Of all but two, however, we possess fragments, with short epitomes from another hand.

Livy's history is distinguished for the animation of its narrative and for the purity of its style, though the accuracy of the statements is sometimes prejudiced by the author's desire for rhetorical effect and by his patriotism. He was not an investigator, and it was his purpose to write an inspiring rather than a critical history of his country.

Lloyd, (John) Selwyn (Brooke), (1904-), English statesman, was born at West Kirby, Cheshire, England, and was educated at Edinburgh and Cambridge. Called to the bar in 1930, he practiced law in Liverpool until the outbreak of World War II. During the war, he rose to the rank of brigadier, and served as a general staff officer of the British Second Army. A conservative in politics, he was elected to Parliament in 1945. In 1951 he was appointed Minister of State in the Foreign Office, and in 1954 became Minister of Supply. He achieved cabinet rank in December 1955, when he was made Secretary of State for Foreign Affairs.

Lloyd George of Dwyfor, David Lloyd George, Earl (1863-1945), British statesman was born of Welsh parentage in Manchester. He was educated at a Church School and privately. Deciding to study law, he was articled to a firm of solicitors at the age of 14 and, in 1884, qualified for practice. He was elected to Parliament in 1890. During the Boer war, he vigorously opposed the policy of the Conservative government.

In 1905, Lloyd George was made member of the Liberal ministry as president of the board of trade. In 1908, he became chancellor of the exchequer. He was the author of the Old-Age Pension law of 1908 and of the Workingmen's Insurance act of 1912. He vigorously advocated the Minimum-wage law of 1912, which settled by intervention of the government the great coal strike of that year. His financial policy finally resulted in the bill to destroy the veto power of the House of Lords.

After the outbreak of World War I, Lloyd George became minister of munitions in Asquith's coalition cabinet. He succeeded Kitchener as secretary of state for war in June 1916 and, in the following December, was made prime minister. He then formed a new coalition cabinet and was granted practically dictatorial powers. In this post of gravest responsibility he served the British nation with great ability, devotion, and skill. Following the successful termination of the war, his ministry was returned in the Parliamentary elections of 1918.

In 1919, Lloyd George headed the British delegation to the Peace Conference of Versailles. In 1921, he brought about the conference with the Irish leaders which later resulted in the establishment of the Irish Free State. His government was defeated in 1922, but he continued to lead a section of the Liberal party. He was raised to the peerage in 1945.

Locke, John (1632-1704), English philosopher, was born at Wrington, England. In 1646, he was sent to Westminster School. Six years later, he entered Christ Church, Oxford, where he took his bachelor's degree in 1655 and his master's degree in 1658. Despite an inclination toward experimental science, he decided to study medicine. In 1665, he went to Berlin as secretary to the British ambassador there. Subsequently, he returned to Oxford to continue his studies, but apparently he never obtained a degree in medicine.

A particularly acute diagnosis which Locke made of a disease afflicting Lord Ashley in 1666 led to their lifelong friendship. He now entered Lord Ashley's family as physician, tutor, and confidential adviser. In 1672, Locke was appointed secretary of presentations and, in the following year, secretary to the council of trade and plantations. In 1675, failing health obliged him to take up residence at Montpellier in the south of France; but he resumed his tutorial life at Oxford in 1679. Following the disgrace of Lord Shaftesbury (formerly Lord Ashley) in 1682, he went to the Netherlands. By an act of Charles II, Locke was expelled from Oxford. After the revolution of 1688, he returned to England and rendered services of great value in the cause of toleration and in maintaining the principles of the revolution. He took an active part in the establishment of the Bank of England, the abolition of the censorship of the press, reform of the coinage, and the promotion of Irish linen manufacture.

His *Adversariorum Methodus* was published in 1686, and, four years later, his famous *Essay Concerning Human Understanding* attained extensive celebrity. To this period belong various letters on toleration and his treatises on government. In 1693, he published *Thoughts on Education* and, in 1695, *The Reasonableness of Christianity*. The latter was written to promote King William's scheme of a comprehension of all Christian sects in one national church.

In 1696, Locke received a reappointment as commissioner of trade and plantations, but failing health compelled him to resign his office and quit London. He spent the remainder of his life in Essex, at the seat of Sir Francis Masham.

Great as were Locke's services to his country and to the cause of civil and religious liberty, his fame rests chiefly on the *Essay Concerning Human Understanding*. He rejected the Cartesian doctrine of the reason as the source of knowledge and maintained the derivation of all knowledge from experience through the senses. His principles of philosophy and psychology affected the general modes of thought in many countries and led to the critical philosophy of Kant.

Locke, William John (1863-1930), English novelist, was born in Barbados. He was an architect by profession but turned to novel writing about 1895. *The Morals of Marcus Ordeyne* gave him wide popularity. This story, as also *The Beloved Vagabond*, was dramatized with great success. Both are typical of Locke's gift for depicting whimsical, eccentric characters. His novels include *Derelicts*, *Where Love Is*, *Simon the Jester*, *The House of Baltazar*, and *The Tale of Triona*. He wrote also the plays *Mr. Cynic*, *The Lost Legion*, and *An Adventure of Aristide Pujol*.

Lockhart, John Gibson (1794-1854), Scottish biographer, was born in Lanarkshire. He was graduated at Oxford, studied law at Edinburgh, and, in 1816, was admitted to the Scottish bar. He soon adopted the profession of letters. For a long period Lockhart and John Wilson were the chief editors of *Blackwood's Magazine*. This connection led to Lockhart's acquaintance with Sir Walter Scott, whose daughter Sophia he married in 1820. In 1821-24, he wrote the novels *Valerius*, *Adam Blair*, *Reginald Dalton*, and *Matthew Wald*. In 1825, he became editor of the *Quarterly Review*, a place which he held for more than 10 years. His *Life of Burns* and *History of Napoleon* were followed, 1836-38, by *The Life of Scott*, which, with the exception of Boswell's *Johnson*, is generally regarded as the most noted biography in the English language.

Lockwood, Belva Ann Bennett (1830-1917), American lawyer, was born at Royalton, N. Y. In 1848, she was married to Uriah H. McNall, who died in 1853. She was graduated at Genesee College, Lima, N. Y., in 1857. After teaching 11 years, she was married to Dr. Ezekiel Lockwood. Soon afterward she began the study of law in Washington. She was graduated at the National University Law School in 1873 and was admitted to the District of Columbia bar. She was active in securing the passage, in 1879, of an act admitting women to the United States Supreme Court and was herself admitted under it the same year. She was engaged in many important law cases, of which several came before the United States Supreme Court. She became prominent in temperance, peace, and woman suffrage movements and was a prolific writer on political and social subjects. In 1884 and in 1888, she was nominated for president by the Equal Rights party. She was a delegate to the International Peace congresses at London in 1908 and Rome in 1911, and, in 1913, became a member of the International Peace Bureau at Brussels.

Lockyer (*lŏk'yĕr*), **Sir Joseph Norman (1836-1920)**, English astronomer, was born at Rugby. In 1857, he became a clerk in the war office, devoting his leisure time to astronomy. In 1870, he was appointed lecturer on astronomy at the Normal School of Sciences at South Kensington. From 1885 to 1913, he was director of the Solar Physics Observatory at South Kensington. He was the first to use the spectroscope to study the sun and by means of it he discovered the element helium in the sun. He gave the name chromosphere to the sun's gaseous envelope. His writings include *The Spectroscope*, *The Chemistry of the Sun*, and *The Dawn of Astronomy*.

Lodge, Henry Cabot (1850-1924), American statesman and author, was born in Boston, Mass. Educated at Harvard University, he was editor of the *North American Review* in 1873-76 and university lecturer on American history at Harvard in 1876-79. He was member of Congress from

1887 to 1893 and thereafter was elected United States senator for six consecutive terms, 1893-1929.

In both houses of Congress, Lodge served with marked ability and distinction. He led the group of senators who opposed, and finally wrecked, President Wilson's plans for American membership in the League of Nations.

Among his numerous writings are *Life and Letters of George Cabot, Short History of the English Colonies in America, Life of Daniel Webster, Life of Washington, Story of the Revolution, The Democracy of the Constitution,* and *The Senate and the League of Nations.* He was elected, in 1908, a member of the American Academy of Arts and Letters.

Lodge, Henry Cabot, Jr. (**1902-**), American statesman, was born at Nahant, Mass., the grandson of Senator Henry Cabot Lodge. After he was graduated from Harvard in 1924, he was a journalist in Boston and New York. Following two terms as a representative in the Massachusetts legislature, he was elected to the U. S. senate in 1936, and was re-elected in 1942. He resigned in 1943 to join the U. S. army. Re-elected to the Senate in 1946, he was defeated in 1952. In 1953 President Eisenhower appointed him U. S. representative to the United Nations. As a candidate for vice president in 1960 he was defeated.

Lodge, Sir Oliver Joseph (**1851-1940**), British educator and physicist, was born at Penkhull, Staffordshire. He was educated at Newport Grammar School and at first planned for a business career. Becoming attracted to science, he entered University College, London, in 1872, and was graduated at the University of London in 1877. He taught natural science in Bedford college for women from 1877 to 1879 and applied mathematics at University College from 1879 to 1881. From 1881 to 1900, he was professor of physics in University College. Liverpool, and, from 1900 to 1919, he was principal of Birmingham University.

In addition to making important discoveries in electricity, notably in connection with the development of wireless telegraphy, he interested himself in educational reforms and devoted much attention to psychic research. He publicly affirmed his belief in a life after death and his expectation that eventually communication would be possible between living persons and the spirits of the dead.

His numerous writings include *Lightning Conductors and Lightning Guards, Signalling Without Wires, Modern Views of Electricity, Pioneers of Science, Life and Matter, Electrons, The Ether of Space, The Substance of Faith, Man and the Universe, The Survival of Man, Reason and Belief,* and also *Christopher: a Study in Human Personality.*

Loeb (*lōb*), **Jacques** (**1859-1924**), physiologist and biologist, was born in Germany. He was educated in the universities of Berlin, Munich, Strasbourg, and Leipzig. Removing to America, he was associate professor of biology at Bryn Mawr College in 1891-92. He was professor of physiology in the University of California from 1902 until 1910, when he was made head of the department of Experimental Biology at Rockefeller Institute, New York.

Loeb conducted extensive researches to demonstrate that life processes are functions of chemistry. He succeeded in fertilizing the female cell of a sea urchin without a male cell. Among his writings are *The Heliotropism of Animals, Dynamics of Living Matter, Mechanistic Conception of Life, Artificial Parthenogenesis and Fertilization,* and *The Organism as a Whole.*

Loeb, James (**1867-1933**), American banker and philanthropist, was born in New York, N. Y. After being graduated from Harvard University, he entered the investment firm of Kuhn, Loeb & Co., founded by his father, but retired in 1901, living thereafter chiefly in Europe. He founded the Institute of Musical Art, New York, later part of the Julliard Foundation. In Munich, Germany, he founded an Institute for Experimental Psychiatry, later part of the Kaiser-Wilhelm Institute. His name is perpetuated in the Loeb Classical Library, an edition of all Greek and Latin literature published attractively with original text and English translation on facing pages. He left this enterprise to Harvard University on his death.

Loeffler (*lĕf'lĕr*), **Charles Martin Turnov** (**1861-1935**), composer, was born at Mulhouse, Alsace, France, and was educated in Switzerland, Germany, and France, becoming a violinist of distinguished ability. He came to the United States in 1881. His numerous compositions include the symphonic poems *The Death of Tintagiles, A Pagan Poem, La Bonne Chanson, La Villanelle du Diable,* and *Memories of My Childhood in Russia;* also the symphony *Hora Mystica,* and the choral compositions *By the Waters of Babylon* and *The Canticle of the Sun.* He was elected to the American Academy of Arts and Letters in 1931.

Loeffler, Friedrich (**1852-1915**), German bacteriologist, was born at Frankfort on the Oder. He was educated at the universities of Würzburg and Berlin. In 1879, he became assistant in the Imperial Health Office; in 1884, he was made staff physician in Friedrich Wilhelm Institute in Berlin; and, in 1888, he was appointed professor in the University of Greifswald. He made important researches on the bacterial origin of contagious diseases. With Schütz, he discovered the bacillus of glanders in 1882, and, in 1884, he isolated and described the Klebs-Loeffler bacillus of diphtheria, first detected by Klebs in 1883.

Loewy, Raymond (**1893-**), American industrial designer, was born in Paris and won high honors as captain in the French army in World War I. When he came to America to engage in engineering work he first made his living as a fashion artist in New York, then turned his attention to industrial design. Stressing the desirability of esthetic qualities, even in the most practical of everyday products, he seeks to achieve these effects by the use of simple lines rather than ornamentation. His ideas have been expressed in such widely different products as automobiles, refrigerators, packages, and office equipment, as well as in more ambitious creations like stratoliners, passenger trains, bus terminals, and ships.

Logan, Joshua (**1908-**), director and producer of plays, was born at Texarkana, Texas, and was educated at Culver Military Academy and Princeton University. Prior to receiving the Pulitzer prize for *South Pacific,* he had been actor, co-author or director in a long line of successful dramas and musical plays, including *Knickerbockers' Holiday, Annie Get Your Gun,* and *Mister Roberts.*

Lombroso (*lôm-brō'zō*), **Cesare** (**1836-1909**), Italian alienist and criminologist, was born at Venice. He was educated at Padua, Vienna, and Paris. In 1862, he became professor of mental diseases at the University of Pavia, and later he was professor of medical law and psychiatry at Turin. Lombroso propounded the theory that criminals constitute a distinguishable type. Although now discredited, the theory led to the scientific study of insanity and criminology and to great reforms in the treatment of criminal classes in Europe and elsewhere. He discovered the cause of pellagra. He was also a noted linguist and a keen student of the occult.

London, Jack (**1876-1916**), American author and socialistic lecturer, was born in San Francisco, Cal. He attended the University of California but left his course unfinished to go to the Klondike. He traveled widely at various times and partially completed a seven years' cruise around the world in a 50-foot yacht.

Among his numerous writings are *The Son of the Wolf, A Daughter of the Snows, The Call of the Wild, The Faith of Men, The Sea Wolf, War of the Classes, Before Adam, Love of Life, John Barleycorn,* and *The Valley of the Moon.*

Long, Crawford Williamson (**1815-1878**), American surgeon, was born in Danielsville, Ga. He was graduated in medicine at the University of Pennsylvania in 1839. He was probably the first to employ ether as an anesthetic in surgery. In March 1842, he administered ether to a patient and during the ensuing period of unconsciousness removed a tumor from the neck. Between this date and 1845 he operated upon several other patients under ether, but did not announce his observations. While Long was still hesitating, Dr. W. T. G. Morton of Boston, at Dr. C. T. Jackson's suggestion, made, in 1846, his first public demonstration. Long published an account of his anesthetical work in 1849. A statue of him was unveiled in Statuary Hall in 1926.

Longfellow, Henry Wadsworth (**1807-1882**), American poet, was born at Portland, Me. He was graduated from Bowdoin at 18, began his poetical career while in college, and at 19 was made professor of modern languages and literature in his alma mater. After three years spent in further preparation in Europe, he held this chair from 1830 until 1835. At 26, he translated the Spanish elegy of *Coplas de Manrique.*

Following the publication of *Outre-Mer* and another year of study in Europe, he filled the chair of modern languages and literature at Harvard with increasing distinction from 1836 to 1854. During this period he published *Hyperion, Voices of the Night, The Spanish Student, The Belfry of Bruges, Evangeline, The Seaside and the Fireside, Kavanagh,* and *The Golden Legend.*

Upon resigning from Harvard, Longfellow's literary career went steadily on. New volumes appeared at frequent intervals for nearly 30 years. His later works include *The Song of Hiawatha, The Courtship of Miles Standish, Tales of a Wayside Inn, Flower-de-Luce, New England Tragedies, Three Books of Song, Aftermath, The Hanging of the Crane, The Masque of Pandora, Keramos, Ultima Thule,* and *In the Harbor.* He also published a translation of Dante's *Divine Comedy.*

Longfellow is justly popular as the American poet who, above all others, expressed the simple, natural affections and sentiments with unvarying kindliness, moral elevation, and fine artistic sense. He was elected to the American Hall of Fame, 1900. See *Literary Plots, Characters, and Allusions* under names of his chief works.

Longstreet, James (**1821-1904**), American general, was born in Edgefield District, S. C. He was graduated at West Point in 1842 and was on duty on the Mexican frontier until 1846. He was in the Mexican War, 1846-48, serving with distinction at Contreras, Churubusco, Molino

del Rey, and also at Chapultepec, at the storming of which he was severely wounded.

In 1861, he resigned his commission as major to take part with the South in the Civil War. He commanded a brigade under Beauregard, fought brilliantly at the battle of Bull Run, and was made major general in 1862. He commanded with increasing distinction in the Seven Days' battles, in the second battle of Bull Run, and at Fredericksburg, after which he was made lieutenant general. He commanded the right wing of Lee's army at Gettysburg. At Chickamauga his opportune attack was decisive. In the campaign of the Wilderness in 1864 he was severely wounded, but recovered in time to direct the defense of Petersburg. He surrendered with General Lee in April 1865, and labored zealously for the restoration of harmony between the two sections.

Longstreet was one of the greatest fighters of the Confederacy, although the controversy over the failure at Gettysburg injured his popularity in the South. President Grant appointed him surveyor of the port of New Orleans, and, during 1880-81, he served as minister to Turkey. He was United States marshal, 1881-84, and United States railroad commissioner from 1898 until his death.

Lope de Vega, Felix. See *Vega Carpio, Lope Felix de.*

Lorentz (*lō'rĕnts*), **Hendrik Antoon (1853-1928),** Dutch physicist, was born at Arnheim. He was educated at the University of Leiden, where he was professor of physics from 1877 to 1923. He did notable work as one of the developers of Maxwell's theory of the ether and of Thomson's theory of electrons. With Lorenz of Copenhagen he discovered the so-called Lorenz-Lorentz formula for refraction. While working with his pupil Zeeman, he foretold and, in 1896, explained the "Zeeman effect" by showing that the radiating centers were electrons. For these important researches the Nobel prize for physics in 1902 was divided between him and Pieter Zeeman. His publications include *Maxwell's Electromagnetic Theory, Textbook of Physics,* and *The Theory of Electrons.*

Lorenzo de' Medici. See *Medici, Lorenzo de'.*

Lorimer (*lŏr'ĭ-mĕr*), **George Horace (1868-1937),** American journalist and writer, was born at Louisville, Ky. He was educated at Colby College and at Yale University and entered journalism. Served as literary editor and as managing editor, and, from 1899 to 1937, as editor in chief of the *Saturday Evening Post.* He was vice president of Curtis Publishing Company, 1927-1932, and in 1932 was made president. His best-known work is *Letters from a Self-Made Merchant to His Son.*

Lossing (*lŏs'ĭng*), **Benson John (1813-1891),** American historian, was born at Beekman, N. Y. He edited magazines and prepared several illustrated works, among which are an *Outline History of the Fine Arts, Lives of the Signers of the Declaration of Independence,* and *Pictorial Field-Book of the Revolution.* The last is the result of journeys to every place of note connected with the American war for independence. Its popularity caused the author afterward to prepare along similar lines the *Pictorial Field-Book of the War of 1812.* He also published a *History of the United States, The Civil War in America,* biographies of several distinguished Americans, and a *Cyclopedia of United States History.*

Loti, Pierre. See *Viaud, Louis Marie Julien.*

Lotze (*lôt'sĕ*), **Rudolf Hermann (1817-1881),** German philosopher, was born in Bautzen, Saxony. He was educated at Leipzig, where he studied medicine and philosophy, and was appointed to a professorship there in 1842. From 1844 to 1881 he occupied the chair of philosophy at Göttingen and in the latter year was transferred to the University of Berlin. His philosophy is dominated by two interests, one in science and the other in art and religion. He attempted to show that a scientific explanation of phenomena by efficient causation does not exclude purpose but requires the idea of a personal deity acting through natural laws. Among his works are *Metaphysics, Universal Pathology, Logic, On the Idea of Beauty, Medical Psychology, Microcosmus, Ideas for a History of Nature,* and *System of Philosophy.*

Louis IX (*lōō'ĭs, lōō'ĭ*; F., *lōō'e'*), or **Saint Louis, (1214-1270),** king of France, was born in Poissy, and succeeded his father, Louis VIII, in 1226. When he attained his majority, he became involved in a war with Henry III of England, and, finally, in 1242, defeated the English at Saintes. In 1244, during a dangerous illness, he made a vow that if he recovered he in person would join the crusaders.

In 1248, having appointed his mother regent, Louis sailed with a large army to Cyprus. In the following year, he proceeded to Egypt, planning by the conquest of that country to open the way to Palestine. He took Damietta, but at Mansura he was defeated and taken prisoner by the Mohammedans. Procuring release in 1250 by the payment of an enormous ransom, he proceeded to Palestine with the survivors of his army. There he fought with the crusaders until 1254.

Louis then returned to France, where he ruled his kingdom with justice and ability. In 1270, he set out upon a new crusade but on arriving at Tunis was stricken with the plague. Fearless in battle, heroic in adversity, energetic, firm, and unswervingly just, Saint Louis was the ideal king of the middle ages.

Louis XII (1462-1515), king of France, succeeded Charles VIII in 1498. He laid claim to the kingdom of Naples and the duchy of Milan. In 1499, he invaded Italy and gained possession of Milan. With the assistance of Ferdinand of Aragon, he conquered Naples in 1500, but, having quarreled with his ally, was expelled in 1503. In 1508, he united with Ferdinand, Pope Julius II, and the Emperor Maximilian in the league of Cambrai against the Venetians. In 1509, he won the battle of Agnadello, which crushed the power of Venice.

In 1511 Ferdinand joined Julius in the Holy League against the French, who, notwithstanding their victory at Ravenna in 1512, were finally driven out of Italy in 1513. At the same time, Henry VIII invaded France and was successful at Guinegate. At the conclusion of peace in 1514, Louis took for his third wife Mary Tudor, sister of Henry VIII of England. By his good government he earned the title of "father of his people."

Louis XIII (1601-1643), king of France, was born at Fontainebleau. When his father, Henry IV, was assassinated in 1610, Louis succeeded to the throne, but during his youth his mother, Marie de' Medici, was regent. The Huguenots rose against her alliances with the pope and Spain, but concluded a peace in 1614. When the king was declared of age, he confirmed the edict of Nantes and summoned the States-General, for the last time until the reign of Louis XVI. Under the guidance of his great minister Richelieu, the king gradually increased the power of the monarchy at the expense of the Protestant nobles and eventually overthrew the Hugenots by the capture of La Rochelle in 1628. In the Thirty Years' War, Louis sided with Gustavus Adolphus against Spain and Austria.

Louis XIV (1638-1715), king of France, was the son and successor of Louis XIII. The first years of his reign, which began in 1643, were under the regency of his mother, who was guided in all matters of state by her favorite, Cardinal Mazarin. From his father he inherited the war with Spain, and this was followed by the civil war of the Fronde, which lasted from 1648 to 1653.

During the life of Mazarin, Louis interfered little with public affairs, but, after Mazarin's death in 1661, he resolved to become his own minister. He changed the feudal monarchy of France into an absolute one, and his favorite motto, *L'état c'est moi,* "I am the state," was at once the expression of the ruling principles of his life and a description of his policy.

On the death of Philip IV, the father of his queen, Louis laid claim to the Netherlands, which he invaded; but this led to the alliance of England, Sweden, and the Netherlands, usually called "the triple alliance," against him and Louis was speedily compelled to make peace. In 1672, he made an attack upon the Netherlands, having engaged on his side Charles II of England. But, at this juncture, William of Orange who had been raised to the stadtholdership, revived the drooping spirits of his countrymen, and the Netherlands was evacuated as fast as it had been overrun.

Several other wars followed, notably the war of the Spanish succession, in which Louis sought to secure the Spanish monarchy for his grandson the Duke of Anjou. This war began in 1701, convulsed Europe for nearly 13 years, and was terminated by the peace of Utrecht in 1713. Many of the most famous names in French literature belong to the 73-year reign of Louis XIV.

Louis XV (1710-1774), king of France, was born at Versailles and succeeded to the throne at the age of five in 1715. During his minority the Duke of Orleans was regent. In 1723, Louis was declared of age, and two years later married Maria Leszczynska, daughter of Stanislas, the dethroned king of Poland. On the death of Augustus, king of Poland, in 1733, Louis supported the claims of his father-in-law to the vacant throne and was opposed by the emperor of Germany, who upheld the claims of the elector of Saxony.

On the death of the emperor Charles VI in 1740, new dissensions arose, and Louis, who had guaranteed the succession of Maria Theresa, dishonorably united with Prussia and Poland to place the Duke of Bavaria on the throne. This led to the War of the Austrian Succession, which was terminated by the Treaty of Aix la Chapelle in 1748.

In 1756, a new war arose between England and France in regard to their colonial empires. By the Treaty of Paris in 1763, France ceded to England, Canada and other North American colonies. During his later years, Louis suffered himself to be governed wholly by favorites, among whom were Marchioness de Pompadour and

Madame Du Barry. Financial difficulties and social ferment prepared the way for the French Revolution.

Louis XVI (1754-1793), king of France, was born at Versailles. He was the grandson of Louis XV, whom he succeeded in 1774. He had already, in 1770, married Marie Antoinette of Austria, daughter of Maria Theresa and sister of the emperor Joseph.

The first acts of Louis, after his accession, endeared him to his people, for he gave them immunities to which they had been hitherto unaccustomed and effected many reforms in the administration; but he soon became embarrassed by financial difficulties and was not fortunate in his choice of ministers.

Necker, his comptroller-general, advised the summoning of the States-General, which had not been summoned since 1614. It was convoked in May 1789, and in June was superseded by the National Assembly, which assumed the whole legislative authority. His abrupt dismissal of Necker was followed by the destruction of the Bastille, the declaration of the rights of man, and an attack of an armed mob, chiefly women, on the palace at Versailles in October. The king and the queen were then forcibly removed by Lafayette to Paris.

The revolution thus begun culminated, as far as the king was concerned, in the insurrection of 1792, the storming of the Tuileries, the abolition of the monarchy, the declaration of the republic, and the execution of the king on the scaffold.

Louis XVIII (1755-1824), king of France, a younger brother of Louis XVI, was born at Versailles. In 1791, he fled from Paris on the same night as the king, Louis XVI, and reached the Belgian frontier in safety. From his retreat he issued from time to time declarations against the Revolutionists, which damaged the king, who had been captured and brought back to Paris. After the execution of his brother, he proclaimed the dauphin king, under the title of Louis XVII, and, in 1795, assumed the title of king himself.

The fall of Napoleon opened his way to the French throne, and, in 1814, he landed at Calais after 23 years of exile. He ruled by the "divine right of kings" in the pre-Revolutionary tradition. On Napoleon's return from Elba, Louis again went into exile until after the battle of Waterloo. He was restored to the throne by the allied powers in 1815 and ruled until his death at Paris.

Louise Auguste Wilhelmine Amalie (1776-1810), queen of Prussia, was born at Hanover, where her father, Duke Karl of Mecklenburg Strelitz, was commandant. In 1793, she was married to the crown prince of Prussia, afterward Frederick William III, and was the mother of Frederick William IV and of William I, who was later emperor. She endeared herself to her people by her spirit and energy during the period of national calamity that followed the battle of Jena, and especially by her patriotic and self-denying efforts to obtain concessions from Napoleon at Tilsit.

Louis Philippe (*lōō'ē' fē'lēp'*), **(1773-1850),** king of France, eldest son of Louis Philippe Joseph, duke of Orleans, was born in Paris. During the French Revolution he first sought security in Switzerland; later he traveled in northern Europe; from 1796 to 1800, he resided in the United States; and afterward he located in England. On the fall of Napoleon he hastened to Paris, where he was received with distrust by Louis XVIII. He was very popular in Paris, but kept aloof from political intrigues. The revolution of 1830 resulted in his appointment as lieutenant general of the kingdom, from which office he proceeded to the acceptance of a constitutional throne.

The country prospered under the government of Louis Philippe, but demands for reform in the electoral system became loud and general. These were unwisely opposed by the king and the Guizot ministry. Insurrectionary movements in the streets of Paris ensued in February 1848, and the "citizen king" saw with alarm that the national guard could not be expected to support him. On February 24, Louis Philippe, deserted by his courtiers, abandoned his throne and fled to England.

Low, David (1891-1963), British cartoonist and caricaturist, was born at Dunedin, New Zealand. He began his career by drawing political cartoons for the Sydney *Bulletin*, then went to London, where he became internationally famous. Because of his keen satire his drawings are considered editorials in crayon form. His *Autobiography* depicts personalities and situations remembered from an important historical period.

Low, Seth (1850-1916), American educator and publicist, was born in Brooklyn, N. Y. He was graduated at Columbia in 1870 and entered his father's tea importing house, from which he withdrew, in 1888, with a large fortune. He was mayor of Brooklyn, 1882-86, and his administration was noted for his application of the civil-service system to city offices. In 1890, he was elected president of Columbia College, which, under his constructive leadership, was transformed into a great modern university. In 1895, he erected for the university the Low Memorial Library at the cost of $1,000,000.

In 1897 he became an independent candidate for mayor of New York. He was defeated, but later was elected for the term 1902-03 upon a fusion ticket.

Low, Will Hicok (1853-1932), American illustrator and painter, was born at Albany, N. Y. In 1870, he began making illustrations for New York magazines, and, in 1873, he went to Paris, where he studied under Gérome and Carolus-Duran. He was also influenced by his association with Millet and other painters of the Barbizon group. He returned to America in 1877 and soon attained prominence. He is most widely known for his illustrations, mural decorations, and stained-glass work. Among his paintings are "May Blossoms," "My Lady," "Aurora," "The Orange Vendor," and "Christmas Morn." He is the author of *A Chronicle of Friendships* and *A Painter's Progress.*

Lowell, Abbott Lawrence (1856-1943), American educator and writer, was born in Boston, Mass. Graduating at Harvard Law School, he practiced law in Boston from 1880 to 1897, and then became connected with Harvard University. He was lecturer on government, 1897-99, and professor of the science of government from 1900 to 1909, when he was elected president of the university succeeding Charles W. Eliot. He retired in 1933.

Lowell became an authority in the field of government and comparative politics. His writings include *The Influence of Party Upon Legislation in England and America, The Government of England,* and *Conflicts of Principle.* In 1910, he was elected member of the American Academy of Arts and Letters.

Lowell, Amy (1874-1925), American poet, essayist, and critic, sister of Abbott Lawrence Lowell, was born at Brookline, Mass. She was privately educated and devoted herself to literary study. In 1912, she published *A Dome of Many-Colored Glass,* which was followed by *Sword Blades and Poppy Seed* and *Six French Poets.* By her essays and poems she became a prominent advocate of "vers libre" and other modern tendencies in American poetry, although her poetic genius never allowed itself to be dominated by these formulas. Her later writings include *Men, Women and Ghosts*; *Tendencies in Modern American Poetry*; *Pictures of the Floating World*; and, with Florence Ayscough, *Fir-Flower Tablets—Poems Translated from the Chinese.* She wrote also a biography of Keats, which embodied her views on the nature of poetry. Her *What's O'clock?* was awarded the Pulitzer prize for the best book of poems published in 1925.

Lowell, James Russell (1819-1891), American poet, essayist, and diplomat, was born in Cambridge, Mass. He was educated at Harvard University and, at graduation in 1838, was poet of his class. He then spent several years abroad studying languages. His *Legend of Brittany* appeared in 1844, and, in 1845, he published a prose work entitled *Conversations on Some of the Old Poets.* In 1846 appeared the first of a satirical series of *Bigelow Papers.*

In 1855, Lowell succeeded H. W. Longfellow as professor of modern languages at Harvard and held the chair until 1877. From 1857 to 1862 he was editor of the *Atlantic Monthly,* and from 1864 to 1872 he was editor of the *North American Review.* He was United States minister to Spain, 1877-80, and to Great Britain, 1880-85.

His writings during the period when he was professor and diplomat include *Under the Willows, and Other Poems*; *The Cathedral,* an epic; *Among My Books,* a collection of essays; *My Study Windows*; *Democracy; Political Essays*; *Heartsease and Rue*; and *The Old English Dramatists.*

Lowell possessed a many-sided genius, and, although an uneven writer, produced some of the best verse in American literature. Among his finest poems are *The Vision of Sir Launfal, She Came and Went, The First Snowfall, After the Burial,* and the *Commemoration Ode.*

He excelled as a prose writer rather than as a poet. His descriptive sketches, political lectures, and critical essays rank among the first in American letters. In brilliancy, suggestiveness, and force, his best prose has seldom been surpassed. Elected to the American Hall of Fame, 1905.

Lowell, Percival (1855-1916), author and astronomer, brother of Abbott Lawrence Lowell, was born in Boston, Mass. He was graduated at Harvard in 1876. In 1833, he went to Japan and lived there at different times until 1893. He established the Lowell Observatory at Flagstaff, Ariz., in 1894. For his observations and writings on what he regarded as canals and other indications of life on the planet Mars, Lowell became widely known. In 1904, he received the Janssen medal of the French Astronomical Society and, in 1908, he was awarded the gold medal of the Astronomical Society of Mexico. The planet Pluto, the position of which he had predicted in 1915, was discovered in 1930.

Lowie, Robert Harry (1883-1957), American anthropologist, was born in Vienna, Austria. Brought to America at the age of 10, he was educated at Columbia University and was appointed to the staff of the American Museum of

Natural History in 1908. He was associate curator of anthropology from 1913 to 1921 and then joined the staff of the University of California becoming professor of anthropology in 1925. By studying Indian tribes on the great plains, he became the leading authority on the social life which they developed.

Loyola (*lō-yō'lä*; *loi-ō'lä*), **Saint Ignatius de (1491-1556),** Spanish reformer and founder of the Society of Jesus, was born at the ancestral castle of Loyola in the Basque province of Guipuzcoa, Spain. His original Spanish name was Ingio de Loyola y Balda, Ignatius having been assumed in later life.

Early Life. Loyola was sent, at the age of 14, to the court of Ferdinand V to learn the rudiments of war and gallantry. Having been wounded at the defense of Pamplona in 1521, he read some biographies of the saints and other devotional books to relieve his weariness in convalescence. His thoughts were thus directed into a new channel, and he resolved to devote himself to the Church. On March 24, 1522, he made a vow to perform a pilgrimage barefoot to Jerusalem. Receiving the papal benediction from Adrian VI in Rome, he proceeded in 1523 to Venice and there embarked for the Holy Land.

Loyola returned to Venice and Barcelona in 1524. Feeling his literary acquirements to be insufficient, he studied at the universities of Alcala and Salamanca in 1526-27. He assimilated a considerable fund of knowledge and directed his energies to personal intercourse with those about him. Having been imprisoned during the inquisition at Salamanca, he sought a wider and safer field for his exertions in France, arriving at Paris in February 1528.

Society of Jesus. He continued his studies at the University of Paris, where he received his degree of master of arts in 1535. Here he gathered the first members of his "company of Jesus," which, later incorporated as the Society of Jesus and known popularly as Jesuits, exercised an extensive influence upon the religious condition of the modern world. In 1534, Loyola and six disciples met formally in the Chapel of Montmarte at Paris and took vows to make a pilgrimage to the Holy Land or, failing in that, to offer their lives to the service of the pope.

In 1537, the rule of the proposed society was submitted to the pope, Paul III. They adopted the motto, "To God's greater glory." In addition to the vows of chastity, poverty, and obedience, they bound themselves to go as missionaries to any country that the pope might indicate to them. The new rule was approved by a bull in 1540.

The association was practically inaugurated at Rome in 1541 by the election of Loyola as its first general, with tenure for life and with absolute powers. The disciples were sent on various missions into different parts of Europe. Loyola remained at Rome, devoted himself to many offices of piety, and spent all possible leisure on composing the *Constitutions of the Society* and his famous *Spiritual Exercises*, published in 1541.

Influence of The Society. While Loyola enjoined mental prayer, frequent self-examination, and religious retirement, he urged his disciples also to use every exertion for the instruction and sanctification of the rest of mankind. The progress of the Society of Jesus surpassed in rapidity all that is recorded of the infancy of the older establishments, and, with a high degree of zeal, learning, and skill, the Jesuits spread their influence to every quarter of the world. Loyola died at Rome, July 31, 1556, and was canonized in 1622 by Gregory XV. See *Jesuits, Jesuit Schools, Educational Reformers.*

Lubbock, Sir John. See *Avebury, John Lubbock, Baron.*

Luce, Clare Boothe (1903-), playwright and diplomat, was born in New York City. From 1930 to 1934 she was on the editorial staff of *Vogue* and of *Vanity Fair*, and was also a newspaper columnist. In 1935 she married Henry R. Luce. Her first successful play was *The Women*, produced in 1937. This was followed by *Kiss the Boys Goodbye* and *Margin for Error*. Her book of European war-time observations, *Europe in the Spring*, was published in 1940. She was twice elected to Congress from Connecticut, serving from 1943 to 1947, and then declined to run again. From 1953 to 1956 she was ambassador to Italy.

Luce, Henry (1898-), editor and publisher, was born of American parents in Shantung Province, China, but received his education in Connecticut. After graduation from Yale, he engaged in journalism as editor and publisher. His chief contribution to American journalism has been in the founding of several successful magazines, including *Time, Life, Fortune*, and *Sports Illustrated.*

Lucretius (*lū-krē'shĭ-ŭs*), or **Titus Lucretius Carus (c. 99 B. C.-c. 55 B. C.),** Roman poet. His principal work, *De Rerum Natura*, a philosophical didactic poem, appeared in 56. He was a follower of Epicurus, and his great poem is largely an exposition of the tenets, physical and moral, of that philosopher. It is inspired throughout, however, with intense moral earnestness and supports the thesis of the mechanistic nature of life with a fervor seldom exceeded by exponents of the more orthodox types of religion. It is doubtful, moreover, if a scientific theme has ever been presented with such a powerful appeal to the sense of beauty. This work stands in a class by itself in Latin literature and ranks perhaps as the world's greatest didactic poem.

According to tradition, Lucretius committed suicide in a fit of madness, this affection having been caused by a love potion which his wife administered to him in order to render his attentions to her more ardent.

Lucullus (*lū-kŭl'ŭs*), **Lucius Licinius (c. 110 B. C.-c. 57 B. C.),** Roman general. He commanded the fleet in the first Mithridatic War. As consul in 74 B. C., he defeated Mithridates, and introduced financial reforms in the administration of Asia Minor, thus incurring the enmity of interests in Rome which profited by the old order. He twice defeated Tigranes of Armenia; but Lucullus' legions became mutinous, and he was superseded by Pompey in 66 B. C. He attempted to check Pompey's power, and was one of those who brought about the coalition known as the First Triumvirate, but soon withdrew from politics. He spent the rest of his life enjoying his great wealth in the company of artists, poets, and philosophers, and exhibiting a luxury which became proverbial.

Ludendorff (*lū'dĕn-dôrf*), **Erich von (1865-1937),** German general, was born at Kruszevnia, near Posen, Prussia. Training at the War Academy prepared him for membership in the general staff at Berlin. In 1914 he was associated with Hindenburg in the victories over the Russians at Tannenburg and the Masurian Lakes. Later he was transferred to the western front, where, as quartermaster-general he directed the last German bid for victory.

Having gone to Sweden when defeat forced his resignation, he returned to Germany and joined Hitler in the abortive beer hall Putsch of 1923. Two years later he was an unsuccessful candidate for the presidency of Germany.

Ludwig, Emil (1881-1948), German biographer, was born at Breslau of a Jewish family named Cohn. He practiced law and had some business experience, but soon turned to the writing of plays in prose and verse, taking up his residence first in England and then Switzerland. In 1920, he began a series of biographies of historical characters, which revealed the true bent of his genius—psychological interpretation of historic characters expressed in a vivid and stimulating style. His works of this type include *Goethe, Wagner, Bismarck, Napoleon, William II, Lincoln, Cleopatra, Hindenburg*, and *Roosevelt.* He wrote also *Genius and Character, Gifts of Life*, and *The Nile*, a "biography" of the river.

Lully (*lü'lē'*), **Jean Baptiste (1633-1687),** composer and founder of French opera, was born at Florence, Italy. At the age of 14 he went to Paris, where he found employment as a servant. He taught himself to play the violin and became attached as a musician to the service of the king. He soon began to compose successfully, became superintendent of court music, and finally was made director of the Royal Academy of Music, founded in 1669. His compositions include operas, ballets, and miscellaneous music. He made simplicity and directness the basis of the French School of Opera. Among his chief compositions are *Alceste, Thésée, Persée*, and *Armide.*

Lummis (*lŭm'ĭs*), **Charles Fletcher (1859-1928),** American author and explorer, was born at Lynn, Mass. He studied at Harvard and, during 1881-83, edited a newspaper in Ohio. In 1884, he walked from Cincinnati to Los Angeles by a roundabout route, purely for pleasure, 3507 miles in 143 days. He lived five years in the Indian pueblo of Isleta, New Mexico, studying Indian languages and customs.

From 1894 to 1909, he was editor of the *Out West Magazine*, and, from 1905 to 1910, he was librarian of the Los Angeles Public Library. In 1895, he founded the Landmarks' Club to preserve historical landmarks. This has preserved the remains of the Pala, San Juan Capistrano, and San Fernando missions in California. In 1902, he organized the Sequoya League for the improvement of the Indians. In 1917, he established the Institute of the West to found local museums throughout the Southwest.

Lunt, Alfred (1893-), actor, was born at Milwaukee and was educated at Carroll College, Waukesha, Wis. His stage career began at the Castle Theatre, Boston, and was followed by acting on a tour with Margaret Anglin in 1914. He is best known for a series of plays in which he and his wife, Lynn Fontanne, have appeared as a team, each being a perfect foil for the other. Examples of plays featuring "the Lunts" are *Reunion in Vienna, Amphitryon, The Great Sebastians*, and *The Visit.*

Luther, Martin (1483-1546), German religious reformer and translator of the Bible, was born at Eisleben in Prussian Saxony. He was graduated at the University of Erfurt with a master's degree in 1505 and then entered the monastery of the hermits of Saint Augustine. In 1507, he was ordained a priest, and, in the following year, he removed to Wittenberg, where he lectured at first

on dialectics and physics and, later, on the Holy Scriptures. In 1511 Luther was sent on a mission to Rome where for the first time he came into contact with the authority of the Roman Church. His recollections of this trip were used some years later in his attacks on the Roman Church.

THE NINETY-FIVE THESES. In the decade preceding 1517 Luther evolved his doctrine of salvation by faith rather than by faith and good works. In 1517, when John Tetzel, a Dominican monk, was commissioned by Albert, Archbishop of Brandenburg, to preach the doctrine of indulgences following the publication of the Papal Bull of Julian II on indulgences. Luther nailed his 95 theses to the door of the Castle Church at Wittenberg. These theses attacked the abuses of the time which crept into the matter of giving indulgences; although it is commonly admitted that Luther had not had in mind a declaration of war but simply an academic challenge to a disputation. This debate marked the beginning of a popular movement destined to have the most far-reaching consequences for Christianity. Among the influential friends attracted to him were Bucer, Melanchthon, Erasmus, and Hutten.

THE DIET OF WORMS. Luther entered into a public debate with Dr. Eck in 1519 at Leipzig, where he called into question the authority of the pope and of the general council, setting up in their place the authority of the Scriptures as interpreted by the individual's reason. Pope Leo X issued a bull of excommunication against Luther, June 15, 1520, if he should not recant within 60 days; Luther's reply was publicly to burn the bull. His cause was tried at Worms by the secular authority. He was put under the ban of the Empire, but his seizure by his enemies was prevented by friends, who concealed him in a castle at Wartburg for a year. During this period, he made a translation of the New Testament, which was published in 1522.

THE LUTHERAN CHURCH. In 1522, Luther returned to Wittenberg and set about organizing his new church. His doctrines included a rejection of asceticism and of the monastic life, and, in 1525, he married Katharina von Bora, who had been a nun but repudiated her vow of celibacy in accordance with the new doctrine. The translation of the Bible occupied large portions of his time, while commentaries, hymns, and other works also came from his pen. At the diet of Augsburg in 1530, the Confession of Augsburg was adopted, and Protestantism, despite all obstacles, was firmly established among the German states.

CHARACTER AND ACCOMPLISHMENTS. Luther was a Titan in intellectual robustness. He was not, however, an exponent of reason or toleration nor a social reformer. He insisted on the Scriptures, privately interpreted, as an authority in the Christian religion. The religious movement that he initiated changed the face of Europe and effectively divided Christendom into two great sections.

Lutyens, Sir Edwin Landseer (1869-1944), English architect, was born in London. After brief training, he began designing small houses, later making plans for large estates, complete with furnishings and gardens. He showed great skill in evolving original designs within the framework of traditional English domestic architecture. He designed the British Embassy in Washington, D. C. His greatest monument is the new section of Delhi, which became the capital of India in 1911. Here Lutyens laid out a garden city larger than Washington, D. C., and constructed buildings of unified design on a scale unmatched in recent times. The residences are long, low, white buildings with classic porticoes, while the governor's palace combined the Greek style of architecture with that of India.

Lycurgus (*lī-kûr'gŭs*), lawgiver of Sparta, flourished in the 9th century B. C. He was uncle of the young king Charilaus, and governed wisely during his nephew's infancy. He traveled in Crete, Ionia, and Egypt. On his return, finding Sparta in anarchy, he redivided property and remodeled the constitution, giving the city its characteristic institutions, which were designed to produce hardy warriors. Lycurgus was afterward honored at Sparta as a god. Laws attributed to him remained in force nearly 1000 years.

Lyell, Sir Charles (1797-1875), British geologist, was born in Kinnordy, Scotland. He was graduated at Oxford and studied law, but left his practice for the study of geology.

Lyell was the ablest early advocate of the theory of uniformitarianism and was successful in securing its universal adoption by geologists. This theory assumes that the great geologic changes which the earth has undergone are the cumulative results of slow-working but persistent processes rather than of transformations due to sudden catastrophic agencies.

For his notable work in establishing this great fundamental conception, Lyell has been called the father of modern geology. He was influential also in securing the recognition of Darwin's theory of evolution. His works include *Elements of Geology, Travels in North America,* and *The Antiquity of Man.*

Lyon, Mary (1797-1849), American educator, founder of Mount Holyoke College, was born at Buckland, Mass. By great effort and perseverance she gained a good education and for several years taught in the public schools of the state. In 1837, she founded a famous seminary, now Mount Holyoke College at South Hadley, Mass., upon the plan of uniting domestic service with intellectual culture. Her success as president of this institution caused many similar schools to be established throughout the country, and the name of Mary Lyon became a household word among all friends of the education and the elevation of women. Her writings include an account of the seminary and a book entitled *The Missionary Offering.* Elected to the American Hall of Fame, 1905.

Lytton (*lĭt'ŭn*), **Edward George Earle Lytton Bulwer-Lytton, Baron (1803-1873),** English novelist, was born in London. In 1826, he was graduated at Cambridge, and, in 1827, he published his first novel, *Falkland.* In 1828, his *Pelham* appeared. This work placed him at once in the first rank of contemporary writers of fiction. Thenceforward his literary career was one of great brilliancy, and for a quarter of a century he reigned as the master of English fiction.

Among his other novels are *The Disowned, Paul Clifford, The Pilgrims of the Rhine, The Last Days of Pompeii, The Last of the Barons, Lucretia, Harold, The Caxtons, The Coming Race,* and *Kenelm Chillingly.* He wrote also the poems *The New Timon* and *King Arthur.* He was created a peer in 1866.

His son, Edward Robert Bulwer-Lytton, Earl of Lytton, "Owen Meredith," (1831-1891) was viceroy of India from 1876 to 1880. His best known work is *Lucile.*

McAdam (*măk-ăd'ăm*), **John Loudon (1756-1836),** Scottish engineer, was born at Ayr, 1756. At the age of 14, he was sent to an uncle in New York, where he remained until the close of the Revolutionary War, acquiring a comfortable fortune as agent for the sale of war prizes. He returned to Britain and, in 1815, was appointed surveyor-general of Bristol roads, where he effected notable improvements in road building by the use of crushed stone. His name soon became synonymous with his valuable invention and macadamized roads were rapidly introduced throughout the civilized world.

McAdoo (*măk'ă-dōō*), **William Gibbs (1863-1941),** American lawyer, railway official, and cabinet officer, was born near Marietta, Ga., and was educated at the University of Tennessee. He practiced at Chattanooga and, in 1892, removed to New York. In 1902, he was elected president of the Hudson and Manhattan railroad. He was secretary of the treasury during 1913-18. In 1914, he married Eleanor Wilson, the youngest daughter of President Wilson. He served, 1917-19, as director general of the railways. At the Democratic national convention, 1924, he failed of the necessary two-thirds votes for presidential candidacy. He was elected to the Senate, 1933-39.

MacArthur, Douglas (1880-1964), American general, was born in Arkansas. Graduating from West Point in 1903, he served in the Philippines and in Mexico, and was on duty in Japan and on the Pacific Coast. In World War I he commanded the "Rainbow" division and was in action at St. Mihiel and Sedan. Made a major general in 1925, he served for several years in the Philippines. In 1930 he was commissioned general, and from 1930 to 1935 was chief of staff of the United States Army.

Sent back to the Philippines in 1935 as director general of national defense, he organized the Philippine army. He was commander in chief when the Japanese invading forces struck in 1941. In the face of overwhelming odds, he withdrew his forces into Bataan Peninsula. In March 1942 he was ordered to Australia to command the Allied forces. In August 1942, the American return began with the occupation of Guadalcanal. MacArthur's forces landed on Leyte in October 1944; in February, promoted to General of the Army, he entered Manila. On September 2, 1945, as Allied Supreme Commander, he received the surrender of Japan, and entered upon its administration. In 1950, when Southern Korea was invaded by Northern Korea communists, General MacArthur was placed in command of the opposing forces—the first commander in chief under the flag of the United Nations. In 1951 President Truman removed him for making public statements critical of Washington policy. In 1952 he accepted the chairmanship of the board of Remington Rand.

Macaulay (*mă-kô'lĭ*), **Thomas Babington Macaulay, Baron (1800-1859),** British historian and statesman, was born at Rothley Temple, Leicestershire. He entered Trinity College, Cambridge, at the age of 18 and acquired a brilliant reputation both as a scholar and as a debater. He began his literary career by contributing to periodicals, his earlier ones including *The Spanish Armada, Moncontour,* and *The Battle of Ivry,* besides essays and critiques. In 1825, he contributed to the *Edinburgh Review* an essay on Milton which became a classic. He was a member of Parliament, 1830-34; member of the supreme

council in India, 1834-38; and war secretary, 1839-41. His martial ballads entitled *Lays of Ancient Rome* appeared in 1842. In 1843, he published his *Essays*, in three volumes. In 1848 appeared the first two volumes of his celebrated *History of England from the Accession of James II*. These created great interest and met with an enormous sale. The third and fourth volumes were published in 1855. On account of rapidly failing health, he was unable to complete his great history. It has been characterized as "a great Whig pamphlet," and some passages have been attacked with telling criticism; but as a literary and historical reviewer, Macaulay stands unchallenged. He was elevated to the peerage as baron in 1857. He was buried in Westminster Abbey.

McBurney, Charles (1845-1913), American surgeon, was born in Roxbury, Mass. He was graduated at Harvard, 1866, and from the College of Physicians and Surgeons, New York, 1870. He then began practice as a surgeon in New York and was professor of clinical surgery at the College of Physicians and Surgeons in 1892-1907. His reputation as a skillful operative surgeon and as a teacher of surgery was world-wide. He became an authority on appendicitis and discovered "McBurney's point," which is of great value in diagnosing that disease. He was consulting surgeon to President McKinley after the president was shot.

McCarthy, Justin (1830-1912), Irish historian and political leader, was born at Cork. He engaged in journalism successively in Cork, Liverpool, and London. In the last named city, he became editor of the *Morning Star* in 1864 and editorial writer for the *Daily News* in 1870. From 1879 to 1900, he was a member of Parliament. He became prominent in the Irish Home Rule party and was chairman of the Irish Parliamentary party in 1890-96.

Novels from his pen include *Miss Misanthrope, Donna Quixote, Maid of Athens*, and *Mononia*. His reputation as a historian rests on his *History of Our Own Times*. Among his other works are *A History of the Four Georges, Epoch of Reform, Life of Pope Leo XIII, The Story of Mr. Gladstone's Life, Modern England, The Reign of Queen Anne*, and *The Story of an Irishman*.

McClellan, George Brinton (1826-1885), American general, was born at Philadelphia, Pa. He was graduated at West Point, 1846, and distinguished himself in the Mexican War.

After four years spent in railroad development, he was, in 1861, commissioned major general of the United States army and was appointed to the command of the department of the Ohio. He subsequently commanded the army of the Potomac, in the organization and training of which he showed great vigor and skill. After the costly Seven Days' battles, he was superseded by General Halleck. Following General Pope's defeat in the second battle of Bull Run, McClellan was again placed in command of the army of the Potomac and fought with Lee the indecisive battle of Antietam, 1862. McClellan's failure vigorously to pursue Lee's retreating army led to his removal. In 1864, as a Democrat, he was the unsuccessful opponent of Lincoln for the presidency. He was elected governor of New Jersey, in 1877.

McCloskey (*mă-klŏs'kĭ*), **John (1810-1885),** American Roman Catholic prelate, was born at Brooklyn, N. Y. After pursuing a collegiate and theological course at Mount Saint Mary's College, Emmitsburg, Maryland, he was ordained priest at Saint Patrick's Cathedral, New York, 1834. He was the first president of Saint John's College, now Fordham University, Fordham, N. Y., 1841-42; was consecrated bishop of Albany in 1847; became archbishop of New York in 1864; and, in 1875, was created cardinal, the first in America. He built the Cathedral at Albany and the Theological Seminary at Troy, and, besides being an effective preacher, was an able executive.

McCollum, Elmer Verner (1879-), American physiological chemist, was born near Fort Scott, Kans. He was educated at the University of Kansas and Yale University. In 1907, he was appointed on the faculty of the University of Wisconsin, where he became professor of agricultural chemistry in 1913. Four years larer, he went to Johns Hopkins University as professor of biochemistry. He discovered Vitamin A, announcing the discovery in 1912, and took a leading part in the identification of other vitamins. His publications include *The Newer Knowledge of Nutrition, The American Home Diet*, and *Foods, Nutrition, and Health*.

McCobb, Paul (1917-), designer, was born at Boston. He studied painting, then turned his attention to design, particularly the design of furniture, in which field he has gained international recognition. He has also been design consultant for several industrial organizations.

McCone, John A. (1902-), business executive, was born at San Francisco. He studied engineering at the University of California and began work as a construction engineer. Later he branched out into banking and shipbuilding. He has served the U.S. government as a member of the President's Air Commission and as chairman of the Atomic Energy Commission. In 1961 he was made head of the Central Intelligence Agency.

McConnell, Francis John (1871-1953), American prelate and educator, was born at Trinway, Ohio. He was educated at Ohio Wesleyan University and Boston University. In 1894, he was ordained to the ministry of the Methodist Episcopal Church and, at different times, held important pastorates in Massachusetts and New York. He was made president of De Pauw University in 1909 and, three years later, was elected bishop, serving in Mexico and later in Pittsburgh. Appointed to a governmental commission to study a steel strike in 1919, he was largely responsible for a report that led to the abolition of the 12-hour day in that industry. His published works include *Religious Certainty, The Preacher and the People, Christianity and Coercion*, and *John Wesley*.

McCormack, John W. (1891-), American Democratic politician, was born at Boston, Mass., where he was educated in the public schools. He was admitted to the Massachusetts bar in 1913 and practiced law in Boston. He was a member of the Massachusetts House of Representatives, 1920-22, and the Massachusetts Senate, 1923-26. A member of Congress since 1927, he was made speaker of the House of Representatives in 1962.

McCormick (*mă-kôr'mĭk*), **Cyrus Hall (1809-1884),** American inventor and manufacturer, was born in Virginia. In 1831, he invented a reaping machine, which he patented and later perfected with further improvements. However, all of the essential elements of modern harvesting machines—the reel, the divider, the reciprocating knife, and the platform—were embodied in his original invention of 1831. In 1847, he removed to Chicago, where he formed a partnership with his brother Leander James McCormick and established a reaping machine plant, which became the most extensive manufactory of harvesting machines in the world. He contributed liberally to education and endowed a chair in Washington and Lee University.

McCormick, Joseph Medill (1877-1925), American politician, was born at Chicago. He was educated at Yale University and became publisher and editor of the Chicago *Tribune*, which, under his direction, became one of the most influential papers in the United States. He was twice elected to the Illinois general assembly and became a member of Congress in 1917. Two years later, he was elected to the United States Senate. His wife, Ruth (1880-1944), daughter of Mark Hanna, was elected to the House of Representatives for the term 1929-31.

McCormick, Robert Rutherford (1880-1955), American publisher, was born in Chicago. He was educated at Yale and Northwestern universities and, taking up the practice of law in Chicago, was active in civic circles from 1904 to 1910. In the latter year, he became, with his cousin Joseph Medill Patterson, coeditor and publisher of the Chicago *Tribune*. The *Tribune's* circulation became the greatest of any newspaper in the United States except that of the New York *Daily News*, a "tabloid" founded by them in 1921.

McCrae, John David (1872-1918), Canadian physician and poet, was born at Guelph, Ont. He was educated at the University of Toronto and studied also at McGill University, where he became a lecturer in pathology and medicine; was appointed surgeon to the Alexandra Hospital in Montreal; and contributed to Osler and McCrae's *System of Medicine*.

He served as a lieutenant in the Boer War and, in World War I, was second in command of the medical unit provided by McGill University. During the battle of Ypres, he wrote the famous lyric, "In Flanders' Fields," for which he is chiefly remembered.

McCutcheon (*mă-kŭch'ĕn*), **George Barr (1866-1928),** American author, was born in Tippecanoe County, Indiana, and was educated at Purdue University. He entered journalism, becoming city editor of the Lafayette *Courier* in 1893. Later devoting himself to the writing of short stories and novels, he produced many popular works, including *Graustark*, a tale of adventure in "Graustark," an imaginary petty kingdom of Europe. His other works include *Brewster's Millions, A Fool and His Money, The Light That Lies, West Wind Drift*, and *Oliver October*.

McCutcheon, John Tinney (1870-1949), American cartoonist, brother of George Barr McCutcheon, was born near South Raub, Ind. He was graduated at Purue University in 1889 and, from that time, was connected with leading Chicago newspapers. His cartoons first became famous in the presidential campaign of 1896. He set out for a trip around the world on the dispatch boat *McCulloch* in 1898 and, in the interest of his paper, visited the Philippine Islands, various other parts of the Orient, and South Africa, where he joined the Boers. In 1909-10, he visited Africa; went to Mexico in 1914; was with the Belgian and German armies later the same year; and spent much of

1915 and 1916 in France and the Balkan Peninsula. He won the Pulitzer prize for cartoons in 1931. Among other works, he published *Filipino Warfare*; *Congressman Pumphrey, the People's Friend*; *T. R. in Cartoons*; and *The Restless Age*.

Macdonald, James Alexander (1862-1923), Canadian clergyman and journalist, was born in Middlesex County, Ont. He was graduated at Knox College, Toronto, 1887; was ordained to the ministry of the Presbyterian Church; and became pastor of Knox Church, Saint Thomas, Ont., 1891. He resigned his pastorate in 1896 and removed to Toronto to become first editor of *The Westminster*, a religious monthly magazine which was later consolidated with other similar periodicals as *The Presbyterian*. He was principal of the Presbyterian Ladies' College, 1896-1901. From 1902 to 1916, he was editor in chief of the Toronto *Globe*. He became widely known as a vigorous editorial writer and a forceful lecturer.

MacDonald, James Ramsay (1866-1937), British politician, labor leader, and Socialist writer, was born at Lossiemouth, Scotland. Except for brief attendance at board schools, he was practically self-educated. At 19, he went to London and soon afterward engaged in secretarial work. In 1891, he threw himself into the Socialist movement, soon attaining prominence as an organizer and as a writer. From 1900 to 1911, he was secretary of the Labor party, and, in 1905, he became editor of the *Socialist Library*.

Turning his attention to public affairs, MacDonald, from 1906 to 1918, was elected continuously to Parliament as a Labor member. In 1911, he was made leader of the Labor party. His record as a consistent and outspoken pacifist cost him his seat in Parliament in 1918. With the success of the Labor party in the elections of 1923, MacDonald again came into prominence as a political leader. Early in 1924 he was made prime minister. Although his government fell later in the same year, he had the distinction of heading the first Labor administration in Great Britain. Again returned to power in 1929, he retained his leadership during a critical election in 1931 only by deserting his party and heading a coalition government. As prime minister he visited the United States in 1929 and 1933. In 1935 he resigned as prime minister and accepted a cabinet position under Stanley Baldwin.

MacDonald, Jeanette (1907-1965), American singer and film actress, was born at Philadelphia, Pa. One of the first and greatest of the screen's singing stars, she made her stage debut in a revue while in her early teens. Her first New York appearance was as a chorus girl in a Broadway musical in 1921. Discovered by a Hollywood "talent scout" during the early years of sound film, she signed a screen contract in 1929, and made her name in *The Love Parade* with Maurice Chevalier. She quickly became a popular star, appearing in many films. Her first role with Nelson Eddy was in *Naughty Marietta*, produced in 1935. Among the numerous films in which she has appeared were *Love Me Tonight* (1932), *The Merry Widow* (1934), *Rose Marie* (1936), *Maytime* (1937), *The Firefly* (1937), *The Girl of the Golden West* (1938), *Sweethearts* (1938), *I Married an Angel* (1939), *New Moon* (1940), and *Three Daring Daughters* (1950).

Macdonald, Sir John Alexander (1815-1891), Canadian statesman, was born in Glasgow, Scotland. His parents settled in Upper Canada during his childhood. After attending Kingston Grammar School, he studied law and was admitted to the bar in 1836. He entered the Legislative Assembly of Upper Canada in 1844; became receiver-general, 1847; attorney general, 1854-57; prime minister, 1857; and government leader in the Assembly, 1864-67. He was chairman of the London Colonial Conference of 1866-67 and, more than any other person, was responsible for the federation of provinces to form the Dominion of Canada. After its establishment, he took a leading part in the new Dominion government as minister of justice and attorney general, 1867-73, and as premier from 1878 until his death.

MacDowell (*măk-dou'ĕl*), **Edward Alexander (1861-1908),** American composer, was born in New York City. His first important teacher was Teresa Carreno. He entered the Paris Conservatory in 1876; in 1878, he went to Germany, where he studied at Wiesbaden under Ehlert and at Frankfort under Heymann and Raff. In 1882, he met Liszt, who brought about the public performance of his *First Modern Suite*. In 1888, he located in Boston, where he soon rose to fame as a performer and as a composer of orchestral numbers. In 1896, he was made the first professor of music in Columbia University. He was one of the seven original members of the American Academy of Arts and Letters.

MacDowell's music displays the most striking originality attained by an American composer. In the smaller forms of composition, he is ranked with Schumann and Grieg. Among his works are the symphonic poems *Hamlet*, *The Saracens*, and *Lovely Alda*; four sonatas for the piano, *Tragica*, *Eroica*, *Norse*, and *Keltic*; and lesser compositions for the piano, including *Woodland Sketches* and *Sea Pieces*.

McElroy, Neil H. (1904-), manufacturer, was born at Berea, Ohio, and received his education at Harvard University. Upon graduation from college in 1925, he entered the employ of the Procter & Gamble Company, at Cincinnati, Ohio. Rising through successive positions, he was elected president of the Procter & Gamble Company in 1948, upon the retirement of Richard R. Deupree. On leave for public service, McElroy was chairman of the White House Conference on Education in 1956, and, in 1957, President Eisenhower appointed him Defense Secretary succeeding Charles E. Wilson, resigned.

McGill, James (1744-1813), merchant, was born in Glasgow, Scotland. About 1770, he went to Canada and engaged in the fur trade at Montreal, accumulating a substantial fortune. He became a member of Parliament and served as brigadier general of militia in the War of 1812. Upon his death, he left £10,000, together with certain lands, for a college to be named for him. Such a college was founded and, in 1821, received a royal charter, incorporating it under the name of McGill University, now one of the leading institutions of higher learning in Canada.

McGill, Ralph E. (1898-), journalist, was born at Soddy, Tenn. He was educated at Vanderbilt University, where his studies were interrupted by service with the U.S. Marines in 1918–19. Beginning his newspaper work as reporter and sports editor of the Nashville (Tenn.) *Banner*, he later joined the staff of the Atlanta *Constitution*. Having advanced through the positions of sports editor, executive editor, and editor, he has been publisher of the *Constitution* since 1960. As an editorial writer, recipient of a Pulitzer prize in 1958, he has become a well-known spokesman for the "Southern Progressive" position in politics.

MacGowan, Kenneth (1888-), American dramatic critic and theatrical producer, was born at Winthrop, Mass. After he was graduated from Harvard University, he reported on the drama and motion pictures for the Boston *Transcript* and later for Philadelphia and New York papers. He edited the *Theater Arts Magazine*, 1919-25, and directed the Provincetown Players and Greenwich Village Theater, 1924-27. He later began producing motion picture plays, including *Little Women* and *Stanley and Livingstone*. He wrote *The Theatre of Tomorrow*, *Continental Stagecraft*, and *Footlights Across America*.

Machiavelli (*mä'kyä-vĕl'lē*), **Niccolò (1469-1527),** Italian statesman and author, son of a jurist of noble family, was born in Florence. He was secretary of the Ten at Florence from 1498 to 1512; went on several important missions; but was deprived of office and exiled by the Medici. Subsequently he retired to a country estate near San Casciano and devoted himself to literary pursuits. His chief works are *The Prince*, *Discourses*, *History of Florence*, *The Art of War*, comedies, and poems.

In *The Prince* and the *Discourses*, Machiavelli set forth views which may be said to have initiated the modern study of political science. Isolating political elements from all others, he described the means by which an individual and a nation might achieve and maintain power. His separation of political from ethical considerations gives rise to the term "machiavellian" to describe unscrupulous means to ends. His purpose was patriotic, to show how Italy might become powerful by extricating itself from the welter of papal and imperial rivalry which divided its strength.

McIntyre, James Francis Aloysius (1886-), was born in New York City, where he attended public schools. From 1899 to 1915 he worked in the financial district, first as a runner, lastly as office manager of a brokerage house. He attended Cathedral College and St. Joseph's Seminary from 1915 until 1921, when he was ordained a priest in the Roman Catholic Church. Entering the chancery office in 1923, he was made chancellor in 1934; domestic prelate in 1936; auxiliary bishop of New York in 1946, and archbishop of Los Angeles in 1948. In 1953 he was created a cardinal.

Mack, Connie (1862-1956), a contraction of the formidable Cornelius McGillicuddy, is one of the immortals of American baseball. He was born at East Brookfield, Mass., and his long and active life spanned a period from the beginning of big-league baseball to the inception of televised games. During his playing days, Connie Mack was a catcher for the Washington Senators and the Pittsburgh Pirates. His fame resulted from his management and ownership of the Philadelphia Athletics, a team that won nine American League pennants and five world series championships, the last in 1930. His autobiography, *My 60 Years in the Big League*, was published in 1950.

McKay, Gordon (1821-1903), American inventor and manufacturer, was born at Pittsfield, Mass. In 1860, he perfected and brought into practical use a shoe sewing machine originally invented by L. R. Blake. Later he invented the heeler, the lasting machine, and the nailing

machine which revolutionized the boot and shoe industry and contributed largely to American leadership in shoe manufacturing. During the Civil War, he leased his machines to more than 60 firms and, in a short time, became a millionaire. In 1876, he organized the McKay Sewing Machine Association, which had a virtual monopoly and collected commissions on all American shoes made by the assistance of his inventions. In 1893, he donated a trust fund of $4,000,000 to Harvard University, to which he later left most of his fortune.

Mackaye (*mă-ki'*), **Percy** (**1875-1956**), American dramatist and poet, was born in New York City. He was graduated from Harvard, 1897, and continued literary studies at Leipzig. After residing successively in Rome, Switzerland, and London, he returned to New York and engaged in teaching. Upon joining a literary colony at Cornish, N. H., in 1904, he devoted himself mainly to dramatic work, making notable contributions to American poetic drama. He composed operas and produced several community masques written by himself. His works include *The Canterbury Pilgrims, Fenris the Wolf, Jeanne d'Arc, Sappho and Phaon, Anti-Matrimony, The Civic Theatre, Caliban by the Yellow Sands, Rip Van Winkle*, and *Poog's Pasture*.

Mackenzie, Alexander (**1822-1892**), Canadian statesman, was born near Dunkeld, Scotland. He removed to Canada in 1842 and was a contractor and journalist until 1861. He was elected to the Assembly of Upper Canada in 1861 and, beginning in 1867, was a member of the Dominion Parliament for 25 years. Upon the resignation of Sir John Macdonald in 1873, he became the first Liberal premier of the Dominion and continued at the head of the government until the election of a Conservative majority to Parliament in 1878. His administration was responsible, among other important measures, for the introduction of vote by ballot, the creation of the Supreme Court of Canada, and the institution of the rule by which the governor-general was bound to act on instructions from the Dominion government.

Mackenzie, Sir William (**1849-1923**), Canadian financier and railroad builder, was born at Kirkfield, Ont., and was educated in the public schools. He taught school but soon left that occupation to engage in the lumber business. His first experience in railroad building was the construction of a section of the Grand Trunk line in Ontario; later he built part of the mountain division of the Canadian Pacific Railroad; and, in 1886, formed a partnership with Sir Donald Mann for the building of the Canadian Northern Railway, a transcontinental line that was subsequently incorporated in the Canadian National System. He was knighted in 1911.

McKim, Charles Follen (**1847-1909**), American architect, was born in Chester County, Pa. He was educated at Lawrence Scientific School, Harvard, and the Ecole des Beaux-Arts, Paris. He began practice in 1872 and was joined in partnership by William R. Mead in 1877 and by Stanford White in 1879, the firm then becoming McKim, Mead, and White.

He made the designs for the Boston Public Library; the Columbia University Library and the Morgan Library, New York; the Agricultural Building at the World's Columbian Exposition, Chicago; and the great Pennsylvania Railway Station, New York, completed after his death. With D. H. Burnham and F. L. Olmsted, Jr., he planned the scheme for the improvement of the city of Washington. He had a part also in the plans for Washington Arch, for the Library and Hall of Fame of the University of New York, and for Madison Square Garden in New York. By his skill in producing monumental effects and by his refined taste, he contributed greatly to architectural progress in the United States.

McKinley, William (**1843-1901**), 25th president of the United States, was born in Niles, Ohio. He was educated at Poland Academy and Allegheny College, though he never finished his course in the latter institution. In 1861, he volunteered in the Union army and entered the Ohio infantry as a private. He served four years, rising by merit to the captaincy of his company and to the rank of major when mustered out in 1865.

He then began the study of law; was admitted to the bar in 1867; and commenced practice at Canton, Ohio. In 1869, he was elected prosecuting attorney for Stark County, where his success attracted local attention. Entering politics as a Republican, he was elected to Congress in 1876, and was re-elected for six successive terms. In 1882, his election was contested and he was unseated, but he was returned at the next election. In 1890, a Democratic legislature grossly gerrymandered his district, making it easy to defeat him for re-election.

His reputation in Congress rests chiefly on the tariff bill that bears his name. This bill and his able advocacy of it before the House distinguished him as the leader of the Republican party on the tariff question. The Republican party went before the country in 1892 almost solely on the issue raised by the McKinley tariff. The high rates, however, resulted in loss of revenue. A reaction set in, and Cleveland was elected.

In 1891, McKinley was elected governor of Ohio by a large plurality and was re-elected in 1893. In 1895, a systematic canvass in McKinley's behalf for the presidential nomination was instituted by his supporters and was continued until the convention of 1896. He was nominated, and, after an extremely bitter campaign on the issue of the gold standard versus free coinage of silver, was elected as champion of the gold standard.

President McKinley's first term is memorable chiefly for the occurrence of the Spanish-American War. That his policy during 1896-1900 was acceptable was shown by his unanimous renomination and by his re-election in 1900 by an electoral majority of 137. His second term began most auspiciously but ended tragically. On September 5, 1901, he visited the Pan-American Exposition in Buffalo, that day having been set apart in his honor and called "the president's day." On the afternoon of the following day, while holding a public reception in the Temple of Music, he was shot twice by Leon Czolgosz. The wounded president was removed to the residence of John G. Milburn, president of the exposition, and he died there, September 14. His remains lay in state in the Capitol at Washington on the 17th and were taken to his home city, Canton, Ohio, where they were interred on the 18th.

Maclaren, Ian. See *Watson, John.*

MacLeish, Archibald (**1892-**), American poet, was born at Glencoe, Ill. A graduate of Yale and Harvard universities, he served in World War I and devoted his time thereafter until 1939 to the writing of poetry and dramas. In 1939 President Roosevelt appointed him Librarian of Congress. He was director of the Office of Facts and Figures 1941-42 and Assistant Secretary of State, 1944-45. His works include *The Happy Marriage, Panic, Air Raid*, and *Cone of Silence*. He has won the Pulitzer prize twice, in 1933 with his narrative poem *Conquistador*, and in 1953 with his *Collected Poems*. His unusual play, *J.B.*, 1959, is based on the Book of Job.

MacLeod (*măk-loud'*), **John James Rickard** (**1876-1935**), physiologist, was born at Cluny, Scotland; was graduated at Aberdeen University and the University of Leipzig; and, in 1901, became professor of physiology at the University of Aberdeen. He lectured at Western Reserve University, Cleveland, 1903-18, and then went to the University of Toronto as head of the department of physiology. He carried on investigations there with Dr. F. G. Banting on diabetes, and, for their joint discovery of insulin as a means of combating this disease, they were awarded the Nobel prize for medicine in 1923. He was professor of physiology at Aberdeen University, 1928-35.

McMaster, John Bach (**1852-1932**), American historian and educator, was born in Brooklyn, N. Y. He was graduated at the College of the City of New York, 1872. After practicing as a civil engineer, he was instructor in civil engineering at Princeton, 1877-83, and professor of American history in the University of Pennsylvania, 1883-1920.

His *History of the People of the United States*, covering the period 1783 to 1861 and valuable for its treatment of social and economic conditions, is a standard work. Among his other writings are *Daniel Webster* and *The United States in the World War*.

MacMillan, Donald Baxter (**1874-**), American explorer, was born at Provincetown, Mass. Educated at Bowdoin College and Harvard University, he taught school from 1898 to 1908. Then he went as assistant on Peary's polar expedition of 1908-09. Thereafter MacMillan engaged almost continuously in arctic exploration and ethnological research, using a small motor ship. He brought back about 40,000 plants from trips to Baffin Land and Greenland in 1937-38. His expeditions, extending from Labrador to the northernmost limits of land, resulted in rectification of the maps and more accurate information on resources and inhabitants. He wrote *Four Years in the White North, Etah, Kabdah*, and *How Peary Reached the Pole*.

McMillan, Edwin Mattison, (**1907-**) American physicist, was born at Redondo Beach, Calif. One of the atomic era's foremost pioneers, he was educated at the California Institute of Technology and received his doctorate from Princeton University in 1932. Since then he has done his research at the University of California, where he teaches physics. McMillan's scientific versatility is remarkable. He was codiscoverer in 1940 of element 93, neptunium, and his research helped in the discovery of element 94, plutonium. During World War II, he worked to perfect radar and sonar detection systems. In 1951, he and Glenn T. Seaborg were awarded the Nobel prize in chemistry for their discovery of plutonium.

Macmillan, Harold (1894-), British statesman, son of Maurice Macmillan, the English book publisher, and his American wife, Helen Belles of Indiana. He was educated at Eton and Balloil College, Oxford. He served in the Grenadier Guards during World War I, and was wounded three times. In 1919 he went to Canada as aide de camp to the ninth Duke of Devonshire, who was then Governor General, and the following year married one of the duke's daughters, Lady Dorothy Cavendish.

Except for a single brief interval, Macmillan has been a member of Parliament since 1924. During World War II he was Parliamentary Secretary of the Minister of Supply, Under Secretary of State, Minister Resident at Allied Headquarters in French North Africa, and Secretary for Air. Since the return of the Conservatives to power in 1951 he has been Minister of Housing and Local Government, Minister of Defense, Foreign Secretary, and Chancellor of the Exchequer. On January 10, 1957 Queen Elizabeth named him Prime Minister to succeed Sir Anthony Eden.

MacMonnies (*măk-mŭn'iz*), **Frederick William (1863-1937)**, American sculptor, was born in Brooklyn, N. Y. He studied under Saint-Gaudens in New York, under Falguière in Paris, and also in Munich.

Among his numerous works are statues of Nathan Hale, City Hall Park, New York, and J. S. T. Stranahan, Prospect Park, Brooklyn; "Pan of Rohallon"; "Faun with Heron"; a statue of Sir Henry Vane, Boston Public Library; a colossal fountain at the World's Columbian Exposition, Chicago; "Bacchante with Infant Faun," Metropolitan Museum of Art, New York, and Luxembourg Gallery, Paris; "Venus and Adonis"; "Cupid"; the figure of Victory for the Battle Monument, West Point; the central bronze doors and the statue of Shakespeare in the Congressional Library; the army and navy groups for the Soldiers' and Sailors' Arch, Prospect Park, Brooklyn; and the colossal group entitled "Civic Virtue" in New York City. He was elected a member of the American Academy of Arts and Letters in 1915. See *Sculpture*.

McMurry, Frank Morton (1862-1936), American educator, was born at Crawfordsville, Ind. He received his education at the University of Michigan, at Halle, and at Jena. He studied also in Geneva and Paris. He was professor of elementary education at Teachers College, Columbia University, from 1898 to 1926. With his brother, Charles Alexander McMurry, he published *The Method of the Recitation* and with R. S. Tarr the *Tarr and McMurry Common School Geographies*.

McNamara, Robert S. (1916-), business executive, was born at San Francisco. After graduation, 1937, from the University of California, he went to Harvard for advanced study and, in 1940, became assistant professor of business education there. In World War II, he was special consultant to the War Department, then enlisted in the U.S. Air Force and rose to the rank of lieutenant colonel. Beginning in 1946, he was a member of the executive staff of the Ford Motor Company until December 1960, when he was appointed Secretary of Defense by President-elect John F. Kennedy. Only a few weeks earlier Mr. McNamara had been made president of the Ford Motor Company.

MacNeil, Hermon Atkins (1866-1947), American sculptor, was born at Chelsea, Mass. He received his art training largely in Paris, where he attended the Ecole des Beaux-Arts. He did important decorative work for the World expositions at Chicago, Paris, Buffalo, Saint Louis, and San Francisco. Much of his sculpture deals with Indian subjects, such as the "Coming of the White Man" at City Park, Portland, Oreg. His "Soldiers' and Sailors' memorial" at Albany, N. Y., "Physical and Intellectual Development" at Northwestern University and the east pediment group in the Supreme Court Building, Washington, D. C. represent other aspects of his genius. Elected to the American Academy of Arts and Letters in 1926.

McNicholas, John T. (1877-1950), American churchman, was born at Kiltimagh, Ireland. Brought to America at four years of age, he was educated in Roman Catholic schools and was ordained a priest in 1901. He was professor in Dominican houses of studies at Somerset, Ohio, in 1904 and at Washington, D. C., 1905-09, thereafter going to New York, N. Y., as pastor of a church there. He spent eight years in organizing work for the Holy Name Society, an anti-profanity organization which now has a membership of over 3,000,000. He was consecrated bishop of Duluth in 1918 and archbishop of Cincinnati, 1925.

McNutt, Paul Vories (1891-1955), American educator and politician, was born at Franklin, Ind. He was graduated from Indiana and Harvard universities and began the practice of law in 1914, lecturing meanwhile at the University of Indiana. After service as a field artillery officer in World War I, he was made professor of law at Indiana University, becoming dean of the law school in 1925. He was high commissioner to the Philippines, 1937-39, and was in charge of mobilizing civilian manpower in 1942.

McReynolds, James Clark (1862-1946), American cabinet officer and jurist, was born at Elkton, Ky. He was graduated at Vanderbilt University and at the University of Virginia. He began practice in Nashville, Tenn., and became professor of law in Vanderbilt University, 1900. In 1913, he was made attorney general by President Wilson. In securing the enforcement of the Sherman Anti-trust Law, he had direction of the dissolution suits against several large corporations. From 1914 to 1941, he was Associate Justice of the United States Supreme Court. A conservative jurist, he opposed interpretations which would extend Congressional authority.

Madariaga, Don Salvador de (1886-), diplomat, critic, and essayist, was born at Corunna, Spain. Education in Madrid and Paris awakened an early interest in international affairs. At different times he has been Spanish ambassador to France and the United States, and he has been active in promoting disarmament through various organizations. Among his writings are *Portrait of Europe* (1952), *War in the Blood* (1957), and *Democracy versus Liberty* (1960).

Madden, Joseph Warren (1890-), American lawyer and administrator, was born at Damascus, Illinois. Educated at Illinois and Chicago universities, he taught law at Oklahoma University, 1914-16, Ohio State University, 1917-21, the University of West Virginia, 1921-27, and the University of Pittsburgh, 1927-35.

In 1935, Madden was appointed chairman of the National Labor Relations Board, an agency set up by Congress that year to protect by sanctions the right of labor to organize and bargain collectively. The novelty of this law, abridging somewhat the right of employers to hire and fire at will, evoked bitter opposition. Madden defended the law's constitutionality before the Supreme Court in the historic Jones and Laughlin case in which the Court, in 1937, upheld the law in terms recognizing for the first time the authority of Congress to regulate manufacturing industry. Under his chairmanship the board established numerous precedents which profoundly affected the entire body of labor law, the decisions being upheld on appeal to the courts in nearly all instances. The law which he had done most to make an instrument of new industrial practices had been firmly established.

Madison, James (1751-1836), fourth president of the United States, was born at Port Conway, Va. He was graduated at Princeton, 1771, and studied law. In 1776, he was a member of the Virginia convention, and, though too modest for an orator, he became one of the most eminent, accomplished, and respected of American statesmen.

He was sent to the Federal Congress, 1780, and, in 1784, to the legislature of Virginia, in which he supported the measures of Jefferson in the revision of the laws and in placing all religious denominations on an equality of freedom without state support. As a member of the convention of 1787, which framed the Federal Constitution, Madison took complete notes in shorthand, thus producing the only record of its proceedings and debates. With Jay and Hamilton, he wrote the *Federalist* in order to induce New York to adopt the Federal Constitution. He supported the adoption of the Constitution but opposed the financial policy of Hamilton and became a leader of the Republican, or Jeffersonian, party. In 1792, he became the leader of the Republican party in Congress, and wrote the Kentucky resolutions of 1798, which contain the basis of the State Rights doctrines. In 1801, Jefferson having been elected president, Madison was made secretary of state, which post he held during the eight years of Jefferson's administration.

In 1809, Madison became president of the United States. The European wars of that period, with their blockades and orders in council, were destructive of American commerce. The claim of the English government to impress seamen from American vessels was violently resisted. Madison vainly endeavored to avoid a war with England, which, nevertheless, was declared in 1812 and continued for over two years. He was elected for a second term, during which he approved the establishment of a national bank as a financial necessity—a measure he had previously opposed and vetoed. In 1817, he retired to his seat at Montpelier, Va., where he served as a rector of the University of Virginia. He was elected to the American Hall of Fame in 1905.

Mæcenas (*mê-sē'năs*), **Gaius Cilnius (c. 70 B. C.-8 B. C.)**, Roman statesman. He was the friend of Virgil and Horace and was celebrated for his patronage of letters. He had a talent for private diplomacy and was employed mainly in that capacity. In 36, he was in Sicily, helping Octavian. Five years later, when the latter was fighting the great sea battle of Actium with his rival Antony and the Egyptian Cleopatra, Mæcenas proved an able and vigilant governor of Rome by crushing a conspiracy of the younger Lepidus, thereby preventing a second civil war.

Maeterlinck (Du., *mä'tĕr-lĭngk*; F., *mä'tĕr'lăN'*), **Maurice (1862-1949),** Belgian poet and dramatist, was born at Ghent. He was educated for the law, but early turned his attention to writing. In 1896, he located in Paris and devoted himself entirely to literature, producing, besides many plays and poems, a number of philosophical works, which have been widely translated. The best known of these are *Wisdom and Destiny, The Treasure of the Humble, The Buried Temple,* and *The Life of the Bee.*

Among his dramatic works are *The Blind, The Intruder, The Seven Princesses, Alladine and Palomides, Sister Beatrice, Monna Vanna, Joyzelle, The Bluebird, Mary Magdalene,* and *The Betrothal.* Several of Maeterlinck's plays have been presented on the American stage, *Monna Vanna* and especially *The Bluebird* having become well known. In 1911, he was awarded the Nobel prize for literature. He took refuge in America in 1940 when Germany conquered Belgium. See *Bluebird, Pelléas et Mélisande.*

Magellan, or **Magalhaens, Ferdinand (c. 1480-1521),** Portuguese navigator. He served his country in the East Indies and Morocco, but, becoming dissatisfied with King Manuel's treatment of him, he offered his services to Spain.

Under Charles V's patronage, Magellan set out in 1519 to reach the Moluccas by the west. Early in 1520, he had reached the Rio de la Plata and, after some months' delay, he passed through the strait called by him Todos los Santos but later renamed, in his honor, the Strait of Magellan. He then sailed across the ocean named by him the Pacific and reached the Philippine Islands. Since, on a previous voyage, he had sailed from Europe farther east than these islands, he had by this time actually circumnavigated the globe. He did not, however, complete his last voyage, but, having become involved in military operations in the Philippine Islands, he was killed in action. His ship, the *Vittoria,* under the command of Sebastian del Cano, arrived in Spain the next year, after completing the first trip around the world.

Magsaysay (*măg-sī-sī*), **Ramŏn (1907-1957),** who rose from a village lad to become president of the Philippine Republic, was born at Iba, Zambeles Province, Luzon. He attended the University of Manila, and during World War II was active in the organization of the guerrilla forces in Western Luzon. He became commanding officer in Zambeles, clearing the Japanese from that area to make way for the return of General Douglas MacArthur. Pending the liberation of the Islands, he was military governor of the district. Elected as a Liberal to the Philippine Congress in 1946, he was re-elected in 1949, and, as a result of his campaign against the Huk guerrillas, he was made Secretary of National Defense. In 1953 he defeated Elpidio Quirino for the presidency. Died in a plane accident.

Mahan (*mä-hăn'*), **Alfred Thayer (1840-1914),** American naval officer and writer, was born at West Point, N. Y. He was graduated at the United States Naval Academy, 1859; served in the Civil War; was president of the Naval War College, 1886-89 and 1892-93; and visited Europe in command of the *Chicago,* 1893-95, receiving many honors, including degrees from both Oxford and Cambridge. He was retired at his own request in 1896. During the war with Spain, he was a member of the Naval Board of Strategy.

By his *Influence of Sea Power Upon History,* Mahan gave the clearest statement made at any time on the effect of the command of the seas and one which, with necessary modifications, would probably apply also to the command of the air. His other works include *Life of Admiral Farragut,* and *The Interests of the United States in Sea Power* He was elected to the American Academy of Arts and Letters in 1905.

Mahler, Gustav (1860-1911), Bohemian composer and conductor, was born in Bohemia, and studied at the University of Vienna. He was a daring innovator in composition and also acted as a brilliant interpreter of music during his career as conductor of the world's greatest symphony orchestras. At the age of 28, Mahler conducted the Hungarian Royal Opera Orchestra. He went on to lead the Imperial Opera of Vienna, the New York Metropolitan Opera Orchestra and the New York Philharmonic. Mahler wrote nine symphonies, one of which, *Symphony of the Thousand,* was written for one thousand voices. He is the subject of several biographies, one by the noted conductor Bruno Walter. Mahler died in Vienna.

Malenkov (*mä-lyĕn-kôv'*), **Georgi Maximilianovich (1902-),** Russian leader, succeeded Josef Stalin as premier of the Soviet Union on the latter's death in March 1953. Born in Orenburg (now Chkalov) on the Ural River, Malenkov served in the Red Army. As a protegé and personal deputy of Stalin, Malenkov rose through a succession of posts to a position of great influence in the Communist hierarchy. He achieved the premiership by his ruthless driving power and his ability in the fields of politics and industry, but was succeeded by Nikolai Bulganin in 1955.

Malik, Charles (1906-), Lebanese minister to the United States and delegate to the United Nations, was born at Bitirram, El Koura, in Lebanon. He was educated at the American Mission School for Boys in Tripoli, and the American University in Beirut. He spent three years working in Cairo, studied at Harvard University (Ph.D. 1937), and returned home to teach philosophy at the American University. As an interpreter of economic and cultural relations between the West and the Middle East, he has made important contributions to the United Nations, particularly the Commission on Human Rights.

Malinowsky, Rodion Yaklovich (1898-), Russian military leader, was born in the Ukraine. He enlisted as a boy in the Tsarist army and fought against the Germans in World War I. Escaping to France, he joined a small contingent of Russian soldiers there, and fought along with U.S. troops at the battle of St. Mihiel. A much-decorated Major General in World War II, he was assigned near the end of the War to a post of command in the Far East, where he remained until he was recalled, in 1957, to become Soviet Defense Minister, replacing Georgi Zhukov.

Malory, Sir Thomas, English author, flourished about 1470. Nothing is positively known concerning his life except the statements in the preface and at the end of his prose epic *Morte D'Arthur.* This work, material for which was drawn from French sources, was completed in 1469 or 1470 and was delivered to Caxton, who printed it in 1485. It contains the great stories of the King Arthur legend—the tales of Lancelot and Guinevere, Tristan and Isolt, and other famous knights and ladies that appear in Tennyson's *Idylls of the King.* See *Morte D'Arthur, Round Table.*

Malpighi (*mäl-pē'gē*), **Marcello (1628-1694),** Italian anatomist, was born near Bologna. He lectured in Bologna, Pisa, and other places and wrote works on the anatomy of plants, the physiology of the silkworm, and medical subjects. He discovered capillary circulation of the blood, described the structure of the lungs, and showed how a chick develops from an egg. In 1691, he became physician to Pope Innocent XII.

Malraux, Andre (1901-), philosopher and essayist, was born in Paris and was educated there in the *Ecole d'Art et d'Archaeologie* and the *Ecole des Langues Orientales.* He has written much on the art of philosophy of the Far East. He was active in the Resistance movement during World War II and held several government positions later. Among his writings are *La Condition Humaine, L'Espoir,* and *Les Voix de Silence.*

Malthus (*măl'thŭs*), **Thomas Robert (1766-1834),** English economist, was born near Guildford, Surrey. He was graduated at Cambridge, 1788, and was for some time fellow of Jesus College. In 1798, he published *Essay on Population,* in which he maintained that population tends to increase out of proportion to the increase of means of subsistence. He predicted a period of overpopulation on the earth and advocated moral restraint in order to check the birth rate. The influence of Malthus on economics, sociology, and biology has been extraordinarily far-reaching.

Beginning in 1807, Malthus held, throughout the remainder of his life, the professorship of history and political economy in the East India Company's College, Haileybury. Others of his works are *The Nature and Progress of Rent* and *Political Economy.*

Manet (*mä'nĕ'*), **Edouard (1832-1883),** pioneer French impressionist painter, was born at Paris. In 1850, he began a period of five years' study with Couture, after which he traveled in the Netherlands, Germany, Italy, and Spain, where he was influenced by the work of Velasquez. He later developed a style which proved highly successful in modern painting. The chief tenet of the school practicing this style is that "things should be represented, not as experience teaches us they are, but as they appear to the eye of the painter." While his principles of art were ably defended by his friend Zola, the importance of his work was not fully realized until after his death.

Mann, Horace (1796-1859), American educational reformer and statesman, was born at Franklin, Mass. He was graduated at Brown University, 1819; studied law; and was admitted to the bar, 1823. He was a member of the Massachusetts legislature, 1827-37 and then secretary of the Massachusetts Board of Education until 1848, when he was elected to Congress. In 1853 he was made president of Antioch College, Ohio. He wrote *Report of an Educational Tour of Germany, Great Britain, and Ireland;* and *On the Study of Physiology in Schools.*

Through his efforts the first Normal School in the United States was established, 1839, at Lexington (now Framingham), Mass. He has been called the father of the American free public school of today. He was elected to the American Hall of Fame in 1900. See *Educational Reformers.*

Mann, Thomas (1875-1955), German author, was born at Lübeck, the son of a wealthy merchant and a Creole lady of Portuguese descent. He entered the insurance business, but soon abandoned that occupation for a more or less nomadic career made possible by the financial success of his writings. His early works include *Die Buddenbrooks, Der Tod in Venedig, Tonio Kröger,* and *Königliche Hoheit.* These and other novels, short stories, and essays entitle

Mann to a foremost place among Germany's prose writers of the 20th century. His style is leisurely, but the details are chosen with an unerring eye to their effect. He received the Nobel prize in literature for 1929. He left Germany, where his books were banned as decadent by the Hitler regime, and accepted a lectureship at Princeton University in 1938.

Mannerheim, Carl Gustav Emil, Baron (1867-1951), Finnish general and statesman, was born while Finland was part of Russia. He was educated for the army and saw action in the Russo-Japanese War and World War I, being made lieutenant general during the latter conflict. After the Russian revolution and the granting of Finnish independence, he resigned his command and led a counter-revolutionary army against the Soviet government.

He was made regent of Finland in 1918, resigning in 1919 when a republican constitution was adopted. He remained, however, the most powerful citizen of Finland, being known as the "Liberator." In 1939, Finland refused to follow the example of other Baltic states in giving air and military bases to Russia. In the war which followed and again in the second Russian war of 1941-44, Mannerheim commanded the Finnish army, but finally had to yield to overwhelming force. He resigned as commander in chief in 1944 to become president of Finland, 1944-46.

Manning, Henry Edward (1808-1892), English prelate, was born at Totteridge. He was graduated at Oxford in 1830; studied theology; was appointed rector of Lavington with Graffham, Sussex, 1834, and archdeacon of Chichester, 1841. In 1851, he withdrew from the Church of England and joined the Roman Catholic Church; was ordained a priest in the same year; was nominated archbishop of Westminster, 1865; and was created cardinal in 1875. He founded a Roman Catholic College at Kensington, 1863, and took an active part in the Vatican Council, vigorously defending the dogma of papal infallibility.

Mansfield, Michael (1902-), political leader was born in New York City, but is identified with Montana, a state which he has represented, first as congressman in the 78-82nd Congresses and, since 1952, as U.S. Senator. He was educated at Montana State University, where for a time he was a teacher of history and political science. In 1961 he became majority leader of the Senate.

Manship, Paul (1885-), American sculptor, was born at Saint Paul, Minn. He received his education in art at the Pennsylvania Academy of Fine Arts and the American Academy at Rome. His work exhibits a classic precision combined with a Western virility and sense of reality. The element of design is prominent in his figures, and he has adopted many suggestions of Greek sculpture, accommodating them to his modern decorative themes. Among the products of his art are "The Awakening of Spring," "Salome," "Playfulness," and "Centaur and Dryad," "Dancing Girl and Fauns," "Little Brother," and the central fountain for Rockefeller Center, New York, featuring "Prometheus." He was elected to the American Academy of Arts and Letters in 1922.

Mantegna (*măn-tän'yȧ*), **Andrea (1431-1506),** Italian painter, chief master of the Paduan School, was born at Vicenza. A precocious genius, he set up a studio of his own when only 17 years old. About 1460, he was induced by Lodovico Gonzaga, duke of Mantua, to settle in that city. There he spent the remainder of his life except for a visit to Rome, 1488–90, to paint a series of frescoes for Pope Innocent VIII. His greatest works produced at Mantua include nine tempera pictures representing the "Triumph of Cæsar," now at Hampton Court, England.

Manutius (*mȧ-nū'shĭ-ŭs*), **Aldus (1450-1515),** became one of the world's first great publishers through his desire to put the Greek and Latin classics into the hands of poor scholars at low cost and in handy form. A tutor to nobility, Manutius got patronage to start his Venetian printery which became immortal as the Aldine Press, and whose insigne is an intertwined dolphin and anchor. The graceful *italic* was introduced by Manutius; he ordered a typeface based on the Italian cursive script, and it first appeared in 1501. On his death, his work was carried on by a son and a grandson.

Manzoni (*măn-dzō'nē*), **Alessandro (1785-1873),** Italian novelist and poet, was born at Milan. His first tragedy, *Il Conte di Carmagnola*, published in 1820, was warmly praised by Goethe; but the work which gave him European fame is his historical novel, *I Promessi Sposi*, a Milanese story of the 17th century and probably the greatest novel in all Italian literature. His noble ode *Il Cinque Maggio* was inspired by the death of Napoleon. Although a devout Catholic, he was a strong advocate of a united Italy. He died at Milan, leaving a memory of a great writer and a singularly noble man. For his funeral, Verdi composed the celebrated *Manzoni Requiem*.

Mao Tse-tung (*mȧ'ô dzŭ'dōŏng*) **(1893-),** Chinese Communist leader, was born in Hunan Province. Becoming interested in the "anti-foreign capital" movement, then in Marxian literature, Mao progressed by gradual stages along the road toward Communism. In 1927 his leadership of the "First Peasants and Workers Army" was prophetic of his later prominence in the ranks of the "agrarian" Communists. By the time of the Japanese War against China, Mao had further strengthened his faith in Communist ideology and had improved his technique in the handling of guerrilla bands. Shrewdly taking advantage of war-weariness among the Chinese people and of incompetence or dissension among Chiang Kai-shek's followers, he utilized captured equipment and Russian support to become the leader in a crushing defeat of the Nationalist forces. In 1950 he sent his armies into Korea in support of the Communist cause there, fighting the United Nations forces.

March, Peyton Conway (1864-1955), American general, son of Francis Andrew March, the philologist, was born at Easton, Pa. He was graduated at Lafayette College, 1884, at the United States Military Academy, West Point, 1888, and at the Artillery School, Fort Monroe, 1898. He served with distinction in the Philippines, 1898-1901, rising from the rank of second lieutenant to that of lieutenant colonel. From 1903 to 1907, he was a member of the general staff and, in 1904, was military attaché to observe the Japanese army in the Russo-Japanese War. In 1917, he was army artillery commander of the American expeditionary forces in France and was promoted to the rank of major general. In 1918, he was appointed chief of staff with the rank of general of the United States army. At his own request, he was retired from active service in 1921.

Marconi (*mär-kō'nē*), **Guglielmo (1874-1937),** electrical engineer and inventor, was born at Bologna. His father was Italian and his mother was Irish. He was educated at Leghorn and Bologna universities.

On his father's estate, 1890, he began experiments to test the theory that the Hertzian electrical waves are capable of passing through any substance and, if started in any given direction, of following an undeviating course without need of a wire or other conductor. These experiments led to the invention of an apparatus for wireless telegraphy, which attracted the attention of Sir William Henry Preece and successfully stood a test conducted by him in England.

Marconi soon afterward succeeded in sending messages from Spezia to a steamer fifteen kilometers distant. He came to the United States, 1899; used his method in reporting the election, 1900; and succeeded, 1902, in establishing wireless telegraphic communication across the Atlantic Ocean. A daily ocean news service by wireless telegraphy was inaugurated by him on transatlantic liners in 1904.

He invented a directive method of wireless telegraphy, 1905; devised a persistent-wave system, 1906; and, in 1907, began a public service of wireless telegraphy across the Atlantic. In 1910, he brought out a new receiver and other improvements, by which the Marconi Company's station in Argentina was enabled to receive signals from Nova Scotia and from Ireland, a distance of 5600 miles. When Italy entered World War I, Marconi assumed charge of his government's wireless service. With Ferdinand Braun, he was awarded the Nobel prize for physics, 1909. Among later improvements in radio due to him is the beam system, which enables airplanes to fly blind. See *Radiotelegraphy*.

Marcus Aurelius, surnamed **Antoninus (121-180),** Roman emperor and philosopher, was born at Rome. His qualities attracted the notice of the emperor Hadrian, who conferred high honors on him even while a child. When 17 years of age, he was adopted, with Commodus, by Antonius Pius, the successor to Hadrian; and Faustina, daughter of Pius, was selected to be his wife. He was made consul in 140, and from this period to the death of Pius, 161, he continued to discharge the duties of his various offices with the greatest promptitude and fidelity.

On his accession to the throne, he illustrated the magnanimity of his character by sharing the government with young Commodus, who henceforth bore the name of Lucius Verus and to whom he gave his daughter Lucilla in marriage. Lucius died in 169, leaving Marcus Aurelius the sole ruler.

Although devoted to peace, the emperor was compelled to engage in wars throughout the whole of his reign. He was successful in repelling invasions of the barbarians on the northern and the eastern frontiers and in crushing insurrections in the East. His administration was vigorous and able.

As a thinker, Aurelius was the flower of the Stoic philosophy, and his love of learning was insatiable. His range of studies was extensive, embracing morals, metaphysics, mathematics, jurisprudence, music, poetry, and painting. He was the author of an elevated ethical work known as the *Meditations*. Though gentle and tolerant by nature and creed, he was actively hostile to Christianity, which, at that time, was threatening the culture and thought to which he was devoted. His death was felt to be a national

calamity; he was deified, and for more than a hundred years his image was found among the household gods of the Romans.

Marcy, William Learned (1786-1857), American statesman, was born at Southbridge, Mass. Following his graduation from Brown University in 1808, he studied and practiced law in Troy, N. Y. After serving in the War of 1812, he entered politics and became prominent in the Albany Regency. In 1831, he was elected United States senator, resigning to become governor of New York, to which office he was elected by the Democrats in 1832, 1834, and 1836. In 1845, he was made Secretary of War under Polk, serving throughout the trying period of the Mexican War and taking an influential part in settling the Oregon Boundary Question. He entered Pierce's cabinet as Secretary of State in 1853 and handled with marked ability such problems as the Mexican Boundary Dispute, the Canadian Reciprocity Treaty, the British Fishery Question, and the Koszta Affair. See *Albany Regency, Koszta Incident.*

Margaret of Angoulême (*ăn'gōō'lâm'*) **(1492-1549),** queen of Navarre and daughter of Charles of Orleans. In 1527, she was married to Henri d'Albret, king of Navarre, to whom she bore a daughter, Jeanne d'Albret, mother of the great French monarch Henry IV. She encouraged the arts and learning. To a certain extent she embraced the cause of the Reformation, and she never ceased to act with a courageous generosity toward the Reformers, who always found an asylum and a welcome in Navarre. She is the author of the *Heptameron,* a narrative poem descriptive of the world's creation.

Maria Theresa (*mȧ-rī'ȧ tĕ-rē'sȧ*) **(1717-1780),** ruler of Austria, daughter of the emperor Charles VI of Germany, was born at Vienna. In 1736, she married Francis of Lorraine, afterward grand duke of Tuscany; at her father's death, in 1740, she became queen of Hungary and Bohemia and archduchess of Austria.

At her accession, the monarchy was exhausted, the people were discontented, and the army was weak, while Prussia, Bavaria, Saxony, and Sardinia, abetted by France, put forward claims to her dominions. The young queen was saved by the chivalrous fidelity of the Hungarians, supported by England. Their aid, however, did not prevent her losing, through the war of the Austrian succession, 1740-48, Silesia to Prussia, Parma and Piacenza to Spain, and some Milanese districts to Sardinia. On the other hand, her rights were admitted, and her husband was recognized as emperor.

The loss of Silesia continued to rankle in her mind; and, with France as an ally, she renewed the contest with the Prussian king. But the issue of the Seven Years' War, 1756-63, was to confirm Frederick in the possession of Silesia. She joined with Russia and Prussia in the first partition of Poland, 1772, securing Galacia and Lodomeria, while from Turkey she obtained Bukowina in 1777. She secured also several districts from Bavaria.

A woman of majestic figure and an undaunted spirit, she combined feminine tact with masculine energy, and raised Austria from a wretched condition to a position of assured power. See *Austrian Succession, War of.*

Marie Antoinette (*mȧ'rē' ăn'twȧ'nĕt'*), **Josèphe, Jeanne (1755-1793),** wife of Louis XVI of France, youngest daughter of Francis I, emperor of Germany, was born at Vienna. Her mother was the famous Maria Theresa. At the age of 14, she was betrothed to the Dauphin and married at Versailles.

Soon after the accession of Louis XVI, libels were circulated by her enemies, accusing her of intrigues in the interests of Austria. From the first hour of the Revolution, she was an object of fanatical hatred to the mob of Paris. At last she resolved on flight. Her husband long refused to abandon his country, and she would not go without him. Finally he consented, and the flight took place on the night of June 20, 1791. The royal fugitives were recognized and captured at Varennes. She was suspected, not unjustly, of inviting an invasion of France by Austrian forces, and, after the storming of the Tuileries, she was confined in the Temple. On October 16, 1793, she was condemned by the Revolutionary tribunal and was guillotined the same day.

Marion, Francis (1732-1795), American general and patriot, was born near Georgetown, S. C. He served in the Cherokee War, 1759-61, and, at the outbreak of the Revolution, was chosen a delegate to the South Carolina congress. He was present at the siege of Charleston, 1780; raised several companies of volunteers among the country lads, or "cowboys," as the British called them; and, with this force, marched to the relief of General Gates, at that time in North Carolina. Marion's men proved of the greatest value through their intimate knowledge of localities and their native shrewdness, which earned for their leader the sobriquet of "Swamp Fox." Among the most noted engagements in which Marion took part were those at Fort Motte, Fort Watson, Parkers Ferry, and Eutaw Springs.

Mariotte (*mȧ'rē'ŏt'*), **Edmé (c. 1620-1684),** French natural philosopher, was born in Burgundy. He was educated for the Church and became the prior of Saint Martin sous Beaune, near Dijon. Turning his attention to science, he did much to promote experimental research in France and was one of the first members of the French Academy of Sciences, founded in 1666. In his *Treatise on the Nature of Air,* he published, in 1676, the discovery that the volume of a gas varies inversely as the pressure to which it is subject, a principle since known in France as Mariotte's law. This same discovery was made 16 years earlier by Robert Boyle in England, where it is known as Boyle's law. Mariotte published also *Traité du mouvement des eaux.*

Maritain, Jacques (1882-), French philosopher and educator, is best known as an exponent of the "neo-Thomist," or "neo-scholastic" school of contemporary Christian thought. He studied at the Sorbonne and later at Heidelberg, where he came under the instruction of Dr. Hans Driesch. Exiled from France as a result of the German invasion, he continued writing and lecturing in the United States. In his books and lectures he has urged a return to the harmony of faith and reason as exemplified in the philosophy of St. Thomas Aquinas. Among his works are *Introduction to Philosophy, Art and Scholasticism, The Things That Are Not Cæsar's, True Humanism,* and *Scholasticism and Politics.*

Marius (*mā'rĭ-ŭs*), **Gaius (c.156 B.C.-86 B.C.),** Roman general, was born near Arpinium. He served with distinction at Numantia under the younger Scipio Africanus and, in 119, was tribune of the plebs. In 114, he went to Spain as propraetor. He then married Julia, the aunt of Cæsar.

Marius served in Africa during the war against Jugurtha, and, as consul, he closed the Jugurthine war in 106. Meanwhile an immense horde of Cimbri and Teutones had burst into Gaul and repeatedly defeated the Roman forces. After two years' fighting, Marius annihilated the Teutones in a terrible two days' battle near Aix, in Provence, where 100,000 Teutones were slain. Then, turning to the Cimbri in north Italy, he crushed them also near Vercellæ in 101. Marius was declared the savior of the state and the third founder of Rome, and, in 100, was made consul for the sixth time. When Sulla as consul was intrusted with the conduct of the Mithridatic War, Marius, insanely jealous of his patrician rival, attempted to deprive him of the command, and a civil war began in 88. Marius was soon forced to flee, and, after frightful hardships and hairbreadth escapes, he made his way to Africa. Here he remained until a rising of his friends took place under Cinna. He then hurried back to Italy and, with Cinna, marched against Rome, which was compelled to yield. Marius and Cinna were elected consuls for the year 86, but Marius died 17 days after taking office.

Markham, Sir Clements Robert (1830-1916), English traveler, geographer, and author, was born at Stillingfleet. After attending Westminster School, he entered the navy, 1844, and accompanied the expedition sent in search of Sir John Franklin, 1851. In 1859-62, he traveled in Peru, from which country he introduced into British India the cultivations of the quinine-yielding cinchona trees. He was geographer to the British expedition to Ethiopia, 1867-68. He then became editor of the *Geographical Magazine* and later president of the Royal Geographical Society. His works include *Franklin's Footsteps, Travels in Peru and India, A History of the Abyssinian Expedition, Richard III, Quichua Dictionary,* and *The Incas of Peru.*

Markham, (Charles) Edwin (1852-1940), American poet, was born in Oregon City, Oreg. He went to California, 1857, and, during his boyhood, worked at farming and blacksmithing. Earning his way through two Western colleges, he pursued special studies in ancient and modern literature and in Christian sociology. He became a teacher and was principal and superintendent of schools in California until his removal to New York in 1899. In early youth, he began writing poems for California newspapers and later won recognition in Eastern magazines. Some of his poems, notably his "Lincoln" and "The Man with the Hoe," have become widely known. He was elected to the American Academy of Arts and Letters in 1929.

Markova, Alicia (1910-), ballerina whose inspired performances have thrilled audiences around the world, was born Alicia Marks in London. At the age of fifteen, she appeared with the ballet of the famed choreographer Serge Diaghilev. Later, she formed a ballet company with the dancer Anton Dolin. She has been the prima ballerina of the Ballet Russe de Monte Carlo and the Opera Ballet of the New York Metropolitan Opera house. Alicia Markova has brought a dedication and artistry to the ballet that is unrivalled in its history. She was the subject of a "Profile" in The New Yorker magazine which described in detail the study and the rigors that attend her approach to every dancing role. She lives in England.

Marlborough, John Churchill, Duke of (1650-1722), English general and diplomat. Through the influence of his sister, he obtained a commission with the Duke of York,

and he first served under Turenne. He deserted James II at the Revolution of 1688, but, though created earl and commander in chief by William III, intrigued with his former master. After a period of disgrace, he went to The Hague to organize the Grand Alliance. Under Queen Anne, he was appointed captain general and duke and won the victories of Blenheim, 1704; Ramillies, 1706; Oudenarde, 1708; and Malplaquet, 1709. He was recalled in 1711 and was dismissed on a charge of peculation, but was restored by George I in 1714. Among great military commanders he is one of the few who never lost an important battle and never failed in a campaign.

Marlowe, Christopher (1564-1593), English dramatist, was born at Canterbury. He was graduated at Cambridge, 1583, and took his master's degree there in 1587. His literary associates included Kyd, Nash, Greene, Chapman, Raleigh, and probably Shakespeare. He was the first to attain mastery of the blank verse adopted by the dramatists of his period, using it with great vigor. In English dramatic literature, he is the most important predecessor of Shakespeare. His chief plays are *Tamburlaine*; *Doctor Faustus*, to which Goethe acknowledged his obligations; *The Jew of Malta*; and *Edward the Second*. He was killed in a tavern brawl. See *Faustus*.

Marquand (*mär'kwŏnd*), **John Phillips (1893-1960),** American novelist noted for his gently satirical studies of New England character, was born in Wilmington, Del. He was educated at Harvard, as were many of his most famous fictional characters. Marquand worked as a newspaperman and advertising copywriter until 1921, when he turned professional writer. Early in his career, he scored success with a series of meticulously-plotted stories featuring an Oriental detective called Mr. Moto. Then, in 1937, *The Late George Apley* established him as a first class literary artist. Among his other best-selling novels are *H. M. Pulham, Esq.* (1941), *So Little Time* (1943), *Point of No Return* (1949), and *Stopover: Tokyo* (1957).

Marquette (*mär'kĕt'*), **Jacques (1637-1675),** French Jesuit missionary and American explorer, was born at Laon, France. He founded Sault Sainte Marie and Kaskaskia missions; accompanied Joliet in his exploration of the Mississippi; and died while attempting to establish a mission among the Illinois Indians.

Marryat (*măr'ĭ-ăt*), **Frederick (1792-1848),** English novelist, was born in Westminster. For many years he served in the navy, in which he rose to the rank of post captain. He devised a signal system for the mercantile marine. Retiring in 1830, he produced many novels which opened up a new field to fiction based on his own experiences. His vivacious narrative and vivid portraiture of character make him the chief English novelist between Fielding and Dickens. His works include *Frank Mildmay*, *The King's Own*, and *Mr. Midshipman Easy*.

Marsh, Othniel Charles (1831-1899), American zoologist and paleontologist, was born at Lockport, N. Y. He attended Phillips Academy, Andover, Mass., and was graduated at Yale in 1860. After a period of study at Berlin, Heidelberg, and London, he was appointed in 1866 to the chair of paleontology at Yale.

At his own expense, Marsh organized and conducted exploring and collecting expeditions involving an outlay of $250,000 for the purpose of obtaining fossil vertebrates. His discoveries of the fossil ancestors of the horse marked a new era in evolutionary science. Among his publications, embracing 237 titles, some of the most important are *Birds with Teeth*, *The Gigantic Mammals of the Order Dinocerata*, and *The Dinosaurs of North America*.

Marshall, Catherine (1914-), American author, was born at Johnson City, Tennessee and was educated at Agnes Scott College. The sudden death of her husband, Senate Chaplain Peter Marshall, brought about a complete change in her activities. Responding to many requests, she began writing about the work and ideas of her late husband and, in effect, took up the ministry where he had left off. Her widely read book, *A Man Called Peter*, has been followed by numerous articles and by an autobiographical narrative, *To Live Again*.

Marshall, George Catlett (1880-1959), American general, was born in Uniontown, Pa. A graduate of Virginia Military Institute and the Army Staff College, he was commissioned a second lieutenant in 1901 and was promoted through grades to major general in 1939. He served in the Philippines and in World War I. After the war he was aide-de-camp to General Pershing and served in China. In 1939 he was appointed chief of staff of the United States army with the rank of general. In this capacity he directed the organization and expansion of the army of the United States. He also planned the American share of Allied strategy. In December 1944, he was advanced to the rank of general of the army. He retired as chief of staff in November 1945, and was made ambassador to China. Appointed secretary of state in 1947, he put forward the "Marshall plan" for the rehabilitation of Europe. He resigned in 1949 and, in 1950-51, was Secretary of Defense. In 1953 he was awarded the Nobel peace prize.

Marshall, John (1755-1835), American jurist, was born in Fauquier County, Va. In 1781, he began to practice law in his native county and soon rose to the head of the Virginia bar. He was a member of the Virginia state legislature and of the state convention that adopted the Constitution. In 1797, he was sent as an envoy to France with Pinckney and Gerry. In 1798, he was elected to Congress and, in 1800, became Secretary of State. He was made chief justice of the United States Supreme Court by President John Adams in 1801.

Marshall's great legal learning and judicial poise dominated the Supreme Court for 34 years, during which his decisions gave the initial impetus to the enlargement of federal power by interpretation of the Constitution. He has perhaps never been excelled by any American jurist in power of analysis, lucidity of statement, and in ability to present a legal proposition from so many different points of view.

Marshall, Thurgood (1908-), lawyer, was born at Baltimore. He studied law at Howard University and in 1933 began practice in his native city. As counsel for the N.A.A.C.P. and in similar connections, he has had wide experience in handling segregation cases and other Civil Rights litigation. In 1962 President Kennedy appointed him federal appellate judge.

Martel, Charles. See *Charles Martel*.

Martin, Glenn L. (1886-1955), American aircraft manufacturer, was born at Macksburg, Iowa, and spent most of his boyhood at Salina, Kansas. His ambition to build and fly a plane of his own was first realized in 1910 at Santa Ana, California, where he was employed as an automobile salesman. A period of exhibition flying followed, and Martin then settled down to the business of manufacturing and developing aircraft. Stages in his progress were marked by the making of a primitive seaplane, the manufacture of armored planes and the "TT" model training plane for the U. S. Army in World War I, the "Martin Bomber." After the war he brought out successive models, chiefly of Navy planes, which were built first at his Cleveland, Ohio, factory and later at his new plant on the Chesapeake near Baltimore.

Martin, Homer Dodge (1836-1897), American landscape painter, was born at Albany, N. Y. He was essentially self-taught; first exhibited at the National Academy in 1857; and, in 1862, located in New York.

Martin was a leader among the artists of the Hudson River school. With George Inness and Alexander Wyant, he is ranked as one of the three great masters of American landscape. Among his best-known works are "The Old Mill," "Old Manor House," "The Iron Mine," "Newport Neck," "Lighthouse at Honfleur," and "Lake Sandford." His view on the Seine, called by him "Harp of the Winds," and "Sand Dunes, Lake Ontario," are in the Metropolitan Museum, New York.

Martin, Mary (1913-), American stage and screen star, was born at Weatherford, Texas, and was educated at Ward-Belmont School, Nashville, Tenn. She was a singer in the musical comedy *Leave It to Me* in 1938, and from 1939 to 1943 worked for Paramount Pictures in Hollywood. Her pictures include *The Great Victor Herbert*, *Rhythm on the River*, *Kiss the Boys Goodbye*, *Love Thy Neighbor*, *Birth of the Blues*, *Star Spangled Rhythm*, and *Night and Day*. She appeared in stage productions of *One Touch of Venus* and *Lute Song*. In 1946-47, she starred in the London production of Noel Coward's musical, *Pacific 1860*, and the following year toured the United States in *Annie Get Your Gun*. She played in New York in *South Pacific*, 1949-51, then in London, 1952. Back in the United States she appeared in *Kind Sir*, 1953-54, *Peter Pan*, 1954-55, and Thornton Wilder's comedy, *The Skin of Our Teeth*, 1955. In private life, she is Mrs. Richard Halliday.

Martin, Paul (1903-), political leader, was born at Ottawa, Canada. His education, at St. Alexander College in Quebec, and the University of Toronto, was followed by the study of law. Since his election to Parliament in 1935, he has held many positions, including Secretary of State and Minister of National Health and Welfare. In 1963 he became Minister of External Affairs in Prime Minister Pearson's cabinet.

Martin du Gard, Roger (1881-1958), French novelist, was born at Paris. At the age of 27, he published the first of 11 novels, the last appearing in 1939, which were collected and translated into English under the title *The World of the Thibaults*. This work, for which its author received the 1937 Nobel prize for literature, traces the fortunes of a family from its rise in the 19th century to the tragedy which overtakes it in World War I.

Martineau, James (1805-1900), English theologian, brother of Harriet Martineau, was born at Norwich. He was graduated at Manchester College, 1827, and preached as a Unitarian minister at Dublin and Liverpool. In 1840, he was appointed professor of mental and moral philosophy

at Manchester New College, Liverpool, of which, after its transfer to London, he was principal, 1868-85. He received degrees from Harvard, Oxford, and Edinburgh in recognition of his ability as one of the profoundest thinkers and most effective writers of his day. His works include *The Rationale of Religious Inquiry, Studies of Christianity, Hours of Thought on Sacred Things, A Study of Spinoza,* and *The Seat of Authority in Religion.*

Martinelli (*mär'tĭ-nĕl'ĭ*), **Giovanni** (**1885-**), Italian singer, was born near Venice, Italy. Possessed of an operatic tenor voice, he made his debut as Ernani in Milan. Being heard by Puccini at Rome, he was engaged to appear in "The Girl of the Golden West"; sang at Covent Garden, London, in 1912; and, in the following year, became a leading member of the Metropolitan Opera Company, New York.

"Marvel, Ik." See *Mitchell, Donald Grant.*

Marx, Heinrich Karl (**1818-1883**), German economist and socialist, was born of Jewish parents at Treves. He was educated at Bonn and Berlin; took an active part in the Liberal movement of 1840; and, after the suppression of the *Rheinische Zeitung,* edited by him, went to Paris. Being expelled from Paris and later from Brussels and Cologne, he settled in London, where he engaged in literary work and took an active part in the International Workingmen's Association. He assisted Liebknecht in establishing the Social Democratic Labor Party in 1869. Although obtaining some income as correspondent of the New York *Tribune,* he lived on the verge of destitution, from which he was saved by contributions from his friend and collaborator, Friedrich Engels.

Marx was the founder of the modern socialistic movement in the sense that he created its basis in economic theory. He taught that the coming of socialism is inevitable, devoting his life work to explaining why and how. The "Communist Manifesto," written by him in 1848, is a brief statement of the program and purposes of the movement, but its main basis is found in *Das Kapital, (Capital),* which occupied the latter half of Marx's life. This work has had an enormous influence as a guide to socialist and liberal thought. The Russian Revolution, through Lenin, drew its inspiration from this source.

Mary (**1516-1558**), queen of England, the daughter of Henry VIII and Catherine of Aragon, was born at Greenwich. She succeeded to the throne in 1553 on the death of her half brother, Edward VI, and after the deposition of Lady Jane Grey.

She began her reign by releasing Gardiner, Bonner, Tunstall, Day, and Heath, Catholics who had been confined during the previous reign for their religious opinions, and by imprisoning in their stead Ridley, Latimer, Cranmer, and other Protestants. Soon afterward, she beheaded Northumberland, Sir Thomas Palmer, and Sir John Gates for advocating the cause of Lady Jane Grey; a few months later she beheaded that unfortunate lady and her husband, Lord Guilford Dudley. In 1554, Mary was married to Philip II of Spain. In 1555, having already repealed all the laws enacted in favor of Protestantism and re-established Catholicism, she began persecutions of the Protestants which earned for her the title of "bloody Mary." In 1558, Calais, which had been in the possession of the English since the time of Edward III, a period of 210 years was taken by the Duke of Guise. This loss to the English nation so distressed Mary that she said the name of Calais would, after death, be found engraven on her heart.

Mary Queen of Scots (**1542-1587**), daughter of James V and Mary of Lorraine, was born at Linlithgow, Scotland. By her father's death she became queen before she was a week old. In 1548, she was sent to France; was brought up at court with the royal princes; and, in 1558, married the dauphin, who for a year, 1559-60, ruled as King Francis II.

On her husband's death, Mary returned to assume the government of Scotland, now in the throes of the Reformation. Refraining from interference with the Protestant movement, she retained her own Catholic faith, but chose Protestant advisers. Despite all protests, she was married to her cousin Lord Darnley in 1565. Darnley, granted the title of king, tried to force her, in the event of her dying childless, to settle the succession on him and his heirs. Deeming her favorite, Rizzio, to stand in the way, Darnley plotted with the Protestant lords to have him murdered, and Mary was obliged to agree to the demands. Her only son, afterwards James VI, was born three months later. Darnley in turn was murdered by the Earl of Bothwell in February 1567 under circumstances pointing to Mary's connivance, and her marriage with Bothwell in the following May alienated the nobles. They revolted; took the queen prisoner at Carberry Hill in June; and carried her to Edinburgh, then to Lochleven Castle, where they forced her to abdicate in July.

The following year, she fled to England and was a prisoner there for many years. The Catholics formed plots to liberate her and put her in place of Elizabeth on the English throne. Mary was accused of complicity in a conspiracy headed by Babington and was tried, found guilty, and executed in Fotheringay Castle. An interest in Mary has been kept alive by the romantic appeal of her beauty and her dramatic career and by the fact that she was the last hope of the Catholic party in England.

Masaryk (*mä'sä-rĕk*), **Thomas Garrigue** (**1850-1937**), Slovak scholar and patriot, was born at Hodonin, Moravia. He began life as a blacksmith; later studied at Vienna and Leipzig; and, in 1882, was made professor in the new Czech University at Prague. He sat in the Austrian Parliament 1891-93, resigning to devote himself entirely to moral education, and became a leader of the so-called realistic movement in philosophy, literature, and politics. Elected deputy in 1907, he vigorously opposed German encroachment upon Austria and combated Austrian aggression in the Balkans. In 1909, he exposed the forgeries upon which Austria based the forced annexation of Bosnia-Herzegovina. At the outbreak of World War I, he went to Italy and thence to England. Later he organized the movement for Czechoslovak independence. In 1918, he was appointed provisional president and, in 1920, was regularly elected president of Czechoslovakia, holding that office until 1935. His publications include *Blaise Pascal, The Problems of Small Nations in the European Crisis,* and *The Spirit of Russia.*

Mascagni (*mäs-kän'yē*), **Pietro** (**1863-1945**), Italian composer, was born at Leghorn. He began early to manifest interest in music. He studied at Milan Conservatory for a brief period, but discontinued this pursuit in order to join a touring operatic troupe. He supported himself by conducting traveling opera companies until 1890, when he won world-wide fame with *Cavalleria Rusticana,* a work of great dramatic intensity which gained unprecedented popularity. Without attempting to improve his deficient technique by careful study, he continued to compose unsuccessfully. Later he achieved better results with *Iris, Isobel,* and *Nero.* None of his work fulfilled the promise of his first phenomenal success.

Masefield, John (**1878-**), English poet and play writer, was born at Ledbury. He ran away from home at the age of 14; became a sailor; and traveled in many lands, spending some time in the United States. Upon returning to England, he devoted his time to writing poems, stories, novels, and plays. Since the appearance of *The Everlasting Mercy,* which won the Polignac prize in 1912, his position as a successful writer has been assured. In 1930, he was appointed poet laureate of England.

Masefield excelled in vigorous narrative poems of striking originality, such as *The Widow in the Bye-Street* and *Dauber,* which express his conception of the tragic and the beautiful. The same originality characterizes his novels *The Street of Today* and *Multitude and Solitude* and his powerful play *The Tragedy of Nan.* He also wrote *Salt Water Ballads, Captain Margaret, The Tragedy of Pompey the Great, The Daffodil Fields,* and *The Tale of Troy.*

Mason, F. van Wyck (**1901-**), American author, was born in Boston, Mass., and educated at Harvard (1924). After a short period in business, he turned to writing and has produced a long and impressive list of carefully-documented historical novels and exciting murder mysteries. Among his most popular works are *Vally Forge 1777, Rivers of Glory, Eagle in the Sky,* and *Golden Admiral.*

Mason, Walt (**1862-1939**), American humorist and poet, was born at Columbus, Ont. He was self-educated. Coming to the United States in 1880, he was connected successively with various newspapers. His reputation was established especially by his prose poems, which were published regularly in more than 200 newspapers in the United States and Canada. Written in meter and rime, they were printed as prose, winning wide appeal through their homespun sentiment. Among his works are *Uncle Walt, Horse Sense, Terse Verse,* and *Walt Mason, His Book.*

Massasoit (*măs'ə-soit'*) (**?-1661**), chief of the Pokanoket, or Wampanoag, Indians, ruled over most of south Massachusetts from Cape Cod to Narragansett Bay in the 17th century. His tribe, once very numerous, was reduced shortly before the landing of the English, to about 300 by a disease, probably the yellow fever. In 1621, three months after Plymouth had been founded, Massasoit and 60 warriors, armed and painted, came to the settlement and made a treaty of peace. This treaty was kept for 50 years, and Massasoit was always friendly to the settlers. His home was at Sowams within the present town of Warren, R. I., and here he entertained Roger Williams for several weeks when the latter was on his way to Providence after being banished from Massachusetts.

Massenet (*mä's'-nĕ'*), **Jules Emile Frédéric** (**1842-1912**), French composer, was born at Montaud. He was educated at the Paris Conservatory under Laurent, Reber, Savard, and Ambroise Thomas. He was professor of composition at the Conservatory, 1878-96. By the excellence of their instrumentation, euphony, and melody, his compositions won wide popularity. His works include the following

operas: *Don César de Bazan, Le roi de Lahore, Le Cid, Le Mage, Thaïs, La Navarraise, Sapho, Cendrillon, Manon,* and *Le jongleur de Notre-Dame.* He also wrote an oratorio, cantatas, overtures, and orchestral suites.

Massey, Raymond (1896-), Canadian-born actor and producer, is most commonly associated with *Abe Lincoln of Illinois,* in which his performance of the title role made stage history. He fought in World War I and was wounded at Ypres, then studied at Balliol College, Oxford. His career in the theater began in the 1920's with the acting of parts in the plays of Eugene O'Neill, George Bernard Shaw, and others. In *The Shining Hour* and *Idiot's Delight* he won widespread recognition as a prelude to his triumph in the Abe Lincoln play. He has appeared in many film plays, among them *The Scarlet Pimpernel, The Hurricane, Arsenic and Old Lace,* and *Action in the North Atlantic.*

Massey, Vincent (1887-), governor general of Canada and brother of Raymond Massey the actor, was born in Toronto. He was educated in St. Andrews and Toronto University and received his M.A. degree from Balliol College, Oxford. From 1926 to 1930 he was Canadian minister to the United States, and from 1935 to 1946 was high Commissioner for Canada in the United Kingdom. In 1947 he was made chancellor of the University of Toronto. He was governor general of Canada, 1952-59, the first native-born Canadian to hold the position.

Masters, Edgar Lee (1869-1950), American poet, was born at Garnett, Kans. He was graduated at Knox College, Ill., studied law; and was admitted to the bar in 1891. His first volume of poems, entitled *A Book of Verses,* appeared in 1898 and was followed by plays and other productions in verse. In 1915, his *Spoon River Anthology,* containing a frank post-mortem appraisal of character in modern free-verse, created wide interest. His writings also include *Blood of the Prophets, Starved Rock, Nuptial Flight, The New World,* and several biographies.

Mather (*măтн'ẽr*), **Cotton (1663-1728),** American colonial divine, was born in Boston. He was very precocious; entered Harvard at 11, was graduated at 15, preached his first sermon at 17, and was minister at Old North Church at 20.

The phenomenon termed "Salem witchcraft" having appeared in the colony, he made investigations and, in 1689, published his *Memorable Providences Relating to Witchcraft and Possessions* and, in 1693, his *Wonders of the Invisible World,* which encouraged the persecutions. Despite his narrow-mindedness, he was a man of extraordinary learning, a remarkably prolific writer, and sincere in his convictions. Nevertheless his connection with the persecution of witches gave him a sinister reputation which the appreciation of his many good qualities has not fully counterbalanced. The most important of his numerous works are *Magnalia Christi Americana, Poem to the Memory of Urian Oakes,* and *Essays to Do Good.* See *Salem Witchcraft.*

Mather, Increase (1639-1723), American colonial divine, father of Cotton Mather, was born at Dorchester, Mass., 1639. For about 60 years he was pastor of the North Church, Boston. In 1685, he was chosen president of Harvard College. He published a large number of works, the chief of which are *A Brief History of the War with the Indians in New England, Cometographia,* and *An Essay for the Recording of Illustrious Providences.* He wielded a dominant influence both in the Church and in the state. He was sent to England in 1688 and secured a new charter uniting the Massachusetts Bay and Plymouth colonies.

Mathews, Shailer (1863-1941), American educator and theologian, was born at Portland, Me. Educated at Newton Theological Institution and the University of Berlin, he taught at Colby College from 1887 to 1894 and then joined the faculty of the University of Chicago's Divinity School, serving as dean from 1908 to 1933. He retired the latter year, but continued, by his writings, to take a leading part in a reinterpretation of Christianity from a social point of view. His publications include *The Social Teaching of Jesus, The Church and the Changing Order, Patriotism and Religion, The Faith of Modernism,* and *New Faith for Old—An Autobiography.*

Matisse (*mä'tēs'*), **Henri (1869-1954),** French artist, originated a style and displayed a mastery of color that will influence artists far into the future. He was born at Cateau-Cambresis, France, and lived a span of years that was to prove as revolutionary as the period of the Renaissance. Matisse studied law in Paris, gave it up to study painting at the Ecole des Beaux Arts, and exhibited works in the classical fashion in 1896. But he quickly broke with this school and led the "Fauves," or "Young beasts," in a sensational art movement at the turn of the century. Matisse showed his greatest power and originality in his later years. He traveled in Africa, lived on the French Riviera, and his paintings reflect the warm colors found in that part of the world. However, Matisse brought to his style a classical discipline of line that is unsurpassed. His water colors and pen-and-ink drawings that look so simple are, upon analysis, found to be masterful examples of "genius of line." He studied with Rouault, and worked with Derain and Vlaminck, and many other artists. Matisse spent his last years bedridden, but he worked constantly. His last and perhaps his most memorable work was the interior design for the Church of Ste Marie du Rosaire, near Nice.

Matsuoka (*mä-tsōō-ô-kä*) **Yosuke (1880-1946),** Japanese statesman, was born on a farm in Yamgouchi. In 1893, he went to the United States, where, befriended by a Scotch couple, he earned his way to graduation in law at the University of Oregon in 1900. Returning to Japan he entered the diplomatic service. Despite a rapid rise, he left this field and entered politics in 1920, being elected to the Diet. He came into notice at the Institute of Pacific Relations, meeting at Kyoto in 1929, for his able advocacy of Japan's future Manchurian policy.

Matsuoka, leaning on the political advice of army leaders, typified the expansionist forces of the empire in the Chinese war. He resigned in 1941.

Matthews, James Brander (1852-1929), American author and educator, was born at New Orleans. He was graduated at Columbia College, 1871, and at Columbia Law School, 1873. He was admitted to the New York bar, but soon turned to literature. From 1892 to 1924, he taught literature and drama at Columbia University and also maintained a close and wide acquaintance with writers in America and abroad. As dramatic critic he was a leading figure in the first three decades of the 20th century. His extensive writings include *The Theaters of Paris, The Historical Novel,* and *Essays on English.*

Mauchly, John W. (1907-), physicist, was born at Cincinnati. He grew up under the influence of his father, Sebastian J. Mauchly, who conducted research in terrestrial magnetism for the Carnegie Institute at Washington. Study at Johns Hopkins University led to engineering applications of physics, and young Mauchly formed a partnership with J. P. Eckert, Jr. for the design and manufacture of digital computing equipment. The two men are co-inventors of the electronic computers ENIAC, BINAC, and UNIVAC. See *Eckert, J. P., Jr.*

Maugham, William Somerset (1874-), English novelist and dramatist, was born in Paris, France. He was graduated from Heidelberg University and studied medicine in London, but soon turned to literature. His writings display a relentless realism combined with a rare mastery of restraint, suspense, and the artistry of words. His thought penetrates incisively beneath the surface of social appearance and lays bare the essential tragedies, satisfactions, and ironies of life. Among his novels are *Of Human Bondage, The Moon and Sixpence,* and *Cakes and Ale.* His plays include *Our Betters* and *Rain.* Despite his announced retirement in 1957, his writings maintain their popularity as contemporary literature.

Maupassant (*mō'pa'säN'*), **Henri René Albert Guy de (1850-1893),** French short story writer and novelist, was born at Chateau Miromesnil. After beginning active life as a clerk and serving as a soldier in the Franco-Prussian War, he was patiently trained to story writing by Flaubert, the novelist. His first story, *Boule de suif,* which appeared in 1880, immediately stamped him as a finished and masterly writer of the naturalistic school.

From 1880 to 1890, he produced about 200 short stories, which, though often morbid, sensual, cynical, and unmoral, are, on the whole, in style, art, and deftness of portraiture, the best in French literature, and some are unexcelled in any literature. In form, scope, and artistic completeness, *The Necklace* is by many regarded as the most remarkable short story in world literature. He became insane in 1892 and died the following year.

Mauriac, François (1885-), French writer, was born in Bordeaux, where he was educated at the university. As a young man he gained recognition in Paris with a book of poems, but he is chiefly known as a leading Roman Catholic novelist. Some of his best known works are *Le Baiser au Lépreaux, Génetrix, Therése,* and *Le Noeud de Vipères.* He has also written several successful plays, and has been leader writer for *Figaro.* He was elected to the Academie Français in 1933, and was awarded the 1952 Nobel Prize in literature.

Maurice (*mô'rĭs*) **(1567-1625),** prince of Orange and count of Nassau, was born at Dillenburg, Prussia, son of William I founder of the Dutch Republic. After his father's assassination in 1584, the provinces of Holland and Zealand and, afterward, Utrech elected him stadholder. A great portion of the Netherlands was still in the hands of the Spaniards, but, under the leadership of Maurice, the Dutch rapidly wrested cities and fortresses from their enemies. In 1597 with the help of English auxiliaries, he defeated the Spaniards at Turnhout and, in 1600, won a splendid victory at Nieuwport. Finally, in 1609, largely through Maurice's generalship, Spain was compelled to agree to a

truce which resulted in the independence of the Dutch. Maurice forcibly suppressed the Remonstrants, of the Armenian anti-Calvinistic sect, in 1618 and brought about the death of their leader, Barneveldt.

Maurois (*mô'rwä'*), **André** (**1885-**), French biographer and essayist, was born at Elbeuf. Educated at Rouen, he served during World War I as an interpreter between French and English forces, his experiences being later embodied in *Silences of Colonel Bramble*. He proceeded then to write biographies in fiction form couched in a delicate but direct style. Some of his subjects were English. *Ariel, or the Life of Shelley* was followed by *Disraeli*, *Byron*, and *Dickens*. He wrote also *Whatever Gods May Be*, *The Weigher of Souls*, *The Thought-Reading Machine*, and *Tragedy in France*.

Maury, Matthew Fontaine (**1806-1873**), American hydrographer, was born in Spottsylvania County, Va. He entered the navy as a midshipman in 1825 but, in 1839, an accident, resulting in lameness, unfitted him for active service. He was placed in charge of charts and instruments, a department from which grew the Naval Observatory and Hydrographic Office. His work there on winds and currents led to an international conference in Brussels in 1853, which was of fundamental importance to navigation. He was given the rank of commander in 1855.

Siding with the South in the Civil War, he headed the harbor defense service and invented a torpedo. After the war, he attempted unsuccessfully to found a Virginian colony in Mexico. The years 1866 to 1868 he spent in England and then accepted the professorship of meteorology at Virginia Military Institute, Lexington, Va. Elected to the American Hall of Fame in 1930.

Mauve (*mouv*), **Anton** (**1838-1888**), Dutch landscape and animal painter, was born at Zaandam. Though he studied with the cattle painter Van Os at Haarlem, he was largely self-taught. His paintings are chiefly landscapes with sheep, horses, cattle, or figures of peasants and include also seashore scenes characterized by fine poetic quality and refined, truthful treatment. With Israels he stands in the foremost rank of modern Dutch painters.

Mawson (*mô'sŭn*), **Sir Douglas** (**1882-1958**), Australian antarctic explorer, was born in Bradford, England, but went at an early age to Australia. He was educated at the universities of Sydney and Adelaide. As a member of the scientific staff of Shackleton's expedition, 1908-09, he reached and determined the location of the south magnetic pole on Victoria Land, in lat. 72° 25′ S., long. 155° 16′ E. He organized and conducted the Australasian expedition to antarctic lands south of Australia, 1911-14. By journeys covering 2400 miles he discovered and explored King George V Land.

As a result of his explorations, he concluded that the continent of Antarctica, an elevated, glacier-covered region, extends without interruption between 86° E. and 150° W. Mawson's discoveries and their results form the most extensive contribution to antarctic exploration during the first quarter of the century.

In 1920, he was appointed to the chair of geology and mineralogy in the University of Adelaide. Besides various scientific papers, he published *The Home of the Blizzard*.

Maxim, Sir Hiram Stevens (**1840-1916**), Anglo-American inventor, was born at Sangerville, Me. He received a common school education, and obtained his scientific knowledge by private study and by attending lectures. He was for four years an apprentice to a coach builder; worked in various ironworks; patented numerous inventions in the United States; and, in 1881, went to England, where he became a naturalized citizen.

Maxim obtained over 100 international patents for inventions. These include the incandescent lamp and other electrical appliances; the Maxim machine gun, automatically loaded and discharged by the force of the recoil; and cordite, a smokeless powder. He devoted much attention also to aerial navigation. For many years he was a director in the British ordnance firm of Vickers Sons and Maxim.

His son, Hiram Percy Maxim (1869-1936), was an American mechanical engineer and inventor of the Maxim silencer for firearms and mufflers for automobiles.

Maximilian, Ferdinand Joseph (**1832-1867**), archduke of Austria and emperor of Mexico, was born in Vienna. He was the brother of Francis Joseph, emperor of Austria-Hungary. In 1863, Napoleon III planned to conquer Mexico and set up an empire there. He offered the crown to Maximilian, who went to Mexico in 1864. The country had long been in a state of confusion, and at first the people seemed inclined to welcome him and to look for peace under his rule. But he pleased no one; the people rose against him; and, in 1866, when the French troops left the country, the empire fell to pieces. Maximilian tried to form a native army for his own defense, but he was captured by the Republicans, was tried and shot near Queretaro.

Maxwell, James Clerk (**1831-1879**), British physicist, was born at Edinburgh. He was educated at the University of Edinburgh and at Cambridge, and, before he was 15, wrote papers of scientific value. In 1865, he became a professor in Marischal College, Aberdeen; in 1860, was appointed to a chair in King's College, London; and, in 1871, was made professor of experimental physics at Cambridge.

In his work *Electricity and Magnetism*, he demonstrated that electromagnetic action travels through space in transverse waves similar to those of light and having the same velocity. His hypothesis that electricity and light are the same in their ultimate nature has been amply confirmed. He was the first to make color sensation the subject of actual measurement.

Mayer (*mī'ĕr*), **Julius Robert von** (**1814-1878**), German physicist, was born at Heilbronn. In 1840, he went to Java, where he made researches on the blood and on animal heat, which led him to consider the problems of the conservation and correlation of forces. In 1842, he published the first announcement of the principle underlying the theory of the conservation of energy. Mayer is entitled to the credit of first conceiving this great doctrine. His complete works were produced in *Die Mechanik der Wärme*. See *Conservation of Energy*.

Mayo, Charles Horace (**1865-1939**), American surgeon, was born at Rochester, Minn. He received his education at Northwestern University and was graduated from Chicago Medical College in 1888. He immediately began practice at Rochester, Minn., where he was made surgeon at Saint Mary's Hospital. He was widely known for successful operations for goiter and, together with his brother, W. J. Mayo, achieved world-wide fame, not only for successful operations, but also for the development of a remarkable surgical clinic. With his brother, he donated 1.5 million dollars in 1915 to establish at Rochester, for medical education and research, the Mayo Foundation, now a part of the University of Minnesota.

Mayo, William James (**1861-1939**), American surgeon, was born at Le Sueur, Minn. He was graduated in medicine at the University of Michigan, 1883, and became a practicing surgeon at Rochester, Minn. Here he served with his brother C. H. Mayo as surgeon of the Mayo Clinic of Saint Mary's Hospital and achieved unusual success in his operations for gallstones and cancer.

Mazarin (F., *mà'zà'răN'*; E., *măz'à-rēn'*), **Jules** (**1602-1661**), prelate and diplomat, was born at Piscina, Italy. Having accompanied a papal legate to the court of France, he became known to Richelieu about 1628. The latter perceived his great political talents and engaged him to maintain the French interests in Italy. In 1639, he openly entered the service of Louis XIII and was naturalized as a Frenchman. In 1641, he received a cardinal's hat through the influence of Richelieu, who, when dying, recommended him to the king as the only person capable of carrying on the latter's political system. Under Mazarin, the influence of France among the nations was increased and, in the internal government of the country, those principles of despotism were established on which Louis XIV afterward acted.

Mazzini (*mät-sē'nē*), **Giuseppe** (**1805-1872**), Italian patriot and revolutionist, was born at Genoa. Sentiments of social equality were early instilled into him by parental example. In 1830, his affiliation with the secret society of the Carbonari led him to enter a political career. The organization of a new Liberal league, "Young Italy," was Mazzini's next work. The first fruit of his league was the revolutionary expedition of Savoy, which was organized by Mazzini at Geneva but was defeated by the royal troops.

An association entitled "Young Europe" and based on principles of European rights and enfranchisement was inaugurated by him in Switzerland. In 1837, he quitted Switzerland and finally took up his abode in London. He assisted in organizing Garibaldi's expeditions of 1860, 1862, and 1867. After an ineffective scheme for a Republican uprising in Sicily in 1870, he ventured to enter Italy and was arrested at Gaeta, where he remained a prisoner until Rome was taken by the Italian army.

Mead, Margaret (**1901-**), American anthropologist, was born in Philadelphia, Pa. After she was graduated from Columbia University in 1924, she undertook an anthropological research project in Samoa which set a new standard of thoroughness in analyzing the life, ways, and motives prevailing in a primitive society. The results were published in *Coming of Age in Samoa*, written after her appointment in 1926 as assistant curator of ethnology, American Museum of Natural History, New York. Other investigations, which laid particular emphasis on education, relations between the sexes, and economic motivation, were made in New Guinea and Bali. Her other publications include *Growing Up in New Guinea*, *Cultural Stability in Polynesia*, *The Changing Culture of an Indian Tribe*, and *Sex and Temperament in Three Primitive Societies*. Her *New Lives for Old* appeared in 1956. She married Gregory Bateson of Cambridge, Eng., in 1936.

Mead, William Rutherford (1846-1928), American architect, was born in Brattleboro, Vt. After being graduated at Amherst College in 1867, he studied architecture. In 1872, he formed a partnership with C. F. McKim. Joined by Stanford White in 1879, the firm was thereafter known as McKim, Mead, and White. Mead participated in much of the notable work of the firm, including the designs for the Boston Public Library; Columbia University Library; New York University Library and the American Hall of Fame. He was elected to the American Academy of Arts and Letters in 1910.

Meade, George Gordon (1815-1872), American general, was born in Cadiz, Spain, where his father was an agent of the United States navy. He was graduated from West Point, 1835, and, after serving one year in the army, resigned to begin practice as a civil engineer. He re-entered military life in 1842, serving with distinction in the Mexican War on the staffs of Taylor and Scott and in the engineer corps.

At the outbreak of the Civil War, he was placed in command of a brigade of volunteers and soon rose to the command of a division. He led his division through the Seven Days' battles; was severely wounded at Frazier's farm; went through the Antietam campaign; and commanded at Fredericksburg, where he particularly distinguished himself. At Chancellorsville. he commanded the fifth corps. When Hooker resigned the command of the army of the Potomac and while the army itself was in hasty movement northward to check Lee's invasion of the North in 1863, Meade was appointed to the command. He accepted it with the greatest reluctance and altogether from a sense of duty. He planned to fight on the line at Pipe creek, but Reynolds fell into collision with Lee's advance at Gettysburg, and Meade's ensuing victory, July 1-3, 1863, became historical. When Grant assumed general command in 1864, Meade continued to command the army of the Potomac.

Meany, George (1894-), American labor leader, was born in New York City. He became an apprentice plumber at sixteen, and a journeyman plumber at twenty-one. From 1922 to 1934 he was business representative of a local plumbers' union, and from 1934 to 1939 president of the New York State Federation of Labor. Becoming secretary and treasurer of the American Federation of Labor in 1940, he continued in that office until 1952, when he was elected to succeed William Green as president. When the American Federation of Labor and the Congress of Industrial Organizations merged in 1955, Meany became president of AFL-CIO.

Medaris, Gen. John B. (1902-), U.S. Army officer, was born at Milford, Ohio. Following service as a youthful Marine in World War I, he studied mechanical engineering at the Ohio State University. Having been for six years a member, then a reserve officer, of the Army ordnance corps, he was recalled to active duty in 1939, served overseas through World War II and continued in the department, rising to the rank of Assistant Chief of Ordnance. In 1956 he was placed in charge of the Redstone Arsenal at Huntsville, Alabama, where his assignment was to expedite the development and production of intermediate range guided missiles.

Medici (*mā'dê-chē*), **Catherine de'.** See *Catherine de' Medici.*

Medici, Lorenzo de' (1449-1492), surnamed "the Magnificent," was a member of an illustrious Florentine family which for centuries exerted great influence throughout Europe. He was instructed by some of the most learned men of the age. In 1469, he succeeded to the wealth and the power of his father and became the virtual head of the Florentine state.

During his rule he exerted himself in every way to promote the growth of literature and the arts. In 1478, the Pazzi, another distinguished family of Florence, formed a conspiracy against him and his brother Giuliano. The plot very nearly succeeded, Giuliano being assassinated and Lorenzo being wounded. The remainder of Lorenzo's administration was unmarked by any great public events, but his regard for literature was further manifested by his establishment of the printing press in his dominions and by his enlargement of the Laurentian library.

Meighen (*mē'ŭn*), **Arthur (1874-1960),** Canadian statesman, was born at Anderson, Ont. He was educated at Toronto University. After studying law at Winnipeg, he was admitted to the bar and, in 1902, located at Portage la Prairie, Man. He was elected to the Dominion House of Commons, 1908, as a Conservative member; was re-elected in 1911 and in 1917; was appointed solicitor general of Canada, 1913; was made member of the Imperial war cabinet, 1918; and prime minister in 1920-21 and 1926. He led the Conservative party in the House until 1927. He was minister without portfolio in the Bennett cabinet, 1932-35, and leader of the Conservative party, 1941-42.

Meissonier (*mĕ'sô'nyā'*), **Jean Louis Ernest (1815-1891),** French military painter, was born in Lyons. He first attracted attention by his "Little Messenger" in 1836 and continued to exhibit at the Paris Salon for many years. Among his best pictures are those of the "Napoleon Cycle," containing the widely known "1807," "1814," and "1815." He served in Napoleon III's Italian campaign and the early part of the Franco-Prussian War, and was colonel at the siege of Paris. He painted upward of 500 pictures.

Melanchthon (*mê-lăngk'thŭn;-tŭn*), **Philipp (1497-1560),** German theologian, was born at Bretten, Baden. He early decided in favor of the Reformation and brought to the aid of Luther great attainments in learning, unusual acuteness in dialectics and exegesis, a remarkable power both of clear thinking and of clear expression, and withal a gentleness and a moderation that most advantageously tempered Luther's vehemence. In 1521, he published his *Loci Communes Rerum Theologicarum,* the first great Protestant work on dogmatic theology. In 1530, by drafting the Augsburg Confession, he made a most important contribution to the cause of Protestantism.

After Luther's death, he lost, in some measure, the confidence of the Protestants by those concessions to the Roman Catholics which his anxiety for peace led him to make, while the zealous Lutherans were no less displeased because of his approximation to the doctrine of Calvin on the Lord's supper. He endeavored to bring about Christian unity in an age of fanatical strife and was one of the most judicious and progressive leaders of the Reformation.

Melba, Nellie (1861-1931), née Helen Porter Mitchell. Australian singer, was born at Burnley, near Melbourne, She studied under Madame Marchesi in Paris and made her stage debut in 1887 in *Rigoletto* at Brussels. In the following year, she appeared as Lucia at Convent Garden, London. She first appeared in the United States in *Lucia di Lammermoor* at the Metropolitan Opera House, New York, 1893. She was notably successful in grand opera in America and, after some years in concert, returned to opera in 1915–16 as member of the Chicago Grand Opera Company. She wrote *Melodies and Memories.* Melba's stage name is derived from Melbourne, the Australian city.

Mellon, Andrew William (1855-1937), American manufacturer and banker, was born at Pittsburgh, Pa.; was educated in the University of Pittsburgh; and was long engaged in the development of coal, coke, and iron enterprises. He founded the town of Donora, Pa., and established steel mills there. He was an officer or director of many industrial and financial corporations, including the Mellon National Bank, the presidency of which he resigned in 1921 in order to become Secretary of the Treasury for the United States. He served ably. Resigning in 1932, he was ambassador to Great Britain until the following year.

He built up one of the most valuable collections of art in private hands, most of which, together with funds for a gallery, he donated to the United States government. The National Gallery of Art, one of the finest in the world, was opened in Washington, D. C., in 1941.

Melville, Herman (1819-1891), American novelist, was born in New York City. He went to sea in a merchant vessel in 1837. Mistreatment led to his escaping from the ship in Marquesas Islands, where he was captured by a cannibal tribe, the Typees. He was rescued by a whaler a few months later, in 1841. Remaining in the South Seas until the next year, he returned to the United States, where he obtained employment in the New York Customs House.

He wrote a number of books based chiefly on his adventures, which met with some success in his day but made him famous after his death. *White Jacket,* describing barbarities in the treatment of enlisted men by the navy, led to the abolition of flogging. *Typee* describes his first voyage and capture by cannibals. In *Moby Dick,* however, Melville created his masterpiece. Ostensibly the pursuit of a white whale, the book is a parable of fate.

Menander (*mē-năn'dĕr*) **(342 B.C.-c.291 B. C.),** Greek comic poet, was born at Athens. His uncle was the poet Alexis. The influence of the latter as well as that of Menander's teacher Theophrastus and of his friend Epicurus is discernible in his style of thought and feeling. He wrote more than 100 comedies, which for wit and grace were held in higher esteem than the works of any other writer of the so-called New Comedy. Many of his plays were adapted for the Roman stage by Plautus and Terence. In the latter part of the 19th century, a fairly complete text of several of Menander's plays was discovered in Egypt. The poet was drowned about 291 B. C.

Mencius (c. 380 B.C.-289 B.C.), Chinese religious philosopher. The name is a Latinized form of Mang-tsze, meaning Mang the Philosopher. Adopting the ideals of practical ethics formulated by Confucius a century earlier, he visited the courts of the rival feudal lords of China, seeking to have each put into practice the principle that the good of the people is the guiding rule of statecraft. He believed that any prince so ordering his affairs would by common consent become the ruler of the entire country. Accepting failure in his mission as the divine will, he

retired and elaborated his views in treatises which his disciples wrote down. They were collected into one of the books of which educated Chinese were required for over two millenniums to have a knowledge. His mother, who was widowed when Mencius was three years of age, was revered in after ages throughout China as the model mother.

Mencken, Henry Louis (1880-1956), American satirist and editor, was born at Baltimore. He was connected in an editorial capacity with the Baltimore *Herald*, the Baltimore *Sun*, and, 1908-23, with the *Smart Set*. In 1924, he founded the *American Mercury* and, as its editor, notably extended his influence as an incisive and iconoclastic critic of many features of American life. He left the *American Mercury* in 1933, returning to the Baltimore *Sun* as part owner. He wrote *The American Language, The American Credo, Prejudices, Americana, Treatise on the Gods*, and *Happy Days*, an autobiography.

Mendel, Gregor Johann (1822-1884), Austrian botanist, was born at Heinzendorf, Silesia. He was educated at Brünn; became a priest in 1847; continued his studies at Vienna; and later taught at Brünn, where he became abbot. During 15 years devoted to teaching natural science he conducted extensive experiments in hybridization. In 1865, he announced the discovery of a law of heredity now universally known as Mendel's law. It was published by the natural history society of Brünn, but attracted little attention until 1900, when De Vries and other investigators brought it to light. This law, based on Mendel's original experiments with garden peas, has become the working basis of nearly all recent investigations in genetics.

Mendeléev (*měn'dyĕ-lyā'yĕf*) **Dmitri Ivanovitch (1834-1907),** Russian chemist, was born at Tobolsk, Siberia. In 1850, he went to Leningrad to study natural science and, in 1866, was made professor of chemistry at the University of Leningrad. He is best known for the enunciation of the periodic law, under which an arrangement of the chemical elements made possible prediction of the existence and even of the properties of several unknown elements which have since been discovered. He published many scientific papers and several textbooks of which his *Elements of Chemistry* has become a standard work and has been translated into many languages.

Mendelssohn-Bartholdy (*měn'dĕl-sōn-bär'tôl'dē'*), **Felix (1809-1847),** German composer, was born of wealthy and cultured Jewish parents at Hamburg. His father became a convert to Christianity and young Felix was brought up in the Lutheran faith. Zelter was his instructor in composition; Ludwig Berger, on the piano.

At the age of nine, Mendelssohn gave his first public concert in Berlin. From this period he began to write compositions of all kinds. At 17, he wrote his well-known overture to *A Midsummer Night's Dream*. In 1825, he went to Paris. He gave concerts there and in Berlin, and later traveled for three years in England, Scotland, France, and Italy. In 1835, he accepted the directorship of the Leipzig concerts. Here, in the center of the musical world of Germany, he was stimulated to his highest and most brilliant efforts. His oratorios *St. Paul* and *Elijah* are his two greatest works, the latter ranking second only to the greatest works of Handel. His *Hymn of Praise, Songs Without Words*, and *Wedding March* are among the most admired of his minor compositions.

Mendes-France, Pierre (1907-) French statesman, was born in Paris. As premier of France for a period in 1954-55, he achieved world fame for the hard realism of his policies, but his uncompromising demands for parliamentary reform, and his decision to withdraw from Indo-China, forced him from power. A brilliant and successful lawyer, he was first elected to the National Assembly in 1932. During World War II, he escaped from a Vichyite prison and joined General de Gaulle's Free French Air Force. Dark and saturnine, Mendes-France is a phenomenally hard worker.

Menninger, William C. (1899-), psychiatrist, was born at Topeka, Kan. He was educated chiefly at Washburn University and the Cornell University Medical School. Following internship in medicine and surgery, he added post-graduate training in psychiatry, a field which he has made a life-long specialty. Through teaching, articles, and public lectures he has shared with many the results of his experience in conducting the Menninger Clinic at Topeka.

Menotti, Gian Carlo (1911-), composer, was born at Cadegliano, Italy, but received his musical education at the Curtis Institute in Philadelphia. He has resided in the United States since 1928. Although he has written *Violin Concerto in A Minor* and *Apocalypse*, an orchestral work, he is best known for his operas, which include *The Medium, The Telephone, The Consul*, and *The Saint of Bleeker Street*. Experimental works are *The Old Maid and The Thief*, a radio opera, and *Maria Golovin*, a television opera. He writes his own libretti, usually in English.

Menzies, Robert Gordon (1894-), Australian statesman, was born at Jeparit, Victoria, Australia, and was educated at the University of Melbourne. A lawyer by profession, Menzies began practice as a barrister at the Victoria bar in 1918, became king's counsel in 1929, and served as attorney general of the Commonwealth of Australia, 1934-39. He became prime minister in 1939, and led his country into World War II. He resigned in 1941 when the Labor party gained control of the government. He was leader of the opposition from 1943 to 1949, when he again became prime minister, a rank he has since held.

Mercator (*mĕr-kā'tĕr*; *mĕr-kā'tôr*), **Gerardus (1512-1594),** Flemish geographer, was born at Rupelmonde, Flanders. His real name was Kremer, "Merchant," of which Mercator is the Latinized form. He took his degree as bachelor of philosophy at Louvain, but devoted his later years to the study of geography. In 1559, he was appointed cosmographer to the Duke of Cleves. He published several important works, including maps and descriptions of France, Germany, and Great Britain. He did much to establish geographical science upon a secure footing. His name is perpetuated by the projection used in nautical maps, in which the meridians are represented as straight vertical lines and the parallels of latitude as horizontal lines perpendicular to the meridians.

Mercier (*mĕr'syā'*), **Désiré Joseph Cardinal (1851-1926),** Belgian prelate, was born at Braine l'Alleud. He was educated at Malines, Paris, and Leipzig; became a priest in 1874; and taught philosophy at Malines, 1877-82, and later at Rome. In 1906, he was consecrated archbishop of Malines and primate of Belgium, and, in 1907, he was made cardinal. Cardinal Mercier came into world-wide notice through his fearless, patriotic conduct in speaking for the Belgian people during the German occupation of his country from 1914 to 1918. Among his various writings on metaphysics, philosophy, and psychology, the most important is his *Origins of Contemporary Psychology*.

Meredith, George (1828-1909), English poet and novelist, was born in Portsmouth. After studying for some time in Germany, he began his literary career with the publication of a volume of poems. As a novelist he rose to a high position in British letters. His fiction is characterized by much introspection and psychological analysis. Among his numerous writings are *The Ordeal of Richard Feverel, Emilia in England, Rhoda Fleming, Beauchamp's Career, The Tragic Comedians, Diana of the Crossways, Ballads and Poems of Tragic Life, The Amazing Marriage, The Tale of Chloe, The House on the Beach*, and *Last Poems*.

Meredith, Owen. See *Lytton, Edward Robert, Earl of.*

Mergenthaler (*mĕr'gĕn-tä'lĕr*), **Ottmar (1854-1899)** American inventor, was born in Württemberg, Germany. He came to the United States in 1872 and entered the employ of the government at Washington, D. C., where he kept in order clocks and electric bells throughout various government buildings. In 1876, he removed to Baltimore, where he devoted many years to the perfection of a typesetting machine. In its final form this became the linotype machine bearing his name now in common use in printing establishments. See *Composing Machine*.

Mérimée (*mā'rē'mā'*), **Prosper (1803-1870),** French novelist, historian and archeologist, was born at Paris. He studied law; entered the civil service; and, in 1831, was made inspector of archeological and historical monuments in France. While he published various historical and scientific researches, he is best known for his narrative and dramatic fiction. This includes *Colomba*, which is his most popular novel, and *Carmen*, a Spanish gypsy romance. The latter was made the subject of Bizet's noted opera of the same name. He became a member of the French Academy in 1844 and was chosen Senator of the Empire in 1853.

Merriam, John Campbell (1869-1945), American paleontologist, was born at Hopkinton, Iowa. He was graduated at Lenox College, Iowa, in 1887 and received the degree of doctor of philosophy from the University of Munich, Germany, in 1893. He was professor of paleontology and historical geology from 1912 to 1920 at the University of California. In 1920, he was made president of the Carnegie Institution in Washington, serving until 1939. He made extensive researches on the fossil reptiles and on the fossil mammals of western North America. He wrote *The Emergence of Man, The Living Past*, and *Science and Human Values*.

Merry del Val (*mĕr'rē dĕl väl'*), **Raphael (1865-1930),** Catholic prelate and diplomat, was born of Spanish parents in London. He was educated at Ushaw College, Durham, England, and at Rome. In 1888, he took orders; in 1892, was made papal chamberlain; and, in 1897, became prelate of the papal household. In 1903, he succeeded Cardinal Rampolla as Papal Secretary of State and was made cardinal. On the accession of Pope Benedict XV, 1914, he was succeeded by Cardinal Ferrata and was appointed Secretary of the Congregation of the Holy Office. It fell to

his lot to advise the papacy during the separation of Church and State in France, 1905, and in the negotiations leading to the restoration of the pope's temporal power in 1929.

Merton, Thomas (1915-), a Trappist monk whose richly imagistic poetry belies the austerity of his chosen life. Born in France, he was educated there, and at Clare College, Cambridge, and Columbia University. He was converted to Catholicism, took the Trappist order of silence, and was ordained a priest in 1949. While Merton's poems mark him as a first-class literary figure, he is best known for his two books dealing with his spiritual philosophy, the autobiographical *Seven Story Mountain* and *The Waters of Siloe.* His *The Silent Life* (1957) is a fascinating account of monastic life. Called Father M. Louis, he works at the Trappist Monastery in Gethsemane, Kentucky. He has also written *Sign of Jonas* (1935), *Last of the Fathers* (1954), and *No Man Is an Island* (1955).

Merz, Charles (1893-), editor, was born at Sandusky, Ohio. After graduation from Yale University, he entered journalism, holding positions with *Harper's Weekly, The New Republic, Collier's,* and *The New York World.* His service as foreign correspondent was at Paris and in the Far East. Since 1928 he has been editor of *The New York Times.* He is author of *The Great American Bandwagon.*

Messerschmitt, Willy (1898-), German aircraft designer and manufacturer, is credited with being chiefly responsible for the rapid expansion of the Nazi air force in the 1930's. He was chief engineer for the firm of Messerschmitt, which he founded, and for the Bayerische Flugzeugwerke, which was later merged with the Messerschmitt Company. In 1936 he was made chairman of the German Institute for Research in Aviation. Since the end of the war his engineering ability and the resources of his factory have been utilized in the construction of prefabricated houses.

Meštrović (*mĕsh'trô-vĭch*), **Ivan (1883-1962)**, Yugoslav sculptor, was born at Vrpolje, Slavonia. The son of a farmer, who apprenticed him to a stonecutter in 1896, Meštrović succeeded in entering the Vienna Academy, where he studied from 1899 to 1904. Exhibitions in Vienna, London, Venice, and Paris attracted notice as a new note in sculpture. His work shows modern adaptations of archaic Greek and Byzantine effects.

Metaxas (*mĕ-tăk'sȧs*), **John (1871-1941)**, Greek soldier and statesman, was born in the island of Ithaca. He studied military science in Athens and Berlin and entered the army in 1880. He took part in the war against Turkey in 1897 and the Balkan War of 1912-13. He was a member of the general staff during World War I. Dismissed from the army and exiled for four years, he returned to Greece and, in 1926, was appointed to the cabinet. He organized a fascist-monarchist party in 1934, with the help of which he made himself dictator in 1936. In 1940, Italy suddenly invaded Greece. Metaxas rallied the country and, with British support in sea and air, delivered a staggering defeat to the Italian invaders.

Metternich (*mĕt'ĕr-nĭĸ*), **Clemens Wenzel, Prince (1773-1859)**, Austrian diplomat and statesman, was born in Coblenz. After a distinguished diplomatic career, he became chief minister of Austria in 1809. After the Congress of Vienna, he was the foremost statesman of Europe, and the period 1815-48 is sometimes styled the "age of Metternich." He was the inspiring genius of the reaction, organizing the Holy Alliance to stem the rising tide of popular government. The revolution of 1848 sent him into exile, from which he returned three years later.

Meunier (*mû'nyā'*), **Constantin (1831-1905)**, Belgian sculptor and painter, was born at Etterbeek. He first painted religious and historical subjects, which he treated in a realistic style. About 1880, he began to study the workers in the mining and factory districts of Belgium, and from that time he devoted his life to what has been styled the "æsthetics of work," producing, after his 50th year, many great sculptures depicting the struggle of man with the earth. Among the finest of these are "The Dock Hand," "The Sower," "The Mine Girl," and "Puddler Resting."

Meyer, Adolf (1866-1950), American psychiatrist, was born near Zurich, Switzerland. After studying in the chief universities of Europe, he came to the United States in 1892 as a fellow at the University of Chicago. Specializing in the study of mental diseases, he had a large part in developing the view that insanity is a series of disorders, many of which can be cured or avoided by the proper measures. To preventive measures he applied the term "mental hygiene," which became widely current. He was made professor of psychiatry at Johns Hopkins University in 1910, retiring in 1941.

Meyer, Albert Cardinal (1903-), Roman Catholic prelate, was born in Milwaukee, Wis. He studied at the St. Francis Seminary there, and in the North American College at Rome. Later, also in Rome, he pursued advanced studies at the University for the Propagation of the Faith. Beginning as parish priest in the Milwaukee area, then teacher at the St. Francis Seminary, he went on to become Archbishop of Milwaukee and later, Archbishop of Chicago. In 1959 he was named Cardinal by Pope John XXIII.

Meyerbeer (*mī'ĕr-bār*), **Giacomo (1791-1864)**, German composer, was born of Jewish parents in Berlin. He early displayed musical talent and made his first public appearance at the age of seven. In 1810, he entered the school of Vogler, at Darmstadt, where he formed an intimate friendship with Weber. His opera *Jephtha's Vow* was produced at Munich in 1813.

He was induced by his friend Salieri to visit Italy, where he became an enthusiastic convert to the new Italian school and began the composition of a series of operas which proved highly popular. His subsequent works include *Romilda e Constanza, Semiramide riconosciuta, Emma di Resburgo, L'esule di Granata, Il Crociato in Egitto, Robert le Diable,* and *Les Huguenots,* in the last of which he reached the climax of his fame. See *Huguenots.*

Mich, Daniel D. (1905-), editor, was born at Minneapolis, Minn. After graduation from the University of Wisconsin he was employed first by the *Wisconsin State Journal* and later by the Muscatine, Iowa, *Journal.* He has served on the editorial staff of *Look* magazine since 1937 and has been editorial director since 1954. He is the author of *The Technique of the Picture Story.*

Michelangelo (*mī'kĕl-ăn'jê-lō*) **Buonarroti (1475-1564)**, Italian painter, sculptor, and architect, was born at Caprese near Arezzo in Tuscany, Italy. When only 13 years of age, Michelangelo was apprenticed to the painter Ghirlandajo for three years. Sculpture, however, appears in a short time to have engrossed his attention. Lorenzo de' Medici, attracted by the drawings and models of the young student, gave him some commissions in 1489.

Early Works. After the death of Lorenzo in 1492, Michelangelo received nearly equal attention from Piero de' Medici; but political disturbances caused him to take refuge in Bologna. He visited Venice, but returned to Florence in 1494. Two years later he made his first trip to Rome. He rapidly distinguished himself in sculpture. Among other works, he finished his colossal "David" in 1504, in which he displayed his characteristic style of form, —a heaviness of the limbs compared with the body.

Monument of Julius II. In 1505, Pope Julius II called the great sculptor to Rome to design for him a sepulchral monument. It was to be a four-sided marble structure decorated with some 40 figures of heroic size. Michelangelo spent 8 months in Carrara superintending the sending of the marble to Rome. The pope suddenly changed his mind and began to consider instead the building of Saint Peter's after the designs of Bramante. In 1545, after the pope's death, the designs for the monument to Julius II were carried out on a much reduced scale, and it was completed in the form now to be seen in the San Pietro in Vincoli. The artist's statue "Moses" was to have formed a part of the monument as originally designed.

Paintings. In 1508, he was ordered to paint the Vatican chambers. He disliked the commission but produced the frescoes of the "Prophets and Sibyls" and the "History of the Creation and Fall of Man." He returned to Florence in October 1512, and, in 1513, his patron, Julius II, died.

During the pontificate of Adrian VI and part of that of Clement VII, beginning about 1524, Michelangelo was engaged on the Laurentian Library and the Medici Chapel in San Lorenzo and on the famous Mausoleum where are the celebrated allegorical figures of "Night" and "Day."

There is no evidence of Michelangelo's presence in Rome between 1513 and 1525. Part of his time was devoted to improving the fortifications of Florence, used against Pope Clement VII in 1529. The city surrendered in 1530, and afterward the artist went to Rome. In 1533 he was commissioned to adorn the Sistine chapel and accordingly began his famous fresco of the "Last Judgment," which was completed in 1541.

Architecture. After this time, Michelangelo produced no great works in painting. He was chiefly employed in architecture, having become architect of Saint Peter's in 1547. This edifice was converted by him from a mere Saracenic hall into the most superb model of a Christian Church.

Cosmo de'Medici made Michelangelo vice president of the Academy of Florence in 1563. The great artist, without remuneration, devoted the remainder of his life to the Church. He carried forward at Rome the Palazzo Farnese, rebuilt an old bridge across the Tiber, converted the baths of Diocletian into the magnificent church of Santa Maria degli Angeli, and superintended the construction of Saint Peter's as far as the dome.

Genius. Whether as painter, sculptor, or architect, he succeeded in uniting magnificence of plan and endless variety of parts with the utmost simplicity and breadth. In his Sistine frescoes, he was the inventor of epic painting. In his "Cartoon of Pisa," he personified motion. His "Last Judgment" exhibits a powerful portrayal of every passion

that sways the human heart. Consummate mastery of artistic expression enabled him to surmount the greatest difficulties with the appearance of perfect ease. His sonnets rank in lyric quality with the poetry of Dante. He was buried at Florence. See *Painting, Sculpture.*

Michelson (*mī'kĕl-sŭn*), **Albert Abraham** (**1852-1931**), American physicist, was born at Strelno, Germany. He was graduated from Annapolis, 1873, and became midshipman in the United States navy. After teaching in the United States Naval Academy, 1875-79, and serving on the staff of the *Nautical Almanac*, Washington, 1880, he studied at Berlin, Heidelberg, and Paris. After his return, he was professor of physics at the Case School of Applied Science, Cleveland, 1883-89, and at Clark University 1889-92. In 1892, he was made professor and head of the department of physics in the University of Chicago.

Michelson determined the velocity of light with a high degree of accuracy and invented an interferential refractometer, making it possible to express linear standards of measure in terms of wave lengths of light. His echelon spectroscope and improved engine for constructing diffraction gratings were also notable achievements. In 1907, he was awarded the Nobel prize for physics. His writings include *Light Waves and Their Uses.*

Michener, James Albert (**1907-**), American writer, was born at New York City. After he was graduated from Swarthmore College in 1929, he spent several years studying abroad and then took up teaching. He later worked in the editorial department of a New York book publishing house. During World War II, he served with the U.S.N.R. in the South Pacific. His *Tales of the South Pacific* (1947) won him the Pulitzer prize and was the basis of the Rodgers and Hammerstein musical comedy *South Pacific* (1949). This was followed by *The Fires of Spring* (1949), *Return to Paradise* (1951), *The Voice of Asia* (1951), *The Bridges of Toko-Ri* (1953), *Sayonara* (1954), *Floating World* (1955), and *The Bridge of Andau* (1957).

Miles, Nelson Appleton (**1839-1925**), American army officer, was born in Westminster, Mass. At the outbreak of the Civil War, he was engaged in mercantile pursuits in Boston, Mass. He entered service as first lieutenant of volunteers in 1861 and distinguished himself at the battles of Fair Oaks and Malvern Hill. In 1862, he was commissioned colonel and led his regiment at Fredericksburg and at Chancellorsville, where he was severely wounded. He commanded a brigade in the Richmond campaign; was promoted brigadier general, 1864; and was brevetted major general for gallantry. At the close of the war, he was commissioned colonel of United States infantry.

Miles succeeded Schofield as commander of the United States army in 1895. In July 1898, he assumed personal command of the army around Santiago, Cuba. On the reorganization of the army in 1901, he was promoted to the grade of lieutenant general. Upon reaching the age limit in 1903, he retired from the army.

Milhaud (*mē' yō'*), **Darius** (**1892-**), French composer, was born at Aix-en-Provence. He studied at the Paris Conservatory, 1910-15, and then served as cultural attaché at the French legation in Rio de Janeiro under the poet-diplomat Paul Claudel, who subsequently wrote librettos for several of Milhaud's dramatic compositions. Upon his return to Paris, he joined the "modernistic" group known as "Les Six," and soon achieved fame as one of France's greatest creative composers. Compelled to leave France in 1940, he became professor of composition at Mills College, Oakland, Calif., where he has since resided and taught. His numerous works include 4 symphonies, 18 string quartets, 15 ballets, 12 operas, and 8 sonatas, besides many other compositions.

Mill, James (**1773-1836**), British economist, philosopher, and historian, was born near Montrose, Scotland. Educated at the University of Edinburgh, he became editor of the *Literary Journal* and wrote for various periodicals, chiefly on economics, in which field he became a principal exponent of the utilitarian school. His *History of British India* brought him a permanent position with the East India Company. He wrote *Elements of Political Economy* mainly to educate his son, John Stuart Mill. His older works include *Liberty of the Press, Law of Nations,* and *Analysis of the Human Mind.*

Mill, John Stuart (**1806-1873**), English philosopher and economist, son of James Mill, was born in London. He was educated at home by his father. In 1820, he went to France, made himself master of the French language, and occasionally attended public lectures on science. In 1823, he entered the India house as a clerk in the examiner's office, where his father was assistant examiner.

His first publications consisted of articles in the *Westminster Review.* He took an active part in the political discussions that followed the revolution of 1830 in France and in the Reform Bill movement in England.

Mill established his reputation in 1843 by the publication of *A System of Logic, Ratiocinative and Inductive,* the success of which paved the way for the *Principles of Political Economy.* His later works include *Essay on Liberty, Examination of Sir William Hamilton's Philosophy,* and *The Subjection of Women,* in which he supported what has been popularly termed the "woman's rights movement." His influence was on the side of humanitarianism. He was one of the most successful popularizers of economics of his or later days. He wrote also *Auguste Comte and Positivism, Utility of Religion,* and *Theism.*

Millais (*mĭ-lā'*), **Sir John Everett** (**1829-1896**), English painter, was born at Southampton. He studied at the Royal Academy, where he won many prizes, including a gold medal in 1847. In 1848, he became associated with Rossetti, Holman Hunt, and others in forming the pre- Raphaelite brotherhood of artists.

His paintings, which include landscapes, portraits, and genre pictures, are vigorous in style and brilliant in color. Among his portraits, which are noted for masterly characterization, are those of Gladstone, Lord Beaconsfield, Carlyle, John Bright, Irving, and Tennyson. His better-known pictures include "Chill October," "The Vale of Rest," "Dew-Drenched Furze," "Eve of St. Agnes," "Effie Deans," "The Blind Girl," all in British galleries; and "Portia" and "The Bride of Lammermoor," in the Metropolitan Museum, New York.

Millay, Edna St. Vincent (**1892-1950**), American poet, was born at Rockland, Me. Her childhood was spent in Camden, Me. Her ability attracted the attention of a stranger, who sent her to Vassar College. She was graduated in 1917 and then lived in Greenwich Village, New York, writing poetry and taking part in plays. Her first volume of verse, *Renascence and Other Poems,* was published in 1917. *The Harp Weaver and Other Poems* won a Pulitzer prize in 1923. She married Eugen J. de Boissevain the same year. *The King's Henchman,* an opera performed first with great success in 1927, was written by Miss Millay. Her other books of poetry, lyrics of sustained emotional power, include *The Buck in the Snow, Fatal Interview,* and *Conversation at Midnight.*

Miller, Hugh (**1802-1856**), Scottish geologist, was born at Cromarty. From the age of 16 to 31 he worked as a stonemason, devoting the winter months to writing, reading, and natural history. In 1829, he published *Poems Written in the Leisure Hours of a Journeyman Mason,* followed in 1835 by *Scenes and Legends of the North of Scotland.* From 1834 to 1840, he was a bank accountant. He was then invited to Edinburgh to edit the *Witness,* a religious paper through whose influence he became founder, though not a member, of the Free Church of Scotland. In its columns he published a series of popular geological articles afterwards collected as *The Old Red Sandstone* which won him a high scientific reputation. He endeavored to reconcile geology with the Mosaic account of creation. His mind failed, and he took his life.

Miller, Joaquin (**1841-1913**), pen name of Cincinnatus Heine Miller, American poet, who was born in Indiana. He became a miner in California; lived among the Indians; was an express messenger; practiced law in Oregon; and edited a paper, which was suppressed for disloyalty. From 1866 to 1870, he was a county judge in Oregon. After serving as journalist in Washington, he visited London, where he published his *Songs of the Sierras* in 1871.

Among his numerous writings are *Songs of the Sunlands, Songs of the Mexican Seas, Shadows of Shasta, The Ship in the Desert, Life among the Modocs, The One Fair Woman* and *True Bear Stories.* His play *The Danites,* dramatized from his novel *The Danites in the Sierras,* met with considerable success.

Miller, William E. (**1914-**), political leader, was born at Lockport, N. Y. After graduation from Notre Dame University, he studied law, practiced at Lockport, and was district attorney for Niagara County, N. Y. Following military service in World War II, he was assistant prosecutor of Nazi war criminals. From 1951 to 1964 he was congressman from New York's 42nd district. In 1961 he became chairman of the Republican National Committee, serving until July 1964, when he was chosen Republican nominee for vice president, which contest he lost.

Millerand (*mēl'răn'*), **Alexandre** (**1859-1943**), French statesman, was born in Paris. Entering politics, he became a Radical Socialist leader and, in 1885, was elected to the Chamber of Deputies. Later he edited *The Voice* and *The Little Republic,* both Socialist organs. Severing his connection with the Socialist party, he served as minister of public works, 1909-10, and as minister of war, 1912-15. Following the retirement of Clemenceau in 1920, he was chosen premier. Upon the resignation of Deschanel, Millerand was elected president of France, Sept. 23, 1920, for the remainder of the unexpired term, 1920-27. He resigned in 1924, however, yielding to criticism of his support of the national *bloc*—an act of partisanship inconsistent with the traditions of the presidency. He was elected senator in 1925.

Milles, Carl (1875-1955), Swedish sculptor, studied under Rodin and became professor of modeling at the Royal Academy in Stockholm. At first meeting with disapproval because of the distortions and grimaces of his gigantic figures, he gradually won recognition as the power and suppressed energy of his statues was appreciated. He took up his residence in America in 1927. Among his works are "The Meeting of the Waters" at St. Louis, Orpheus Fountain in Stockholm, Diana and Triton fountains in Chicago, and a colossal Peace Monument with Indian motif in the St. Paul City Hall.

Millet (*mĭl'ĕt*), **Francis Davis (1846-1912),** American painter, illustrator, and author, was born at Mattapoisett, Mass. He was graduated from Harvard in 1869 and studied art at the Royal Academy at Antwerp and also in France and Italy. As an artist he is most widely known for his mural paintings, the most noted of which is "Evolution of Navigation," in the Customhouse at Baltimore. Other important mural decorations are in the Cleveland Post Office, the Minnesota State Capitol, and the Supreme Court at Madison, Wis. Among his chief easel pictures are "A Cozy Corner" and "An Old-Time Melody," in the Metropolitan Museum, New York; and "Between Two Fires," in the Tate Gallery, London. He was a member of the American Academy of Arts and Letters. His books include *Capillary Crime and Other Stories, The Danube,* and *The Expedition to the Philippines.* He was drowned on the *Titanic.*

Millet (*mē'lĕ'*), **Jean François (1814-1875),** French artist, the greatest of all painters of peasant life, was born in the village of Gruchy. He first worked as a farm laborer, but his taste for painting was so evident that he was sent to study with Mouchel, a painter in Cherbourg. Mouchel induced the town authorities to grant his pupil an annuity to help him in his studies. Millet afterward went to Paris and studied with Delaroche. He painted small pictures, portraits, and signboards to support himself.

In 1849, Millet settled in Barbizon near the forest of Fontainebleau. He lived here much like the peasants and began his work of painting the peasant life of France, which he depicted with great simplicity, dignity, and truth. Millet was a friend of Rosseau, Corot, Troyon, Dupré, Daubigny, Diaz, and other noted masters of the Barbizon school, which has exercised a great influence upon modern painting. His most widely known work, "The Angelus," now in the Louvre, Paris, was sold for over $100,000. "The Gleaners," one of his best paintings, and some 20 other works are also in the Louvre.

Among the important works of Millet owned in the United States are "The Sower" and the "Knitting Lesson," in the Metropolitan Museum, New York; "A Shepherdess Seated," "Harvesters Resting," and portrait of himself, Boston Museum of Fine Arts; "Potato Harvest," "Sheepfold," "Breaking the Flax," and others in the Walters Gallery, Baltimore; "Bringing Home the Calf" and "Women Feeding Chickens," Art Institute, Chicago; and the famous "Man with the Hoe," in the San Francisco Museum. See *Painting.*

Millikan, Robert Andrews (1868-1953), American physicist, was born at Morrison, Ill. He was educated at Oberlin College and Columbia, Berlin, and Göttingen Universities. In 1896, he was appointed on the faculty of the University of Chicago and rose by 1910 to the position of professor of physics there. In 1921, he was made director of the laboratory of physics at the California Institute of Technology, Pasadena.

Millikan performed experiments establishing the electrical nature of the electron and he determined its electrical charge with an accuracy that had never before been approached. For his achievements in this field, he was awarded the Nobel prize for physics in 1923. He subsequently detected a cosmic radiation of great penetrating power, named for him the Millikan ray. His interest in reconciliation of science and religion appears in his *Evolution of Science and Religion.*

Miltiades (*mĭl-tī'ă-dēz*), **(c. 540B. C. -489 B.C.),** Athenian general. Forced by Darius to flee from the Chersonese, of which he had become tyrant, he took refuge in his native city, Athens. On the second Persian invasion of Greece, he was chosen one of the ten generals. He particularly distinguished himself by the great victory which he gained over the Persians at Marathon, 490, with a small body of Athenians and 1000 Platæans. For his failure in an expedition which he led against Paros, he was fined 50 talents, which he was unable to pay. He was accordingly thrown into prison, where he died.

Milton, John (1608-1674), English poet and publicist, was born in London. His education, begun under a private tutor of Puritanical opinions, was continued at Saint Paul's School, London, from his 15th year. A love of letters was early instilled into him, and he delighted in poetical reading and the study of both modern and ancient literature. When 16, Milton entered Christ's College, Cambridge, and he received his degree of bachelor of arts in 1629. He composed several odes and elegies in this period, among which stands his noble "Hymn on the Morning of Christ's Nativity."

Early Poems. In 1632, he went to his father's house at Horton, where he lived for five years. Here he studied Spenser and Shakespeare, read the classics, and became a great admirer of Italian poetry. His *Masque of Comus* was acted at Ludlow Castle at Michaelmas, 1634, and, in 1637, "Lycidas" was written, "L'Allegro" and "Il Penseroso," among the most beautiful of descriptive poems, were produced in these years of calm and pleasant solitude.

Life Abroad. In 1638, Milton's father gave him money to visit the continent, where he remained 15 months. In Paris, he made the acquaintance of Grotius, the celebrated founder of international law; in Florence, he passed readily into literary society, where he became known for the skill of his Italian verses; at Arcetri, he visited Galileo; Rome and Tuscany nourished his classic predilections and his sense of beauty in form. News of the outbreak of disturbances in England caused him to return home, and, after some time spent in Geneva, he reached England in August 1639 and took up his residence in London.

Political Tracts. In the following 20 years of civil war and political unrest in England, Milton wrote no poetry, but he contributed keen polemical writings to the struggle. These are singularly able and entitle him to a place among the most eloquent writers of English prose. In 1644, his treatise *Of Education* expressed views tending to utopianism; this same year, he published his greatest prose work, an appeal against all parties in behalf of freedom of the press, entitled *Areopagitica: a Speech for the Liberty of Unlicensed Printing.*

In 1649, Milton was appointed secretary for foreign tongues to the Council of State. He was completing, in 1652, two books in Latin designed for circulation abroad as a defense of the people of England, when he became totally blind. His blindness, though it incapacitated him for regular official business, left him able to perform public duties, and he drew up several controversial treatises for Cromwell during the last years of the Commonwealth.

Later Works. At the Restoration in 1660, two of Milton's books were publicly burned, and his arrest was ordered; but this only consigned him to an obscurity that gave him full leisure to write his *Paradise Lost.* This he completed about 1665, and it immediately commanded a large sale. It has taken its place in literature as the greatest epic poem in the English language. Milton next published his *History of England,* and, in 1671, his *Paradise Regained* and *Sampson Agonistes* appeared. His literary labors closed in 1674 with a treatise *On Logic* and another, *Of True Religion.*

Domestic Life. Milton was thrice married; in 1643, to Mary Powell; in 1656, to Catharine Woodcock; in 1663, to Elizabeth Minshull. His domestic relations were not of the happiest, partly, perhaps, because of his explosive temper and his Puritanical austerities. By his first wife he had three daughters.

Genius. Milton enriched the world with many of its noblest images and sentiments. Like Dante and Virgil, Milton was a prophet of social regeneration. The originality of his *Paradise Lost* and its sublimity of conception become increasingly impressive. Since Dante, there has been no such approach to the ideal epic of humanity. See *Paradise Lost.*

Mirabeau (*mē'rà'bō'*), **Gabriel Honoré Riqueti, Count de (1749-1791),** French orator and statesman, was born at Bignon, near Nemours. He was endowed with an athletic frame and extraordinary mental abilities, but was of a fiery temper and disposed to every kind of excess. When the States-General was convened in 1789, he sought to be elected a representative of the nobles of Province, but was rejected and, like Marius in ancient Rome, left them with the threat that he would overthrow the aristocracy.

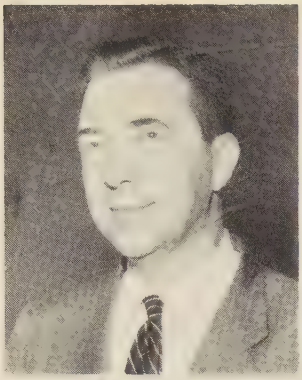
He offered himself as a candidate to the Third Estate; was enthusiastically returned both at Aix and at Marseilles; and, by his talents and oratorical powers, soon acquired great influence in the States-General and the National Assembly. To suppress insurrection, he effected, in 1789, the institution of the national guard. In 1790, he was elected president of the club of the Jacobins and, in 1791, of the National Assembly. His bold and brilliant career was cut short by his death.

Mistral (*mēs'tràl'*), **Frédéric (1830-1914),** French poet, was born at Maillane. He attended school at Avignon and began preparation for the law at Aix, but soon decided to devote his growing powers to the creation of a literature in Provencal. In 1859, the appearance of his *Mirèio,* a pastoral poem, brought him national fame. He continued to write lyrics, fantasies, and pastoral and dramatic poems, by which he elevated Provencal to the dignity of a literary language. In 1904, he was awarded the Nobel prize for literature with José Echegaray.

Mitchell, Donald Grant (1822-1908) "Ik Marvel," American novelist and essayist, was born at Norwich, Conn. He was graduated from Yale, 1841, and studied law. He

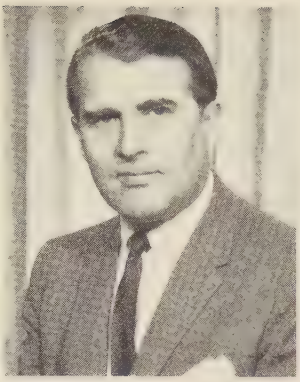
United Press International

Originally a specialist in bacteriology, Dr. Jonas E. Salk is noted for his development of an effective vaccine for the prevention of poliomyelitis.



United Press International

Physicist and educator, Dr. James A. Van Allen is best known for his discovery of the "Van Allen Belt," a band of radiation that encircles the earth.

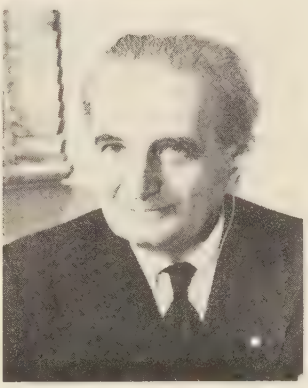


Dr. Werner von Braun, "the prophet of the space age," has contributed important recommendations for the solution of space problems as for instance in suggesting "ablation."

SCIENTISTS

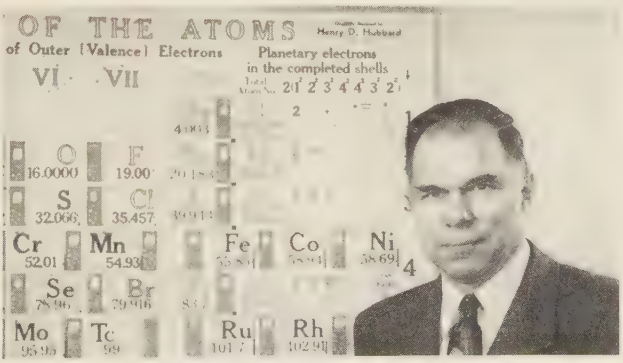
Agricultural chemist and educator, Dr. George Washington Carver's prime interest was peanuts from which he developed more than 300 synthetic products. An agricultural research foundation, set up by him at Tuskegee, bears his name. His birthplace in Missouri was made a national monument in 1951.

Culver Pictures, Inc.



Theodore von Karman formerly served as director of the Guggenheim Airship Institute and as adviser to the Wright-Patterson Air Base at Dayton, Ohio.

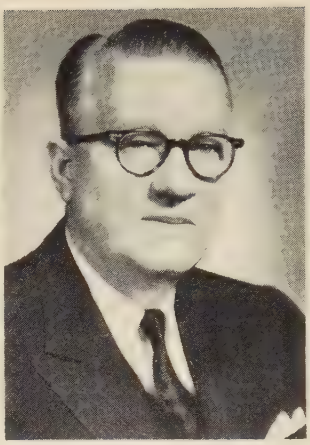
A leader in the field of astrophysics, Bulgarian-born Fritz Zwicky has done research dealing especially with cosmic rays.



As co-discoverer of plutonium and other new elements, Dr. Glenn T. Seaborg shared in the Nobel prize for chemistry awarded in 1951. In 1961 he was made chairman of the Atomic Energy Commission.

Thomas J. Watson, Jr., joined the International Business Machine Company in 1937 after graduating from Brown University. Served as a lieutenant colonel in the Air Force during World War II. He is now president of I. B. M.

Director and Chairman of the Board of Federated Department Stores, Inc., Fred Lazarus, Jr. has had a long career in merchandising. He is nationally known as a leader in philanthropic and public service organizations.



Eugene J. McNeely is executive vice president of the American Telephone and Telegraph Company.

AT&T Photo

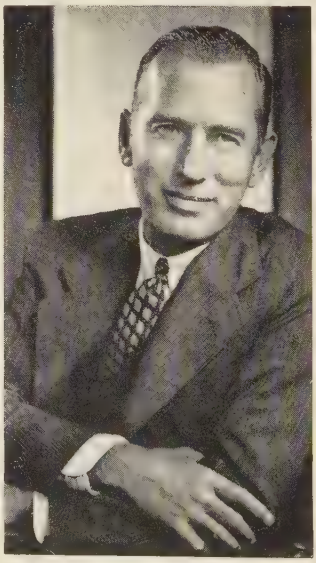
BUSINESS MEN

Henry Ford II (*right*), son of Edsel and grandson of Henry Ford, is chairman and chief executive officer of the Ford Motor Company.

Crawford H. Greenewalt (*right, below*), is chairman of the Board of Directors of the E. I. du Pont de Nemours Company. He is a graduate of M. I. T. in chemical engineering.

George Keith Funston (*below*), president of the New York Stock Exchange, studied at Trinity College and Harvard, and served on the research staff of the Harvard Business School.

Wide World



Karsh, Ottawa

was consul at Venice, 1853, and, in 1855, settled on his farm, "Edgewood," near New Haven. His best-known works are the volumes of sentimental essays entitled *Reveries of a Bachelor* and *Dream Life*. These gained his election to the American Academy of Arts and Letters in 1908. See *Reveries of a Bachelor*.

Mitchell, James Paul (**1902-1964**), American government official, was born in Elizabeth, New Jersey, where he was graduated from Battin High School. He had wide experience in the field of personnel management and industrial relations in both private industry and in government work. Before World War II he was personnel and training director of the Western Electric Company's plant in Kearny, New Jersey, and during the war had charge of the industrial personnel division of the U. S. Army Engineering Corps. From 1945 to 1947 he was personnel director of R. H. Macy's department store in New York, and was then made vice president of Bloomingdale's department store. In April 1953 President Eisenhower appointed him assistant secretary of the army in charge of manpower and reserve affairs. Then in October 1953 he was appointed secretary of labor to succeed Martin P. Durkin.

Mitchell, John (**1870-1919**), American labor leader, was born at Braidwood, Ill. He received a common school education, later read law one year, and privately made a special study of economic questions. He began work in coal mines, 1882, and, as worker or labor leader, continued to be identified with mines and mining.

His official connection with the united mine workers of America began in 1895 and, from 1899 to 1908, he served as president of that organization. He directed the strikes of the anthracite miners in 1900 and 1902 and was a vice president of the American Federation of Labor, 1898-1914.

With Gompers and Morrison, he was involved in the famous Buck Stove case and, in 1908, by virtue of an injunction was adjudged in contempt of court and was sentenced to imprisonment. However, the entire case was dismissed upon appeal to the United States Supreme Court. The outcome began the movement against the employment of injunctions in labor cases which resulted in the Norris-LaGuardia Act of 1932.

Mitchell, Maria (**1818-1889**), American astronomer, was born at Nantucket, Mass. She assisted her father, William Mitchell, in his work in astronomy and soon became fitted to make investigations herself. In 1847, she was awarded a gold medal by the king of Denmark for the discovery of a comet. She was employed in observations connected with the coast survey and in compiling the *Nautical Almanac*, and was the first woman to become a member of the American Academy of Arts and Sciences. From 1865 to 1888, she was professor of astronomy at Vassar College. She was elected to the American Hall of Fame in 1905.

Mitchell, Margaret (**c. 1900-1949**), (Mrs. John R. Marsh), American novelist, was born in Atlanta, Ga., where she began her writing career as a reporter and feature writer with the Atlanta *Journal*. Owing to an ankle injury, she gave up journalism and spent ten years writing her only novel, *Gone With the Wind*, which was published in 1936. Dealing with the Civil War and the Reconstruction periods, it became the most successful novel of the present century, selling more than 8 million copies, including translations into many languages. The film version (1939) also proved enormously popular, grossing over $40 million. Margaret Mitchell died of injuries received when she was run down by an automobile.

Mitchell, Silas Weir (**1829-1914**), American physician, poet, and novelist, born in Philadelphia, Pa. He was educated at the University of Pennsylvania and was graduated from Jefferson Medical College, 1850. He established a practice in Philadelphia and became prominent as a physiologist and especially as a neurologist, devising a system of rest treatment now widely adopted throughout the world.

During the Civil War, he turned his attention to literature and achieved eminence as a man of letters, producing novels, essays, and poems of a high order of merit. Among his literary works are *Hephzibah Guiness*, *Hugh Wynne*, *The Autobiography of a Quack*, *Dr. North and His Friends*, *Youth of Washington*, and *Complete Poems*.

Mitchell, William (**General "Billy" Mitchell**) (**1879-1936**), American air force officer, was born at Nice, France, of American parents. He began his military career in 1898 when he enlisted in the U.S. army as an infantry private. He served in the Spanish-American War, in the Philippines, and in World War I, rising to the rank of brigadier general in 1920. During World War I, he was chief of the Air Service of the Allied armies in Europe. A bold advocate of strong air power, his outspoken criticism of the air policy of the U.S. army and navy led to his being court-martialed in 1925 and his suspension from the service for 5 years. He resigned from the army in 1926. Many of General Billy Mitchell's prophesies concerning military aviation came true, and in 1945 Congress posthumously awarded him the Medal of Honor.

Mitropoulos (*mē-trŏ′pōō-lŏs*), **Dimitri** (**1896-1960**), conductor, pianist, and composer, was born in Athens, Greece. He studied music in Greece, Belgium, and Germany, and was guest conductor of many European orchestras before coming to the United States in 1936. He was director and conductor of the Minneapolis Symphony Orchestra from 1937 to 1949, and then joined the New York Philharmonic Symphony Orchestra of which he was permanent conductor from 1950 to 1960.

Modigliani, Amadeo (**1884-1920**), Italian artist, who painted in Paris, was born in Leghorn, Italy, and went to Paris in 1906. Cubism and African art influenced him at first, but then he evolved a style, supported by technical brilliance, that produced timelessly beautiful paintings, especially portraits. Modigliani died of tuberculosis in Paris, and it was only after his death that his aesthetically distorted pictures received any appreciation. At times, Modigliani seems to have used the elongations of El Greco to combine with his serene modern settings.

Modjeska (*mŏ-jĕs′kä*), **Helena** (**1844-1909**), (Mme. Chlapowski, née Opido), actress, was born in Krakow, Poland. She made her debut in Bochnia, 1861, and soon became a leading actress in her native country. Her first appearance in English drama was in *Adrienne Lecouvreur* at San Francisco, 1877, after which she made a tour of the United States and England. She returned to America and gained foremost rank as a tragic actress.

Modjeski (*mŏ-jĕs′kē*), **Ralph** (**1861-1940**), American bridge builder, was born at Krakow, Poland, the son of the celebrated actress Modjeska. He changed his name to Modjeski for purposes of naturalization. He came with his mother to America when he was 15 years of age; was educated at Paris and the University of Illinois; and became consulting bridge engineer at Chicago in 1892. The bridges designed by him include the Northern Pacific Railway bridge at Bismarck and the Columbia River bridge at Celilo, Oregon. He was also on the board of engineers for the reconstruction of the Quebec bridge and chief engineer for the Delaware River bridge at Philadelphia.

Mohammed, or **Mahomet** (**c. 570-632**), the founder of the religion of Islam, commonly called Mohammedanism, was born at Mecca, Arabia. He first gained his livelihood by tending the flocks of his uncle Abu Talib, who had adopted him at an early age and with whom he later made trading journeys to southern Arabia and Syria. In his 25th year, he took service, probably as a camel driver, with the rich widow Khadija, who married him in 595. For some time he carried on a trade as merchant in Mecca.

Religious Conditions of Arabia. At this time, no central government had been established in Arabia, and various tribes, partly nomad, partly sedentary, held sway over ill-defined districts. A certain unity was maintained by language and custom and by mercantile and religious pilgrimages. From time immemorial, the city of Mecca had been sacred to these peoples. Jews, Christians, and Magi, mingling with innumerable Oriental worshipers, all congregated in Mecca at stated times. Mohammed was thus familiarized with the religious ideas prevailing then in southwestern Asia.

Mohammed's Mission. Mohammed was in the habit of withdrawing from his usual occupation to a cave, where he remained alone for hours, wrapped in thought. When 40 years of age, at the mountain of Hira near Mecca, he had the first of a long series of visions that convinced him of being the special messenger of God.

When his mission in life was thus revealed to him, Mohammed began to announce the eternal rewards awaiting those who pleased God by prayer and righteousness and the eternal punishments in store for those guilty of murder, theft, adultery, dishonesty, luxury, and other sins. By obedience to his message, each one might attain to *islam*, that is, the perfect surrender of the will to God. God's mercy was principally to be obtained by prayer, fasting, and almsgiving. The pilgrimage to Mecca was recognized by the new creed. He did not preach openly at first. His earliest revelation was communicated only to his family and one friend, Abu Bekr, and by the fourth year of his mission, he had made but 40 proselytes.

Persecution and Conflict. Mohammed's contravention of tribal and religious customs and beliefs gradually awakened opposition against the new prophet and against his adherents. He emigrated to Taif, from which he soon barely escaped with his life. With his loyal followers he went to Medina about 622. From this memorable migration, called the hegira, dates the origin of Islam and of the Mohammedan era. At Medina, Mohammed became the head of a civil community, which he ruled as a theocracy. He went to war with the enemies of Islam, especially the Meccans. With the aid of his allies, the Chuzaites, Mohammed took Mecca in 630 and was publicly recognized as chief and prophet. With this recognition, the victory of the new religion in Arabia was assured.

Mohammedanism. Toward the end of the 10th year of the hegira, he undertook, at the head of at least 40,000 Moslems, his last solemn pilgrimage to Mecca, and there on Mount Arafat, he instructed them in all the important laws and ordinances of the faith. The ceremonies observed by him on that occasion were fixed for succeeding ages.

Mohammed was prophet, teacher, legislator, and conqueror. When he died, unbelievers were brought to the faith by force of arms. A vast empire bowed before the shibboleth, "Koran, tribute, or sword." Islamism was later checked in the West by Charles Martel and in the East by Leo the Isaurian.

Mohammed's whole religious system is embodied in the *Koran*, which is the standard of faith as well as the basis of Mohammedan law. This book is made up of the successive revelations received by Mohammed through a series of years. The confession of faith of a Moslem serves as the summary of his religion,—"There is no God but the true God, and Mohammed is His messenger."

Moissan (*mwȧ'sȧN'*), **Henri (1852-1907),** French chemist, was born in Paris. Educated at the Museum of Natural History, he became professor of chemistry at the Sorbonne. He is best known for his success in obtaining the element fluorin in the free state, which he accomplished by electrolysis, and for his development of the electrical furnace for producing high temperatures. He melted and volatilized many substances previously considered infusible and prepared numerous new compounds, particularly carbides, silicides, and borides. From these results he was led to undertake the artificial preparation of the diamond and succeeded in making minute specimens. In 1906, he was awarded the Nobel prize for chemistry.

Molière (*mô'lyâr'*), **(1622-1673),** is the stage name of Jean Baptiste Poquelin, greatest of French dramatists. He was born in Paris. His father, Jean Poquelin, who was purveyor of furniture to the royal court, trained the boy to follow his trade of upholsterer. He was, however, further educated, 1636-41, at the Jesuit College at Clermont, where he studied philosophy under the famous Gassendi. Upon the illness of his father, he pursued the family trade in the household of Louis XIII. He followed the king in his journey to Narbonne in 1642 and saw there the French Theater as it was emerging from neglect and flourishing under the talents of Corneille and the patronage of Richelieu. A passion for the stage awoke in him and became so insistent that he quitted his employment, assumed the name of Molière, and joined a society of young men devoted to theatrical pursuits.

Earlier Successes. For the next few years, Molière wandered in the provinces, an active actor-manager and playwright. In 1653, his first regular comedy, *The Giddy-Head*, played by his troupe at Lyons, won a great success by the wit and skill of its dialogue. The next year, in Languedoc, he produced *The Loving Spite*.

In 1658, Molière and his company received the patronage of the court in Paris. Molière already possessed a reputation for great power of invention and for skill in dramatic construction. His troupe became known as the "King's comedians," and, for his remaining 15 years, Molière labored incessantly as a player and dramatist under the marked favor of Louis XIV. His first great Paris success, *The Affected Misses*, was a keen satire on the ridiculous pedantry of the women in the literary salons. In this play we see Molière at his best, in the satiric comedy of manners.

For types of character, Molière now needed but to study the world before him. Although he occasionally fell back on farces in the manner of Plautus and the Italian comedy and wrote extravaganzas for court pleasures, these were only interludes in his career. His particular forte was in submitting contemporary customs and manners to a penetrating analysis and imparting to his characters vitality, wit, and realism.

Greatest Dramas. Within the next few years, Molière wrote *The School for Husbands*, *The Bores*, and *The School for Wives*. The truth with which he depicted the frailties of women is sometimes ascribed to his unfortunate marriage, in 1662, at the age of 40, to 18-year-old Armande Béjart, an actress. In 1666, Molière produced *The Misanthrope*, one of his best plays. As a comedy it has less interest than *The Hypocrite*, produced in 1667, which is generally considered his greatest drama.

Then followed in 1668 *The Miser* and, in 1670, *The Simple Gentleman* and *The Cheats of Scapin*. Absurd affectation of learning is satirized ingeniously in *The Learned Ladies*. His last play, *The Imaginary Invalid*, exposed quackery in the medical profession.

Character and Genius. Molière's conduct in public affairs was honorable and manly. He was devoted to his professional comrades and sincere in his friendship with Corneille, Racine, Boileau, and the nobles who were glad to place his genius on a level with their affluence and rank.

Molière was much greater as a dramatist than as an actor. His work is marked by the profound study that he devoted to every type of folly, affection, and hypocrisy that beset his age. His characters are strong types rather than individuals, and his conceptions lack mystery and beauty. On the other hand, his gift for immortalizing various types of character, his creative art, and his knowledge of men and their motives make him unique in comedy. He died following a convulsion which seized him on the stage when playing *The Imaginary Invalid*. A monument to him is to be seen in the cemetery of Pére Lachaise, Paris. See *Literary Plots, Characters, and Allusions* under titles of chief works.

Molotov (*mô'lŭ-tŭf*), **Vyacheslav Mikhailovich (1890-**), Russian statesman. He organized Bolshevik student groups before the Russian Revolution in 1917, after which he held party posts in Leningrad and Gorki. In 1921, he was secretary of the Communist party. In 1930, he was president of the Soviet of People's Commissars, the body which performs the function of economic planning and control. He was transferred to the office of foreign commissar in 1939 in place of Litvinov, the transfer marking a reorientation in Russian policy and being followed by a treaty with Germany. After the German attack on Russia, Molotov co-operated with the Allies. After the surrender of Japan, his policies became antagonistic to the Western powers. He was replaced in 1949 by Andrei Vishinsky, but on the death of Stalin in 1953 again became foreign minister. In 1956 he was succeeded by Dmitri Shepilov, but remained as First Deputy Premier. In 1957 he was further demoted by Khrushchev, being sent as ambassador to Outer Mongolia.

Moltke (*môlt'kĕ*), **Helmuth Karl Bernhard, Count von (1800-1891),** German general, was born in Parchim. He was graduated from the Military Academy at Copenhagen, 1818, and entered the Prussian service in 1822. In 1835, he went to Turkey; remained there several years; and took part in the campaign of the Turks in Syria against the viceroy of Egypt. He became lieutenant general of the Prussian army, 1859, and drew up the plans of the campaigns against Denmark, 1864, and Austria, 1866. He was commander in chief of the Franco-Prussian War, 1870-71, and to his brilliant strategy are ascribed the splendid victories of the German arms. In recognition of his service to the nation, he was created count in 1870 and field marshal of the German Empire in 1871.

Mommsen (*môm'zĕn*), **Theodor (1817-1903),** German historian and classical scholar, was born at Garding. He studied at Kiel, 1838-43; examined Roman inscriptions in France and Italy for the Berlin Academy, 1844-47; and, in 1848, was appointed to the chair of law at Leipzig, of which he was deprived two years later on account of the part he took in politics. In 1852, he became professor of Roman law at Zurich; in 1854, obtained a similar appointment at Breslau; and, in 1858, was made professor of ancient history at Berlin.

He edited the monumental *Corpus Inscriptionum Latinarum*; helped to edit the *Monumenta Germaniæ Historica*; and, from 1873 to 1895, was secretary of the Academy of Sciences. His greatest works are his *History of Rome* and *The Roman Provinces*. Freeman characterized Mommsen as "the greatest scholar of our times, well-nigh the greatest scholar of all times. . . . Language, law, mythology, customs, antiquities, coins, inscriptions, every source of knowledge of every kind—he is master of them all." He made important contributions to almost every field of classical learning. In 1902, he was awarded the Nobel prize for literature.

Monet (*mô'nĕ'*), **Claude (1840-1926),** French landscape painter, was born in Paris. While influenced by Courbet, Corot, and Manet, he formed his own style directly from the study of nature, endeavoring to depict the fleeting aspects of things and to reproduce effects of light and air without regard for elements of detail or composition. In 1874, he exhibited the painting entitled "Impression, Rising Sun," which suggested the name for the impressionist school, of which he was the leader.

After 20 years of struggle against ridicule and criticism, his artistic ideas were recognized and have since been influential in modern art. Among his characteristic pictures are "The Orchard," "The Sun in a Fog, Waterloo Bridge," and "Rouen Cathedral," all in the Luxembourg Museum, Paris. Representative works are found in the Walters Gallery, Baltimore; the Art Institute, Chicago; and other American collections.

Moneta (*mô-nā'tȧ*), **Ernesto Teodoro (1833-1918),** Italian journalist and peace advocate, was born in Milan. He took part in the Milan uprising of 1848; was a general staff officer in Garibaldi's army; and, from 1861 to 1867, served in the Italian army. From 1867 to 1896, he was director of the influential Milan newspaper *Il Secolo*.

About 1886, he began to advocate the cause of international peace and to form peace societies in northern Italy. He represented Italy in several peace congresses and was president of the International Congress at Milan in 1906. In 1903, he published *Le guerre, le insurrezione, e la pace nel secolo XIX*, in recognition of which he was awarded one-half of the Nobel peace prize in 1907.

Monroe, James (1758-1831), fifth president of the United States, was born in Westmoreland County, Va. He was educated at William and Mary College, served in the Revolutionary army; was present at several battles; and, in 1783, entered the General Congress as a delegate from his native state. In the Virginia convention, 1788, he opposed the adoption of the Federal Constitution and allied himself with the Republican (now Democratic) party, which party elected him to the United States Senate in 1790.

Four years later, he went to France as minister, but was recalled in 1796. He was governor of Virginia, 1799-1802. In 1803, as the associate of Livingston, he was dispatched on a special mission to negotiate for the purchase of Louisiana. In 1803, in England, and, in 1805 in Spain, he performed special diplomatic services for his country. In 1811, he was again governor of Virginia and, in the same year, became secretary of state under President Madison.

In 1816, Monroe was elected president of the United States by the Republican party. The acquisition of Florida from Spain and the settlement of the vexed question of the extension of slavery by the Missouri Compromise helped his practically unanimous re-election in 1820.

President Monroe's most noteworthy acts include the recognition of the independence of Mexico and of the South American republics and the promulgation of what has since been called the "Monroe Doctrine." The period of his administration was known as the "era of good feeling." In 1825, he retired to his seat at Oak Hill, Loudoun County, Va., and later to New York, where he died. He was elected to the American Hall of Fame in 1930. See *Monroe Doctrine.*

Montagu (*mŏn'tà-gū*), **Lady Mary Wortley (1689-1762),** English poet and letter writer, eldest daughter of Evelyn Pierrepont, afterward Duke of Kingston. In 1712, she married Edward Wortley Montagu and, in 1716, accompanied him on his embassy to Istanbul. An account of this journey appeared in *Letters,* which established her reputation as a witty and brilliant writer. After her return to England in 1718, she shone conspicuously in the circles of talent and fashion, despite prejudice aroused by her attempt to educate the public to the advantages of inoculation against smallpox. Pope was among her friends, but he at length quarreled with her and satirized her and was satirized in turn. In 1739, she settled on the continent, remaining there until 1762, when she returned to England. Her letters are frequently scandalous and always amusing.

Montaigne (*mŏn-tān'*; F., *môN'tān'y'*), **Michel-Eyquem de (1533-1592),** French essayist, was born on the feudal estate of his father, Pierre Eyquem, in Perigord. As soon as he could speak, he was placed under the care of a German tutor, with whom he conversed entirely in Latin, learning Greek as a pastime and speaking no French. He became so familiar with Latin, the language of learning, that he was able, at 13 years of age, to complete his formal education in the College of Guienne at Bordeaux.

Having no taste for military life, Montaigne studied law and, from 1554, served as councilor in the parliament of Bordeaux. He went several times to court and enjoyed the favor of Henry II. Montaigne married Françoise de la Chassaigne when he was 33 years of age.

The cruelty and bloodshed of the religious wars filled Montaigne with distaste for public life, and he retired to his estate, resolved to spend the rest of his life in study. During this dismal period, he began his *Essays,* which were first published in March 1580 and won such immediate popularity that within a few years they had been read by nearly every man of education in France.

Shortly after the publication of the *Essays,* Montaigne undertook a journey for his health to Germany, Switzerland, and Italy, which he described in his *Journal of Travel.* While abroad, he was elected mayor of Bordeaux by the votes of the citizens, and he was subsequently honored with re-election. In 1586, he retired from office and returned to his estate. When, soon afterwards, the plague added to the miseries and difficulties with which he was surrounded, he became a wanderer with his family. In 1588, he went to Paris and engaged in vain attempts to reconcile Henry of Navarre and the Duke of Guise. Here he made the acquaintance of Mademoiselle de Gournay, whom he regarded tenderly as his adopted daughter and to whom his widow intrusted the task of publishing the first complete edition of his works.

His *Essays* have exercised an influence, particularly on French and English literature, greater perhaps than any other single modern book. An English translation of it by John Florio is the only book that Shakespeare is definitely known to have possessed. These essays range over every subject connected with human life and manners, and exhibit acuteness of thought combined with great depth of sympathy. Montaigne's merit is that, in an age of religious intolerance, he tried to build up a human morality and to lead man into the paths of justice, integrity, and forbearance, without appeal to supernatural fears.

Montcalm (*mŏnt-kăm'*), **Louis Joseph, Marquis de (1712-1759),** French general, was born near Nimes, France. He was commander in chief of the French troops in Canada, 1756-59. He captured Fort Ontario, Oswego, 1756, and Fort William Henry, 1757. He repulsed the British under Abercrombie at Ticonderoga in 1758; repelled Wolfe's attack on Quebec in 1759, but was defeated and mortally wounded in the battle of the Plains of Abraham, near Quebec, September 13th of the same year. By this defeat, France lost Canada, which then passed under the control of England.

Montesquieu (*mŏn'tĕs-kū'*; F., *môN'tĕs'kē'û'*), **Baron la Brede et de (1689-1755),** French publicist, was born of a noble family at the Chateau de la Brede near Bordeaux, France. While still a student, he collected a large mass of extracts from the civil law, which later formed the first part of his great work, *The Spirit of the Laws.*

In 1714, he became a councilor in the parliament of Bordeaux, and, in the following year, he married Mademoiselle de Lartigues. In 1716, he was made president of the parliament. In 1721, he published his *Persian Letters;* which, purporting to be from the pen of two Persians traveling in Europe, satirized the follies and vices of France. Although this small book appeared anonymously, its authorship was soon revealed. Its success was great, but, in 1728, Montesquieu altered some of the more offensive pages to facilitate his admission to the French Academy.

The years 1729-31 Montesquieu spent traveling in Hungary, Italy, Switzerland, Germany, the Netherlands, and England and made the acquaintance of many eminent men. Following these travels by a retirement of two years, he was able to give to the world in 1734 his *Considerations on the Causes of the Grandeur and Decadence of the Romans.*

He devoted the next 14 years to the preparation of *The Spirit of the Laws,* which appeared at Geneva in 1748. It found an audience immediately and ran through 22 editions in 18 months. The purpose of this book was to find in nature and history the explanation of the existing maxims and institutions of various nations, and to show how diversities in physical and moral circumstances have contributed to produce diversities in social institutions. He made answer to the charge of atheism in his *Defence of the Spirit of Laws.*

Montessori (*mŏn'tĕ-sō'rē*), **Maria (1870-1952),** Italian educator, received the degree of doctor of medicine from the University of Rome in 1894. As principal of a school for feeble-minded children, her success led her to apply similar principles and methods to the education of normal children. Her system stressed the freedom of the child. She became director of the Montessori Research Institute established at Barcelona in 1817 and in 1922 was government inspector of schools for Italy. Her most important works are *Pedagogical Anthropology* and *The Montessori Method.*

Monteverdi (*mŏn'tà-vâr'dē*) or **Monteverde, Claudio (1567-1643),** Italian composer, was born at Cremona. He introduced many innovations in musical composition; originated the monodic style; and, having produced the first operas of importance in *Arianna* and *Orfio,* is frequently called the founder of modern opera. From 1601 to 1612, he was chapelmaster at Mantua and, from 1613 until 1643, at San Marco in Venice.

Montgolfier (*mŏnt-gŏl'fĭ-ĕr*; F., *môN'gôl'fyā'*), **Jacques Etienne (1745-1799)** and **Joseph Michel (1740-1810),** distinguished as the inventors of the balloon, were the sons of a paper manufacturer at Annonay, France. Etienne, after a few successful experiments with the balloon, went to Paris, where his discovery created a great sensation and was substantially recognized by Louis XVI. Joseph was elected to the institute in 1807. The parachute also is one of his inventions. See *Airship.*

Montgomery of El Alamein, Field Marshal Bernard Law Montgomery, Viscount (1887-), British general, was born in Ulster, Ireland. He served with distinction in World War I. As a major general in World War II he took part in the evacuation of Dunkirk. In 1942 he took command of the defeated British eighth army in Egypt. In the battle of El Alamein he defeated the Germans under Rommel, and pursued them 1500 miles to Tunisia. As general he led the Anglo-American invasions of Sicily and Italy. He commanded the British ground forces in the invasion of France, and the northern wing of the Allied army, with the rank of field marshal, in the invasion of Germany. After commanding the British army of occupation, he was made chief of the imperial general staff, and in 1946 was raised to the peerage.

Montini, Giovanni Battista (1897-), who as Paul VI became Supreme Pontiff of the Roman Catholic Church in 1963, succeeding Pope John XXIII, was born near Brescia, in northern Italy. Along with private study he received training at the Arnaldo Lyceum in Brescia. Later, at the Gregorian University and the University of Rome, he studied theology, philosophy, and civil and canon law. He was thus prepared for the foreign service of the Holy See. After serving as secretary to the apostolic nunciature

at Warsaw, he returned to accept the post of document writer at the Vatican. For Pope Pius XII he performed many tasks in the difficult period of World War II. He was first on a list of new cardinals appointed by Pope John XXIII, for whom he carried out many important assignments.

Moody, Dwight Lyman (1837-1899), American evangelist, was born at Northfield, Mass. He became a Congregationalist and, from 1856, devoted himself to religious work in Chicago and elsewhere. During the Civil War, he served on the Christian commission. His church and school at Chicago having burned in 1871, he went to England and succeeded in raising funds for rebuilding them. For many years Ira D. Sankey, the singer, was associated with him in a remarkably successful evangelical campaign. Moody established a school for Christian workers at Northfield, Mass., and a Bible Institute at Chicago.

Moody, Helen Wills (1906-), (Mrs. Aidan Roark), tennis player, was born at Centreville, Calif. She studied art at the University of California, but her career as an artist was eclipsed by her fame as an athlete. After winning her first Women's National Tennis Championship in 1923, she went on to take it six more times. She won the English Championship eight times and the French Championship four times. Her most dramatic victory came in 1935 at Wimbledon in defeating Helen Jacobs, to whom she had defaulted two years earlier.

Moody, John (1868-1958), American financial analyst, was born at Jersey City, N. J. Educated in public schools, he engaged in newspaper work until 1890 and then was employed for 10 years by an investment banking house. Here he conceived the idea of supplying authoritative data to investors regarding securities. In 1900 he founded *Moody's Manual of Railroads and Corporation Securities,* which was followed in 1909 by *Moody's Manual,* analyzing securities. He wrote *The Truth about the Trusts, The Investor's Primer,* and *The Long Road Home.*

Moody, William Vaughn (1869-1910), American poet and playwright, was born at Spencer, Ind. After being graduated from Harvard, 1893, he taught English at Harvard and Radcliffe, leaving in 1895 to become instructor at the University of Chicago, where he was appointed assistant professor of English and rhetoric, 1901. His lyrical drama *The Masque of Judgment, Poems,* and *The Fire-Bringer* brought recognition which was greatly extended by his drama *The Great Divide.* Appearing in 1907, it took rank as one of the best American plays. He was elected to the American Academy of Arts and Letters in 1908.

Mooney, Edward (1882-1958), American prelate, was born at Mt. Savage, Md. He was ordained priest in 1909. After teaching in Cleveland, and holding a pastorate in Youngstown, Ohio, he was appointed apostolic delegate to India in 1926 and to Japan in 1931. He was made archbishop of Rochester in 1933, and archbishop of Detroit in 1937. He was created cardinal in 1946.

Mooney, James (1861-1921), American ethnologist, was born at Richmond, Indiana. He engaged in journalism, and in 1885 began a connection with the Bureau of American Ethnology lasting throughout his life. He studied chiefly the Indians of the South and the West, and prepared a large number of Indian exhibits. His publications include *Sacred Formulas of the Cherokees, Calendar History of the Kiowa Indians,* and *Cheyenne Indians.*

Moore, Henry (1898-), English sculptor, was born in Yorkshire. His bold and original creations adorn many a church, museum, park, and other public place in England and throughout the world. With no family artistic inheritance, Moore applied himself to sculpture at an early age and with his first exhibition showed his ability both to shock and to please art critics. Adventurous and searching, always trying to capture life's most vital and basic forms, Moore has been a profound student of geology and zoology and a brilliant experimenter in the use of wood, stone, marble, and metal as sculpturing media. His most famous and spectacular works are massive figures of women. His sketches of Londoners sleeping in the Underground during World War II air raids were put in book form in 1944.

Moore, Sir John (1761-1809), British general, was born in Glasgow, Scotland. He served in the British army during the American Revolutionary War; in Corsica, 1793-94; and subsequently in Ireland, the Netherlands, Egypt, and Sicily. In 1798, he was made major general. On his return from an expedition in aid of Sweden, he was sent to Portugal in 1808 to command an army in co-operation with the Spaniards against the French. He was obliged to retreat from Salamanca to the sea; won the battle of Corunna in 1809; but fell during the action, dying at the moment of victory.

Moore, John Bassett (1860-1947), American publicist and authority on international law, was born in Smyrna, Del. He was graduated from the University of Virginia, 1880; studied law at Wilmington, Del.; and was appointed law clerk in the State Department. In 1886, he became third assistant secretary of state. In 1891, he was made professor of international law and diplomacy at Columbia University. He represented the government in various foreign missions and in 1913, became counselor to the Department of State, resigning in 1914 to resume his chair at Columbia. He was a judge of the Permanent Court of International Justice from 1921 to 1928 and a member of the Permanent Court of Arbitration at The Hague from 1912 to 1938. Besides many other books in his field, he wrote *Digest of International Law,* which became the standard authority.

Moore, Marianne Craig (1887-), American poet, was born in St. Louis, Mo. She is universally admired for the depth, wit, and precision of her works. Educated at Bryn Mawr, she taught at a U. S. Indian School at Carlisle, Pa. for four years. From 1921 to 1925, she was an assistant at the New York Public Library, and from 1925 to 1929, she was editor of the influential magazine, *The Dial.* Her first published work, *Poems,* was a collection made, unknown to her, by her friends, in 1921, which established her as an important poet. Other volumes have been *Observations* (1924), *Selected Poems* (1935), *Nevertheless* (1944), and *Collected Poems,* which won the Pulitzer prize for poetry in 1952. T. S. Eliot has said of Marianne Moore that she has created "part of the small body of durable poetry written in our time."

Moore, Thomas (1779-1852), Irish poet, was born at Dublin. He was graduated from Trinity College, Dublin, 1798, and, in 1799, went to London to study law, taking with him a translation of the *Odes of Anacreon,* which he published in 1800. In 1801 he published his juvenile poems as *The Poetical Works of the Late Thomas Little, Esq.,* a pseudonym suggested by his diminutive stature. In 1803, he was appointed registrar to the admiralty in Bermuda, but soon returned to England by way of the United States and Canada, leaving a deputy in charge. His deputy having embezzled funds for which he was responsible, he lived in Europe to escape imprisonment until he was able to satisfy the debt through proceeds of his writings. He then returned to England.

Meanwhile Moore had written the highly popular oriental poems *Lalla Rookh* and *Loves of the Angels.* His greatest and most enduring work, however, consisted of songs, which include "Oft in the Stilly Night," "Canadian Boat Song," and "Come, Ye Disconsolate." Moore was intrusted with the memoirs of Lord Byron and, by use of them, composed his *Notices of the Life of Lord Byron.* He afterward reluctantly destroyed the memoirs.

Moran (*mô-răn'*), Thomas (1837-1926), American artist, was born at Bolton, Lancashire, England. His early life was spent at Philadelphia, where he learned engraving. He then studied painting in England, France, and Italy. His large paintings the "Grand Cañon of the Yellowstone" and the "Chasm of the Colorado" were bought by Congress. His other works include "The First Ship" and "Ruins on the Nile," in the Wilstach Collection, Philadelphia; "Bringing Home the Cattle," in the Albright-Knox Art Gallery, Buffalo; also "Balboa Discovering the Pacific," "Hiawatha and the Serpents," and "The Wilds of Lake Superior."

More, Paul Elmer (1864-1937), American essayist and critic, was born in Saint Louis, 1864. He was graduated from Washington University in 1887 and continued his studies at Harvard. He taught Sanskrit at Harvard, 1894-95, and at Bryn Mawr, 1895-97. He was literary editor of the *Independent,* 1901-03, and of the New York *Evening Post,* 1903-09. He was editor of the *Nation,* 1909-14, to which he contributed many reviews and critical essays.

In the field of literary criticism he achieved foremost rank by his profound scholarship, keen philosophical analysis, and effectiveness of method. His critical work is contained in the *Shelburne Essays.* His writings include also *Helena and Occasional Poems, The Great Refusal, Benjamin Franklin, Nietzsche, Hellenistic Philosophies,* and *The Christ of the New Testament.* In 1915, he was made a member of the American Academy of Arts and Letters.

More, Sir Thomas (1478-1535), English author and statesman, was born in London. He was educated at Oxford and Lincoln's Inn; rose to eminence as a lawyer; was appointed undersheriff for London; and was elected a burgess of the Parliament under Henry VII, where he was often successful in resisting claims of the crown. In 1514 and in 1515, he was sent on commercial embassies to the Netherlands and, after his return, became a privy councilor. In 1523, he was chosen speaker of the House of Commons. He became lord chancellor in 1529.

His political duties did not prevent his production of a number of literary works, the chief of which was the *Utopia.* He constantly refused to lend his authority to Henry VIII's project of divorce and second marriage. In 1534, he refused to swear allegiance to the Act of Succes-

sion for securing the throne to the offspring of Anne Boleyn and was committed to the Tower. In July 1535, he was charged with traitorously attempting to deprive the king of his title as supreme head of the Church and was condemned and executed. See *Utopia*.

Morehouse, Daniel Walter (1876-1941), American astronomer, was born at Mankato, Minn. He was graduated at Northwestern Christian College, Excelsior, Minn., at Drake University, and at the universities of Chicago and California. In 1900, he was appointed professor of physics and astronomy at Drake University. In 1908, he discovered a comet, which was named Morehouse in his honor. He lectured on astronomy at the University of California in 1910-11.

Morgan, Sir Henry (1635-1688), epic British adventurer, was born in Wales, and either was kidnaped or ran away to the West Indies. He became the leader of a band of buccaneers who, with the tacit approval of the British Crown, operated out of Jamaica and the Barbados against Spanish shipping and the Spanish domains in the Caribbean. Morgan's most famous coup came in 1670-71, when he led 37 ships and 2200 men against a superior Spanish force and captured Panama City. Morgan let his victory become an unabridged holocaust. When accounts of his savage cruelty reached England, he was ordered to be returned under arrest. However, his bravery and public popularity won for him a knighthood from Charles II. He was sent back to Jamaica with the respectable titles of Lieutenant Governor and Commander in Chief.

Morgan, John Pierpont (1837-1913), American financier and art collector, was born in Hartford, Conn. He was graduated from English High School, Boston; studied at the University of Göttingen; and entered the bank of Duncan, Sherman, and Company, 1857. In 1871, he became a member of the firm of Drexel, Morgan, and Company, later J. P. Morgan and Company, leading private bankers of the United States, with branch houses in London and Paris.

He financed the largest reorganization of railways and consolidation of industrial properties in the United States; organized and floated securities of the United States Steel Corporation, 1901, with a capital of $1,100,000,000; and gained financial control over many important railway systems and American and British ocean transportation lines.

Morgan gave large donations to the New York Trade Schools, the Cathedral of Saint John the Divine, and many other institutions. He made valuable gifts to the American Museum of Natural History, the Metropolitan Museum of Art, and the New York Public Library.

The greatest art collector of his day, Morgan owned famous collections of pictures, books, manuscripts, tapestries, and porcelains. His collection of rare books was housed in a white marble structure built for the purpose in connection with his New York home. In 1912, he gave to the Library of Congress a complete set of autographs of the signers of the Declaration of Independence.

Morgan, John Pierpont (1867-1943), was son of the preceding, was born at Irvington, N. Y. He was graduated from Harvard and joined the firm of Morgan and Company, to the control of which he succeeded at the death of his father in 1913.

Under his management, the firm greatly extended its business. It took a leading part in financing Allied loans during World War I and in the unprecedented expansion of American investments abroad in the postwar period. The firm was dominant also in floating domestic securities in the 1920's, but its prestige declined when the banking and security laws of 1933 and 1934 required the segregation of the banking and investment portions of the business.

Morgan, Thomas Hunt (1866-1945), American zoologist, was born at Lexington, Ky. He was educated at the State College of Kentucky and Johns Hopkins University. He was made professor of biology at Bryn Mawr College in 1891 and of experimental zoology at Columbia University in 1904. In 1928, he became director of the Kerckhoff laboratories at the California Institute of Technology. His investigations, mainly in the field of animal evolution, genetics, and heredity, place him among the foremost zoologists of the time. In 1933 he won the Nobel prize for medicine, which was awarded for the discovery that inherited physical characteristics are dependent on genes, in the chromosomes of sperm and germ cells, the behavior of which he described. His publications include *Heredity and Sex*, *The Physical Basis of Heredity*, and *Embryology and Genetics*.

Morgenthau (*môr'gĕn-tou*), **Henry (1856-1946),** American diplomat, was born in Mannheim, Germany. He was brought to the United States in 1865 and was educated in the College of the City of New York and Columbia University. He practiced law in New York from 1879 to 1899 and then was made president or director of a number of financial or industrial corporations and became prominent in the Democratic National Committee. In 1913-16, he was ambassador to Turkey, where, after the outbreak of World War I, he was charged also with the diplomatic interests of Great Britain, France, Italy, Russia, Belgium, and other countries. He later served on a commission sent to Poland and as chairman of the Near East Relief. He narrated his experiences in *Ambassador Morgenthau's Story*.

Morgenthau, Henry, Jr. (1891-) American administrator, the son of Henry Morgenthau, the diplomat, was born in New York City. Educated at Cornell University, he later published *The American Agriculturist* from 1922 to 1933, serving also on state commissions relating to conservation and agriculture. When Franklin D. Roosevelt became president in 1933, he appointed Morgenthau to head the Farm Credit Administration, from which he was transferred in 1934 to be Secretary of the Treasury. It fell to his lot to finance expenditures beyond any previous governmental outlays in American history. The influence of treasury policies on the nation's economic life was enlarged by banking laws of which Morgenthau was a leading supporter. He left the Treasury in 1945.

Morison, Samuel Eliot (1887-), historian, was born at Boston. A graduate of Harvard, he continued his studies at Oxford, having served meanwhile with the American forces in World War I. In his historical writings he has paid much attention to sea warfare. He wrote the history of U.S. Naval Operations in World War II. His book, *John Paul Jones* (1959), was awarded a Pulitzer prize.

Morley, Christopher (Darlington) (1890-1957), American editor and author, was born at Haverford, Pa. He was graduated from Haverford College and, as a Rhodes scholar, studied at Oxford University, 1910-13. He joined the editorial staff of Doubleday, Page and Company in 1914 and was later an editor successively of the *Ladies' Home Journal*, the Philadelphia *Public Ledger*, and the New York *Evening Post*. His works include *The Eighth Sin*, *Parnassus on Wheels*, *Thunder on the Left*, *The Romany Stain*, and *Kitty Foyle*.

Morley of Blackburn, John, Viscount (1838-1923), English statesman and writer, was born in Blackburn and was educated at Cheltenham and Oxford. He was called to the bar, but devoted his time chiefly to writing and public duties. Among other publications, he edited the *Fortnightly Review*, 1867-83, and *Macmillan's Magazine* 1883-85.

In 1883, Morley entered Parliament. From the first, he advocated home rule for Ireland, and his articles in favor of it, followed by speeches in 1885, made him Gladstone's most conspicuous supporter. He became chief secretary for Ireland in 1886 and again in 1892.

Morley's place in English letters is assured by his authoritative *Life of Gladstone*, his *Life of Burke*, *Life of Cobden*, and other important works, among which are *Diderot and the Encyclopædists*, *Notes on Politics*, and *Recollections*. He was created viscount in 1908.

Morrill, Justin Smith (1810-1898), American legislator, was born in Strafford, Vt., and devoted himself to mercantile pursuits until his election to Congress. He sat in the House of Representatives from 1855 to 1867 and in the Senate from 1867 until 1898. In 1861, he secured enactment of a bill for the establishment, through public land grants, of state colleges for teaching agriculture and the mechanic arts. Under a measure of 1890, he obtained an annual grant of $25,000 to such colleges, which came eventually to number about 70.

Morris, Gouverneur (1752-1816), American statesman, was born at Morrisania, N. Y. He was graduated from King's College, now Columbia, 1768; studied law; and was admitted to the bar, 1771. He was one of those who drew up the state constitution of New York in 1776. He was also a member of the Continental Congress, 1777-80, and aided Robert Morris in the organization of the bank of North America in 1781. In 1787, he was one of the committee to draft the Federal Constitution; was minister to France, 1792-94; and served as a United States senator, 1800-03.

Morris, Robert (1734-1806), American financier and statesman, was born in Liverpool, England, and was sent to America at the age of 14. He amassed a large fortune as a merchant in Philadelphia. Sent as a delegate to the Continental Congress in 1775, he signed the Declaration of Independence. In 1781, he was created superintendent of finance. Failing public support, he borrowed on his personal credit, when necessary, to provide funds for the army. He founded the Bank of North America, which aided in financing the Revolution. In 1787, he nominated Washington for the presidency.

Morris, William (1834-1896), English poet and artist, was born near London. He was educated at Marlborough School and Oxford; studied architecture and painting; and became the associate of Burne-Jones and Rossetti. In 1861, he established a business in artistic furniture, tapestry, printing, book-illumination, and stained glass. Artistically he did much to elevate the public taste in domestic decoration.

Morris took a keen interest in typography, establishing the *Kelmscott Press*, which reprinted various choice works. In his later years, he became known as one of the leaders of the socialist movement in England. His life was a protest against commercialism and a crusade for artistic handicraft such as was typical of medieval times. His works include *The Earthly Paradise*, *The Life and Death of Jason*, *Love Is Enough*, and *News from Nowhere*. See *Earthly Paradise*.

Morrison, Herbert Stanley (**1888-**), English labor leader and statesman. Beginning work as an errand boy, he held various manual labor jobs, but early proved his administrative ability in the trade union movement. As secretary of the London Labor party, he evinced a rare knowledge of London government, which he later used in modernizing the city's traffic facilities as minister of transport in 1929-31. He was first elected to Parliament in 1923. In 1940, Churchill made him home secretary, minister for home security, and minister in charge of air raid precautions. In the Labor ministry of 1945 he was Lord President of the Council.

Morrow, Dwight Whitney (**1873-1931**), American banker, diplomat, and politician, was born at Huntington, W. Va., in 1873. Educated at Amherst College and Columbia University, he entered the employ of a New York law firm in 1899, becoming a member in 1905. From then until 1914, he was a partner in the firm of J. P. Morgan and Company. He resigned in 1927 to accept appointment as ambassador to Mexico. By a high order of diplomacy he succeeded in smoothing over a controversy arising from Mexico's taking over of oil properties owned by American corporations. In 1930, he represented the United States at the London Naval Conference. On his return, he stood for Republican nomination as United States senator, declaring for the repeal of the prohibition amendment. He was elected, but died the following year.

Morse, Jedidiah (**1761-1826**), American preacher and author of textbooks. He was educated at Woodstock Academy and at Yale College, where he was graduated in 1783. After teaching for a few years, he entered the Congregational ministry. While active in religious and moral movements, he achieved fame as author of the first American textbooks on geography. In 1874, he published *Geography Made Easy*; in 1797, *Elements of Geography*; and, in 1814, *Universal Geography*.

Morse, Samuel Finley Breese (**1791-1872**), American artist and inventor, was born at Charlestown, Mass. From Phillips Academy he was admitted to Yale University, at which he was graduated in 1810. After five years passed in the study of painting and sculpture in England, Morse opened a studio at Boston in 1815. Indifferent success led him to travel as a portrait painter. At this time he met Lucretia P. Walker of Concord, N. H., whom he married October 1, 1818.

Invention of the Telegraph. After the death of his wife in February 1825, Morse settled in New York. There he made general progress with his brush and became first president of the National Academy of Design. He sailed for Italy in 1829 in order to execute a commission for some pictures. At this time, he spent two years in Rome and one in Paris. On the return voyage from Havre to New York in 1832, in the course of a conversation on recent discoveries in electromagnetism, Morse conceived the idea of a magnetic telegraph. His plan was complete as to its main features—a current passing through a wire between two places, signals to be made at one terminus by alternately making and breaking the circuit at the other. It remained to devise an apparatus to embody his ideas.

Development of the Invention. In 1835, Morse was appointed professor of the literature of the arts of design in New York University. In a studio allotted to him in Washington Square, he prosecuted his experiments with Professor Gale and Alfred Vail, both of whom he subsequently admitted into partnership. In 1837, Morse filed a caveat at the patent office in Washington and applied to Congress for $30,000 to defray the expense of an experimental line of 50 miles. With the Honorable F. O. J. Smith, now admitted as the fourth member into partnership, Morse sailed for Europe to procure patents there in 1838. Discouragement and disappointments awaited him except in France, where he readily obtained a patent.

In 1840, Morse obtained his American patent, but not until 1843 did Congress appropriate the money for the establishment of the trial line between Washington and Baltimore. On May 24, 1844, success crowned the public test. Early in August 1845, he sailed from New York to present his telegraph again to European governments.

Honors. In his last years, Morse received not only an adequate pecuniary reward for his services, but countless other honors. In 1848, he married Sarah E. Griswold and moved to a splendid mansion which he had built near Poughkeepsie, N. Y. Orders and decorations were bestowed upon him by the sovereigns of Turkey, Prussia, Württemberg, Austria, France, Denmark, Spain, Portugal, and Italy.

In 1856, Morse went to Europe to superintend some of the preparations for laying the Atlantic cable. Presentations at royal courts and honors by men of science and affairs attended his progress. In 1858, he received $80,000 from the nations of Europe and saw his telegraph then in use, to the almost complete exclusion of its rivals everywhere. America honored him by the erection of a bronze statue in Central Park, New York. At his death memorial services were held in many American cities. Reports of these meetings, with addresses and poems, were published by order of Congress. See *Telegraph*.

Morton, William Thomas Green (**1819-1868**), American dental surgeon, was born at Charlton, Mass. After establishing himself in dental practice in Boston, he began early in 1844, to study medicine in the office of Dr. Charles T. Jackson, where he became acquainted with the value of sulphuric ether as a local anesthetic and used it first in dental operations. Actual surgical anesthesia by ether was made known to the public, October 16, 1846, through an operation for facial tumor performed at the Massachusetts General Hospital by Dr. J. C. Warren, to whom Morton had imparted his knowledge of the method. In November 1846, Morton obtained a patent for the process of anesthesia by means of ether.

Although he was probably the first to recognize the general anesthetic properties of ether and deserves credit for its public introduction into surgery, its use was doubtless first suggested to him by Dr. Jackson, while the discoveries of both seem to have been antedated by the successful though unpublished employment of ether in surgical operations by Dr. C. W. Long of Georgia in 1842. Morton was awarded the Montyon prize for medicine and surgery by the French Academy in 1852. He refused $100,000 offered by Congress for his patent. He was elected to the American Hall of Fame in 1920.

Moses, Hebrew lawgiver and prophet, is believed to have lived and flourished about the 15th century B. C. Moses, according to the traditional account, was the son of Amram, of the tribe of Levi, and was born when this Hebrew tribe was settled in northeastern Egypt in bondage to the Egyptians.

To save him from the consequences of an Egyptian royal edict that all male infants of the Hebrews should be drowned, Moses was placed in a basket and hidden among the rushes which grew along the banks of the Nile. The king's daughter came to the river, where she found the child. She took it and brought it up as her own. When grown, Moses was sent to the king's palace at Heliopolis, where he enjoyed the advantages of education and refinement. He became adept in all the sciences of Egypt, Assyria, and Chaldea. He also led armies against the Ethiopians, pursuing them to Saba, or Meroe.

Fearing because he had murdered an Egyptian overseer who was illtreating a Hebrew slave, Moses fled and escaped into Midian, where he remained for many years tending the flocks of his father-in-law, Jethro. While there, he heard the voice of Jehovah bidding him deliver his race from slavery. He returned to Egypt and prevailed on the Egyptian king to permit the Hebrews to depart. Their departure is known in history as the Exodus.

Shortly after the Exodus, Moses heard a voice calling him into Mount Sinai. He ascended and, after 40 days, returned, bearing a stone tablet on which was written the decalogue, or ten commandments. These laws were more or less successfully enforced on the Hebrews, who for the space of a generation, fought under the leadership of Moses against various peoples of the desert northeast of Egypt. Their conquests brought them eventually to the more fertile land of Canaan. Throughout this period, Moses appeared as a representative of Jehovah, the worship of whom became, mainly through his efforts, the national religion of the Hebrews. Moses has therefore continued to be reverenced as the prophet of Jehovah and the lawgiver of Israel.

Moses did not enter the land of Canaan with the Hebrews but is said to have obtained a view of it from the top of Mount Pisgah just before his death at 120 years of age. According to the biblical account, he was buried at the foot of Mount Nebo by Jehovah himself.

Moses, Anna Mary Robertson, "Grandma Moses" (**1860-1961**), American artist, was born at Greenwich, New York. Following the discovery in 1938 of some of her landscape paintings in a drugstore at Hoosick Falls, N. Y., she became famous as an American primitive artist. She has had many exhibitions of her work in leading art galleries, and millions of Christmas-card reproductions of her paintings have been sold.

Moses, Robert (**1888-**), city planner and New York park commissioner, was born in New Haven, Conn. He studied at Yale, Oxford, and Columbia, and was the first American president of the Oxford Union debating society. In the administration of Governor Alfred E. Smith he was secretary of a non-partisan committee to modernize

the administrative machinery for the state of New York. As chairman of the state Council of Parks and member of the State Fine Arts Commission he began to concentrate on the type of public service for which his vision, organizing ability, and political resourcefulness made him peculiarly fitted. His big opportunity came when he was commissioned by Mayor La Guardia to reorganize the city parks department of New York. Moses brought about a historic expansion of recreational grounds and facilities in New York and on Long Island. Jones Beach is his best known achievement.

Motley, John Lathrop (1814-1877), American historian and diplomat, was born in Dorchester, Mass. He was graduated from Harvard in 1831 and afterward studied at Göttingen and Berlin. After traveling for some years in Europe, he returned to the United States; studied law; and was admitted to the bar. In 1841, he became secretary of legation at Leningrad; was minister to Austria, 1861-67; and served as minister to England, 1869-70. On three works Motley built up a great literary reputation. They are *The Rise of the Dutch Republic*; its sequel, *The History of the United Netherlands*; and *John of Barneveld*. He was elected to the American Hall of Fame in 1910.

Moulton (*mōl'tŭn*), **Forest Ray (1872-1952),** American astronomer, was born at Le Roy, Mich. He was educated at Albion College and the University of Chicago, to the faculty of which institution he was appointed in 1898. He rose by 1912 to a professorship in the Department of Astronomy there and, by his various researches, won a position of prominence among the scientific scholars of America. In 1936, he accepted the secretaryship of the American Association for the Advancement of Science. His publications include *Celestial Mechanics*, *Descriptive Astronomy*, *Periodic Orbits*, and *Consider the Heavens*.

Moulton, Richard Green (1849-1924), educator and author, was born in Preston, England. He was graduated from London and Cambridge universities and from the University of Pennsylvania. In 1892, he became professor of English literature at the University of Chicago, and, in 1901, was made head of the department of general literature. One of his chief interests was popularizing the Bible as literature. Among his works are *The Ancient Classical Drama*, *The Literary Study of the Bible*, *Shakespeare as a Dramatic Thinker*, *The Modern Study of Literature*, and *The Modern Reader's Bible*.

Mountbatten of Burma, Louis Mountbatten, Earl (1900-), British admiral, was born at Windsor, England. He began his naval career as a cadet at the age of thirteen, and served as a midshipman in World War I. During World War II, he led the British Commandos in raids on Norway and France, and then served as supreme Allied commander in Southeast Asia, 1943-46. He was the last British viceroy of India, 1947, and the first governor general of the newly-created Indian dominion, 1947-48. In 1953-54, he was commander in chief of the Allied naval forces in the Mediterranean. He is the uncle of Philip Mountbatten, Duke of Edinburgh, husband of Queen Elizabeth II of England.

Mozart (*mō'zärt*; G., *mō'tsärt*), **Johann Wolfgang Amadeus (1756-1791),** Austrian composer and chief founder of the opera, was born at Salzburg, Austria. When three years old, Mozart attracted attention by his delight in striking chords on the piano. With his sister he made his first appearance in public at Munich in his sixth year, later visiting Vienna, Paris, and London. After his return to Salzburg, his father gave him a thorough education in musical theory and practice.

At the age of 15, he produced the opera *Mithradates* at Milan amid great applause. After a long series of concert journeys over Europe, 1763-1773, he sought other employment in Paris without success. He had, however, the opportunity of hearing the various kinds of music then in vogue.

He was now appointed concert master and organist at Salzburg with a small salary and permission to travel occasionally to perform his new works. His opera *Idomeneo*, composed in 1780, was as original in its phraseology and development as in its modulation, harmony, and instrumentation. He is said to have written it to win the good graces of the Webers, a musical family of Mannheim, with whom he subsequently lived in Vienna and whose daughter Constanza he married in 1781.

Mozart was obliged to break with his hard master, the Archbishop of Salzburg, and he supported himself with difficulty by giving concerts and music lessons. Amid incessant rebuffs and violent intrigues, he set *The Marriage of Figaro* to music as an Italian opera in 1786. Its happy reception at Prague induced him to settle there, where he finished his master opera, *Don Giovanni* in 1787.

In 1788, he returned to Vienna. Then followed the busiest period of his life. Frequent concert journeys and incessant labor exhausted him; the fear of early death oppressed him. In this condition he composed his exquisite opera *The Magic Flute* and commenced a *Requiem*, which was never finished.

Mozart united profound learning and universal genius in all his works, whether song, sonata, concerto, symphony, mass, or opera. He was the greatest pianist of his time in Germany. He revolutionized the lyrical drama by *Idomeneo*, and the romantic opera may be said to have been created in *Don Giovanni* and *The Magic Flute*. Mozart is the first composer in whose works all traces of the old tonality disappear; he was the father of the modern school.

Muench, Aloisius (1889-1962), clergyman, was born at Milwaukee, Wis. He was educated at the Seminary of St. Francis de Sales and the University of Wisconsin. Later he studied at Louvain, the Sorbonne, Oxford, and Cambridge. After serving in parishes at Milwaukee and Madison, Wis., he was assigned to overseas posts, particularly in West Germany, where he was Papal Nuncio. In 1959 he was appointed Cardinal by Pope John XXIII.

Muhlenberg (*mū'lĕn-bûrg*), **Frederick Augustus Conrad (1750-1801),** American clergyman and political leader, son of Heinrich Melchoir Muhlenberg, was born at New Providence (now Trappe), Pa. He was educated at the University of Halle, Germany; entered the Lutheran ministry; and was pastor in New York City, 1773-76. He then returned to his native state; resigned from ministerial work; entered politics; and was elected to the Continental Congress in 1779. After distinguished service in the Pennsylvania legislature, of which he was twice speaker, he was elected to the first United States Congress. He was the first speaker of the House of Representatives, 1789-91.

Muhlenberg, Heinrich Melchior (1711-1787), American clergyman, founder of the German Lutheran Church in America, was born at Einbeck, Germany. He studied at Göttingen and Halle; was pastor of a Lutheran church in Lusatia, 1739-41; and settled in Pennsylvania, 1742, as a missionary. In 1748, he was instrumental in forming the first American Lutheran synod. In 1762, while he resided in Philadelphia, he formulated the constitution for the Lutheran congregation there. This became the basis of the constitutions under which most congregations were subsequently established.

Muir (*mūr*), **John (1838-1914)** American naturalist and explorer, was born at Dunbar, Scotland; was educated in Scotland and at the University of Wisconsin. He discovered Muir Glacier, Alaska, and visited the arctic regions in search of the DeLong Expedition. On foot he visited many of the grander scenes in the mountains of California. Between 1899 and 1912, he traveled in Asia, Australasia, South America, and Africa. He was a pioneer advocate of forest conservation and of the establishment of national parks.

His writings include *The Mountains of California*, *Our National Parks*, *My First Summer in the Sierra*, *The Yosemite*, *The Story of My Boyhood and Youth*, and many scientific articles. In 1915 appeared *Letters to a Friend* and *Unpublished Prose and Letters*, both of which contain much material on Alaska.

Müller (*mül'ĕr*; E., *mül'ĕr*), **Friedrich Max (1823-1900),** British philologist and Orientalist, son of a German poet, Wilhelm Müller, was born in Dessau, Germany. He was educated at Leipzig; studied at Paris; and settled in England in 1846. In 1854, he was appointed professor of modern languages at Oxford, where, from 1868 to 1875, he was professor of comparative philology, a science to which he made large contributions.

Besides editing the *Rig-Veda*, he published *Lectures on the Science of Language* and *Chips from a German Workshop*, dealing, not merely with the origin of languages, but with the early religious and social systems of the East; also *The Origin and Growth of Religion*, *Comparative Mythology*, and *Biographical Essays*. He was chief editor of the series of works entitled *The Sacred Books of the East*.

Mumford, Lawrence Quincy (1903-), librarian, born in Ayden, North Carolina. He was graduated from Duke University in 1925, where he received his master of arts degree in 1928, and the following year was graduated from the Columbia University School of Library Science. After serving on the library staffs of Duke and Columbia, he joined the staff of the New York Public Library in 1929, where he served until 1945, when he became assistant director of the Cleveland Public Library and director in 1950. In 1954 he was elected president of the American Library Association, and was named Librarian of Congress by President Eisenhower.

Mumford, Lewis (1895-), American author and social philosopher, was born at Flushing, Long Island. His education at Columbia University, City College of New York, and New York University was supplemented by independent reading and research suggested by the Scottish biologist, Patrick Geddes. In the same way that Geddes had studied Edinburgh as a whole, Mumford studied New York, its history, its architecture, its character, and its significance as a phase of civilization. His essays in the *Dial*, the *New Republic*, and other magazines contained, not only criticism of art and architecture, but also an appraisal

of the social values that are reflected by a city's activities and development. Among the books which express his philosophy are *Sticks and Stones, Technics and Civilization,* and *Culture of Cities.*

Munch, Charles (**1891-**), American conductor, was born at Strasbourg, Alsace-Lorraine, France, where he began training as a violinist, continuing his studies later in Paris and Berlin. He became a teacher at the Strasbourg Conservatory, and later at Leipzig, Germany, where he conducted at Gewanhaus, the famous concert hall. He then went to Paris where he conducted a number of important orchestras. In 1946, he came to the United States, making his American debut with the Boston Symphony Orchestra. He was guest conductor of the New York Philharmonic Symphony Society for three seasons, and in 1949 succeeded Serge Koussevitzky as leader of the Boston Symphony Orchestra, with which he toured Europe in 1952 and Russia in 1956. Munch has been director of the Berkshire Music Center, Lenox, Mass., since 1951, and also director of the summer festival concerts at Tanglewood.

Münchhausen (*mün*ĸ*h'ou-zĕn*), **Hieronymus Karl Friedrich, Baron** (**1720-1797**), member of an ancient and noble German family, was born in Hanover, Germany. He served as cavalry officer in the Russian campaign against the Turks, 1737-39. By false and ridiculously exaggerated tales of his exploits and adventures, he attained celebrity so remarkable that his name has become proverbial. The title of the tales ascribed to him is *Baron Münchausen's Narrative of His Marvelous Travels and Campaigns in Russia.*

Munkácsy (*mŏŏn'kä-chē*), **Michael** (**1844-1900**), Hungarian painter whose real name was Michael Lieb, was born at Munkacs. Left an orphan, he was apprenticed to a joiner at the age of 11 and, after several years of hard work and privation, he made the acquaintance of artists who befriended him.

In 1870, his first important picture, "The Last Day of a Condemned Man," now in the Wilstach Collection, Philadelphia, was exhibited with great success at Paris. Soon afterward, he established his residence there and became one of the most popular artists of his time. Among his best-known pictures are "Milton Dictating *Paradise Lost* to His Daughters," and the world-famous "Christ before Pilate," purchased by John Wanamaker.

Munsel, Patrice Beverly (**1925-**), American soprano, was born at Spokane, Wash. She joined the Metropolitan Opera Company in 1943, the youngest singer to become a member of that organization. She made her debut as Philine in *Mignon,* and has sung 11 leading roles with the Metropolitan. In the part of Adele in *Die Fledermaus* in 1950, she stopped the performance twice on the first night. In 1953, she starred in the film biography of Melba. She has been guest star of several European opera companies, including the Royal Opera at Copenhagen, Denmark. In private life, she is Mrs. Robert C. Schuler.

Munsey, Frank Andrew (**1854-1925**), American publisher, was born in Mercer, Me. He was educated in the public schools of Maine and began his business career in a country store. He went to New York, 1882, and started *The Golden Argosy,* a juvenile weekly, later the adult monthly *The Argosy.* In 1889, he launched *Munsey's Weekly,* which was converted, in 1891, into *Munsey's Magazine.* He also acquired *The All-Story Magazine,* the New York *Sun,* and the Baltimore *News.* His publications include *Afloat in a Great City, The Boy Broker, A Tragedy of Errors,* and *Derringforth.* On his death, he bequeathed his residuary estate, about 40 million dollars, to the Metropolitan Museum of Art, New York City.

Münsterberg (*mün'stĕr-bĕr*ĸ), **Hugo** (**1863-1916**), psychologist, was born at Danzig, Germany. He was graduated from the universities of Leipzig and Heidelberg and taught psychology at the University of Freiburg five years. In 1892, he was made professor of psychology and director of the Psychological Laboratory at Harvard University.

At first his researches were in the field of physiological psychology, but, in later years, he devoted himself to the application of psychological laws to the problems of everyday life and wrote various popular books dealing with the psychology of testimony, of medicine, and of education. Besides important works in German, his writings include *Psychology and Life, The Americans, Psychology and Industrial Efficiency,* and *The War and America.*

Murat (*mü'rä'*), **Joachim** (**1767-1815**), French marshal, was born near Cahors, France. Rising by reason of his intrepidity as a cavalry leader, he was elevated by Napoleon to the highest commands and married Napoleon's sister Caroline. He was made king of Naples as Joachim I Napoleon. He led the cavalry in Napoleon's Russian campaign, 1812, and at the battle of Leipzig. Following the emperor's return from Elba, Murat was defeated in Italy and was deposed by the allies, but, returning to the attack, was captured and shot.

Murillo (*mû-rĭl'ō*; Sp., *mōō-rēl'yō*), **Bartolomé Estéban** (**1617-1682**), Spanish painter, was born in Seville, Spain. Left an orphan at 10, he was apprenticed to an artist who taught him the rudiments of painting. From 1642 to 1645, he studied the works of the great masters under Velasquez at Madrid. Returning to Seville, he married, in 1648, a wealthy and noble lady; established a distinguished home; and became the most celebrated religious painter of Spain, ranking high among the great painters of the world.

A favorite subject with Murillo was "The Immaculate Conception," which he painted 15 times. One of the most famous of his pictures by this name was purchased by the French government in 1852 for 586,000 francs. It was presented to the Spanish government in 1940 and transferred to the Prado Museum, Madrid. Other noted works are "Saint Anthony of Padua and Infant Jesus" and "Saint Francis of Assisi" at Seville; "The Divine Shepherd," and "Annunciation," at the Prado Museum, Madrid; "Holy Family," "Angels' Kitchen," and "Beggar Boy," in the Louvre, Paris. See *Painting.*

Murphy, A. Gordon (**1899-**), engineer, was born in Montreal and was educated at Westmount Academy and McGill University. Before being appointed chief engineer of the St. Lawrence Seaway in 1954, he had served for several years as structural engineer with the Department of Railways and Canals and with the National Harbour Board. From 1947 to 1954 he was Port Manager at Montreal.

Murphy, John Benjamin (**1857-1916,**) American surgeon, was born at Appleton, Wis. He was graduated from Rush Medical College, Chicago, in 1879. After engaging in practice, 1879-82, he studied surgery in Vienna, 1882-84. Returning to Chicago, he attained eminence as a surgeon. He invented the anastomosis button, known as Murphy's button, which greatly facilitated intestinal operations. He was widely known also for his success in autogenous bone grafting and in uniting the femoral artery when severed by a gunshot wound. Murphy became professor of surgery in Northwestern Medical School and chief surgeon at Mercy Hospital. His writings include *Gunshot Wounds of the Abdomen, Surgery of the Stomach,* and *Original Experimental and Clinical Research.*

Murphy, Robert D. (**1894-**), diplomat, was born at Milwaukee, Wis. and was educated at Marquette and George Washington universities. A career diplomat, he became personal adviser to President Franklin Roosevelt in 1940 and helped to co-ordinate diplomatic and military operations in the invasion of North Africa. He assisted in the Berlin peace negotiations and became the first postwar U.S. ambassador to Japan. He was recalled in 1953 to represent the State Department at the UN headquarters. He retired in 1959. His book *Diplomat Among Warriors* (1964) is fully documented and is considered a prized historical work.

Murphy, William Parry (**1892-**), American physiologist, was born at Stoughton, Wis. After being graduated from the University of Oregon and the Harvard Medical School, he was closely associated in hospital work with George R. Minot, with whom he shared in the discovery that the eating of liver has a curative effect in the treatment of pernicious anemia. In recognition of this work and his research on diabetes, he was, in 1935, made senior associate at the Harvard Medical School, shortly after being awarded one-third the Nobel prize in medicine for 1934.

Murray, George Gilbert Aimé (**1866-1957**), British scholar and publicist, was born at Sydney, Australia. He went to England in 1877 and was educated at Oxford University. During 1889-99, he was professor of Greek at the University of Glasgow and, from 1908 to 1936, regius professor of Greek at Oxford University. Following World War I, he took a prominent part in advocating the organization of the League of Nations and later directed its activities on intellectual co-operation. His publications include *Five Stages of Greek Religion; Faith, War, and Policy; Problems of Foreign Policy; Hamlet and Orestes; Liberality and Civilization,* and many verse translations of Greek dramas.

Murray, Sir James Augustus Henry (**1837-1915**), British lexicographer and philologist, was born at Denholm, Scotland. He was graduated from London University and engaged in teaching during 1855-85. His *Dialect of the Southern Counties of Scotland* established his reputation as a philologist. The great work of his life, the editing of the Philological Society's *New English Dictionary,* was begun at Mill Hill, 1870, and was continued at Oxford for the remainder of his life. This dictionary, designed to be the most complete and exhaustive ever attempted in any language, was nearly finished at his death.

Murrow, Edward R. (**1908-**), radio news correspondent, was born at Greensboro, N. Car. After he was graduated from Washington State University, he became assistant director of the Institute of International Education, in which capacity he made many contacts abroad. In May, 1937, he was sent to Europe as representative of the Columbia Broadcasting System and arrived just in time to

be present at the Nazi invasion of Austria. From then on he was in the midst of stirring events which led to World War II and reached their climax in the bombing raids on London. Murrow's on-the-spot reporting of these events enabled American listeners to share in many historic happenings overseas. His opening words, "*This is London,*" became the title of a book in which he recounted numerous observations and experiences. In addition, he has created a living form of documentary review entitled "I Can Hear It Now," a series of recordings which recall dramatic moments in history. From 1961 to 1964 he served as head of the United States Information Agency.

Musial, Stanley (**1920-**), baseball player and champion athlete, was born at Donora, Pa. As a youthful pitcher in minor league baseball, he suffered a shoulder injury and changed to outfielder. Called to the St. Louis "Cardinals" in 1943, he helped to win a pennant and to defeat the New York Yankees in the World Series. After war service, he returned to the Cardinals, this time as first baseman. He retired in 1963, having accumulated an extraordinary number of records in major league baseball. He was made vice president of the Cardinal ball club. In 1964 President Johnson named him director of the Nation's Physical Fitness program.

Mussolini, Benito (**1883-1945**), Italian statesman, was born at Dovia, Italy, of a family long identified with revolutionary politics. His earlier activities were in the field of journalism. He traveled extensively throughout Europe and was known for his extreme socialistic views, which led to his expulsion from Switzerland.

About 1908, his opinions began to take a nationalistic direction. In 1915, he was one of the strongest advocates of war against Austria. He served at the front until he was incapacitated by a wound. Then he set about organizing the so-called Facisti, originally a group of intellectuals opposed to Bolshevism. The group became a party in 1921 and, in 1922, succeeded in making Mussolini prime minister and virtually dictator of Italy. In this capacity, he devoted himself vigorously to strengthening Italy's economic and political situation. In 1929, he granted the pope sovereignty over a newly created Vatican City within Rome. A policy of expansion led to the conquest of Ethiopia in 1936 and Albania in 1939. His alliance with Hitler is 1936-39 was known as the Berlin-Rome axis. In 1940 he declared war on France and Great Britain and in 1941 on the United States. After a few initial successes he suffered continuous defeats. When the German resistance in Italy collapsed, he was captured by "partisans" and shot, April 28, 1945.

Mussorgsky (*mŭs-sôrg'skē*), **Modest Petrovitch** (**1839-1881**), Russian composer, was born at Karev. He became an able performer at the age of 10. After entering the Military Academy at Leningrad, he continued musical studies. Upon graduation, he entered the Russian army, but later resigned his commission to devote himself entirely to musical composition. In 1870, he completed his celebrated opera *Boris Godounov*, which treats a patriotic subject with remarkable dramatic power. His other works include the operas *Khovantchina*, *The Match-Maker*, and *Œdipus*.

Mustapha (*mŏŏs'tä-fä*) **Kemal Pasha** (**1879-1938**), Turkish ruler, was born of humble parentage at Saloniki. He came into prominence as a leader of the Young Turks and won recognition by his reckless courage while fighting against the Italians in Tripoli. In World War I, he further distinguished himself in the defense of the Gallipoli Peninsula against the Allied forces and was a trusted confidant of the German commander in chief, von Sanders.

After the conquest of Palestine by the Allies in 1918, Kemal organized the so-called Nationalist army. He established a new government at Ankara, supplanting the regular government in Istanbul and obtained recognition and favorable terms of peace from the dominant European powers. Elected first president of the Turkish republic in 1924, he pursued a policy of modernization, abolishing the caliphate and polygamy, and adopting the Latin alphabet.

Mutsuhito (*mŏŏt-sŏŏ-hē-tō*) (**1852-1912**), emperor of Japan, ascended the throne in 1876. His reign was marked by profound social and governmental changes. The feudal system was abolished. Under his rule Japan entered upon an unprecedented era of prosperity. Civilization made rapid progress, and the introduction of Western arts and ideas secured for Japan the foremost place among Asiatic nations. He gave the Japanese a Parliamentary constitution based somewhat on European principles.

Nansen (*nän'sĕn*), **Fridtjof** (**1861-1930**), Norwegian arctic explorer, was born near Oslo, and was graduated from the University of Oslo, 1888. He started on his first arctic expedition in 1882 and, in 1888-89, undertook a celebrated journey across Greenland. The highest altitude registered was over 10,000 feet, with a temperature of from 80° to 90° below zero. In 1893, Nansen sailed in the *Fram* to make an examination of the entire polar regions and penetrated farther north than any of his predecessors.

Nansen then became professor of zoology at Oslo University; took an active part in the separation of Norway and Sweden in 1905; was minister for Norway at London, 1906-08; and was made professor of oceanography in Oslo University, 1908. During World War I, he was active in providing for the welfare of prisoners and was later appointed high commissioner of the League of Nations for the repatriation of war prisoners. His efforts were directed also toward the relief of the famine sufferers in Russia in 1921-22. He received the Nobel peace prize for 1922. His publications include *Across Greenland*, *Eskimo Life*, *Farthest North*, *Norway and the Union with Sweden*, and *Hunting and Adventure in the Arctic*.

Napier (*nāp'yĕr*; *nâ-pēr'*), **Sir Charles James** (**1782-1853**), British general, was born at London. He served first during the Irish rebellion, 1798. At the battle of Corunna, during the Napoleonic wars, he was severely wounded and was taken prisoner. He then returned to England and devoted himself to literary work. In 1810, he went to the Iberian Peninsula; fought at Coa and Busaco, where his jaw was broken and his eye was injured by a shot; and took part in actions at Fuentes de Onoro and Badajoz, both in 1811.

From 1822 to 1830, Napier was governor of Cephalonia; in 1841, he was sent to India to command the army of Bombay against the Amir of Sind. Here he destroyed the fortification of Emaun Ghur, 1843, and at the battle of Meanee (Miani), with 2800 English and Sepoys, he defeated 30,000 Baluchs. After the annexation he was governor of Sind until 1847.

Napier (*nā'pēr*), **John** (**1550-1617**), Scottish mathematician, was born at Edinburgh. He matriculated at Saint Andrews in 1563, traveled on the continent, and settled down to a life of literary and scientific study. In 1594, he published *Plaine Discovery of the Whole Revelation of Saint John*, which was translated into Dutch, French, and German. What he is remembered for, however, is the discovery of logarithms, probably the most valuable instrument for calculations since the invention of numbers. He explained the system in *Mirifici Logarithmorum Canonis Descriptio*, 1614. He invented a calculating apparatus, known as "Napier's bones." See *Logarithms*.

Napoleon Bonaparte (**1769-1821**), military leader and emperor of France, was born of Italian parents at Ajaccio on the Island of Corsica. After a few months spent in learning French at Autun, he was sent, at the age of 10, to the Military School at Brienne, France, and subsequently to Paris, where, in 1785, he obtained a commission in the artillery. He saw action first at the siege of Toulon in 1793. After the fall of Toulon, Napoleon was suspected, not without reason, of being implicated with the government of Robespierre, and he shared in the disgrace of its fall.

Early Campaigns. Napoleon's defense of the Tuileries in October 1795 led the Directory to put him in charge of the army operating against Italy. Two days before entering upon the campaign, he married Josephine Beauharnais, March 1796. In Italy began the course that marked him as a man of determination, force, and quick action. After his victories there, he decided to move on to Vienna; but Austria made overtures of peace with large cessions of territory.

The Directory placed Napoleon in command of a great expedition then being prepared against Egypt. He reached Alexandria, July 1, 1798, and took possession of Cairo. His fleet, however, was destroyed in the Nile by Nelson. Unable to return to Europe, he immediately prepared an expedition into Turkey. Success attended his first efforts, but he was checked at Acre by British marines under Smith.

Period of Greatest Power. Hearing that the armies at home were meeting with misfortune, Napoleon secretly embarked for France. The revolution of November 10, 1799, gave rise to the formation of a new constitution, and Napoleon, as "first consul," became the virtual ruler of France. In 1800, failing to conclude peace with Austria and England, he determined to stake all on the chance of a campaign, and entered Italy. He won brilliant victories at Marengo and at Hohenlinden, after which he made peace with Austria and England, gaining all Italy.

In August 1802, Napoleon was made consul for life. In this capacity, he reorganized and centralized governmental administration in France. In May 1804, he was proclaimed hereditary emperor of the French and, a year later, king of Italy. England, Russia, and Austria formed against him a coalition, which was dissolved as a result of three great victories won by Napoleon: over the Austrians and Russians at Austerlitz in 1805; over the Prussians at Jena in 1806; and over the Russians at Friedland in 1807.

Napoleon's chief aim was now the humiliation of England. In this, however, he failed, being compelled to witness the defeat of his army in Spain and Portugal and the destruction of his navy assembled for the invasion of Britain. In 1809, Austria attacked Napoleon, but was decisively defeated at Ratisbon and Wagram. With a view to stopping the hostile machinations of the old legitimate dynasties, Napoleon obtained a divorce from Jose-

phine in 1809 and married Maria Louisa, archduchess and daughter of the emperor of Austria.

Downfall. In order to break the power of England, Napoleon had, in 1806, promulgated the Berlin decree, forbidding all trade with England. This decree caused great hardship and discontent on the continent. Russia allied herself with England and was accordingly attacked by Napoleon in 1812. He defeated the Russians at Borodino, September 7, 1812, and entered Moscow. The burning of the city and a subsequent military reverse compelled the French to retreat in the dead of winter. In this disastrous campaign, Napoleon lost nearly 400,000 men as well as much of his prestige. Hastening to Paris, he raised new armies with which to face a combination of all the powers of Europe. After a series of terrible battles, including Lutzen, Boutzen, and Dresden, he made a last stand at Leipzig. Here, in the "battle of the nations," he was overwhelmingly defeated, October 1813. Paris was taken by the allied armies on March 30, 1814. Napoleon was forced to abdicate unconditionally on April 11, 1814. He received the sovereignty of Elba, a small Italian island.

Last Campaign. Napoleon, ascertaining that general discontent in France followed the accession of the Bourbons, left Elba, accompanied by 600 soldiers of the old guard, and landed at Cannes. He entered Paris on March 20, 1815, dethroned Louis XVIII, and re-established himself on the throne of France. He was immediately denounced by the allied sovereigns. Despairing of averting a war by negotiation, Napoleon resolved, with his usual vigor and decision, to strike the first blow. He defeated the Prussians at Flanders, but ultimately suffered an overwhelming defeat at the hands of the English and Prussians on June 18, 1815, at Waterloo.

Banishment. The defeated emperor fled to Paris and finally abdicated in favor of his son, Napoleon II, June 22. Finding escape impossible, he surrendered on July 15 and was carried a prisoner to the island of Saint Helena. The remainder of his life was politically insignificant, but he wrote several able and interesting works, chiefly relating to his eventful career.

Genius and Achievemenst. Napoleon ranks as one of the world's greatest military leaders. His career has been variously estimated, some regarding him as the chief bearer of the Revolutionary gospel to Europe, while by others he has been described as an archadventurer, who used democratic ideas to cloak the most despotic tyranny. His career caused the last remnants of feudalism to crumble and was an important factor in making possible the modern middle-class society. He is responsible also for the codification of French law, which was adopted in many parts of Europe. He was buried at Paris in a mausoleum under the dome of the Hotel des Invalides.

Napoleon III, or **Charles Louis Napoleon Bonaparte (1808-1873),** emperor of the French, was born in Paris. He was the son of Louis Bonaparte, king of the Netherlands, and of Hortense Beauharnais, daughter of Empress Josephine.

In 1830, he took part in a revolutionary movement in Italy and, in 1836, entered France; but, seeking to arouse the soldiery at Strasbourg in his favor, he was taken prisoner and was transported to the United States, whence he went to Switzerland and later to England. In 1840, he landed at Boulogne, again hoping to arouse the French soldiery in his favor. For this second attempt, he was tried for high treason and received a sentence of perpetual imprisonment in the castle of Ham. In 1846, he escaped in the disguise of a workman and once more took up his residence in London.

In 1848, on the abdication of Louis Philippe, the provisional government permitted his return to France. In December of the same year, he was elected by an immense majority president of the newly-constituted republic. In 1851, by his bloody *coup d'état,* Louis Napoleon secured his election as president for ten years. A year later, he again appealed to the people and obtained an almost unanimous vote for the restoration of the empire.

In 1854, Napoleon joined England and Turkey in the war against Russia. In 1859, in behalf of Italy, he entered upon the war with Austria which ended in the Treaty of Villafranca. This was followed by the annexation of Savoy and Nice by France, 1860. He occupied Mexico in 1863, but the issue of that occupation was the execution of the emperor Maximilian in 1867. In 1870, the Franco-Prussian War broke out. This led to the surrender of the emperor and his army at Sedan and to the ultimate re-establishment of the republic. He died at Chistlehurst, England.

Nash, Ogden (1902-), American writer, was born at Rye, New York, and was educated at Harvard. He is a versifier whose comic poems depend for their delightful effect on unexpected rhymes and sophisticated themes. Nash has been a frequent contributor to *The New Yorker.* With Kurt Weill and S. J. Perelman, he wrote *One Touch of Venus,* starring Mary Martin, in 1943. Many collections of his poems have been published, including *Hard Lines* (1931), *The Bad Parents Garden of Verse* (1936), *I'm A Stranger Here Myself* (1938), and *The Private Dining Room* (1953).

Nasser, Gamal Abdel (1918-), Egyptian army officer and political leader, was born in the Assiout Province of Egypt. He is a graduate of the Royal Military Academy, was in active service during World War II, and advanced to the rank of Colonel. He headed the twelve-man Revolutionary Command Council which took over control of the army, forced the abdication of King Farouk, and proclaimed Egypt a republic. After serving as Minister of the Interior and Deputy Prime Minister, he became Prime Minister, but without relinquishing his leadership of the country's military forces. His foreign policy includes rapprochement and leadership with regard to Arab states, continued hostility toward Israel, and cautious acceptance of Soviet aid, particularly in the completion of his major project, the Assuan Dam. As between the Communist world and the West, he has sought to maintain an attitude not so much of passive neutrality as of resolute independence.

In June 1956 Nasser was elected first president of the Republic of Egypt. Following the withdrawal of proposed loans by the United States, Britain, and the International Bank to finance the Assuan Dam, President Nasser in July decreed the seizure of the Suez Canal Company and nationalization of the canal. Joint military action by Great Britian and France to regain control of the canal and by Israel to stop Egyptian border attacks halted canal operations. The United Nations international police force took over disputed Suez points after the UN had obtained a cease-fire and withdrawal of the invading forces. An important step in his program of expansion was the merging of Syria with Egypt to form a single state known as "The United Arab Republic."

Nathan, George Jean (1882-1958), American editor and dramatic critic, was born at Fort Wayne, Ind. Educated at Cornell and Bologna universities, he joined the editorial staff of the New York *Herald* in 1905. His incisive views on acting and the other theater arts made him a valued contributor to numerous magazines of a sophistic type, including *Smart Set,* of which he was editor, with H. L. Mencken, from 1914 to 1923, the two then founding, and editing until 1930, the *American Mercury.* His publications include *Bottoms Up, The World in Falseface, The House of Satan, Art of the Night,* and *Encyclopedia of the Theatre.*

Nebuchadnezzar (*nĕb'ŭ-kăd-nĕz'ar*), **(? - c. 562 B.C.),** king of Babylon, was the son of Nabopolassar. Proceeding by command of his father, Nebuchadnezzar defeated Necho, king of Egypt, and conquered Palestine. In 605 or 604 B. C., he became king; took Jerusalem about 597; and made Zedekiah king as his vassal. Zedekiah soon rebelled and Nebuchadnezzar again took Jerusalem after a terrible siege, destroyed the temple, threw down the walls of the city, and carried the people captive to Babylon. He took Tyre after a siege of 13 years, overran Egypt, and became one of the most powerful sovereigns of his time. His restoration of Babylon by the erection of walls, magnificent temples, and other notable structures has been revealed in modern times by archeological excavations. He became insane in his later years.

Necho (*nē'kō*) **(? - 594 B. C.),** Egyptian king, the Pharaohnechoh of the Bible and the Nechos of Greek writers, succeeded Psammetichus in 610 B. C. When the Assyrian empire fell, Necho endeavored to conquer Syria and, at the beginning of his campaign, defeated and slew Josiah, king of Judah, at Megiddo, and, shortly afterward, deposed Josiah's son Jehoahaz, elevating Eliakim in his stead. Necho extended his conquests to the Euphrates, but was driven back by Nebuchadnezzar. He ruled Egypt with vigor, sending an expedition by sea around Africa, and attempting a canal from the Nile to the Red Sea.

Necker (*nĕk'ĕr,* F., *nĕ'kâr'*), **Jacques (1732-1804),** French financier and statesman, was born at Geneva. He became a banker at Paris, where his financial ability and his economic writings led to his appointment as director of the finances in 1776. His reforms excited the hostility of the court, and he was dismissed in 1781. In 1788 he was recalled and supervised the assembling of the States-General. Again abruptly dismissed by the king, the States-General forced his recall. In 1790 the revolutionary factions turned against him, and he was forced to leave France. He died in Switzerland. His daughter was the famous Madame de Staël.

Needham, Joseph (1900-), biologist, son of a British physician, has made world-wide contacts through his studies in biochemistry. He has lectured at Stanford, Yale, Cornell, Johns Hopkins, and other universities in the United States and at leading institutions in England, on the Continent, and in the Far East. As head of a British scientific mission to Chungking during World War II, he became interested in Chinese history and has written a comprehensive work, *Science and Civilization in China* (1954). He also wrote *Heavenly Clockwork* (1960).

Nehru (*nā'rōō*) **Jawaharlal, Pandit** (**1889-1964**), Indian politician, was born at Allahabad of a wealthy Hindu family. He was educated in England. Returning to India in 1912, he joined the nationalist movement, and was a member, and three times president, of the Indian National Congress. His opposition to the government led to his imprisonment on several occasions. In 1947 he became the first premier of the Dominion of India. An avowed pacifist, except toward Pakistan, he maintained an uneasy neutrality as between Soviet Russia and the West.

Neihardt (*nī'härt*), **John Gneisenau** (**1881-**), American poet, was born at Sharpsburg, Ill. From 1901 to 1907, he lived among the Omaha Indians. The result was an epic cycle: *The Song of Hugh Glass, The Song of Three Friends,* and *The Song of the Indian Wars,* based on the relations of Indians and whites. He was professor of poetry at the University of Nebraska, and literary editor of the St. Louis *Post-Dispatch.* In 1944 he was appointed director of information in the Office of Indian Affairs at Chicago. His other poetic works include *The Lonesome Trail, Black Elk Speaks, The Song of the Messiah,* and *The Song of Jed Smith.*

Nelson, Horatio, Viscount (**1758-1805**), English admiral, was born at Burnham Thorpe, Norfolk. He entered the navy in 1770 and was promoted to a lieutenancy in 1777. In 1782, he acted under Lord Hood in American waters.

On the eve of the French Revolutionary War, he was again called into service. In command of the *Agamemnon* he advanced his reputation by gallant conduct, losing his right eye during the storming of Calvi, in Corsica. His conspicuous bravery at the engagement with the Spaniards off Cape Saint Vincent in 1797 brought him the rank of rear admiral. In the same year he lost his right arm at Santa Cruz and, in the following year, with an inferior force, annihilated the French fleet in the Bay of Abukir, for which act he was raised to the peerage as Baron Nelson.

In 1801, for his victory over the Danish fleet at Copenhagen, he was made viscount and commander in chief. During the threatened Napoleonic invasion, he kept a vigilant watch in the channel. In 1805, he crowned his great career by a memorable victory off Trafalgar over the French fleet commanded by Villeneuve. It was before this battle that Nelson gave his famous signal "England expects that every man will do his duty." The admiral was mortally wounded in action and died the same day.

Nelson, Knute (**1843-1923**), American lawyer and legislator, was born in Norway. He came to the United States in early childhood, lived in Wisconsin and Minnesota, and served in the Civil War. He was admitted to the bar in 1867 and served in the legislatures of Wisconsin and Minnesota. In 1892 and in 1895 he was chosen governor of Minnesota and, from 1895 to 1923, he represented Minnesota in the United States Senate as a Republican of independent views. He was the author of the act creating the Department of Commerce and Labor.

Nepos (*nē'pŏs*), **Cornelius,** Roman historian, was born probably at Verona and flourished during the time of Julius Cæsar and the first years of the reign of Augustus. He enjoyed the friendship of Cicero. His only extant work, *Vitæ Excellentium Imperatorum,* is held in high esteem as an educational class book. It is a series of brief biographies, based mainly on Greek sources.

Nero Claudius Cæsar Drusus Germanicus (**37 A.D.-68 A. D.**), Roman emperor, was born at Antium, in Latium. His father was a Roman consul and his mother was Agrippina, daughter of the emperor Germanicus. He was adopted by the emperor Claudius, who had married Agrippina, and, four years later, he succeeded Claudius on the throne, which he occupied for 14 years.

His whole reign was characterized by licentiousness, brutality, and cruelty. In order to please his mistress Poppæa Sabina, he put his mother to death, on the plea that she had plotted against him; and he afterward murdered his wife, Octavia, in order to marry the same mistress.

A fire destroyed a great part of Rome in Nero's reign. It is asserted by some writers that the city was set on fire by the order of Nero, who attributed the fire to the Christians and persecuted them with the most unrelenting cruelty. He afterward killed Poppæa Sabina; murdered Antonia, the daughter of Claudius, because she refused to marry him; and finally married Statilia Messalina, whose husband he had put to death. The philosopher Seneca, who had been his tutor, and the poet Lucan took their own lives at his order. Finally the senate declared him an enemy of his country and he committed suicide.

Nerudo, Pablo (**1904-**), pseudonym of Ricardo Neftali Reyes, Chilean poet and political leader. At the age of 17 he was awarded a prize for a poem, *La Cancion de la Fiesta,* in the annual spring contest at Santiago. Then followed many poems, usually on conventional themes but written in an original style. Travel and years spent as Consul at Rangoon, Batavia, Ceylon, Madrid, and finally Mexico City, gave him opportunity for wider development but his poetry gradually became more political in theme and outlook. Sympathy with the Republicans during the Spanish Civil War completed his orientation toward the Left, and on his return to Chile he was elected Senator on the Communist ticket. As the outcome of a quarrel with President Videla he fled to Mexico and remained there until an administration more friendly to him was chosen to succeed Videla's. While in Mexico he completed his most ambitious work, *Canto General,* for which the Mexican artist Diego Rivera supplied part of the illustrations. Available to English readers is the collection of poems entitled *Residence on Earth.* Examples and discussions of his poetry may be found in *Poetry* magazine for May 1943, January and June 1945, and January and May 1952.

Nervi, Pier Luigi (**1891-**), engineer and architect, was born in Lombardy, Italy, and studied civil engineering at the University of Bologna. He became designer for the *Societa Costruzioni Cementizia* of Bologna and Florence, in which capacity he has created daring original concrete structures. He is enthusiastic over the way in which concrete, being fluid, responds to basic design, but he says the design must flow from within, not be forced from the outside. Among unusual creations such as showrooms, hangars, and restaurants, his UNESCO buildings at Paris are considered to be his finest work.

Nestorius (*nĕs-tō'rĭ-ŭs*), (**? - c. 451**), bishop of Istanbul, was born in Syria. He was made patriarch of Istanbul in 428, was deposed for heresy by the council of Ephesus in 431, and was banished to the Libyan Desert. The heresy he taught, called Nestorianism, was that the two natures, the divine and the human, coexist in Christ, but are not united. He would not allow the Virgin Mary the title that had been given to her as the "Mother of God." The orthodoxy of the Church, as against the doctrine of Nestorius, was championed by Cyril of Alexandria.

Nevin, Ethelbert (**1862-1901**), American composer, was born at Edgeworth, Pa. As a child he was a remarkable pianist; later he studied in Europe under von Bülow and Klindworth, exhibiting a rare gift for composition. From 1887 to 1893, he taught in Boston, then studied in southern Europe until 1900, when he returned and associated himself with Horatio Parker at Yale. His compositions, all cast in miniature form, are characterized by dainty originality and exquisite melody. *Narcissus,* one of a group entitled *Water Scenes,* and a song, "The Rosary," are among the most popular.

Nevins, Allan (**1890-**), American historian and educator, was born at Camp Point, Ill., and was graduated from the University of Illinois. From 1913 to 1927, he worked mainly as an editorial writer on the New York *Evening Post,* the *Nation,* and the New York *World.* In 1927, he became an instructor in American history at Cornell University, and in 1931 at Colombia University, where he has achieved eminence as a foremost authority on the development of the United States. Nevins's work is marked by literary ability and a broad range of period and subjects. He has edited the diaries and letters of many noted Americans, written biographies (that of Grover Cleveland won him a Pulitzer prize in 1932), and lucid accounts of critical historical periods. His *Inner History of the Grant Administration* won a Pulitzer prize in 1937. The first two volumes of his most monumental work, dealing with the background of the American Civil War, were published in 1946, and entitled *The Ordeal of the Union,* followed by the two-volume *The Emergence of Lincoln* in 1950. Nevins held the honored chair of Harmsworth Professor of American History at Oxford in 1940-41. During World War II, he served as a public affairs officer.

Newall of Clifton-upon-Dunsmoor, Cyril Louis Norton, Baron (**1886-**), British soldier, was born in India. Educated at the Royal Military College, Sandhurst, Eng., he served in the British army in India, where he learned flying in 1911 and helped establish the first flying school in India. In World War I, he was advanced to leadership on a brigade of the air force. He held various positions in the royal air force thereafter, being appointed marshal of the Royal Air Force in 1940. The test of his career came in that year, when Germany attacked England by air on a scale never before attempted in warfare. Newall's preparations, both technical and in the training of men ,was sufficiently effective to prevent a projected invasion, hold down bombing losses, and later turn the scales. From 1941 to 1946 he was governor general of New Zealand. He was raised to peerage in 1946.

Newcomb (*nū'kŭm*), **Simon** (**1835-1909**), astronomer and mathematician, was born in Wallace, N. S. He came to the United States in 1853; was graduated from Harvard, 1858; and was appointed professor of mathematics, United States navy, in 1861, in which position he oversaw the construction of a telescope completed in 1873. From 1877 to

1897, he was director of the *Nautical Almanac*; was professor of mathematics and astronomy, Johns Hopkins, 1884-94.

Newcomb established formulas from which it was possible to construct accurate lunar tables. His tables of the planetary system were adopted by nearly all the observatories of the world. His numerous writings include *Popular Astronomy, Principles of Political Economy, His Wisdom the Defender, Reminiscences of an Astronomer,* and *Side Lights on Astronomy.* He was elected to the American Hall of Fame in 1935.

Newcomen (*nū-kŭm'ĕn*), **Thomas (1663-1729),** English inventor, was born at Dartmouth. A blacksmith by trade, he is known chiefly as the inventor of the atmospheric steam engine. In this engine, steam was admitted into the cylinder and was then suddenly condensed by a stream of cold water, thus creating a vacuum into which the piston was driven by atmospheric pressure. This engine was commonly used for pumping. Watt's acquaintance with it was a contributing cause of the invention of his engine, in which steam provided the motive power. See *Steam Engine.*

Newman, John Henry (1801-1890), English prelate and author, son of a London banker, was born in London. He was graduated from Trinity College, Oxford, 1820; was ordained to the ministry of the Angelican Church in 1824; and, in 1828, became vicar of Saint Mary's. He was a leader in the tractarian, or Oxford, movement and, in 1841, wrote *Tract XC,* which was severely condemned by officials of the Angelican Church.

After three years of retirement, Newman became a convert to the Roman Catholic Church. As he had exerted great influence among the Angelicans, the effect of this step was great. He went to Rome and was ordained a priest; founded the Brompton Oratory in 1850; and directed the Edgbaston Oratory for many years. He took part in controversies with Kingsley in 1864 and with Gladstone in 1874. He was created cardinal in 1879. Among his chief works are *Apologia pro Vita Sua, An Essay in Adi of a Grammar of Assent,* and *The Dream of Gerontius.* He wrote also the well-known hymn, "Lead Kindly Light." See *Oxford Movement.*

Newton, Sir Isaac (1642-1727), English mathematician and scientist, was born at Woolsthorpe near Grantham, Lincolnshire, England. He obtained his early education at Grantham Grammar School, where he already showed a keen interest in mechanical contrivances. In his 15th year, he was recalled from school to assist in the management of the family's farm. Having demonstrated his unfitness for the business of a farmer, he was sent back to school at Grantham. In 1661, he was admitted to Trinity College, Cambridge, at which he was graduated with the degree of master of arts in 1668. While at Cambridge, he formulated the binomial theorem.

Early Discoveries. In May 1665, Newton committed to writing his first ideas on fluxions, or the calculus, a discovery which afterward gave rise to a controversy with Leibnitz as to priority. In 1665, he discovered the unequal refrangibility of light and the nature of colors. Driven from Cambridge by the plague of this year, he went to Woolsthorpe. It is said that, at Woolsthorpe, in 1666, the fall of an apple, as Newton sat in his garden, suggested to him the most magnificent of his later discoveries, the law of gravitation.

The Law of Gravitation. On his first attempt, however, by means of the law so suggested to his mind, to explain the lunar and planetary motions, he employed a current estimate of the radius of the earth which was so erroneous as to produce a serious discrepancy between the real force of gravity and that required by theory to explain the motions. He accordingly abandoned the hypothesis and returned to his inquiries into the application of fluxions and to the construction of a small telescope, which he completed in 1668. The next year, Newton was appointed to the Lucasian chair of mathematics at Cambridge. In 1672, he was elected a member of the Royal Society, to which he disclosed, in February of that year, his discovery of the composition of light.

Newton had long since deduced from the laws of Kepler the important law that gravity decreases with the square of the distance. In 1682, he heard of Picard's more accurate measure of the earth's diameter, and, repeating with this measure his former calculations, he found to his extreme delight that the force of gravity by which bodies fall at the earth's surface, 4000 miles from the earth's center, when diminished by the reciprocal of the square of 240,000 miles, the moon's distance, was almost exactly equal to that which kept the moon in its orbit. Hence it followed that the same power retained all the other satellites round their primaries and all the primaries round the sun.

Newton had surmounted the difficulties of the planetary motion. The results of his profound studies were afterward set forth in his immortal work, the *Principia,* 1686-87. In this book, written in Latin, Newton established the science of theoretical mechanics as it exists today. In the whole history of science, no single contribution of any man has been as great as this.

Public Services. Shortly before the *Principia* was given to the public, Newton had been called to take an active part in defending the rights of Cambridge University against the illegal encroachments of James II. He sat in the Convention Parliament, 1689-90. He was made warden of the mint in 1696, and, three years later, he was appointed master of the mint, an office which he held until the end of his life. Newton again took a seat in Parliament in 1701, as the representative of his university. In 1705, he was knighted. In Parliament, he recommended the public encouragement of various inventions. He was president of the Royal Society from 1703 until his death, a period of 25 years. Newton died at Kensington and was interred in Westminster Abbey.

Ney (*nā*) **Michel (1769-1815),** marshal of France, the son of a cooper, was born in Saarlouis. He entered the army as a private hussar in 1788; became a general of brigade in 1796; and distinguished himself by his bravery in the wars of the Revolution and of the Empire. He earned for himself from the army under Napoleon and from Napoleon himself the title of "the bravest of the brave." When Napoleon abdicated in 1814, Ney attached himself to Louis XVIII, but, on the former's return from Elba, he joined his old master and commanded the Old Guard at Waterloo. On the second return of the Royalists to power, he was arrested, tried by his peers, and shot.

Nicholas II (1868-1918), last emperor of Russia, son of Alexander III, whom he succeeded, was born in Leningrad. His coronation as czar took place with impressive ceremonial at Moscow, 1896. Proposals for avoiding war, made to the powers in 1896, led to the First Peace Conference at The Hague in 1899 and to the establishment of the Permanent Court of Arbitration. His reign was marked by the construction of the Trans-Siberian Railroad to the Pacific Coast, by the Russo-Japanese War, by the granting of a constitution in 1905, and by participation in World War I. Increasing dissatisfaction with his rule in internal as well as external affairs culminated in the Russian Revolution. He was dethroned in March 1917 and, with his whole family, was officially murdered in July 1918.

Nicholson, Meredith (1866-1947), American novelist, was born at Crawfordsville, Ind. He received his education in the public schools of Indianapolis. In 1891, he published a volume of poems called *Short Flights* and, in 1900, an account of Indiana authors entitled *The Hoosiers.* In 1905, he produced the widely popular novel *The House of a Thousand Candles.* His writings include also *The Main Chance, The Port of Missing Men, The Little Brown Jug at Kildare, The Lords of High Decision, Old Familiar Faces,* and *The Poet,* a fictionized biography of James Whitcomb Riley. He later entered politics and held diplomatic posts in Paraguay, Venezuela, and Nicaragua.

Nicias (*nĭsh'ĭ-ăs*) **(? - 413 B.C.),** Athenian statesman and general, was the son of the wealthy Niceratus. After the death of Pericles, he was the political opponent of Cleon and later of Alcibiades, attracting to his cause the more conservative elements in the state. In the Peloponnesian War, Nicias was opposed to vigorous prosecution of hostilities against Sparta. In 415, he was appointed one of the commanders against Sicily in spite of the fact that he opposed that ruinous expedition. At first, he was successful; but later his fleet was destroyed, his army began a retreat, and he was captured and put to death.

Nicolle (*nē'kŏl'*), **Charles Jules Henri (1866-1936),** French bacteriologist. From an assistant professorship at the Rouen School of Medicine, he was called to the Pasteur Institute at Tunis. There he served also as surgeon in the French army, stationed at Algiers. In 1909, he made the first of a series of discoveries by which he demonstrated that typhus germs are transmitted through lice. This led to his development of a vaccine which imparts immunity to the human organism. His researches, with their promise of wiping out typhus as a plague, were signalized by the award of the 1928 Nobel prize in medicine.

Niehaus (*nē'hous*), **Charles Henry (1855-1935),** American sculptor, was born at Cincinnati, Ohio. He was educated in the public schools of Cincinnati and at the Royal Academy, Munich, and studied classical sculpture at Rome. His ability is best displayed in his monumental sculpture, which exhibits dignity of composition and purity of line. He executed the Garfield Statue, Cincinnati; statues of Ingalls, Allen, Garfield, and Morton in the rotunda of the Capitol, Washington; statues of Gibbon and Moses, Congressional Library; statues of Hooker and Davenport, Connecticut Statehouse; an equestrian statue of General Forrest, Memphis, Tenn.; a statue of McKinley at Canton, Ohio; the pediment of the State Capitol at Frankfort, Ky.; the John Paul Jones Monument in Washington; and Soldiers' and Sailors' memorials in New Jersey.

Nietzsche (*nē'chē*), **Friedrich Wilhelm** (**1844-1900**), German philosopher, was born at Rocken, near Leipzig. He was educated at the universities of Bonn and Leipzig. He was at first the friend and follower of Wagner in art and Schopenhauer in philosophy, although later both fell under his condemnation. At 25, he became professor of philology at Basel, resigning in 1879 from failing health.

In the ensuing ten years, he wrote, often during acute physical distress, the daring philosophical essays on which his fame rests. He maintained that there are two fundamental ethical types: the morality of slaves, or the weak and inferior among mankind, who foster all virtues that protect their weakness; the morality of the strong, the masters of mankind, who stand superior to the common mass of slaves and have no need for their utilitarian virtues. He denounced Christian morality as belonging to the slave type, asserting that only through the morality of the strong can men, that is, the few, the masters, rise to higher stages and attain the state of the "superman."

Among his works are *Thus Spake Zarathustra*, *Beyond Good and Evil*, *The Genealogy of Morals*, *The Twilight of the Gods*, and *The Will to Power*. His latest works are characterized by an insane egoism, the symptom of a mental disease from which he suffered before his death.

Nightingale, Florence (**1820-1910**), a philanthropic nurse, was born of wealthy English parents at Florence, Italy. At the age of 22, she entered a training school for nurses and she afterward studied the methods of nursing and hospital management with the sisters of Saint Vincent de Paul, Paris. In 1854, she volunteered to organize a staff of nurses for service in the Crimean War, and, during the terrible winter of 1854-55, she ministered with unwearied devotion to the suffering soldiers. On her return to England in 1856, she established a training college for nurses at Saint Thomas's and King's College hospitals. It was largely due to her influence that women were first employed as nurses for military hospitals.

Nijinsky (*nĭ-zhĭn'skĭ*), **Vaslav** (**1890-1950**), world-famous dancer and choreographer, was born in Russia, of Polish parents. A protege of Diaghilev, to whose company he once belonged, Nijinsky rose rapidly to the highest rank as a dancer. Two ballets created especially for him by Michael Fokine were *Spectre de la Rose* and *Petruchka*. Nijinsky's reputation as a choreographer rests upon four ballets which he originated: *Till Eulenspiegel*, *L'Apresmidi d'un Faun*, *Jeux*. and *Sacre du Printemps*. In 1919, at the height of his fame, he became mentally ill. The best of treatment encouraged the hope that he might return to the ballet stage, but he died without regaining his sanity.

Nimitz, Chester William (**1885-**), American naval officer, was born at Fredericksburg, Tex. After being graduated from Annapolis in 1905, he rose through the grades to rear-admiral in 1938. He was chief of the Bureau of Navigation when, after the disaster at Pearl Harbor, he was placed in command of the Pacific fleet with the rank of admiral. The fleets under his command checked the Japanese advance at the Coral Sea and Midway; occupied or cut off their posts in Micronesia; and crushed Japanese naval power. He was made admiral of the fleet in 1944 and chief of naval operations, 1945. Retired, 1947. He was named head of the Truman Commission on Internal Security and Individual Rights, 1951.

Nixon, Richard Milhous (**1913-**), lawyer and politician, was born in Yorba Linda, California. After attending Whittier College, he was graduated from Duke University Law School, and was admitted to the California bar. He practiced law in Whittier, California. After serving as an officer in the United States Navy during World War II, he was elected to Congress from California in 1946 and was reelected in 1948. He gained prominence while a member of the Committee of Un-American Activities for his work in exposing disloyal persons. In 1950 he was elected to the United States Senate, and in 1952 and 1956 he was the successful Republican candidate for vice president. In 1960, as his party's nominee for the presidency, he was defeated by John F. Kennedy.

Nobel (*nô-bĕl'*), **Alfred Bernhard** (**1833-1896**), Swedish chemist and inventor, was born at Stockholm. In 1862, his father, a mechanician, began to manufacture nitroglycerin. In 1867, through the accidental escape of some nitroglycerin from a cask into the siliceous sand of the packing, Alfred discovered how to make a safe and manageable explosive—dynamite. He also invented blasting gelatin and several kinds of smokeless powder. Ultimately he patented more than 100 inventions and established manufactories in various parts of the world.

At his death he left a fund of $9,200,000 to provide five annual prizes to be awarded to the persons making the most important contribution in physics, chemistry, physiology or medicine, literature, and the cause of world peace. These prizes amount to about $40,000 each, and the first awards were made in 1901. See *Nobel Prizes*.

Nogi (*nô'gē*), **Maresuke, Count** (**1849-1912**), Japanese general, was born in Choshu. He served in the Satsuma rebellion of 1877 and was twice severely wounded. In the Chinese-Japanese War of 1894-95, he commanded a brigade at the battles of Kinchow and Port Arthur and, at the conclusion of the war, was promoted lieutenant general. While in command of the third army in the Russo-Japanese War, he captured Port Arthur, 1905. He was created baron in 1895, and count in 1906.

Nordau (*nôr'dou*), **Max Simon** (**1849-1923**), German physician and writer, of Jewish descent, was born at Budapest. He received his university education at Budapest, Berlin, and Paris; traveled through Europe; and took up his residence in Paris, 1880. His books on moral and social questions, more especially two in English translation, *Lies of Our Civilization* and *Degeneration*, led to extensive discussion. The latter argued that genius is allied to degeneration. They were followed by *The Drones Must Die*. He published works also in Italian and French. His body was transferred from France in 1926 to Tel Aviv, Palestine.

Nordenskjöld (*nōōr'dĕn-shûld'*), **Nils Adolf Erik, Baron,** (**1832-1901**), explorer and geologist, was born at Helsinki, Finland. He was educated at the University of Helsingfors and was appointed curator of the faculty of mathematics and physics. In 1855, he was dismissed for political reasons and left the country. In 1858, he was appointed state mineralogist at Stockholm, having obtained letters of naturalization as a Swedish subject.

Nordenskjöld conducted several voyages of exploration in the Arctic Ocean and made frequent visits to Spitsbergen, where he measured an arc of the meridian In 1878-79, he discovered the so-called Northeast Passage, traversing, along the northern shores of Europe and Asia, the whole Arctic sea from the Atlantic to the Pacific. Proceeding on his cruise, he was the first to circumnavigate Asia and Europe. For these achievements he was made baron in 1880.

Nordica (*nôr'dĭ-kä*), **Lillian** (**1859-1914**), née Lillian Norton, American singer, was born at Farmington, Me. Her musical education was obtained at the New England conservatory, Boston, and at Milan, Italy.

She made her debut as an operatic soprano at Brescia, Italy, in *La Traviata*. In 1887, she appeared in London with marked success, continuing her triumphs in Paris, Leningrad, and other European capitals. She was best known in Wagnerian roles.

Possessed of a magnificent voice, a pleasing presence, and marked dramatic ability, she ranked among the foremost American singers of her time and won great distinction abroad. While engaged in a world tour, she contracted pneumonia from exposure in shipwreck and died at Batavia, Java (now Jakarta, Indonesia).

Norris, Benjamin Franklin (**1870-1902**), American novelist, generally known as Frank Norris, was born in Chicago. He studied art in Paris, 1887-89, and pursued literary courses at the University of California and at Harvard, 1890-95. He was war correspondent in South Africa at the time of the Jameson raid; was editor of the San Francisco *Wave*, 1896-97; and, during the Spanish-American War was correspondent in Cuba for *McClure's Magazine*.

His story of San Francisco slums, *McTeague*, published in 1899, was his first successful novel. This was followed by an ambitious trilogy comprising *The Octopus*, *The Pit*, and *The Wolf*—the last left unfinished. This series was intended to constitute the epic of wheat and contains an arraignment of the evils of railway monopoly and grain speculation. See *Octopus, The*.

Norris, George William (**1861-1944**), American legislator, was born in Sandusky County, Ohio. Working his way through school by doing farm work and by teaching, he succeeded in obtaining a law degree at Valparaiso University and began practice of law in Nebraska in 1885. Entering politics, he began in 1903, a distinguished career in Congress as a progressive Republican and later as an independent. For 10 years he sat in the House and then was elected to the Senate for five successive terms but was defeated in 1943. In the face of the most intense popular pressure he voted against war with Germany in 1917. He sponsored, among other measures, the anti-injunction act of 1932; the 20th, or "lame duck," amendment to the Constitution; and the establishment of the Tennessee Valley Authority. In Nebraska he brought about the change to a unicameral legislature.

Norris, Kathleen (**1880-**), née Kathleen Thompson, American author, was born at San Francisco. In 1909, she married Charles Gilman Norris. In the following year, she began writing short stories and contributed to the leading popular periodicals of America. Her works include *Mother*, *The Story of Julia Page*, *The Heart of Rachael*, *Undertow*, *The Beloved Woman*, *Certain People of Importance*, *Wife for Sale*, *Lost Sunrise*, and *Corner of Heaven*.

Norstad, Lauris (1907-), American Air Force officer, was born in Minneapolis, Minn., the son of a Lutheran minister whose father had emigrated to the United States from Norway. During World War II he served in Europe and Africa, rising from the rank of major general in the Air Force to that of lieutenant general, his promotion coming as a result of his great skill in staff work. In 1952 he was made a general. Soon after the creation of NATO, General Norstad became commander in chief of the U. S. and Allied Air Forces in Central Europe. In 1956 he succeeded General Gruenther as supreme allied commander. From 1956 to 1962 he served as head of the NATO forces.

North, Frederick North, Baron (1732-1792), English statesman, was educated at Oxford. He entered the House of Commons at the age of 22 and was made junior lord of the treasury in 1759. In 1767, he was appointed Chancellor of the Exchequer and leader of the House of Commons, being there opposed to Fox and Burke. In 1770, he became Prime Minister and his course, to a large extent, caused England to lose the American colonies. He resigned in 1782.

North, Sterling (1906-), American critic and author, was born in Edgerton, Wis., and studied at the University of Chicago. He has been a book reviewer and literary editor of metropolitan newspapers for over 20 years. From 1933 to 1943, he was literary editor of the Chicago *Daily News*. He was then literary editor of the New York *Evening Post*, and literary editor of the New York *World-Telegram and Sun*, 1949–56. His columns, pungent and outspoken, were syndicated to many papers across the country. North, who is the author of twenty published books, drew upon his youth in Wisconsin to write two sensitive novels, *Plowing on Sunday* (1934) and *Night Outlasts the Whippoorwill* (1936). He also has written another novel, *Seven Against the Years* (1939), and several children's books. His *So Dear to My Heart* was made into a motion picture by Walt Disney.

Northcliffe, Alfred Charles William Harmsworth, Viscount (1865-1922), British newspaper proprietor, was born in Chapelizod, Ireland. In 1888, he founded the weekly periodical *Answers*, which had an immediate success. In 1894, he bought the London *News* and, two years later, founded the *Daily Mail*. He subsequently founded the Glasgow *Daily Record*, acquired the Leeds *Mercury*, the Birmingham *Gazette*, and the London *Times*. He was elevated to the peerage in 1905.

After the outbreak of World War I, he conducted a vigorous editorial campaign to secure greater efficiency in providing military equipment and munitions. In June 1917, Northcliffe was sent to the United States as special representative of the British government to co-ordinate the work of the various war commissions. He was also made director of propaganda in enemy countries.

The influence which Northcliffe was able to wield by means of his chain of newspapers was an unprecedented factor in British public life.

Norton, Charles Eliot (1827-1908), American educator, critic, and scholar, was born at Cambridge, Mass. He was graduated from Harvard, 1846, and entered a counting-house in Boston. He went as supercargo on an East Indian voyage, 1849; later made several trips to Europe; and became known as a Dante scholar and an authority on art. From 1864 to 1868, he was editor, with James Russell Lowell, of the *North American Review*. He was professor of the history of art at Harvard, 1875-98.

By his finely endowed personality, he exercised a great cultural influence upon his generation. Among his writings are *Considerations on Some Recent Social Theories*, *Historical Study of Church-Building in the Middle Ages*, and translations of Dante's *Vita Nuova* and *Divina Commedia*.

Nostradamus (1503–1566), This French astrologer, less commonly referred to by his name Michel de Notredame, was a doctor of medicine, successful in combating the plague, who at one time was attached to the court of Charles IX. He is remembered chiefly for his book of rhymed prophecies. Some of his predictions have come true, especially when a favorable interpretation is given to their somewhat ambiguous phrasing.

Nourse, Elizabeth (1860-1938), American painter, was born at Cincinnati, Ohio. She began study at the Cincinnati Art School at 13 and, by designing and decorative work, earned means to continue study in Paris, where her teachers were Boulanger and Lefebvre. Continuing to work in Paris, she became one of the ablest American painters in France. Her painting "Closed Shutters" was purchased by the French government for the Luxembourg Gallery. Among her other paintings are "Good Friday in Rome," "Consolation," and "The Family Repast." Her work is represented in America in the Chicago Art Institute, the Detroit Art Museum, and other collections.

Noyes (*noiz*), **Alfred (1880-1958)**, English poet, was born in Staffordshire. He received his education at Exeter College, Oxford. From early life he devoted himself to literature. He contributed numerous poems and critical articles to English and American reviews. In 1913, he gave the Lowell lectures on "The Sea in English Poetry" in Boston. He was elected to the professorship of modern English literature at Princeton University in 1914. During World War I, he was temporarily attached to the British foreign office. His many books of prose and verse include *The Loom of Years*, *The Flower of Old Japan*, *Forty Singing Seamen*, *The Enchanted Island*, *Tales of the Mermaid Tavern*, *The Winepress*, *Walking Shadows*, *The Elfin Artist*, *Torch-bearers*, *The Unknown God*, and *Voltaire*. His autobiography, *Two Worlds for Memory*, was published in 1953.

Noyes, John Humphrey (1811-1886), American religious leader, was born at Brattleboro, Vt. After graduation from Dartmouth College, he became a Congregational minister in 1833.

Professing a second conversion and a revelation of the dual sexual nature of God, he gathered around him, in 1838, a group which attempted to return to the communism of the early Church. Property was held in common and a system of complex marriages led to a communism in the care of children. The community was forced to migrate to Oneida, N. Y., where the hostility chiefly of the Protestant churches induced an abandonment of the more distinctive institutions of the community. In 1881, most of the members formed a joint stock company, which has become known especially for the manufacture of silverware.

Nye, Edgar Wilson (1850-1896), "Bill Nye," American writer and humorist, was born at Shirley, Me. After spending his childhood in Wisconsin, he went to Wyoming; studied law; was admitted to the bar in 1876; and was elected to the state legislature. He also acted as postmaster and newspaper correspondent. Through his humorous contributions to the press he achieved wide popularity. His health failing, he returned East, finally settling in New York. In company with James Whitcomb Riley, he made frequent tours of the country, giving entertainments consisting of lectures and readings. His writings include *Bill Nye and the Boomerang*, *The Forty Liars*, *Baled Hay*, *Remarks*, *Chestnuts*, *Bill Nye's Blossom Rock*, *The Cadi*, and comic histories of England and the United States.

Nyerere, Julius K. (1922–), teacher and political leader, was born in Tanganyika. He was educated in the schools there and at Edinburgh University. In 1960, having gained prominence as leader of the Nationalist Movement, he became president of newly-independent Tanganyika. He was largely responsible for the union, in 1964, between Tanganyika and Zanzibar.

Oakley, Annie (1860-1926), a crack shot with a rifle or shotgun, was for many years the female star of Buffalo Bill's wild west show. Phoebe Anne Oakley Mozee was born in Darke County, Ohio, and learned to handle a gun when she was nine. She married a vaudeville actor, Frank E. Butler, from whose lips she could shoot a cigarette at 30 feet, or a dime held between his finger and thumb. Joining Buffalo Bill in 1885, she appeared in calf-high scalloped boots, a sombrero, and cowgirl garments, and her specialty was breaking glass balls thrown several at a time into the air to a height of 45 feet. The "infallible little shot" could handle a horse as well as a gun. She died at Greenville, Ohio.

Oberlin (*ō'bĕr-lĭn*), **Jean Frédéric (1740-1826)**, Alsatian clergyman and philanthropist, was born in Strasbourg. He was educated at Strasbourg University; studied theology; and became a Lutheran clergyman. He was celebrated for his philanthrophy and for his services to the population of Ban de la Roche, among whom he labored for 60 years. He made roads, improved the system of agriculture, and promoted education. At the time of the French Revolution, not only was Ban de la Roche saved, through the reputation of the people and their pastor, from all molestation, but Oberlin was able to offer an asylum to proscribed persons. Oberlin College, Ohio is named for him.

Obregon (*ō'brâ-gōn'*), **Alvaro (1880-1928)**, Mexican statesman, was born in Nogales, Sonora, Mex., of Basque and Yaqui parentage. Joining Carranza in 1913, he distinguished himself by defeating Huerta and winning several other victories at the head of a Constitutional army. In 1915, he opposed Villa, over whom he won four victories.

After serving as Carranza's minister of war, he resigned in May 1917 and retired to his estate, where he accumulated a fortune by controlling the chick-pea crop on the Western Coast. Becoming a candidate for the presidency, he was charged by Carranza with rebellion and was arrested. He escaped; raised an army; succeeded in driving Carranza from power; and was elected president in 1920.

Obregon's administration resulted in substantial progress in carrying out the revolutionary program of 1915. After an intervening term by Calles, Obregon was again elected president in 1928, but before taking office he was assassinated.

O'Casey, Sean (**1884-1964**), Irish playwright, was born in Dublin. His greatest works are associated with the Abbey Theater at Dublin, where his first play, *The Shadow of a Gunman*, was produced in 1925. O'Casey had no formal education, but worked as a laborer and fought with the Irish Revolutionary Army in the bitter "trouble" with England until his dramatic genius emerged. His most famous plays are *Juno and the Paycock* (1924) and *The Plough and the Stars* (1926). Both were put on at the Abbey Theater, and both are lit by a lyrical beauty and emotional intensity. He wrote three autobiographical works, *Pictures in the Hallway* (1942), *Inishfallen, Fare Thee Well* (1949), and *Rose and Crown* (1952). O'Casey, a self-exile from Ireland, lived in Devon, England.

Occam (*ŏk'ăm*), or **Ockham, William of** (**c. 1280-c. 1349**), English scholastic, was born at Ockham in Surrey. He entered the Franciscan order; studied at Oxford and Paris; and was a leader in the Franciscans' protest against Pope John XXII's denunciation of evangelical poverty. After imprisonment at Avignon, Occam fled to Munich and there found a defender in Emperor Louis of Bavaria, whom he in turn stoutly defended against the temporal claims of the pope. Besides insisting on the divine right of rulers, Occam won fame as the reviver of nominalism. He held that God's existence could not be proved. Among his writings on government, philosophy, and theology are his *Dialogus* and *Tractatus de Sacramento Altaris*.

Ochs (*ŏks*), **Adolph Simon** (**1858-1935**), American newspaper proprietor, was born in Cincinnati, O. of Jewish parentage. He attended public school in Knoxville, Tenn. Beginning work as a printer's devil at 15, he succeeded, five years later, in acquiring the debilitated Chattanooga *Times*, which he made a leading paper in the South. In 1896, he obtained ownership and control of the New York *Times*, then in financial difficulties, and increased its net circulation from about 10,000 to over 400,000 in the next 35 years, the annual receipts rising to more than 25 million dollars. Ochs owned the Philadelphia *Public Ledger* from 1902 to 1912, when he sold it to Cyrus H. K. Curtis.

O'Connell, Daniel (**1775-1847**), Irish Nationalist leader and orator, was born in County Kerry. He studied at the College of Douai, France, and was admitted to the Irish bar in 1798. He organized the Catholic party and contended successfully for the admission of Catholics to Parliament, himself entering Parliament in 1829. His remarkable speeches in Parliament were equaled only by his popular addresses throughout Ireland. In 1840, he revived the Catholic party for repeal of the Anglo-Irish union. In this cause, however, he met determined opposition from the British government. In 1844, he was found guilty of sedition, but the House of Lords set aside the verdict.

O'Connell, William Henry (**1859-1944**), American cardinal, was born at Lowell, Mass. He was graduated from Boston College, 1881, and immediately entered the American College at Rome, where he was ordained priest, 1884. In 1895, he was appointed rector of the American College at Rome. He was made bishop of Portland, Me., 1901, and was named assistant at the pontifical throne, 1905. He became archbishop of Constance, 1906; succeeded to the see of Boston, 1907; and, in 1911, was made cardinal.

O'Connor, Thomas Power (**1848-1929**), Irish journalist and politician, popularly known as "Tay Pay," was born at Athlone He was graduated from Queen's College, Galway, 1866; took up journalism in Dublin, 1867; went to London, 1870; and there became an editor on the *Daily Telegraph*. Afterward he was employed in the London office of the New York *Herald*. In 1880, he entered Parliament as a member for Galway and, after 1885, was member for Liverpool for more than 30 years. He was a powerful supporter of the Irish Nationalist party and toured the United States several times, speaking in the interests of Irish Home Rule. He founded and was editor of the *Star*, the *Sun*, and *T. P.'s Weekly*.

Odlum, Floyd Bostwick (**1892-**), American financier, was born at Union City, Mich. Educated at the University of Colorado, he came East and, after gaining experience in the electric power business, interested a number of friends in Massachusetts in the idea of investment trusts. With an initial investment of about $40,000 in 1923, he formed a company to hold utility stocks. The company grew during the 1920's but its greatest expansion came after the disasters which overtook most investment trusts after 1929. Odlum's ability in negotiation enabled him to secure control of 22 other trusts, which he merged to form Atlas Corporation.

Oehlenschläger (*û'lĕn-shlâ'gĕr*), **Adam Gottlob** (**1779-1850**), Danish poet and dramatist, was born near Copenhagen. In 1803, he published *The Play of St. John's Eve*, which attracted favorable notice. This was followed by a series of national tragedies in verse, which raised him to the first rank among Danish poets. His plays show epic and lyric rather than dramatic qualities and they display unrivaled command of language. He ranks among the Danes as Goethe among the Germans.

Oersted (*ûr'stĕth*), **Hans Christian** (**1777-1851**), Danish physicist, was born at Rudkjobing, in the Island of Langeland. He was graduated from the University of Copenhagen. He then traveled in the Netherlands, Germany, and France and, in 1806, was appointed professor of natural philosophy in the University of Copenhagen.

In 1820, he published an essay entitled *Experiments on the Effect of Opposing Electricity Upon the Magnetic Needle*, in which he showed the identity of the forces of magnetism, electricity, and galvanism.

Oettershagen, Martin W. (**1891-**), engineer, was born at Chicago. He studied at the Armour Institute of Technology and Northwestern University. His engineering work for the city of Chicago included bridge designing and harbor improvements. He was Port Manager from 1917 to 1954, and more recently has served as deputy administrator for the St. Lawrence Seaway Development Corporation.

Offenbach (*ôf'ĕn-băk*; *ôf'ăn'bäk'*), **Jacques** (**1819-1880**), French composer of comic operas, was born of German Jewish parents in Cologne. In 1833, he began study at the Paris Conservatory; in 1849, became leader of the orchestra at the Théâtre Français; and, in 1855, opened the Bouffes Parisiens, where he produced operas of his own composition until 1866. Among his many works are *Les Deux Aveugles*, *Le Violoneux*, *Le Mariage aux Lanternes*, *Orphée aux enfers*, *Barbe-Bleue*, *La Grande Duchesse*, *Geneviève de Brabant*, and *Les Brigands*. His *Tales of Hoffmann*, published after his death, became popular.

Oglethorpe (*ō'g'l-thôrp*), **James Edward** (**1696-1785**), English general and founder of Georgia, was born at London. He served in the British army and in Parliament. He planned a colony in America as a refuge for debtors then imprisoned in English jails and also for persecuted German Protestants. George II gave the necessary land, named Georgia in his honor, and Parliament contributed $50,000. He brought over 120 persons and founded the city of Savannah in 1733. In anticipation of a war with Spain, Oglethorpe returned to Georgia in 1738 with a regiment of 600 men. He invaded Florida and was unsuccessful in an attack on Saint Augustine, but later repulsed a Spanish invasion of Georgia. He left the colony in 1743 and surrendered the charter to the British government in 1752. He died in England.

O'Hara, John Francis (**1888-1960**), American educator and churchman, was born at Ann Arbor, Mich. Educated at the Montevideo (Uruguay) Jesuit College and Notre Dame University, he was ordained a Roman Catholic priest in 1916. The next year, he began teaching at Notre Dame University, of which he became president in 1934. In 1939, he was made auxiliary bishop of the army and navy diocese. As part of a policy to promote cultural solidarity throughout the Americas, he instituted a movement for interchange of students with South American universities and conducted a news service. He was made bishop of Buffalo in 1945 and archbishop of Philadelphia, 1952.

O'Hara, John (**Henry**) (**1905-**), American author, was born in Pottsville, Pa., the son of a doctor. He is a writer of incisive novels and short stories dealing with many levels of American life, and he is also an accomplished journalist and film writer. Both his locale and his father's profession recur in O'Hara's themes. He was a reporter on small papers in Pennsylvania, and then on large New York City dailies, specializing in sports and drama criticism. O'Hara's first novel, published in 1934, was *Appointment in Samarra*. Its tragic hero, Julian English, is one of two memorable characters that O'Hara has created, the other being the vivid Pal Joey. In 1935, O'Hara's brilliant repertorial talents were shown in *Butterfield 8*, an episodic but gripping novel set at the end of the prohibition era in New York. He wrote the libretto for the stage adaptation of his Pal Joey stories, with music by Richard Rodgers, which appeared on Broadway in 1940 and was revived in 1954. O'Hara's great popular success has come since the publication of *A Rage to Live* in 1949, followed by *The Farmers Hotel* (1951), *Ten North Frederick* (1955), and many volumes of collected short stories.

Ohm (*ōm*) **Georg Simon** (**1787-1854**), German physicist, was born at Erlangen. He was educated at the University of Erlangen. He held the chair of physics at Cologne, 1817-26; was director of the Nuremberg Polytechnic School, 1833-49; and became professor at Munich in 1849. "Ohm's law" was a result of his researches in electricity. The unit of resistance in an electrical conductor was named the ohm by the Paris congress of physicists in 1881 in honor of his achievements. See *Ohm's Law*.

O'Keeffe, Georgia (**1887-**), American painter, was born at Sun Prairie, Wis. Having studied at the Chicago Art Institute, the Art Students' League in New York City, and Columbia University, she worked as illustrator for advertising agencies and then taught art at the University of Virginia and the West Texas State Normal College. From 1918, she confined her activities to painting under the encouragement of Alfred Stieglitz, photographic artist, to whom she was married in 1924. Exhibiting simplicity and directness of approach in pure tones of luminous color, she depicted chiefly flowers, buildings, and desert scenes, usually with an element of obscure symbolism.

Olaf (*ō'läf*), **Saint** (**995-1030**), king of Norway. When a youth he went as a viking to England, where he fought many battles and became zealously interested in Christianity. In 1015, he succeeded in securing the throne of Norway. The severity with which he sought to exterminate paganism alienated his subjects, who adhered to Canute of Denmark. Olaf fled to Russia and, in 1030, gave Canute battle at Stiklestad, where Olaf was defeated and slain. His body, laid in the Cathedral of Trondhjem, is said to have wrought many miracles. Olaf became the patron Saint of Norway.

Olivier (*ō-lĭv'ĭ-ā*), **Sir Laurence Kerr** (**1907-**), British stage and motion picture actor and director, was born in Dorking, England, gaining early theatrical experience with the Birmingham Reportory Theatre in the 1920's. He began his motion picture career in 1930. Best known for his acting in such Shakespearean roles as Hamlet, Romeo, and Richard III, he has also appeared in many other plays, both classical and modern. He has directed and acted in numerous productions of the Old Vic company of London. Sir Laurence is married to Vivien Leigh, the actress, with whom he has appeared in a number of plays.

Olmsted (*ōm'stĕd*), **Frederick Law** (**1822-1903**), American landscape architect, was born at Hartford, Conn. He studied engineering at Yale and became interested in landscape gardening. About 1850, he traveled on foot through England and on the continent, studying parks and ornamental grounds. He is best known for planning Central Park, New York, and the Capitol grounds, Washington. He designed parks and public works at Chicago, Buffalo, Brooklyn, Boston, Milwaukee, and Montreal and acted as commissioner of the National Park of the Yosemite. He published *Walks and Talks of an American Farmer in England*, and *A Journey in the Seaboard Slave States*.

Olney (*ōl'nĭ*), **Richard** (**1835-1917**), American lawyer and statesman, was born at Oxford, Mass. He was graduated from Brown, 1856, and at Harvard Law School, 1858. He was admitted to the bar in 1859; practiced law at Boston; was elected to the Massachusetts legislature, 1874; and became a member of President Cleveland's cabinet. While serving as attorney general, 1893-95, he set the precedent for securing labor injunctions from federal courts, taking this action in the Pullman strike of 1894. He was Secretary of State in 1895-97. He then resumed the practice of law in Boston. His state papers are noteworthy for their vigor.

Omar (*ō'mär*), **Abu-Hafsa-ibn-al-Khattab** (**c. 581-644**), second caliph of the Moslems. Before 617, he persecuted Mohammed and his followers, but, having been converted to the faith of Islam, he devoted himself to its interests and advised the Mohammedan leader Abu-Bekr to undertake conquests in order to propagate the new religion. On the death of Abu-Bekr, Omar became caliph and pushed on the wars of conquest with increased vigor, subduing Iran, Syria, Palestine, Egypt, and Armenia. Omar is thus to be considered the organizing genius of Mohammedanism, which he found an obscure sect and left a powerful empire.

In 637 A. D., he was summoned to Jerusalem to receive the keys of that city and, while there, he gave orders to build a mosque, now called by his name, on the site of the temple of Solomon. He instituted the practice of dating from the hegira. He was assassinated.

Omar Khayyam (*ō'mär kī-äm'*) (**? - c. 1123**), Persian astronomer and poet, was born at Nishapur in the latter part of the 11th century. Having been appointed astronomer to the sultan, he reformed the Moslem calendar. Of his Arabic mathematical treatises, one on algebra was edited and translated by Woepcke in 1851. Omar was known to the Western world only as a mathematician until the translation of his *Rubaiyat* by Edward Fitzgerald was published in 1859. Omar was the poet of agnosticism. Though some see nothing in his poetry save the wine cup and roses, others read into it the multiple meanings of Sufi mysticism.

O'Neill, Eugene Gladstone (**1888-1953**), American playwright, was born in New York City. He studied at Princeton and Harvard universities. *Thirst, and Other One-act Plays*, published in 1914, is the first of a series which brought him to the forefront of contemporary dramatists. Those of later authorship include *The Moon of the Caribbees, Emperor Jones, All God's Chillun Got Wings, Desire under the Elms, Mourning Becomes Electra*, and *Days without End*. His *Beyond the Horizon, Anna Christie*, and *Strange Interlude* won awards of the Pulitzer prize for the year's best play of 1920, 1922, and 1928 respectively. In 1936, he was awarded the Nobel prize for literature. His play *Long Day's Journey into Night* was first published and produced posthumously in 1956.

Onnes (*ŏn'nĕs*), **Heike Kamerlingh** (**1853-1926**), Dutch physicist, was born at Groningen. He was educated at the University of Groningen; became assistant in the Delft Polytechnic School; and later was appointed professor of physics at Leiden. In 1883, he instituted a long series of investigations into the effects of low temperatures on matter. He succeeded in liquefying helium in 1908 and also determining its boiling point, density, and critical temperature. Continuing his experiments with helium, he produced, in 1911, a temperature very near to absolute zero. He also showed that, at certain temperatures, there might be a perpetual electric current through metals. In 1913, Onnes was awarded the Nobel prize for physics.

Oppenheimer, J. Robert (**1904-**), American physicist, was born in New York City and was educated at Harvard, Cambridge, and Göttingen. He also studied at the California Institute of Technology and Leyden and Zurich. In his research work he was especially interested in following out the implications of "quantum mechanics," and he did much experimental work on problems in nuclear physics. From teaching and research at the University of California he was called, in 1942, to join the atomic bomb project. He became director of the War Department's laboratory at Los Alamos, New Mexico. Since 1947 he has been director of the institute for advanced study at Princeton University.

Optic, Oliver (**1822-1897**), is the pseudonym of William Taylor Adams, American juvenile writer, born in Medway, Mass. For many years he was a public school teacher in Boston. He wrote more than one hundred books for boys.

Orange, Prince of. See *William I*, the Silent; *William III*, king of England.

Orcagna (*ôr-kän'yä*), **Andrea di Cione** (**c. 1300-c. 1368**), Italian painter, sculptor, architect, and poet, was born at Florence. His father was a sculptor and goldsmith and his elder brother was a painter. He was appointed architect of the Church of Or San Michele at Florence, 1355, and his greatest work, the marble tabernacle of this church, is considered one of the most beautiful art creations of Italy. He was also chief architect of the Cathedral at Orvieto. The frescoes of the "Last Judgment" and "Christ and the Virgin," in the Church of Santa Maria Novella at Florence, still survive as examples of his painting. His work was studied by succeeding painters, especially by Michelangelo and Raphael.

Origen (*ŏr-ĭ-jĕn*) (**c. 185-c. 254**), Greek Church father, was born at Alexandria. Much of his life was spent in Alexandria, where he won a great reputation as a teacher. He succeeded Clement as the head of the Catechetical school, but was finally compelled by persecution to leave in 231. From Alexandria he retired to Cæsarea and afterward to Tyre. In the persecution under Decius in 250, Origen was cast into prison and was subjected to protracted torture.

His writings were exceedingly numerous. A treatise on *Prayer*, an *Exhortation to Martyrdom*, and a polemical pamphlet *Against Celsus* are the most important of his works left to us. His theology represents a blend of the Greek science and philosophy of his day with the Hebraic elements of Christianity.

Orlando, Vittorio Emanuele (**1860-1952**), Italian statesman. Becoming a barrister and a law professor at the University of Rome, he was elected to the Chamber of Deputies in 1898. At different times he served as minister of education, minister of justice, and minister of the interior. He favored Italian intervention in World War I. After the disastrous defeat of Italian arms at Caporetto, he became premier and represented Italy at the Versailles Peace Conference. Popular dissatisfaction with the results of his negotiations led to the downfall of his ministry in 1919. He resigned his seat in Parliament in 1925 and his professorial chair in 1932 rather than espouse the cause of the Fascists. After the fall of Fascism, he took part, as an "elder statesman," in the reorganization of Italy.

Ormandy, Eugene (**1899-**), American musical director, was born in Budapest, Hungary, where he was a child musical prodigy before the age of five. He came to the United States in 1921. From 1931 to 1935 he was conductor of the Minneapolis Symphony Orchestra, and since then has been leader of the Philadelphia Symphony Orchestra.

Osborn, Alexander Faickney (**1888-**), advertising executive, was born in New York City. After he was graduated from Hamilton College in 1909, he became a newspaper reporter in Buffalo, N. Y. He entered the advertising business in 1915, and from 1919 to 1928 he was a partner of Bruce Barton and Roy Durstine. Since 1928 he had been a member of the firm of Batten, Barton, Durstine, and

Osborn. Among the books he has written are *Your Creative Power* and *Wake Up Your Mind.*

Osborn, Henry Fairfield (1857-1935), American paleontologist, was born at Fairfield, Conn. In 1877, he was graduated from Princeton, where he was assistant professor of natural science, 1881-83, and professor of comparative anatomy, 1883-90. He was then professor of zoology at Columbia University and curator of the American Museum of Natural History until 1910, after which time, while retaining connections with these institutions, he devoted himself to research. The exhibitions devised by him became models for other museums throughout the world.

His explorations in various western states resulted in important contributions to American paleontology. He also conducted exploring expeditions in Africa in search of mammalian fossils.

Oscar II (1829-1907), king of Sweden and Norway, was born in Stockholm. He was trained for the navy; studied at the University of Upsala; and was crowned king of Stockholm and at Drontheim in 1872. He reigned over Sweden and Norway until 1905 and thereafter over Sweden. He was an intelligent and judicious ruler, and, though he opposed the separation of Norway from the joint kingdom, his patience and tact made a peaceful solution possible. He was a keen student of naval and military history and a talented writer.

O'Shaughnessy, M. M. (1864-1934), American hydraulic engineer, was born in Limerick, Ireland. He was educated at the Royal University of Dublin and, in 1885, emigrated to California. Seven years later, he was appointed chief engineer of the California Midwinter Exposition, held in 1893-94. He was construction engineer of numerous water power and drainage projects in California and Hawaii, including the Morena Dam at San Diego, Cal. He died only a few days before the completion of the Hetch Hetchy Dam, to which he had devoted about 20 years of his life.

Osler (*ŏs'lĕr*), **Sir William (1849-1919),** physician, educator, and author, was born at Bondhead, Ont. He was graduated from McGill University, Montreal, 1872. He was professor of medicine at McGill University, 1874-84; at the University of Pennsylvania, 1884-89; at Johns Hopkins University, 1889-1905; and at Oxford University from 1905 until his death.

Osler worked in nearly every field of medicine and, by his ability as an organizer and as a teacher, greatly influenced medical progress in all English-speaking countries. A remark of his on the comparative uselessness of men over 60 years of age gained wide notoriety in the distorted form that men over 60 should be chloroformed. He took an active part in the medical preparations for the British forces in World War I. He is most famous for his *Principles and Practice of Medicine,* first published in 1892. Other works include *Science and Immortality, Counsels and Ideals,* and *A Way of Life.*

Osmeña (*ōs-mā'nyä*), **Sergio (1878-1961),** Filipino statesman, was born in 1878. Educated in law, he became governor of Cebu and, from 1916 to 1935, represented Cebu in the Philippine legislature, being leader of the Nationalist party. In 1935, he was elected vice president of the Philippines, with Manual Quezon as president. On the latter's death in July 1944, while both were refugees in the United States from the Japanese conquerors of their homeland, Osmeña succeeded to the presidency. He returned to liberated Manila in 1945 but was defeated for re-election in 1946.

Ossoli (*ŏs'ô-lē*), **Marchioness.** See *Fuller, Sarah Margaret.*

Otho I (*ō'thō*) **(912-973),** the Great, emperor of the West, son of the emperor Henry I of Germany. In 936, he was formally crowned king of the Germans and, in 962, became Holy Roman Emperor. His reign was a succession of generally triumphant wars, during which he brought many turbulent tribes into subjection and acquired and maintained almost supreme power in Italy, imposing laws with equal success on the kings of Lombardy and the popes at Rome. He also consolidated the power of the German emperors and established Christianity at many different points in the Scandinavian and Slavonic lands.

Otis, Elisha Graves (1811-1861), American inventor, was born at Halifax, Vt. He became a carriage worker and established manufacturing concerns at Albany and Yonkers, N. Y. In his Yonkers factory, he perfected a safety device for passenger elevators by means of which the suspended car is prevented from falling even though the cables on which it is hung should break. This safety elevator made the modern high building possible and probably increased the value of city real estate more than any other 19th-century invention.

Otis, James (1725-1783), American statesman and orator, was born at West Barnstable, Mass., and became a leader of the Boston bar. He was advocate general in 1760, when the revenue officers demanded his assistance in obtaining from the superior court general search warrants allowing them to enter any man's house in quest of smuggled goods. Otis refused, resigned his office, and appeared in defense of popular rights. Elected to the Massachusetts Assembly in 1761, he became prominent in resistance to the Revenue Acts. His fame rests chiefly on *The Rights of the British Colonies Asserted and Proved,* published by him in 1764. He was killed by lightning.

Ouida (*wē'dä*). See *Ramée, Louise de la.*

Ovid (*ŏv'ĭd*), or **Publius Ovidius Naso (43 B.C.-17 A.D.),** Roman poet, was born of a noble family at Sulmo. He was educated for the law, but his love of poetry turned him from the legal profession. In 8 A. D., he was banished to Tomi by Augustus for an undisclosed cause.

Besides his celebrated *Metamorphoses,* treating in the spirit of burlesque all the transformations recorded in legend from the creation of the world to the time of Julius Cæsar, he was the author of a poem called *Ars Amatoria; Fasti,* a sort of poetical Roman calendar; and *Tristia* and *Epistolæ ex Ponto,* elegies written in complaint of his banishment. A masterly facility of composition, a vigorous fancy, a fine eye for color, and highly musical versification are the merits which made him a favorite both in his own day and in after ages. He died in exile at Tomi.

Owen, Sir Richard (1804-1892), English comparative anatomist, was born at Lancaster, Eng. He studied medicine at Edinburgh and London, then began work in zoology by preparing catalogues of the collections in the Museum of the Royal College of Surgeons and lecturing on comparative anatomy. In 1856, he became superintendent of the Natural History Department of the British Museum, a position favorable for studying living and fossil animals.

By his monumental work on anatomy and fossils, Owen became the logical successor of Cuvier in the fields of zoology and paleontology. His numerous researches in zoology were largely devoted to structure and embraced every group from the sponges to man.

Owen, Robert (1771-1858) English social reformer, was born in North Wales. In 1799, he married the daughter of David Dale, from whom he, with others, bought the village and cotton mills of New Lanark, Scotland. Here he introduced improved housing and education, making it a model and highly successful community, based partly on cooperative enterprise. Extending and enlarging his ideas of social improvement, he came to the United States in 1824 and founded a communist society at New Harmony, Ind.; but the enterprise failed and, in 1827, he returned to Great Britain, where similar experiments were made at Ralahine and at Tytherley. Owen began the agitation for one of the earliest factory laws, in 1819; he founded the first infant schools in England; and was the forerunner of socialist and consumer co-operative movements. His ideas are developed in his *Book of the New Moral World.*

Owens, Jesse (1915-) American Negro track and field star, was born in Alabama. Considered the greatest track athlete of the century, he first showed his exceptional skill while in high school at Cleveland, Ohio. Later, as a member of the Ohio State University track team, Jesse Owens, one day in 1935, broke three world records and tied a fourth. At the Olympic games in 1936, he won four gold medals by equalling the world record in the 100-meter race (10.3 sec.), by breaking it in the 200-meter race (20.7 sec.) and also in the broad jump (26 ft. 5-5.16 in.), and winning the 400-meter relay race. Because he failed to make a scheduled track and field tour through Sweden following his Olympic triumphs, he was suspended by the Amateur Athletic Union.

In 1951, Jesse Owens returned to Berlin's Olympic Stadium as part of a show arranged by the U. S. High Commission and the Army and addressed 75,000 German citizens whom he urged to "stand fast with us in the fight for freedom and democracy." Made secretary of the Illinois Athletic Commission in 1952, he resigned in 1955 to undertake for the State Department a good will tour of India which met with great success. Since then, he has, as a member of the Illinois Youth Commission, which is dedicated to keeping youngsters active in sports and out of trouble, organized what he calls Junior Sports Jamborees that have proved successful.

Oxford, Robert Harley, Earl of (1661-1724), English statesman, was born in London. He entered Parliament in 1689, and, in 1701, was elected speaker by a large majority. He retained this post until 1704, when he became secretary of state. He was forced out by other ministers, whose power he had sought to undermine through paying court to his cousin, Lady Masham, an intimate of Queen Anne. This connection served to bring him back to power as virtual prime minister, his popularity having been greatly increased by an attempt on his life on the part of a French refugee, France at that time being England's foe in the War of the Spanish Succession. The Peace of Utrecht was

signed through Oxford's efforts in 1713. When, in 1714, he lost the favor of his cousin, Lady Masham, Bolingbroke succeeded in getting him dismissed and became premier himself.

On the subsequent death of Queen Anne, both of the rivals, formerly colleagues, were suspected of having conspired to restore the Stuarts. When George I was proclaimed king, Bolingbroke fled to France, but Oxford remained to meet his fate. He was sent to the Tower, and, after two years' imprisonment, was brought to trial, acquitted, and released.

Oxford and Asquith (*ŏks'fẽrd and ăs'kwĭth*), **Herbert Henry Asquith, Earl of** (**1852-1928**), English statesman, was born at Morley, Yorkshire. He was educated to the bar. He entered Parliament in 1886 and rose rapidly to first rank as a debater, becoming one of the most effective speakers on the Liberal side. He was chancellor of the exchequer 1905-08, and, on the death of Sir Henry Campbell-Bannerman, 1908, became prime minister.

For a long period, Asquith tactfully controlled the contentious elements of his own party and placated the Labor members and the Irish Nationalists. To meet war conditions, he formed a coalition cabinet in May 1915, which continued in power until December 1916, when it was superseded by the virtual though authorized dictatorship of Lloyd George at the head of a special war council. He was elevated to the peerage in 1925. His *Genesis of the War* is an important historical document.

Oyama (*ō-yä-mä*), **Iwao, Prince** (**1842-1916**), Japanese soldier, was born in Kagoshima. He entered the Japanese army; was appointed colonel in 1871; and was promoted to the rank of major general in the same year, lieutenant general in 1878, general in 1891, and field marshal in 1898.

During the war between Japan and China, he was minister of war, but took the field as commander of the second army and captured Kinchow, Talienwan, Port Arthur, and Weihaiwei. In 1904, he was chief of the general staff and, when war broke out with Russia, he was appointed commander in chief in Manchuria, defeating the Russians at the three great battles of Liaoyang, the Shaho, and Mukden. He was created prince in 1907.

Packard, Vance (**1914-**), journalist, was born at Granville Summit, Pa. He is a graduate of Pennsylvania State University and also studied at Columbia University. As a writer, his various assignments have included newspaper reporting, editing the Associated Press Feature Service, and staff work on several magazines. He is the author of *The Hidden Persuaders*, '57, *The Status Seekers*, '59, and *The Waste Makers*, '60, books which shed new light on some contemporary social and economic problems.

Paderewski (*pä'dĕ-rĕf'skē;-rĕs'kē*), **Ignace Jan** (**1860-1941**), Polish pianist and composer, was born in Podolia, Poland. He began to play the piano at three and, at seven, was placed under a local teacher. In 1872, he studied at Warsaw and later at Berlin. In 1884, he resolved to adopt the career of a virtuoso; removed to Vienna; placed himself under his fellow countryman Theodor Leschetizky; and, at the end of three years' hard study, made his debut in Vienna, immediately taking rank among the foremost pianists of the world.

In 1890, he astonished London with his marvelous playing and, in 1891, made the first of many remarkably successful tours in the United States. His compositions include the operas *Manru* and *Sakuntala*, a symphony, and numerous works for the piano, of which his *Minuet* has become widely known.

During and after World War I, he took a prominent part in securing the independence of Poland and he signed the treaty of peace in behalf of the newly formed republic. In 1919, he was chosen the first premier of Poland. He resigned the same year and later resumed his career as a pianist.

Paganini (*pă'gă-nē'nē*), **Niccolo** (**1782-1840**), Italian violinist, was born at Genoa. He received instruction in his ninth year at Genoa and afterward at Parma. In 1798, he began foreign tours alone; from 1801 to 1804, he lived in retirement; resumed concert tours in 1805; and played in Italy with great success for more than 20 years.

Paganini was one of the world's greatest masters of the violin. His intensity and passion enabled him to sway great audiences at his will. A feat that attracted special attention was his playing of a military sonata on a single string. He wrote many compositions.

Page, Thomas Nelson (**1853-1922**), American novelist and diplomat, was born in Hanover County, Virginia. After being graduated in law at the University of Virginia, 1874, he practiced at Richmond, Va., 1875-93, but subsequently turned to literature and lecturing.

His novels deal chiefly with the courtly and high-spirited aristocracy of Virginia at or about the time of the Civil War. Besides novels, he produced dialect stories and verse. In 1913, he was appointed American ambassador to Italy and served until 1922. Among his numerous writings are *In Ole Virginia, The Burial of the Guns, Meh Lady, Marse Chan, The Negro—The Southerner's Problem, The Land of the Spirit,* and *The Coast of Bohemia.*

Page, Walter Hines (**1855-1918**), American journalist and diplomat, was born at Cary, N. C. After being graduated from Johns Hopkins University, he edited the *Forum* from 1890 to 1895 and, for the next few years, acted as literary adviser to Houghton, Mifflin & Company and as editor of the *Atlantic Monthly*. In 1899, he helped to found the firm of Doubleday, Page and Company and became editor of its magazine, the *World's Work*.

In 1913, Page was appointed ambassador to England. At the opening of World War I, his situation was a delicate one since he was charged with the diplomatic interests of Germany and Austria and with many other difficult ambassadorial tasks imposed by American neutrality. Then and later he labored strenuously for his ideal of cooperation among the English-speaking peoples.

Paine, John Knowles (**1839-1906**), American composer, was born in Portland, Me. After studying in his native city, he continued his musical education in Germany, 1858-61. In 1862, he became instructor and, from 1876 until 1906, he was professor of music at Harvard, occupying the first chair of music established in an American university. While his early works are strictly classical in form and spirit, his later compositions show transitions to the romantic school. His choral music to the *Œdipus Tyrannus* of Sophocles, 1881, was perhaps the best American composition of its time. His works include *Centennial Hymn*; *St. Peter*, an oratorio; *Azara*, an opera; *Spring*, a symphony; *The Tempest* and *An Island Fantasy*, symphonic poems; and the vocal-orchestral works *The Nativity, Song of Promise*, and *Phœbus, Arise.*

Paine, Thomas (**1737-1809**), Political and philosophical writer, was born at Thetford, England. He was at first a staymaker and afterward an exciseman. In 1774, he came to America and found employment with a publisher in Philadelphia. In 1776, Paine wrote a pamphlet entitled *Common Sense*, which maintained the cause of the colonies against the mother country. The influence of this publication was extraordinary, and it won him the friendship of Washington, Franklin, and other American leaders. He became secretary to the Committee of Foreign Affairs; visited France, 1787; and later went to England, where he published *The Rights of Man*, in reply to Burke's *Reflections upon the Revolution in France*. Going to France, he was elected in 1792 by the department of Pas de Calais as a deputy to the National Convention. At the trial of Louis XVI, he proposed that the king should be spared and offered him an asylum in America. In 1793, Robespierre caused Paine to be imprisoned for nearly a year. While in France, he wrote his famous *Age of Reason* in favor of deism. In 1802, he returned to the United States. He was elected to the American Hall of Fame in 1945.

Palestrina (*păl'ĕs-trē'nä*), **Giovanni Pierluigi da** (**c. 1526-1594**), Italian composer, was born near Rome. In 1551, he was made master of the Julian Chapel, Rome, and in 1554, published a collection of masses that were so highly approved by Pope Julius III that he appointed their author one of the singers of the papal choir. His numerous masses, motets, hymns, offertories, magnificats, litanies, and madrigals mark an epoch in the annals of music and have led to his being called the "Homer of music." His place in the older styles of composition corresponds to that of Bach in the modern forms.

Paley (*pā'lĭ*), **William** (**1743-1805**), English theologian, was born at Peterborough. He was educated at Christ's College, Cambridge. In 1776, he obtained the vicarage of Dalston and, within the next nine years, became prebendary, archdeacon, and chancellor of Carlisle. In 1785, he attained high reputation by his *Principles of Moral and Political Philosophy*. In this work he propounds the ethical theory called utilitarianism. In 1790 appeared his most original and valuable work. *Horæ Paulinæ*, which was followed by *A View of the Evidences of Christianity* and by *Natural Theology.*

Palissy (*pă'lē'sē'*), **Bernardde** (**c. 1510-1589**), French potter and naturalist, was born at La Chapelle Biron in the province of Perigord, France. In early youth, Palissy worked at his father's kiln; later he was apprenticed to a glass stainer at Agen. He spent his nights in study to obtain scientific knowledge and manual skill in his craft. Contact with geometry and designing and his love of outdoor life led him to study surveying.

In 1528, Palissy set out to make a tour of France, living by the practice of his two trades. His scientific knowledge was extended by experience thus gained, and his latent artistic qualities were stimulated. About 1539, Palissy married and settled at Saintes. An enameled cup of *faience*, probably of Oriental ware, inspired him in an attempt to discover how white enamel was produced. He experimented for 16 years, exhausting all his resources and even burning his furniture. Disappointed in this quest, he nevertheless discovered a new kind of ware superior in

workmanship, design, and color to any previously made in France.

He became famous and was patronized by the nobility, who employed him to embellish their mansions with ornaments of the newly discovered ware. These ornaments received the name of *rustic figulines*. The marshal De Montmorency became his patron, and Catherine de' Medici protected him, although he was a stout Huguenot, and gave him a site in Paris for his furnaces.

Palissy remained in Paris for many years and devoted himself to his artistic employments and to the study of chemistry, geology, and natural history. Beginning in 1575, he delivered a number of public lectures on natural history, which were published later under the title *Discourses on Waters and Fountains*. In 1588, he was thrown into the Bastile as a heretic and was condemned to death. There he wrote many of his philosophical, artistic, and horticultural meditations, which were included in the *Garden*.

In chemistry, Palissy's classification of salts is still regarded as exact, and he was the first to establish a rational theory of crystallization. In literature, his poetic power and graphic style place him among the great writers of France; yet it is to the practical craftsman and artist that the world is most indebted. He died while in the Bastile under sentence of death.

Palladio (*păl-lä'dyō*), **Andrea** (**1518-1580**), Italian architect, was born at Vicenza. Having studied with the greatest care the writings of Vitruvius and the monuments of antiquity at Rome, he settled in his native city, where he acquired a wide reputation by his restoration of the basilica of Vicenza. His style, a composite characterized by great splendor of execution and justness of proportion, exercised an immense influence on the architecture of northern Italy. From his writings Thomas Jefferson obtained the architectural ideas carried out in the University of Virginia and widely imitated elsewhere.

Palma (*päl'mä*), **Tomás Estrada** (**1835-1908**), Cuban patriot, was born at Bayamo, and studied law at the University of Seville, Spain. He took part in the Cuban Revolution of 1868-78; rose to the rank of general; and became president of the Cuban republic. He was captured, however, by the Spaniards in 1877 and was imprisoned until the close of the rebellion. Palma then went to Honduras; became a teacher and later postmaster general; married a daughter of President Guardiola; came to the United States; and established a Boys' School in Central Valley, N. Y. During the Cuban Revolution of 1895, he was minister plenipotentiary for the Cuban republic and was subsequently president of Cuba, 1902-06.

Palmer, Alice Freeman (**1855-1902**), American educator, was born at Colesville, N. Y. She was graduated from the University of Michigan, 1876; was professor of history at Wellesley College, 1879-81, and president in 1882-87; and served as nonresident dean of the Woman's Department at the University of Chicago, 1892-94. In 1887, she married George Herbert Palmer, professor of philosophy at Harvard University. She was one of the most forceful and cultured of American educators. Her sudden death at Paris removed perhaps the most inspiring personality among modern teachers of women. A beautiful memorial to Alice Freeman Palmer, sculptured in relief by Daniel Chester French, has been erected at Wellesley College. She was elected to the American Hall of Fame in 1920.

Palmer, D. D. (**1845-1913**), founder of chiropractic, was born near Toronto, Ont., and removed later to Iowa. He practiced so-called magnetic healing. In 1895, he treated a partially deaf patient by correcting, through manipulation, the abnormal placement of certain vertebræ, and the subsequent restoration of the patient's hearing led Palmer to regard such vertebral adjustments as a treatment of extremely wide curative value. Later, in cooperation with his son B. J. Palmer, he founded at Davenport, Iowa, the Palmer School of Chiropractic, which was instrumental in spreading widely this type of therapeutics.

Palmerston (*päm'ĕr-stŭn*), **Henry John Temple, Viscount** (**1784-1865**), English statesman, was born at Broadlands, Hampshire. He entered Parliament in 1807 and, in the same year, became a junior lord of the admiralty. From 1809 to 1828, he was secretary for war. In the administrations of Earl Grey, Viscount Melbourne, and Lord John Russell, he held the post of foreign secretary resigning in 1851 owing to a disagreement regarding the *coup d'état* of Louis Napoleon. In 1852, he became home secretary under Aberdeen, whom he succeeded as first lord of the treasury in 1855. He was prime minister from 1859 to 1865.

Palmerston's strong foreign policy was marked by sympathy for oppressed nationalities. He aimed at being the minister of the nation rather than a political party, and consequently his party affiliations varied at different stages of his career. He was one of the most generally acceptable ministers since the time of Pitt.

Papin (*pä'păN'*), **Denis** (**1647-c. 1712**), French physicist, was born at Blois. He studied medicine and practiced for some time. Later he became a pupil and assistant of Huygens; made improvements in the air pump; and attained wide reputation as a scientist.

While associated with Robert Boyle in London, he invented the double air pump and the air gun. To Papin belongs the honor of having first applied steam to produce motion by raising a piston. He invented also the safety valve; showed that liquids in a vacuum boil at a lower temperature than when exposed to the air; discovered the principle of the action of the siphon; and improved the pneumatic machine of Guericke.

Paracelsus (*păr'ä-sĕl'sŭs*), otherwise **Theophrastus Bombastus von Hohenheim** (**1493-1541**), physician and alchemist, was born in Switzerland. He entered Basel University at 16; studied alchemy and chemistry with Withemina, bishop of Würzburg; and, at the mines in Tyrol, learned the properties of metals and minerals. He acquired fame as a medical practitioner; was made town physician at Basel; and lectured on medicine at the university. He flouted the teachings of the medical authorities of the time, Galen and Avicenna, and publicly burned their works, declaring himself to be the monarch of medicine. A dispute with the authorities in 1528 drove him from Basel, and, after wandering for a dozen years, he settled in 1541 at Salzburg.

Paracelsus insisted vigorously on the necessity of observation in science and he learned many facts which he used to confound those who depend on older authorities. He appears also to have believed in magic and alchemy, and he claimed to have discovered the secret of prolonging human life indefinitely.

The hostility excited by his contempt for the authorities of the day and by a measure of quackery in his pretensions long blinded the world to the man's real achievements. He improved pharmacy and therapeutics, introduced many new remedies, made new chemical compounds, and taught that diseases were not mere excesses or deficiencies of certain liquids but were actual entities.

Park, Mungo (**1771-1806**), African explorer, was born near Selkirk, Scotland, and was educated at Edinburgh University. In 1795, he set out for Africa to find the source and the course of the Niger River, in which undertaking he succeeded the following year. He returned to Great Britain and published his *Travels in the Interior of Africa*. In 1805, he headed an expedition in search of the mouth of the Niger. After suffering great hardships, Park and his three remaining companions were drowned in the rapids near Bussa. The details of the expedition were made known through his journal and the discoveries of later explorers.

Parker, Sir Horatio Gilbert (**1862-1932**), novelist, was born in Camden East, Ont. He was educated at Trinity College, Toronto; was trained in journalism in Australia; and there began his literary and dramatic work. He traveled extensively in the East, in Europe, Egypt, and northern Canada, and settled in England, where he became a member of Parliament in 1900 and was knighted in 1902. He initiated and organized the first imperial universities conference in London, 1903. Parker was in charge of publicity work for the British government for more than two years in the first part of World War I. His services were rewarded by a baronetcy in 1915. His writings include a book of poems entitled *A Lover's Diary, The Vendetta, The Trial of the Sword, The Seats of the Mighty, The Battle of the Strong, The Right of Way, History of Old Quebec, A Ladder of Swords, Northern Lights, The World in the Crucible*, and *The Promised Land*.

Parker, Horatio William (**1863-1919**), American composer, was born at Auburnville, Mass. He was graduated from the Royal Conservatory, Munich, 1885; was professor of music in the Cathedral School of Saint Paul, Garden City, L. I., 1885-87, and was organist in Holy Trinity Church, New York, 1888-93, and Trinity Church, Boston, 1893-1901. He became professor of the Theory of Music at Yale in 1894

In 1893, he produced his oratorio *Hora Novissima*, regarded as one of the finest American compositions. In 1911, with Brian Hooker, who wrote the libretto, he won the Metropolitan Opera prize of $10,000 for the opera *Mona*. In 1914, with Hooker, he was awarded for *Fairyland* the $10,000 prize offered by the national federation of women's clubs for an American opera.

Parker's other compositions include the overtures *Regulus* and *Count Robert of Paris*; the oratorios *St. Christopher* and *Morven and the Grail*; and the choral works *The Holy Child, The Kobolds, The Dream King, A Wanderer's Psalm*, and *A Star Song*. He was elected to the American Academy of Arts and Letters in 1905.

Parker, Louis Napoleon (**1852-1944**), English dramatist and composer, was born of American parents at Calvados, France. He was educated at Freiburg, Germany, and at the Royal Academy of Music, London, of which he became a fellow in 1898. He was director of music in Sherborne

School, Dorsetshire, from 1877 to 1896. Cantatas composed by him include *Silvia* and the *Twenty-third Psalm.* He is the author of many plays, including *The Love-Knot, Rosemary, Disraeli, Pomander Walk, The Bridge,* and *The Pageant of Kenilworth.*

Parker, Matthew (1504-1575), English prelate, was born at Norwich, England. He studied at Corpus Christi College, Cambridge, and was ordained a priest in 1527. In 1535, he was appointed chaplain to Queen Anne Boleyn. In 1552, he was presented by King Edward VI with the deanery of Lincoln. On the accession of Queen Mary, he was deprived of his preferments and was even obliged to conceal himself.

On the death of Mary and the accession of Elizabeth, 1558, Parker was appointed by the queen archbishop of Canterbury. It is to Parker we owe the "Bishops' Bible," undertaken at his request and published at his expense in 1572. He had also the principal share in drawing up the *Book of Common Prayer.* It was under his presidency, too, that the *Thirty-nine Articles* were finally reviewed and subscribed to by the clergy, 1562.

Parker, Theodore (1810-1860), American clergyman and scholar, was born at Lexington, Mass. He entered Harvard in 1830 and, during his collegiate course, supported himself by teaching private classes and schools. He was graduated from Harvard Divinity School in 1836 and, the next year, became a Unitarian minister at West Roxbury. Parker was somewhat separated from the conservative Unitarians, as shown by his sermon *The Transient and Permanent in Christianity* and by his *Discourse on Matters Pertaining to Religion.* For many years he preached to immense congregations at Melodeon and Music halls, Boston. He also lectured throughout the country and became an ardent antislavery agitator.

Parkhurst, Charles Henry (1842-1933), American Presbyterian clergyman, was born in Framingham, Mass. He was graduated from Amherst, 1866, and studied theology at Halle and Leipzig. He was pastor of the Congregational Church, Lenox, Mass., from 1874 to 1880, when he was made pastor of Madison Square Presbyterian Church, New York.

Parkhurst became widely known for his vigorous, fearless sermons and by his work in behalf of civic and social reform. In 1891, he was made president of the Society for Prevention of Crime. His writings include *The Blind Man's Creed, The Swiss Guide, Our Fight with Tammany, A Little Lower than the Angels,* and *My Forty Years in New York.*

Parkinson, Cyril Northcote (1909-), historian and journalist, was born at Barnard Castle, England. Educated at Cambridge and King's College, he became a teacher and lecturer on maritime history at the University of Liverpool. He has been visiting lecturer at several American universities. Along with serious works like *The Trade Winds* and *War in the Eastern Seas* he has written some thoughtful books in lighter vein, for example, *Parkinson's Law* and *The Law and the Profits.*

Parkman, Francis (1823-1893), American historian, was born in Boston and was graduated from Harvard in 1844. He began the study of law, but soon chose as his life work the writing of the history of French power in America. In preparation for his task he made several trips to Europe and lived for some time among the Indians of the Northwest.

In addition to rare powers as an investigator, he possessed consummate literary ability and produced a series of valuable works, which place him in the highest rank among American historians. His books include *The Conspiracy of Pontiac, The Jesuits in North America, La Salle and the Discovery of the Great West, The Old Régime in Canada, Montcalm and Wolfe, A Half Century of Conflict,* and *California and the Oregon Trail.* He was elected to the American Hall of Fame in 1915. Recently a biography of Parkman has been written by Howard Doughty.

"Parley, Peter." See *Goodrich, Samuel Griswold.*

Parmenides (*pär-mĕn'ĭ-dēz*), Greek philosopher, the greatest member of the Eleatic school, was born at Elea and flourished in the 5th century B. C. In his didactic poem *On Nature,* he sought to demonstrate the reality of absolute being, or matter. He held that nonexistence, or empty space, was inconceivable. This belief involved logically the denial of all motion. Parmenides took this step and maintained that motion was only apparent and existed for the senses alone, whereas the intelligence must refuse to recognize the validity of such appearances.

Parnell (*pär'nĕl*), **Charles Stewart (1846-1891),** Irish statesman, was born in Avondale and was educated at the University of Cambridge. He entered public life in 1875 as member of Parliament for Meath. In 1880, he became leader of the Irish party and entered upon an agitation for a reform in the method of land ownership in Ireland. In October 1881, he was imprisoned at Kilmainham under the Coercion Act, but was released in April 1882.

At the general election of 1885, all Home Rule candidates nominated by Parnell were elected, and he subsequently entered into an alliance with the followers of Gladstone. In the next Parliament, he proposed a bill to suspend evictions in Ireland and to reduce rent; the bill was rejected, but the agitation continued.

In 1888, a special commission was appointed to examine charges made against Parnell and others by the London *Times* of palliating the murder of a government official in Ireland. The inquiry cleared Parnell, and he then brought suit for libel against the *Times* and recovered £5000 damages.

Parrhasius (*pă-ra'shĭ-ŭs*), Greek painter, son of Evenor, also an artist, was born at Ephesus in the 5th century B. C. He practiced his profession at Athens, where he received the rights of citizenship. According to Pliny, he was the first to establish a true proportion between the different parts of a picture and to indicate the round by light and shade. One of his most notable pictures represented a personification of the Athenian democracy, showing graphically the varying moods which actuated it.

Concerning his skill, a tale is recorded describing his contest with Zeuxis. The latter painted some grapes with such perfection that birds came to peck at them. Zeuxis then demanded that Parrhasius should draw aside the curtain and display his picture. Upon discovering that his competitor's painting was the curtain itself, Zeuxis acknowledged himself outdone, for, while Zeuxis had deceived birds. Parrhasius had deceived a skilled artist.

Parry, Sir Charles Hubert Hastings (1848-1918), English composer and musical scholar, was born in Bournemouth. After being graduated from Oxford, he took an extended course in music. In 1883, he was appointed choragus of Oxford University and, in 1891, was made professor of the Royal College of Music.

Parry is best known by his oratorios *Judith, Job,* and *King Saul* and by his choral works with orchestra *The Glories of Our Blood and State, Ode to St. Cecelia's Day, War and Peace, The Pied Piper of Hamelin,* and *The Soul's Ransom.* He also composed symphonies, overtures, and chamber music. His numerous writings include *The Evolution of the Art of Music.*

Parsons, Sir Charles Algernon (1854-1931), English inventor and shipbuilder, was educated at the University of Cambridge. He devoted his attention to electricity and engineering and became proprietor of electrical supply and marine engine works. He invented the compound steam turbine about 1884; notably improved it by a condenser in 1891; and adapted it for practical maritime use in 1897. In 1910, he invented a geared turbine engine. He wrote *The Steam Turbine* and numerous papers on related subjects. See *Steam Engine.*

Parsons, William Barclay (1859-1932), American engineer, was born in New York City. He was graduated from Columbia University in 1879. He made surveys for the Canton-Hankow Railway, China, 1000 miles, in 1898-99; designed and constructed the underground railway system in New York; was a consulting engineer for the Panama Canal; and was chief engineer of the Cape Cod Canal, 1912-14. For his services in World War I, he was decorated by the governments of Great Britain and Belgium besides being cited by the American government for conspicuous distinguished service. His writings include *Turnouts, Track, An American Engineer in China,* and *Robert Fulton and the Submarine.*

Partridge, William Ordway (1861-1930), American sculptor and author, was born at Paris, France. He studied at Columbia University and received his art education in Rome, Florence, and Paris.

Partridge's sculpture is characterized by refinement, imagination, and versatile technique. He excels in portrait busts. His works include a statue of Shakespeare, Lincoln Park, Chicago; a bronze statue of Alexander Hamilton, Brooklyn; the Kauffmann Memorial, Washington; a statue of Whittier, Boston Public Library; an equestrian statue of General Grant for Grant Square, Brooklyn; the Schermerhorn Memorial at Columbia University; the group "Christ and Saint John," Brooklyn Museum of Fine Arts; and a statue of Pocahontas made for the Jamestown Exposition, 1907. His writings include *Art for America, The Song Life of a Sculptor, The Technique of Sculpture, The Angel of Clay,* and *The Czar's Gift.*

Pascal (*păs'kăl*; F., *pàs'kàl'*), **Blaise (1623-1662),** French philosopher and mathematician, was born at Clermont Ferrand. He founded the modern theory of probabilities and anticipated the mathematics of conic sections. He also formulated the law of pressure in liquids, since known by his name. In 1654, he gave up the study of mathematics and natural philosophy and embraced the austere religious life of the Jansenists at Port Royal near Paris, where he spent his remaining years.

The controversy between the Jesuits and the Jansenists led to Pascal's publication of the *Provincial Letters* in favor of the latter. His celebrated *Thoughts on Religion,* exalting

faith above reason, has been translated into most European languages. Pascal's style is unsurpassed in graceful energy and remains a model of French prose.

Passy (*pä'sē'*), **Frédéric** (**1822-1912**), French statesman and economist, was born in Paris. He was educated for the law and, in 1846, became auditor to the council of state. He entered politics but withdrew upon the proclamation of the Second Empire. He then turned his attention to topics of social science on which he lectured extensively. In 1868, he founded the International League of Peace. After the fall of Napoleon III, he re-entered politics, serving in the Chamber of Deputies, 1874-89. In 1901, he was awarded, with Henri Dunant, the first Nobel peace prize.

Pasteur (*pàs'tûr'*), **Louis** (**1822-1895**), French chemist and bacteriologist, was born at Dole. He received the degree of doctor of science at the Ecole Normale, Paris, 1847. He became professor of physics at Dijon, 1848, and of chemistry at Strasbourg, 1849. After holding various scientific positions at Lille and Paris, he was professor of chemistry at the Sorbonne, 1867-89. Later his researches were made in connection with the Pasteur Institute.

From 1854 to 1857, Pasteur conducted researches on ferments and fermentation, which led to the conclusion that this process is due to living organisms. Treatment of milk so as to destroy such organisms is known, after him, as pasteurization. He studied and successively combated the contagious silkworm disease as well as fowl cholera and anthrax, which he treated by vaccines of diluted virus. His last work was connected with a vaccine treatment for hydrophobia. Pasteur is regarded as the founder of the modern science of bacteriology.

Pater (*pā'tĕr*), **Walter Horatio** (**1839-1894**), English essayist and critic, was born in London. He was educated at Oxford; became a fellow at Brasenose College; and spent practically all of his life in quiet study at Oxford. He came early under the influence of Ruskin and found his mission in interpreting the spirit and the ideals of the Renaissance. His *Studies in the History of the Renaissance*, published in 1873, revealed him as a penetrating critic with a beautiful prose style. Among his other works are *Marius the Epicurean*, *Imaginary Portraits*, *Plato and Platonism*, *The Child in the House*, and *Greek Studies*.

Pathé, Charles (**1873-1937**), French photographer, was born in Paris. He exploited an early Edison patent for a motion picture machine, the patent being unprotected in Europe, and, by leasing machines, established a highly profitable business in connection with a motion picture exchange which he began. He then organized a service for photographic events in the news. With headquarters at Joinville, France, he distributed these films to motion picture theaters throughout the world under the name of the Pathé news reel.

Patri, Angelo (**1877-**), American educator and child psychologist, was born in Italy and was brought at an early age to New York, where he was graduated from Columbia University. He began teaching in the public schools in 1898. He was very successful with young children and began writing with a view to showing parents how to deal with problems of childhood. In addition to syndicated articles in the press, his publications include *Pinocchio in America*, *The School that Everybody Wants*, *Problems of Childhood*, and *The Questioning Child*.

Patterson, Joseph Medill (**1879-1946**), American journalist and publisher, was born in Chicago. He was graduated from Yale University in 1901 and from then until 1905 was on the staff of the Chicago *Tribune*, of which he was, with R. R. McCormick, co-editor and publisher from 1914 to 1925. He then began, with spectacular success, two new publications, *Liberty Magazine*, in Chicago, and the "tabloid" *Daily News*, in New York. During World War I, he enlisted as a private and rose to the rank of captain in the Rainbow Division. *Liberty Magazine* was sold in 1931 to Bernarr Macfadden. He wrote *A Little Brother of the Rich*, *By-Products*, and *Rebellion*.

Patton, George Smith, Jr. (**1885-1945**), American general, was born at San Gabriel, Cal. A graduate of West Point in 1909, he entered the cavalry and was promoted through grades to lieutenant-general in 1943. He was made general in 1945. He was the first man detailed in the tank corps, and devoted himself to the development of tank and motorized forces. In North Africa, in his dash across northern France after St. Lo, in the "battle of the Bulge," and in the invasion of southern Germany, his command was distinguished by the celerity of its movements. Injuries received in an automobile accident caused his death at Heidelberg.

Paul III (Alessandro Farnese) (**1468-1549**), pope from 1534 to 1549, was born in Tuscany. His acts include the decree of excommunication against Henry VIII of England, and the edict incorporating the order of the Jesuits.

Paul VI. See *Montini*.

Paul, Saint (**? - c. 67**), apostle of Christianity among the Gentiles and chief founder of the Christian Church, was born at Tarsus, a Greek city of Cilicia in Asia Minor. His family were Jews, belonging to the tribe of Benjamin, but they enjoyed the rights of Roman citizenship. His Jewish name was Saul, but, among the Gentiles, he adopted the Latin name Paul. By trade he was a tentmaker.

Conversion. Paul obtained a knowledge of the Greek language and literature at Tarsus and then, about 19 A. D., went to Jerusalem to study the law of Moses under Gamaliel. He became a strict member of the sect of the Pharisees and took a prominent part in the persecution of the Christians. When the rumor spread that some of the worst offenders were actual members of the synagogue in Damascus, he obtained an order to go and arrest them. On the road to that city about 37 A. D., he experienced a vision that convinced him of the Messiahship of Jesus and inspired him with a belief that he was commissioned to preach the new religion among the nations of the earth.

He then retired to Arabia for nearly three years. Returning, he began to preach the new gospel in Damascus and Jerusalem, but Jewish hostility forced him to leave these cities, and minister to the Gentiles.

Missionary Journeys. In 40 A. D., he assisted Barnabas in the evangelization of Antioch. After a short visit to Jerusalem in the famine year of 44, Paul and Barnabas were set apart by the prophets and elders of the church at Antioch for the evangelization of the more distant Jews. From Seleucia they proceeded to southern Asia Minor—Pamphylia, Pisidia, and Lycaonia.

At Antioch, Paul's preaching occasioned a momentous controversy. The extreme Jewish element of the Church insisted on the need of circumcision. Paul maintained that faith was sufficient for salvation. Paul prevailed, partly because of his success in evangelizing the Gentiles. Paul's victory meant the freeing of Christianity from Jewish elements prejudicial to its general acceptance.

Starting again in 51, Paul and Silas traversed Asia Minor from south to north. Crossing the Ægean to Europe, they visited Philippi, Thessalonica, Berea, Athens, and Corinth. On his return to Asia Minor, Paul visited Ephesus, proceeded thence to Cæsarea and Jerusalem, and closed his journey at Antioch.

The third journey of Paul commenced about 57 and extended over much the same district as the previous one. Returning to Jerusalem, he was brought to trial by his Jewish opponents before Felix, the procurator at Cæsarea, and, later, before King Agrippa. Using his right as a Roman citizen, Paul appealed to Cæsar, arriving at Rome in 62, where he was a prisoner for two years. He is believed by some scholars to have made a fourth missionary journey, going into Spain and other countries.

Character and Influence. In the quality of his moral energy Paul surpassed all other apostles of Christianity. His teaching was essentially practical in its nature. The central doctrine of salvation by faith in the Christ, although fundamentally experiential rather than intellectual, became, in his ministry, the means of making Christianity a universal religion rather than a Jewish sect. He was executed in Nero's reign.

Pauling, Linus (**1901-**), chemist and educator, was born in Portland, Oreg. and was educated at Oregon State College and the California Institute of Technology. Beginning with emphasis on physical chemistry and quantum mechanics, his research led to atomic physics. In 1954 he received the Nobel Prize for Chemistry, based on his work on chemical bonds and molecular structures. Because of his writing and lectures warning against dangers of radioactive fallout in weapons testing and war, he was awarded the Nobel Peace Prize in 1962.

Pavlov (*päv'lôf*), **Ivan Petrovitch** (**1849-1936**), Russian physiologist, was born in Rjasau. He was graduated in medicine at Leningrad, 1883. In 1890, he was made professor at the military academy, Leningrad, and, in 1897, was appointed director and professor of physiology in the Imperial Academy of Sciences.

Pavlov established a new school of Russian physiologists and made important researches in connection with the physiology of the heart, secretive glands, and digestion. In 1904, he was awarded the Nobel prize for medicine. His *Work of the Digestive Glands*, translated into many languages, shows that bodily processes normally attending the taking of food by an animal will take place as the result of a stimulus, such as the ringing of a bell, if the food and the neutral stimulus have previously been associated in the animal's experience. On this classic study is based the widely held doctrine of conditioned reflexes, which may be said to have revolutionized our understanding of animal and human intelligence.

Payne, John Howard (**1791-1852**), American dramatist, was born at New York. He made his debut as an actor in New York City in 1809; was successful for 30 years; and also wrote several plays, of which *Brutus*, *Charles II*, and *Clari* are the best-known. The song "Home, Sweet Home" occurs in *Clari*, which was produced as an opera in Lon-

don, 1823. Yet the author of "Home, Sweet Home" had no home for the last 40 years of his life and died while American consul at Tunis. His remains were brought to America and were buried at Washington in 1883.

Peabody, George (1795-1869), American merchant and philanthropist, was born at South Danvers, now Peabody, Mass. When 22 years old, he was a partner of Elisha Riggs in a wholesale dry goods business in Baltimore. In 1829, he became the head of this firm, which established branches in New York and Philadelphia. Withdrawing from the Baltimore firm in 1843, he established himself in London as a merchant and broker and accumulated a large fortune.

In 1852, Peabody sent a large donation to found an educational institute and library in his native town. He contributed $1,400,000 to the city of Baltimore for an institute of science, literature, and fine arts. The Peabody education fund received more than $3,000,000 for the promotion of education in the Southern states. In appreciation of his gifts for education, which amounted to about $7,000,000, Congress authorized a medal to be struck. To the city of London he donated a fund of $2,500,000 for the construction of lodging houses. His philanthropic munificence, at that time unparalleled, brought him great honors and gratitude from England and from the United States. He was elected to the American Hall of Fame in 1900.

Peabody, Josephine Preston (1874-1922), American poet and dramatist, was born in New York. She attended Radcliffe College, 1894-96, and was instructor in English literature at Wellesley College, 1901-03. In 1906, she married Professor Lionel S. Marks of Harvard University.

In 1897, she published *Old Greek Folk-Stories*, which was followed in 1898 by *The Wayfarers*, her earliest volume of verse, and by *Fortune and Men's Eyes* in 1900. Her first drama, *Marlowe*, appeared in 1901. In 1910, her drama in verse entitled *The Piper* was awarded the Stratford on Avon prize and its favorable reception in England and America won for the author high rank in American poetical drama. Her works include also *The Singing Man*, *Harvest Moon*, and *The Wolf of Gubbio*.

Peale, Charles Willson (1741-1827), American portrait painter, was born in Maryland. He received his art education from Copley and Benjamin West. Among his portrait paintings are several of Washington. In 1785, he formed a collection of natural curiosities and founded Peale's Museum at Philadelphia. In 1805, he helped to found the Pennsylvania Academy of Fine Arts, the first of its kind in the United States.

His son, Rembrandt (1778-1860), painted several historical pictures, among them the well-known "Roman Daughter," in the Boston Museum, and "The Court of Death," in the Detroit Art Gallery.

Peale, Norman Vincent (1898-), American clergyman, was born in Bowersville, Ohio. He was graduated from Ohio Wesleyan University in 1920, and in 1922 was ordained a minister in the Methodist Episcopal Church. After holding various pastorates, he became, in 1932, minister of the Marble Collegiate Reformed Church, Fifth Avenue, New York. He is author of a number of religious books, and has become widely known as the writer of a syndicated newspaper column.

Pearson, Lester Bowles (1897-), Canadian statesman, was born at Toronto and received his education at the University of Toronto and St. John's College, Oxford. As a lecturer on modern history and secretary in the Department of External Affairs, both at Ottawa and in the London office of the High Commission for Canada, he acquired a grasp of international problems useful in his later work in diplomacy. He was Canadian Ambassador to the U.S. in 1945–46 and assisted in drawing up the UN charter at San Francisco. He led the Canadian delegation to the UN General Assembly, of which body he served as president in 1952–53. He represented Canada at the signing of the North Atlantic Treaty and was president of NATO in 1957, the year in which he was awarded the Nobel Peace Prize. In 1963, after a spirited campaign in which the Liberals were victorious, he succeeded Diefenbaker as prime minister of Canada.

Peary, Robert Edwin (1856-1920), American arctic explorer and discoverer of the north pole, was born at Cresson, Pa. He was graduated from Bowdoin, 1877; entered the U.S. navy as a civil engineer in 1881; was assistant engineer for the Nicaragua ship canal, 1884–85; and engineer in charge of the Nicaragua Canal Surveys, 1877–88.

In 1886, he made a reconnaissance of the Greenland inland ice cap. He was chief of the arctic expedition of the Academy of Natural Sciences of Philadelphia which, in 1891-92, sailed to the northeast angle of Greenland, and he discovered and named Melville land and Heilprin land, lying beyond Greenland. He made another arctic voyage in 1893-95, when he discovered the famous Eskimo meteorites near Melville Bay. These were later removed to the American Museum of Natural History, New York. One of them, the largest known meteorite, weighs 90 tons.

Peary made many other voyages to the Arctic Ocean, continuing his explorations and ethnographic studies. In 1902, he made his first attempt to reach the north pole, attaining lat. 84° 17′ north. In the summer of 1905, he reached 87° 6′—a new "farthest north." On July 6, 1908, he left New York in the steamer *Roosevelt* on his final voyage. Establishing winter quarters at Cape Sheridan, he made preparations for the northward journey over the ice pack. On March 1 following, he set out from Cape Columbia over the frozen ocean and, on April 7, 1909, reached the north pole. In honor of this achievement, he received the thanks of Congress and was promoted to the rank of rear admiral. His writings include *Northward Over the Great Ice*, *Snowland Folk*, *Nearest the Pole*, and *The North Pole*. See *Polar Exploration*.

Pedro I (*pĕ′drō*; *pā′drō*) **(1798-1834),** emperor of Brazil, was the second son of John VI of Portugal. At the time of Napoleon's invasion of Portugal, he was taken to Brazil by his parents and became prince regent of Brazil on his father's return to Portugal, 1821. He declared the independence of Brazil and was crowned as Pedro I in 1822. The new empire did not prove successful under his rule, and, in 1831, Pedro abdicated and withdrew to Portugal, the throne of which he secured for his daughter.

Pedro II, or **Dom Pedro de Alcantara (1825-1891),** emperor of Brazil, son of Pedro I. Upon his father's abdication, the son was declared emperor of Brazil at the age of five years. He was crowned in 1841. He was distinguished by his love of learning and his wide culture, and he gave the country an enlightened and progressive administration. In 1871, a law was passed providing for the gradual abolition of slavery and, in 1888, the immediate emancipation of slaves was decided upon. The result was a revolt of the Republican party supported by the rich planters. Pedro was forced to abdicate and a republic was established in 1889. The deposed emperor spent the remainder of his life in France.

Peel, Sir Robert (1788-1850), English statesman, was born near Bury, Lancashire, 1788. He was graduated at Oxford in 1808 and entered Parliament as a Tory in the following year.

In 1810, Peel was appointed undersecretary for the colonies; from 1812 to 1818, was secretary for Ireland; and, in 1821, became home secretary. In 1829, he sponsored a bill relieving Catholics of disabilities due to their religion. This bill was carried and consent was practically extorted from the king.

Peel was premier for a short time in 1834-35. In 1841, he came into power again as a result of a victory of his party's protectionist policy over free trade. He carried legislation revising the tariff and introduced an income tax. The famine in Ireland in 1845 increased the popular pressure in favor of the free admission of grain, a policy which was supported by the Liberal party. Peel yielded, and the so-called Corn Laws were repealed. This action caused the temporary disruption of the Conservative party, and Peel retired from office in 1846. He continued to lead a group in Parliament which gave a general support to the Liberal party.

Peel was a statesman of great integrity, a master of finance, and a fluent speaker. He was slow in forming his convictions, but was conscientious in acting on them. He died as the result of a fall from his horse. See *Corn Laws*.

Peirce, Benjamin (1809-1880), American mathematician and astronomer, was born at Salem, Mass. In 1829, he was graduated at Harvard, where he became professor of mathematics, 1833, and was professor of mathematics and astronomy from 1842 until his death. He was superintendent of the United States Coast Survey, 1867-74. His reputation as the leading American mathematician of his day rests on his development of analytic morphology, or the calculation of the forms taken by liquids when acted on by forces. To him also is due much information on the rings of Saturn.

Peirce, Charles Sanders (1839-1914), American mathematician and philosopher, was born at Cambridge, Mass. He was educated chiefly by his father, a mathematician, and when 22 years old joined the United States Coast Survey. In the course of 26 years at this post, he conducted researches in astronomy and gravity measurements. He described a previously undetected inaccuracy in pendulum observations. To him is chiefly due the first attempt to use the wave length of light as a standard of measure. He wrote many papers on mathematical reasoning, in which he expanded algebra into an instrument for logical analysis of mathematics.

Peirce's chief title to fame is his development of the original principles of pragmatism, which William James and others carried further and, as Peirce thought, distorted. The principle was first published in 1878 in an article "How to Make Ideas Clear," in which Peirce wrote: "Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then our conception of these effects is the whole of our conception of the object."

Peirce, Cyrus (1790-1859), American educator, was graduated from Harvard in 1810; studied for the ministry; and was pastor for eight years. He then taught several years at Andover and at Nantucket. In 1839, he was chosen by Horace Mann as principal of the newly organized State Normal School at Lexington, now Framingham, Mass. This institution was the first State Normal School in the United States. Only three students enrolled at the opening of this school, but the earnestness and the skill of the principal soon established confidence and attracted students.

Pelopida (*pē-lŏp'ĭ-dăs*) (**? - 364**), Theban general and patriot, flourished in the first part of the 4th century B. C. He was a fast friend of the Theban statesman Epaminondas, whom he aided in a military capacity throughout the period of the Theban struggle against Sparta.

In 382 B. C., Pelopidas was driven from Thebes by the Spartans and was forced to seek refuge at Athens, whence he returned secretly with a few associates, 379, and recovered possession of the citadel, with his own hand slaying the Spartan leader Leontiades. His "sacred band" of Theban youth largely contributed to the victory of Epmainondas at Leuctra, in 371, but failed in a subsequent attack on Sparta itself. In 364, he won the battle of Cynoscephalæ, but was himself killed.

Penn, William (1644-1718), American colonizer and founder of Pennsylvania, was born in London. He studied at Oxford; early gave evidence of strong religious impulses; and adopted the new doctrines of the Society of Friends. His excessive zeal led to his expulsion from the university and a consequent estrangement from his father. In 1668, he was arrested for attending religious meetings forbidden by law and was tried before the court of common pleas and heavily fined. He remained in prison for some time, refusing to pay the fine, but his father ultimately paid it for him.

In 1681, Penn, who had inherited from his father a claim of £16,000 against the government, obtained from the king in satisfaction therefor a grant of an extensive tract of country lying west of the Delaware River and north of Maryland and which, in the royal patent, was called Pennsylvania. This territory Penn resolved to form into a commonwealth based upon perfect religious toleration. He accordingly set sail thither, arriving in Delaware Bay on October 27, 1682, and founded the city of Philadelphia. In 1683, he entered into a treaty of lasting friendship with the Indians.

In 1684, he returned to England, where, by his influence with James II, he secured the release of 1200 imprisoned Quakers. After the accession of the Prince of Orange as William III, Penn was twice accused of treason and was arrested in 1690 on a charge of conspiracy, but was at length honorably acquitted in 1693. In 1699, he paid a second visit to Pennsylvania and his stay, which lasted two years, was marked by many useful measures. Elected to the American Hall of Fame in 1935.

Pennell (*pĕn'ĕl*), **Joseph (1860-1926),** American etcher, illustrator, and author, was born of Quaker parentage in Philadelphia. He attended art schools in his native city and studied etching under S. J. Ferris. In 1884, he went to Europe and thereafter lived chiefly in London.

Pennell was greatly influenced by Whistler, but developed a strongly original style and became the most widely known of all American graphic artists. His art is simple and direct, and he excels in grasping the artistic possibilities of his subjects, which are chiefly landscape and architectural. He is represented by etchings, drawings, and lithographs in the leading art collections of Europe and America. He also illustrated a large number of books.

His written works include *A Canterbury Pilgrimage, Our Journey to the Hebrides, Lithography and Lithographers, The Glory of Greece*, and, jointly with his wife, *The Life of James McNeill Whistler*. He was elected to the American Academy of Arts and Letters in 1911.

Penney, James Cash (1875-), American merchant, was born on a farm near Hamilton, Mo. He began his mercantile career in a Hamilton store. He then found employment in dry goods stores in Colorado, but was soon working in Wyoming, where, within a few years, he acquired three stores of his own. This was the nucleus of what was to prove one of America's greatest chain of stores, which today number more than 1600 in all states of the Union and do a business in the neighborhood of half a billion dollars a year. Mr. Penney has extensive farming and philanthropic interests.

Pepin (*pĕp'ĭn*) **the Short (714-768),** king of the Franks and father of Charlemagne, was the second son of Charles Martel. In 751, he deposed Childeric III and founded the Carlovingian dynasty. He was the first Frankish monarch whose election received the sanction of the pope. He conquered the Lombards and gave the pope part of their territory. This gift may be said to have laid the foundation of the temporal power of the popes.

Pepper, George Wharton (1867-1961), American jurist and politician, was born at Philadelphia and was educated at the University of Pennsylvania. He was admitted to the bar in 1889 and began the practice of law in Philadelphia. He was professor of law in the University of Pennsylvania from 1893 to 1910. In 1922, he was appointed United States senator to fill the unexpired portion of the term of Senator Penrose, deceased, and was elected for a term ending in 1927. Pepper's published works include *The Borderland of Federal and State Decisions, Pleading at Common Law and Under the Codes, Men and Issues*, and *Family Quarrels*.

Pepperrell, Sir William (1696-1759), American colonial general, was born at Kittery, Me. From 1727 until his death, he was a member of the British council for the province of Massachusetts and, after 1730, was also Chief Justice of the Court of Common Pleas. He commanded a successful expedition against Louisburg in 1745 and was made a baronet in 1746. He was acting governor of Massachusetts, 1756-58, and, in 1759, was made lieutenant general. He published an account of a *Conference with the Penobscot Tribe*.

Pepys (*pēps*; *pĕp'ĭs*; *pĕps*), **Samuel (1633-1703),** English administrator and diarist. During the reigns of Charles II and James II, 1660-88, he was secretary for the affairs of the navy, a position which he filled with diligence and skill. He wrote *Memoirs of the Royal Navy*. He left to Magdalene College, Cambridge, his large collection of books, manuscripts, and prints, including about 2000 ancient English ballads. His reputation is founded on his famous *Diary*, written from 1660 to 1669, which affords a curious insight into the manners and court life of his day and is one of the most diverting books in the language.

Pérez Galdós (*pā'răth găl-dōs'*), **Benito (1843-1920),** Spanish novelist and dramatist, was born at Las Palmas, Canary Islands. He began the study of law at Madrid, but soon turned his attention to journalism and the writing of fiction. In extent and in character creation, this work of Galdos rivals that of Balzac. The best known of his romances are *Dona Perfecta, Gloria, La Familia de Leon Roch, Marianela, Fortunata y Jacinta*, and *Angel Guerra*.

About 1890, Galdos turned his attention to the drama, producing a series of brilliant plays which placed him next in rank to Echegaray among contemporary Spanish writers. The list of his plays includes *Reality, Mad for the Sake of the Family, The Condemned, Will, The Wild Beast, The Grandfather*, and *Love and Science*.

Peri (*pâ'rê*), **Jacopo (1561-1633),** Italian composer, was born in Florence. He made an attempt to reconstruct the music of the Greek tragedies. This resulted in his development of a new recitative style adapted to dramatic declamation. In 1594, he applied his new method to the composition of *Dafne*, now regarded as the first opera. In 1600, he composed *Euridice*, on a text by the poet Rinuccini. Soon afterward, Caccini produced a composition, using the same text, and claimed the credit for originating the declamatory style, but the priority of Peri's work has been established beyond question.

Pericles (*pĕr'ĭ-klēz*) **(c. 490 B.C. -429 B.C.),** Athenian statesman, was born at Athens. He received a careful education and, when about 26, began to take part in public affairs. He soon gained the leadership of the Democratic party in the state and was elected general for many successive years. Cimon, the head of the Aristocratic party, was ostracized and gradually Pericles attained an unrivaled ascendancy in the affairs of the city.

Pericles made it his aim to create a state which should be unique in history both for the qualities of its citizens and for the achievements of its architects and its other artists and thinkers. To this end, he strengthened the position of Athens at the head of the Athenian empire, preparing her for a war with Sparta which he regarded as inevitable. The wealth accruing from the empire was devoted to the erection of the Parthenon, the Propylæa, and other buildings that converted Athens into the most beautiful city of the ancient world.

In private life, Pericles gathered about himself a coterie of brilliant spirits, including Anaxagoras, Phidias, and Aspasia. Indictments brought against his friends marked a certain waning of Pericles' influence. This change was due partly to the hardships attendant on the prosecution of the Peloponnesian War, which broke out in 431 B. C. mainly as a result of Pericles' foreign policy. He conducted the war with vigor and skill during the first two years of hostilities but, having been weakened by an attack of the plague in 430 B. C., he died the next year.

Perkin, Sir William Henry (1838-1907), English chemist, was born in London. He was educated in chemistry at the Royal College in London and there became an assistant in chemical investigation and research.

In 1856, he discovered the aniline dye known as Perkin's purple and thereby became the founder of the coal-tar dye industry. He invented a method for the artificial produc-

tion of madder red, or alizarin; also a process of making coumarin from the Tonka bean and cinnamic acid from benzaldehyde. See *Dyes and Dyeing.*

Perkins, Frances (**1882-**), American sociologist, the first woman to be made a cabinet officer of the United States, was born at Boston. Educated at Mt. Holyoke College and Columbia University, she became secretary of the Consumers League in New York. From 1911, when she witnessed a fire in a shirt factory that destroyed 146 girl workers, she began to work for the prevention of industrial accidents. Under the governorship of Franklin D. Roosevelt, she showed great ability on the State Industrial Commission, and, when Roosevelt became president of the United States in 1933, he appointed her secretary of labor. She resigned in 1945. The next year she was appointed a member of the United States Civil Service Commission. She married Paul Wilson in 1913.

Perkins, (Richard) Marlin (**1905-**), American zoo director, was born at Carthage, Mo., and studied at the University of Missouri. He was curator of reptiles at the St. Louis Zoo from 1926 to 1938; curator of the Buffalo (N. Y.) Zoo, 1938-44, and since 1944 has been director of the Lincoln Park Zoo, Chicago. The popular TV program, Zoo Parade, which he originated in 1949, has won many awards. Besides scientific papers, Marlin Perkins has written a number of books, namely, *Animal Faces* (1944), *One Magic Night* (1951), and *Zooparade* (1954).

Peron, Juan Domingo (**1895-**), soldier and political leader, was president and virtual dictator of the Republic of Argentina. Even before his election in 1945, when presidents came and went in rapid succession, it was Colonel Peron who exercised the power behind the scenes, while holding the triple posts of vice president, minister of war, and secretary of labor and social welfare. With political shrewdness he cultivated the support of the working class, so that his eventual seizure of power had little effective opposition. Criticism from independent newspapers was kept in check by government restrictions. Relations between Peron's government and the United States ranged from hostile to technically friendly. Economic difficulties which arose from time to time caused Peron to become somewhat more favorably inclined toward the "Colossus of the North." A revolt in 1955 resulted in his overthrow and exile.

Perrault (*pĕ'rō'*), **Charles** (**1628-1703**), French poet and critic, was born in Paris. He was educated for the law, but turned his attention to letters, winning election to the French Academy by his verses. Most important of all his many writings are the *Mother Goose Stories*, published in 1697, in which *Sleeping Beauty*, *Little Red Riding Hood*, *Cinderella*, *Bluebeard*, *Puss in Boots*, and *Tom Thumb*, now comprising an indispensable part of the world's nursery books, were first put into literary form. See *Bluebeard*, *Mother Goose.*

Perry, Bliss (**1860-1954**), editor, author, and educator, was born in Williamstown, Mass. He was graduated from Williams in 1881 and studied also at Berlin and Strasbourg universities. He was professor of English at Williams College in 1886-93 and at Princeton, 1893-1900; edited the *Atlantic Monthly*, 1899-1909; and, in 1906, was appointed to the chair of belles-lettres at Harvard, a position formerly filled by Longfellow and by Lowell. His publications include *The Broughton House*, *The Plated City*, *The Amateur Spirit*, *Walt Whitman*, *The Praise of Folly*, and the autobiographical *And Gladly Teach.* He became a member of the American Academy of Arts and Letters in 1910.

Perry, Matthew Calbraith (**1794-1858**), American naval officer, a brother of Oliver Hazard Perry, was born at Newport, R. I. He entered the naval service in 1809; in 1819, was appointed executive officer of the *Cayne*, which convoyed the pioneer settlers of Liberia to Africa; and later extirpated piracy in the West Indies.

In 1833, Perry was stationed at the Brooklyn navy yard, where, under his superintendence, was built the first regular steamship for the United States navy. Its construction and successful operation won for him the name of father of the steam navy. He was made commodore in 1841 and, in 1852, was sent to Japan to induce that country to enter into relations wit the countries of the West. Two years later a treaty was concluded with Japan by which an American consul was to be received in one of the Japanese ports. From this time dates the radical change in Japanese life due to contact with the West.

Perry, Oliver Hazard (**1785-1819**), American naval commander, was born in South Kingston, R. I. During the War of 1812, he was chosen to fit out a fleet at Presque Isle, now Erie, Pa. After equipping nine vessels, he sailed against the British fleet, comprising six ships, though larger and stronger than those of the Americans. The English so hotly attacked the *Lawrence*, Perry's flagship, that out of 101 men on it only 18 were uninjured. At this juncture, Perry left the *Lawrence* and was rowed to the *Niagra* in a small boat. Resuming the conflict, he gained a splendid victory, taking all the English ships. He sent the following dispatch announcing the result: "We have met the enemy and they are ours. Two ships, two brigs, one schooner, and one sloop."

Perse, St. John. See *Leger St. Leger, Alexis.*

Pershing, John Joseph (**1860-1948**), American soldier, was born in Linn County, Mo., 1860. He was graduated at Kirksville State Normal School, 1880, and at West Point, 1886. He served as lieutenant of cavalry in the Apache Indian campaign in New Mexico and Arizona in 1886 and in the Sioux campaign, 1890-91. He was in Cuba, 1898; saw action in the Philippine Islands, 1899-1903; and, as military attaché, accompanied Kuroki's army in Manchuria in the Russo-Japanese War, 1905. The following year, he was made brigadier general. Later, in the Philippines, he commanded operations against the Moros, resulting in their final defeat at the battle of Bagsag, 1913. In 1916, he was placed in command of the U. S. troops sent into Mexico in pursuit of Villa and was promoted to major general.

After the declaration of war against Germany, 1917, he was made commander of the southern division and was selected leader of the first military force sent to France. He was elevated to the permanent rank of general, an honor which he was the fourth American to receive, the others being Grant, Sherman, and Sheridan.

Pershing showed his military capacity in World War I most notably by offering effective resistance to the German offensive at the Marne salient in 1918, by planning and successfully carrying out operations contributing largely to crushing this salient, by the victorious annihilation of the salient at Saint Mihiel, and by the winning of the desperate battle of the Argonne Forest. He steadily insisted that the American army be kept as a distinct force, acting with the French and British but not divided among them. In 1925-26 he headed a commission for holding a plebiscite in Tacna-Arica to determine its disposition between Chile and Peru. His memoirs, *My Experiences in the World War*, was published in 1931. The last years of his life were spent at Walter Reed Hospital, in Washington. His body, after lying in state in the Capitol, was buried in Arlington National Cemetery.

Pestalozzi (*pĕs'tä-lôt'sē*), **Johann Heinrich** (**1746-1827**), Swiss educational reformer, was born at Zurich. He studied at Zurich; became extremely interested in the problems of education; and, in 1775, established on his estate, Neuhof, a school which was intended to draw its support from popular subscription. This venture proved a financial failure and he gave it up in 1780. With government support, he founded a school for poor children at Stanz in 1798. Later he taught at Burgdorf and Yverdun.

The idea which lay at the basis of his method of intellectual instruction, known as the Pestalozzian system, was that everything should be treated in a concrete way. Objects themselves became, in his hands, the subjects of lessons tending to the development of the powers of observing and reasoning. His special attention, however, was directed to moral and religious training of children as distinct from their mere instruction.

Almost all Pestalozzi's methods are now adopted in the elementary schools of Europe and America, and to no other man has modern primary instruction been so largely indebted. His chief works are *How Gertrude Instructs Her Children* and *Leonard and Gertrude.*

Petain (*pā'tăN'*), **Henri Philippe** (**1856-1951**), French general, was born at Cauchy la Tour. While widely known on account of his lectures at the Ecole de Guerre, he was only a colonel in infantry at the outbreak of World War I.

For notable services in the French retreat from Charleroi to the Marne, 1914, he was promoted to the rank of general of a division. In the battle of Artois, May 1915, Pétain's corps broke the German front, taking Carency. In the following June, Pétain completed the capture of the so-called Labyrinth. When the Germans carried the outer works of Verdun, Feb. 21-24, 1916, Pétain was chosen to defend the fortress. He reorganized the battered French defenses and defeated the Germans, successfully resisting the greatest and most costly series of attacks ever made on a single position. During the victorious Allied offensive directed by Foch in 1918, Pétain was commander in chief of the French armies. Upon his triumphal entry into Metz, 1918, he was made a marshal of France.

After the defeat of France in 1940, Pétain formed a government, with its seat at Vichy, to administer unoccupied France. The restored French government, in August, 1945, found him guilty of treason. His sentence of death was commuted to life imprisonment, but he was released shortly before his death.

Peter the Great, or **Peter I** (**1672-1725**), emperor and civilizer of Russia was born at Moscow. He became joint czar of Muscovy in 1682 with his half brother Ivan. From Timmermann of Strasbourg, Peter received lessons in military art and mathematics. He afterward had the good fortune to fall under the guidance of Lefort of Geneva, who initiated him into the sciences and arts of civilization

and, by showing him how far Muscovy was in these respects behind the rest of Europe, influenced the whole of Peter's future career. By the death of Count Ivan in 1696, he became sole master of the empire and devoted himself vigorously to the task of introducing Western methods and Western culture into Russia.

Campaigns and Policy. Peter's first step was to secure access to the Baltic Sea and the Black Sea in order to build up a commerce with other European nations. He took Azov from the Turks in 1696, thus obtaining an outlet on the Black Sea. He brought from abroad engineers and naval architects to build a fleet, and he visited the Netherlands and England, traveling as a subordinate member of the Russian embassy in order to study shipbuilding and other Western arts. He returned to Russia to suppress a rebellion of the army. This accomplished, he set about reorganizing the army on Western models. He also introduced into Russia printing, systematic taxation, and Occidental habits of dress.

Access to the Baltic Sea was prevented by Sweden, which Peter attacked in 1700. Although he was defeated at Narva, he later appropriated a portion of Ingria, a province of Sweden on the Baltic coast, when the Swedish king Charles XII was occupied elsewhere. Here he laid the foundation of the new capital, Saint Petersburg, now Leningrad. In 1709, Charles XII invaded southern Russia and was defeated at Pultowa. The following year, Peter seized the whole of the Baltic provinces and a portion of Finland. In 1711, he carried on an unsuccessful war with the Turks, losing the port of Azov and the territory belonging to it.

In 1712, Peter carried his arms into Pomerania and Finland, completely subduing the latter province in the next year. In 1716-17, he visited Germany, the Netherlands, and France, and collected books and art treasures. His policy, particularly in the reorganization of the Church, excited intense opposition in conservative circles in Russia. A widespread conspiracy was formed against him in 1718. His eldest son, Alexei, was implicated and, having been condemned to death by Peter, is believed to have died as the result of torture. In 1722, Peter forced the shah of Persia to give up the three Caspian provinces along with the towns of Derbent and Baku.

Achievements. Peter's accomplishments were many. He established a body of 100,000 troops, under a discipline as regular as that of any army in Europe. He built a navy of 40 ships and 200 galleys. He fortified all the chief cities and beautified them. He built an academy for naval affairs and navigation, and also colleges at Moscow, Leningrad, and Kiev for languages, literature, and mathematics. He established schools in the villages for the peasants, a college of physicians and a dispensary at Moscow, an observatory, a repository for natural curiosities, botanical houses, and printing houses. Lastly, he permitted a general liberty of conscience among his people.

Peter the Hermit (**c. 1050-1115**), French monk and preacher, was born at Amiens. He is said to have made a pilgrimage to the Holy Land about 1093, and, having there witnessed the cruelties inflicted upon the Christians by the Mohammedans, communicated on his return with Pope Urban II, by whom he was authorized to preach the First Crusade for the recovery of Jerusalem from the hands of the Turks. His enthusiasm aroused western Europe to undertake several expeditions, all of which, except the last, were unfortunate; but at length, in 1099, he had the satisfaction of seeing Jerusalem throw open its gates to the victorious crusaders under Godfrey de Bouillon, though he himself had little share in the glory of the victory. His last years were spent in a monastery, which he had founded at Huy.

Petrarch (*pē'trärk*), **Francesco** (**1304-1374**), Italian poet, was born at Arezzo in Tuscany. He was educated at Avignon, Montpellier, and Bologna. His attentions were early devoted to literature; but it was not until the death of his father, in 1326, that he was allowed to follow his inclination. Having settled at Avignon, he became deeply attached, in 1327, to the beautiful Laura de Noves. After having traveled in the vain attempt to forget his love, he settled at Vaucluse, a romantic spot, where he wrote some of his finest works.

His literary reputation attracted the regard of princes. He was invited to Naples, to Paris, and to Rome, and received the laureate crown in the capitol of the last-named city. Among the warmest friends and patrons was the Colonna family. While he prided himself on his Latin works, his lasting fame rests upon the *Canzoniere* in Italian, which contain the sonnets to the golden-haired Laura. See *Italian Literature: Early Period.*

Petrie, William Matthew Flinders (**1853-1942**), English Egyptologist, was born at Charlton, Eng. He was educated privately and, in 1875-80, was occupied in the study of ancient remains at Stonehenge, Eng. In 1881, he began a long series of investigations and excavations at Giza, Egypt. He discovered the long lost Greek city of Naucratis and the towns of Am and Daphnæ. After the publication in 1893 of his *Ten Years Diggings in Egypt*, he was made professor of Egyptology in the University of London. In 1894, he was instrumental in establishing a fund for Egyptian research, which made possible, besides other important excavations, that of the site of Memphis. His numerous publications include *Religion and Conscience in Ancient Egypt, The Formation of the Alphabet, Some Sources of Human History, Seventy Years in Archaeology*, and *Egyptian Science.*

Pfeffer (*pfĕf'ĕr*), **Wilhelm** (**1845-1920**), German botanist, was born at Kassel. He was educated at the universities of Göttingen, Marburg, Würzburg, and Berlin. He was made professor of botany at Bonn in 1873, at Basel in 1877, at Tübingen in 1878, and at Leipzig in 1887. While his earlier researches were connected with taxonomy and morphology, he soon changed from the study of plant forms to the study of plant functions and, with Sachs, rose to unquestioned pre-eminence in plant physiology. By his work on osmotic pressure, he laid the basis of modern physical chemistry. His *Pflanzenphysiologie*, translated by Ewart in 1905, forms one of the most comprehensive treatises on plant physiology in the English language.

Phidias (**c. 500 B.C. -c. 432 B.C.**), Grecian sculptor, is generally supposed to have been born in Athens. He was the son of Charmides and was descended from a family of artists. He studied art under Hegias at Athens and then under Ageladas of Argos.

Phidias began his career as a painter, but came into prominence as a sculptor upon the rebuilding and adorning of Athens after its destruction by Xerxes. His great works were all executed during the favorable period when Greece was triumphant over her foreign enemies and her people enjoyed liberty at home.

His first public work was probably the statue of Athena (Minerva) at Platæa. The bronze "Athena Promachos," which stood on the Acropolis at Athens, doubtless came soon afterward. Among his other works are the ivory and gold "Minerva" in Pellene, Achaia; the thirteen statues which the Athenians placed as an offering in the temple of Delphi in memory of the victory of Marathon; and the "Lemnian Minerva," presented by the inhabitants of Lemnos to their new Athenian allies.

When Pericles became the virtual ruler of Athens, Phidias received a commission to execute all the more splendid statues that were to be erected, and he was made general superintendent of all works of art under construction in the city. To Phidias we owe the supervision of the glorious Propylæa and Parthenon. His genius is still attested by the sculptures and friezes taken from the Parthenon in modern times and preserved in London under the name of the Elgin marbles.

About 433 B. C., Phidias went to Olympia, where he produced a colossal statue of Zeus (Jupiter Olympus) made of ivory and gold. This statue was considered one of the seven wonders of the ancient world. It served, also, to fix for all time the material form in which Zeus was represented. A gold and ivory statue of Athena in the Parthenon vies with that of Zeus as the sculptor's most famous work.

On his return to Athens, political passions were running high. The party inimical to Pericles attacked that great statesman through his friends. Phidias was accused of fraud and impiety and was thrown into prison.

Phidias' work is as free as that of Homer himself from any taint of exaggeration, affectation, or false emphasis. With his keen power of ideal majesty, he combined a full technical mastery over every form of plastic art. He was a consummate master in marble, bronze, ivory, gold, or ebony; in sculpture, relief, engraving, chasing, enameling; in colossal statues or the most delicate ornamentation of a fringe or molding. See *Sculpture.*

Philip II (**382 B.C.-336 B.C.**), king of Macedon, father of Alexander the Great, was born at Pella, and came to the throne in 359. He completed the thorough unification of his kingdom and then speedily entered upon a policy of aggression, his object being to subject all the Grecian states to his rule.

In Thrace, he captured the small town of Crenides, which, under its new name of Philippi, soon acquired great wealth and fame. After capturing all the towns of Chalcidice, the last of which was the city of Olynthus, he made peace with the Thracians and the next year with the Athenians. It was while this siege of Olynthus was in progress that Demosthenes delivered his famous oration *On the Peace*, in which he sought in vain to arouse his countrymen to a sense of their danger.

In 339, the Amphictyonic council, composed of several Grecian states, declared war against the Locrians and, the next year, appointed Philip commander in chief of all their forces. The Athenians, alarmed at his entrance into Greece, formed a league with the Thebans against him; but their united forces were utterly defeated at the battle of Chæronea, 338. Philip was now master of all Greece. In attaining this end, he had shown himself to be possessed of a high degree of astuteness as a soldier and statesman, but the means which he employed were utterly unscrupu-

lous. While he was busily engaged in preparations for war upon the Persian king, he was assassinated and was succeeded by his son, Alexander the Great.

Philip II (**1165-1223**), king of France, called Philip Augustus on account of his great abilities and successful administration. He was crowned king with his father, Louis VII, in 1179 and, on the death of the latter, in 1180, came into full possession of the kingdom. He was one of the greatest monarchs of the Capetian dynasty.

Following the accession of Richard the Lion-hearted to the throne of England in 1189, Philip and he set out together on the Third Crusade. After staying three months in the Holy Land, Philip returned home and waged war against Richard's dominions in France. He conquered Normandy, Anjou, Maine, Poitou, and Touraine and was one of the chief consolidators of the French monarchy. The first charter of the University of Paris was granted in his reign.

Philip II (**1527-1598**), king of Spain, son of Charles V, was born at Valladolid. After the death of his first wife, Maria of Portugal, he married Mary, the queen of England, in 1554. He spent over a year in England and, in 1556, succeeded his father in the sovereignty of Spain, Sicily, Milan, the Netherlands, Franche Comte, Mexico, and Peru. A league between Henry II of France and the pope was overthrown by Philip, and, on the death of Mary, he married the French princess Isabella and retired to Spain, 1559. Devoting himself to the cause of the Church, Philip determined to crush all opposition to it in his dominions. This policy caused a revolt in the Netherlands, which, after a long struggle, achieved independence in 1579. His effort to overthrow Protestant England ended in the disaster of the Armada, 1588. He fatally injured Spain by crushing the spirit of liberty, by persecuting the industrious Moors, and by destroying her commerce by heavy taxation. See *Armada*.

Philip, King (**? - 1676**), sachem of the Wampanoag tribe of Indians, was the son of Massasoit, who, for nearly 30 years, was the stanch ally of the Pilgrim settlers. In 1662, Philip succeeded his elder brother and, for several years, kept the treaties of his father. But at length, goaded by the encroachments of the whites, he formed a confederation of tribes and, in 1675, "King Philip's war" broke out. The Indians surprised and murdered a great many colonists, but were eventually overcome and, in 1676, Philip himself was captured and slain in Rhode Island. See *King Philip's War*.

Philip Neri, Saint (**1515-1595**), was born of a distinguished family at Florence. From 1533 to 1537, he studied theology and philosophy in Rome. In 1548, he established the confraternity of the Holy Trinity for aiding the sick and founded a hospice which later became one of the finest at Rome. He entered the priesthood and, in 1574, established the famous congregation of the Oratory, where instruction was given to the uneducated. For their benefit sacred musical entertainments were given in the Oratory and hence were designated by the name oratorio.

At first these entertainments consisted of hymns set to popular tunes, but later Neri introduced sacred dramas with music composed by Palestrina and other leading musicians of Rome. From these musical productions developed the modern form of composition known as oratorio. Philip Neri was beatified in 1615 and was canonized in 1622. The apostle of Rome, as he is called, is the most popular saint of the Roman people.

Phillips, Hubert (**1891-**), editor, is a graduate of Merton College, Oxford. After serving in World War I he lectured on economics at Bristol University and for a time was director of extra-mural studies. On the staff of the *News-Chronicle* he conducted "Dogberry's Column" and was Bridge editor. He has made many radio broadcasts and is editor of Ptarmigan Books. Among his numerous miscellaneous writings are *Mathematical Puzzles, Bridge with Mr. Playbetter, Meet William Shakespeare, Profitable Poker*, and *The Pan Quiz Book*.

Phillips, Stephen (**1868-1915**), English poet, was born at Somertown, near Oxford. He entered Queen's College, Cambridge, in 1886, but, at the end of the first term, joined Benson's company of Shakespearean players. After six years, he left the stage and soon devoted himself entirely to literature.

In 1897, his volume of *Poems* containing "Christ in Hades," "Marpessa," and the fine lines "To Milton, Blind" established his rank as a poet of a high order. This volume was followed by *Paolo and Francesca, Herod, Ulysses, The Sin of David, Nero, The Last Heir, Pietro of Siena*, and *The King*, a series of beautiful poetic dramas which stand unsurpassed in recent English verse. His writings also include *Iole, Lyrics and Dramas, Panama and Other Poems*, and *Armageddon*. See *Paolo and Francesca*.

Phillips, Wendell (**1811-1884**), American orator and reformer, was born in Boston, Mass. He was graduated from Harvard in 1831; studied law there; was admitted to the bar in 1834; but soon withdrew from this profession and began the real work of his life.

A remarkably eloquent speech in Faneuil Hall in 1837 made him at once the principal orator of the Antislavery party, and thenceforth he was William Lloyd Garrison's loyal and valued ally in the struggle for abolition. He also championed the cause of temperance and woman's rights and advocated the rights of the Indians. As an orator Phillips ranked with Clay, Webster, and Everett.

Phillpotts (*fĭl'pŏts*), **Eden** (**1862-1960**), English novelist, was born at Mount Aboo, India. He was educated at Plymouth, England; was a clerk in the Sun Fire Insurance Company's office, 1880-90; studied for the stage; but soon adopted literature. In his earlier novels *Lying Prophets* and *Children of the Mist*, he described Devonshire life in the charming manner of Blackmore, with tragic elements resembling Hardy. His later writings include *The Human Boy, Sons of the Morning, The Secret Woman, The Whirlwind, The Virgin in Judgment, Dance of the Months, The Joy of Youth, The Bronze Venus, Circe's Island, Thorn in Her Flesh*, and poems under the title *Brother Beast*.

Phipps, Henry (**1839-1930**), manufacturer, was born in Philadelphia and was educated in the public schools of Allegheny City, Pa. He worked as office boy and clerk in Pittsburgh and, within five years, became a partner in a powder distributing agency and in a small steel mill. Later he became associated with Andrew Carnegie in iron and steel manufacturing. A multimillionaire, he devoted much time and money to art and philanthropy. He gave a million dollars each to the University of Pennsylvania and the Johns Hopkins Hospital, and the same amount to New York City for the construction of tenement houses.

Picasso (*pē-kä's-sō*), **Pablo** (**1881-**), Spanish painter and sculptor, was born at Malaga. He received his early art training from his father. In 1903, he took up his residence in Paris. There he founded the school of painting known as cubism, in which an attempt is made to create an abstract language of form divorced from the visual appearance of objects. After 1918, he returned to more orthodox ways of painting, specializing in scenes of circuses or aspects of poorer life in the city. By his directness, rigid economy of means, and audacity of subject, he became an outstanding figure in 20th century art, being numbered among the leaders of the post-impressionist school. In sculpture, he was one of the earliest to adapt characteristics of primitive statues to modern purposes.

Piccard (*pē'kär'*), **Auguste** (**1884-1962**), Swiss physicist and aeronautist, was born at Basel. Educated chiefly in Switzerland and Germany, he was appointed in 1922 to a chair in physics at Brussels University. In order to obtain data on cosmic rays he carried through a series of balloon ascents in 1931-34 which took him to the greatest altitude then reached by man—54,120 feet, or more than 10 miles above sea level. The balloons were specially constructed to meet the conditions encountered in the stratosphere and to permit many kinds of observations. On his ascent in 1934 he was accompanied by his twin brother, Jean Felix, who taught chemistry at the University of Lausanne.

Pickering, Edward Charles (**1846-1919**), American astronomer, was born at Boston. He was graduated at Harvard, 1865. He was instructor in mathematics at Harvard, 1865-67, and professor of physics at the Massachusetts Institute of Technology from 1867 to 1876, when he was appointed director of the Harvard Observatory.

At the Institute of Technology he established the first physical laboratory in the United States. Under his administration, the work of the observatory was extended to photometry and photography as applied to astronomical observations. He established also an important Astronomical Observatory at Arequipa, Peru. His writings include *Elements of Physical Manipulation*.

Pickett, George Edward (**1825-1875**), American soldier, was born at Richmond, Va. He was graduated from West Point, 1846, and entered the army as second lieutenant in the war with Mexico, during which he was brevetted captain for conspicuous bravery. Between 1848 and 1861, he served for the most part on the western frontier.

At the outbreak of the Civil War, Pickett resigned from the United States army and entered the Confederate service. Beginning as colonel in July 1861, he rose to the rank of major general by October 1862. He was engaged in several desperate battles under Lee, but won especial distinction at Gettysburg, July 3, 1863, as the leader of the unsuccessful assault upon which the fate of the Confederacy hung. The point reached by his troops in this charge is marked upon the field of Gettysburg by a granite monument. In the campaign of 1864-65, he made the final stand at Five Forks. Pickett was one of the finest infantry soldiers of the war.

Pickford, Mary (1893-), motion picture actress, was born at Toronto, Ont. Her family name was Gladys Smith. She made her debut on the regular stage at the age of five, but her chief successes were in motion pictures. She starred in *Tess of the Storm Country*, *Madame Butterfly*, and numerous other pictures that made her the most popular favorite in the early history of the motion picture drama. Her later pictures include *Coquette*, *The Taming of the Shrew*, and *Secrets*. She wrote *My Rendezvous with Life*.

Piel, Gerard (1915-), editor and publisher, was born at Woodmere, Long Island. Following graduation from Harvard University he engaged in journalism, first as science editor of *Life*, and later as publisher of the new *Scientific American*. Upon the reorganization of the publishing company, he became president of Scientific American, Inc.

Pierce, Franklin (1804-1869), 14th president of the United States, was born in Hillsboro, N. H. His father, General Benjamin Pierce, was a soldier in the war for independence and governor of New Hampshire. Franklin Pierce was educated at Bowdoin College, where he formed a lifelong friendship with his biographer, Nathaniel Hawthorne. In 1837, he was elected to the United States Senate, of which he was the youngest member. At the commencement of the Mexican War, he volunteered as a private, but was appointed brigadier general and led his brigade in the battles of Contreras and Churubusco.

In 1852, Pierce was nominated Democratic candidate for the presidency against General Scott, the Whig nominee, and received the votes of all but four states. He appointed an able cabinet and one of the very few that have remained unchanged throughout the administration. The chief events of Pierce's administration were the Kansas-Nebraska Bill, specifically repealing the Missouri Compromise; the Gadsden Purchase; the Koszta incident; and commercial treaties with Great Britain and Japan.

Pike, Zebulon Montgomery (1779-1813), American soldier and explorer, was born in Lamberton, N. J. At 15, he was cadet in his father's regiment, and was made first lieutenant in 1800. In 1805, he set out from Saint Louis to explore the sources of the Mississippi, returning in 1806. He then immediately began the exploration of the Arkansas river, which he ascended to Pueblo, Colo. He discovered Pike's Peak, which is named in his own honor, and visited the site of the present town of Leadville. He was promoted to the rank of major in 1808, colonel in 1812, and brigadier general in 1813. He died of wounds received in the expedition against York, now Toronto, Ont.

Pilsudski (*pĭl-sōōt'skē*), **Joseph (1867-1935)**, Polish soldier and statesman, was born at Zulou, near Vilna, Poland. He organized the Polish Socialist party which aimed, in part, at the freeing of Poland, then divided among Russia, Austria, and Germany. The Russian government, which had exiled him to Siberia, 1887-92, imprisoned him in 1900. He simulated insanity and escaped through an ingenious plot by his supporters. During World War I, he commanded a brigade in the Austrian army. On Austria's defeat in 1918, he organized the Polish army, with which he maintained the independence of Poland and, in 1920, inflicted a crushing defeat on the Russian armies advancing against Warsaw. He was made chief of state and first marshal of Poland.

Pinchot (*pĭn'shō*), **Gifford (1865-1946)**, American forester and politician, was born in Simsbury, Conn. He was graduated from Yale in 1889 and studied forestry extensively in Europe. At Biltmore, N. C., he began the first systematic forest work ever done in America. He was chief of the forest service in the United States Department of Agriculture, 1898-1910. He became professor of forestry at Yale in 1903 and, with his mother and his brother, founded the Pinchot School of Forestry at that university. In 1920, Pinchot became commissioner of forestry for Pennsylvania.

Pinckney (*pĭngk'nĭ*), **Charles Cotesworth (1746-1825)**, American statesman, was born at Charleston, S. C. He fought during the Revolution; assisted in framing the Constitution of the United States; acted as special envoy to France, 1796-97; and was an unsuccessful Federalist candidate for vice president of the United States in 1800 and for president in 1804 and 1808. He is the author of the famous sentiment "Millions for defense, but not one cent for tribute," in answer to Talleyrand's insulting proposal from the French Directory.

Pindar (*pĭn'dər*) (**c. 522 B.C.-443 B.C.**), Greek lyric poet, was born at Cynoscephalæ, near Thebes. He began his career as a poet at an early age. Infused with marked piety and true Homeric spirit, Pindar's work illustrates the spiritual unity of Greek art. Of his many works—which consisted of hymns, poems, odes, songs, dirges, and encomiums on princes —only his *Epinicia*, or *Odes*, have come down to us entire. These odes, commemorating victories in the public games, are characterized by great nobility and splendor of style.

Pinero (*pĭ-nĕr'ō*), **Sir Arthur Wing (1855-1934)**, English dramatist, was born in London. He was educated in private schools; was an actor from 1874 to 1881; and then became a playwright. He produced a long series of cleverly written plays, including several of the most popular successes of the modern English stage. He excelled in technical construction. His works include *Dandy Dick*, *Sweet Lavender*, *The Profligate*, *The Cabinet Minister*, *Lady Bountiful*, *The Princess and the Butterfly*, *Iris*, *His House in Order*, *The Thunderbolt*, *The Second Mrs. Tanqueray*, and *The Enchanted Cottage*.

Pinkerton, Allan (1819-1884), detective, was born in Glasgow, Scotland. He emigrated to America in 1842 and, in 1850, opened a detective agency in Chicago. He guarded President Lincoln on his inaugural journey to Washington and was authorized to organize the United States Secret Service, which he conducted until the close of the Civil War. Later his recovery of $700,000 for the Adams Express Company, the arrest of some noted English bank forgers, and the breaking up of the "Molly Maguires" in the coal districts gained him an international reputation. After his death, his sons carried on his work under the name of the Pinkerton detective agency.

Pisistratus (*pĭ-sĭs'trə-tŭs*) (**c. 612 B.C.-527 B.C.**), tyrant of Athens. He won popularity as a private citizen by his charm of manner and generosity and by the part he took in a successful war with Megara about 570-565 B. C. In the turbulent politics of the time, he adopted the cause of the laborers and seized the government in 560 by means of an artifice. Inflicting wounds on himself, he claimed that his political enemies had done it and asked for a bodyguard to defend him. His fellow citizens voted him a guard, which he armed and used to crush opposition to his government.

Pisistratus was twice expelled, but he regained his power and ruled with mildness and justice. He enforced the laws of Solon, who was his friend and relative; reduced taxation; made provision for the disabled and aged; and greatly extended Athenian influence, notably by occupying the ports controlling navigation to the wheat producing territory about the Black Sea. Pisistratus also encouraged literature and the arts.

Pitcher, Molly (c. 1744-1832), is the sobriquet of Mary Ludwig, American heroine of the Revolutionary War. She was born probably near Carlisle, Pa. She married John Hays, an artillerist, and accompanied him in his campaigns.

At the battle of Monmouth in 1778, she acquired her sobriquet from the soldiers, to whom she brought water in a pitcher, ignoring the danger. To her is frequently attributed an act performed by another heroine of the period, Margaret Corbin, who took her wounded husband's place at his gun and prevented its capture. Molly Pitcher was granted a pension by Pennsylvania in 1822.

Pitman, Sir Isaac (1813-1897), English educator and inventor of the Pitman system of stenography, was born at Trowbridge. He became master of a school at Barton on Humber, Lincolnshire, in 1832. In 1837, he published *Stenographic Soundhand*, his first studies of the art which made him famous. A few years later, he issued a second volume, called *Phonography, or Writing by Sound*.

About 1840, Pitman won a prize of £200 offered by the British government for the best method of collecting the proposed "penny postage" on prepaid letters. His suggestion was the use of postage stamps, which have since been universally employed. In 1843, he founded the phonetic society and soon afterward began the publication of the weekly *Phonetic Journal*.

Pitt, William (1708-1778), first earl of Chatham and often referred to as the Elder Pitt, an English statesman, was born in Westminster. In 1735, he entered Parliament. From the beginning, his oratory made him a leader, and he contributed greatly to Walpole's downfall in 1742. He later became a member of the privy council and, in 1756, was called upon to form a new cabinet, of which the Duke of Devonshire was prime minister. Pitt's vigorous war policy brought England successfully through the Seven Years' War with France and earned for Pitt the title of the "Great Commoner."

Pitt resigned in 1761, but, five years later, was called upon to form a new cabinet and became Viscount Pitt and Earl of Chatham. Ill health forced his retirement in 1768; but he kept up an active interest in public affairs; opposed Lord North's policy of taxing the colonies; and, upon the alliance of the colonies and France, protested, in a last great effort, against the proposal to make peace. At the close of this speech, he fell into the arms of his friends and died a few days later.

Pitt, William (1759-1806), English statesman, son of William Pitt, the "Great Commoner," and called the Younger Pitt, was born at Hayes. He was educated at Cambridge; studied for the bar; and entered Parliament in 1781. His first speech, favoring Burke's plan of economic reform, was made in the same year. At the age of 23, he became chancellor of the exchequer and, at 25, was regarded as one of England's most powerful prime ministers. He ruled

absolutely over the cabinet and was at once the favorite of the sovereign, of the Parliament, and of the nation.

From this time, the life of Pitt becomes the history of England. For 17 years, he held his great position without a break. The year 1793 saw the beginning of the Anglo-French War. His successful leadership of the government during one of the most trying periods of British history led his admirers to confer on him the title of "the pilot that weathered the storm." His persistent enmity to Napoleon contributed much toward the emperor's final overthrow.

In 1800, Pitt effected the union with Ireland, but, chagrined because the king had frustrated his Catholic Emancipation measures, he resigned office in 1800. In 1804, he again became prime minister. He effected the third great coalition against France, but the defeat of Austria and Russia at Austerlitz proved his deathblow, and he died soon after.

Pius IX (**1792-1878**), (Giovanni Maria Mastai-Ferretti), pope, was born at Sinigaglia, Italy. He was educated at Volterra and Rome; was ordained priest, 1819; was created archbishop of Spoleto, 1827; became cardinal in 1840; and was made pope in 1846.

Shortly after his accession, Pius granted a constitution to the Italian states. After the insurrection at Rome, 1848, he fled to Gaeta, but was restored by French aid two years later. In 1859-60, he lost the greater part of his dominions, but was maintained in Rome by a French garrison. In 1870, the infallibility dogma was promulgated by the ecumenical council held at Rome. In that year, Rome was occupied by the troops of Victor Emmanuel, the pope being held practically a captive in the Vatican.

Pius X (**1835-1914**), (Giuseppe Melchiorre Sarto), pope, was born at Riese, Treviso, Italy, the son of a postman. He was educated at Castelfranco and at the diocesan seminary of Padua and was ordained priest, 1858. He officiated nine years as curate at Tombolo; was parish priest of Salzano for nine years; and was made canon and chancellor of the diocese of Treviso in 1875. In 1884, he was appointed bishop of Mantua, and, in 1893, Leo XIII made him a cardinal and patriarch of Venice.

On the death of Leo XIII, 1903, the conclave elected him pope. As priest and bishop, his life had been spent in the pastoral and episcopal service of the Church rather than in the paths of diplomatic and official service and he continued to display deep interest in social questions and in bettering the life of the poor. In 1907, he issued an encyclical against the Modernist movement in the Church. He was beatified in 1951, and was canonized in 1954.

Pius XI (**1857-1939**), (Achille Ratti), pope, was born at Desio, near Milan, Italy, the son of a weaver. He was educated for the Church, finishing his studies at Rome, where he celebrated his first mass, 1879. Returning to Milan in 1882, he taught theology and sacred eloquence. In 1888, he became a director, and later prefect, of the Ambrosian Library at Milan. He was appointed subprefect, 1900, and, prefect, 1914, of the Vatican Library, Rome. At a critical period in World War I, 1918, he was designated apostolic visitor to Poland. In recognition of services performed there, he was named papal nuncio, 1919, and was appointed titular archbishop of Lepanto, 1920. Succeeding Cardinal Ferrari, he was elevated, July 3, 1921, to the cardinalate as archbishop of Milan. Upon the death of Benedict XV, Cardinal Ratti was elected pope, Feb. 6, 1922.

Pius XII (Eugenio Pacelli) (**1876-1958**), pope, was born in Rome, Italy. Ordained a priest at 23, he was employed in the secretariat of Pope Leo XIII. As papal nuncio to Munich in 1917, he laid the groundwork for peace proposals from Pope Benedict XV to the German government. He was the papal nuncio to the German republic and negotiated concordats with Bavaria and Prussia. In 1929, he was made cardinal and also papal secretary of state. In 1936, he made an airplane tour of the United States. He was chosen pope March 2, 1939, on the third ballot of the conclave. He proclaimed the dogma of the Assumption of the Virgin Mary in 1950.

Pizarro (*pĭ-zär′rō*; Sp., *pē-thär′rō*), **Francisco** (**c. 1470-1541**), Spanish conquistador, was born at Trujillo. He received little education; entered the army; and, in 1509, embarked with other adventurers for America. Having distinguished himself in Panama, he set out in 1524 by way of the Pacific on a voyage of discovery with another soldier named Almagro; landed on the island of Gallo, on the coast of Peru; and afterward returned to Spain for authority to conquer the country. In 1529, he obtained the royal sanction and, in 1531, set sail from Panama with three ships.

On his arrival at Peru, Pizarro found a civil war raging between the two sons of the emperor, who had just died. With overtures of peace he approached the victorious Atahualpa, who had become the reigning Inca, and was admitted into the interior of the country. He then invited Atahualpa to a banquet; had him imprisoned; and commenced a wholesale butchery of his subjects, after which he forced Atahualpa to disclose his treasures and then perfidiously put him to death.

Pizarro's power, by virtue of the mere terror he inspired, was now established and he might have continued to maintain it, had not a contest arisen between him and his old comrade Almagro, whom he put to death. Finally the sons and friends of the latter rose against Pizarro, seized him in his palace at Lima, and executed him.

Planck, Max (**1858-1947**), German physicist, was born at Kiel, and was educated at the universities of Munich and Berlin. He taught at Munich, at Kiel, and later at Berlin, where he became professor of mathematical physics and director of the institute of theoretical physics. Planck won for himself a distinguished place in the history of science by his so-called quantum theory of radiant energy, according to which such energy is "not emitted continuously but in discrete atomic quantities." He received the Nobel prize in physics for 1918. He published many technical works on thermodynamics and radiation.

Plato (**c. 429 B.C.-347 B.C.**), Greek philosopher, was born of noble parents in Ægina. His own name was Aristocles, the surname Plato, "Broad," being applied to him as indicative of his broad shoulders. He was of robust constitution and thoroughly trained in gymnastics. His mind was no less carefully cultivated. He made rapid progress in mathematics, mastered all the philosophies of his day, and wrote many poems, most of which he afterward burned.

Association with Socrates. The outstanding fact of his life was his connection with Socrates, in whose society Plato spent the ten years from 409 to 399 B. C. After the trial and execution of his beloved teacher, in 399 B. C., Plato quitted Athens and resolved to keep clear of politics and to give himself wholly to philosophy.

The Academy. He retired first to Megara, where he resided with Euclid. He then visited Cyrene and Egypt, returning to Athens about 395 B. C. Some years later he visited Italy and Sicily. In 387 B. C., he settled at Athens in a small house adjoining the "Academia," one of the principal gymnasiums of the city. Here he founded his school of philosophy, known as the Academy, which attracted pupils from all parts of Greece, among them Aristotle. This school was endowed and became the first university known to history. It flourished for about 900 years, and was finally closed by Justinian in 529 A. D.

Experiences in Sicily. Upon the death of Dionysius the Elder, tyrant of Syracuse, Plato, at the instance of his friend Dion, again went to Sicily, about 367 B. C., planning to assist the younger Dionysius in establishing a model state. The project failed. A second visit likewise ended in disappointment. These relations with the tyrant of Sicily brought down severe censure on the philosopher. His last years were saddened both by the failure of his hopes and by the reproaches of his enemies.

Writings. Plato was the most Socratic of all the disciples of Socrates. His reverence for his master is shown by the place that he assigned to him in his works, all of which are written in the form of dialogue with Socrates in the leading role. The well-known *Phædo*, for example, gives the last conversations of Socrates on the immortality of the soul. The fullest account of Plato's own philosophy and social theories are given in the *Republic*, the *Timæus*, and the *Laws*.

One of the most notable of Plato's doctrines is his theory of ideas. These ideas are not mere concepts of our minds; they are realities of which material objects are copies. His picture of the ideal state in the *Republic* entitles him to be called the first scientific socialist.

Influence. Plato's writing exercised an inestimable influence on Aristotle, the Stoics, Cicero, Plutarch, the Neoplatonists, the Christian fathers, the earlier scholastics, the philosophy and poetry of the Renaissance in Italy and England, and on the 19th-century revival of historical and philosophical studies in Germany. See *Educational Reformers*.

Platt, Charles Adams (**1861-1933**), American painter, etcher, and architect, was born in New York City. He studied in art schools of New York and Paris. His early paintings are largely views in New England, smooth in surface and sympathetically handled. These include "Snow" and "Clouds." He later turned to architecture and etching. The subjects of his etchings are drawn largely from scenes in the Netherlands and from the life of fishermen. Among the buildings he designed are the University of Illinois and the Freer Gallery of Art at Washington, D. C. He was elected to the American Academy of Arts and Letters in 1919.

Plautus (*plô′tŭs*), **Titus Maccius** (**c.254 B.C.-184 B.C.**), comic poet of ancient Rome, was born at Sarsina in Umbria. He early associated himself with actors, and, while employed to turn a baker's mill, wrote three plays. From the proceeds of these he was enabled to devote himself to the work of a playwright.

Twenty-one comedies legitimately assigned him are extant, though several are incomplete. They are based on

Greek comedies, but the genius of Plautus imparted to them an essentially Roman quality. They present great vivacity, well constructed plots, and humorous, lifelike characters and situations. His Latin is particularly pure and vigorous. He has found noteworthy imitators in Shakespeare, Molière, Dryden, Addison, and Lessing. His literary career continued uninterrupted until his death.

Pletho, Georgius Gemistus (**c. 1355-1450**), Byzantine humanist and philosopher, was born at Istanbul and, after a period of exile spent among the Turks, settled at Mistra, the site of ancient Sparta. He became known early as a vigorous exponent of the Neoplatonic philosophy, which he adapted into a creed for a religion that he hoped would supersede Christianity and Mohammedanism. On an official visit to Italy in 1438, he lectured and wrote a tract on the works of Plato, thereby arousing a wide interest in this philosopher among the scholars of the West.

Pliny (*plĭn'ĭ*) **the Elder,** known in Latin as **Gaius Plinius Secundus** (**23 A.D.-79 A.D.**), Roman naturalist and encyclopedist, was born probably at Como, Italy. Of his many works, his famous *Historia Naturalis* is the only one that has come down to us. This comprises 37 books, embracing 20,000 topics collected from about 2000 different volumes. This work was the greatest encyclopedia of ancient times. He was admiral of the fleet when the eruption of Vesuvius in 79 A. D. overwhelmed Herculaneum and Pompeii. He approached this volcano during the eruption partly to rescue victims and partly to investigate the phenomenon, but was overcome by poisonous fumes and perished. See *Biology, History of.*

Pliny the Younger, known in Latin as **Gaius Plinius Cæcilius Secundus** (**c. 61 A.D. -c.113 A.D.**), nephew and adopted son of Pliny the Elder, was born at Como. He is celebrated chiefly for his *Letters*, of which ten books are extant. In 100, he was appointed consul; he then composed his *Panegyricus*, an eulogy of Trajan, which is also extant. In 111, he was appointed governor of the provinces known as Bithynia and Pontica; in this capacity, he wrote to Trajan, with respect to the Christians in his province, an interesting letter which is one of the earliest historical references to Christianity. The *Letters* of Pliny are remarkable, not only for their elegance, but for the light they throw upon the history of the period in which they were written.

Plotinus (**c. 205 A.D.-270**), Neoplatonic philosopher, was born of Roman parents at Lycopolis, Egypt. At 8 years of age, he went to Alexandria to study philosophy. For some time he listened unsatisfied to the different lecturers, but, having heard the Platonic philosopher Ammonius Saccas, he zealously embraced his teachings and subsequently elaborated them. He went to Rome in 244. There he spent the remainder of his life lecturing on philosophy to enthusiastic audiences.

Plotinus' system was based mainly on Plato's "theory of ideas," and he taught that from the invisible world of ideas emanate powers which produce, at various stages, pure intelligence, the soul of the world, the souls of men and of animals, and, finally, matter. Man, according to Plotinus, belongs to the world of intelligence and to that of the senses, and the character of his life determines the world to which he will incline the more strongly. The supreme goal of human life is union with pure intelligence and with God.

The emperor Gallienus assigned to Plotinus two cities in Italy in which to establish an ideal state to be called Platonopolis and to be modeled after the commonwealth described in Plato's *Republic*. The project was prevented, however, by the interference of courtiers.

Plutarch (**c. 45 A.D. -c. 125 A.D.**), Greek moralist and biographer, was born at Chæronea in Bœotia. He belonged to a good family and received an excellent preliminary education in Athens under Ammonius of Alexandria. Subsequently, he traveled and accumulated in Egypt vast stores of historical and mythological lore. He acquired the habit of diligently examining public and private records and of carefully writing down his observations.

On his return to Greece, he visited the principal academies, studied the government of Sparta, and collected much historical information from books, statues, medals, inscriptions, and paintings. Plutarch studied in turn the positive sciences and medicine. Apparently, he remained ignorant of nothing connected with the history and development of the philosophic sects known in his time.

His fellow citizens sent him as proconsul to Achaia. This and other public offices that he held give evidence of the high public esteem he enjoyed. During his residence in Rome, he gave courses in philosophy and developed his ideas and doctrines through conversations.

Later, Plutarch returned to establish himself in his native Chæronea, where he continued to live a public-spirited and laborious life. His renown as a sage had spread through Greece; Athens accorded him the right of citizenship; Corinth and Elis invited him to their great civic feasts; and he was made priest of the oracle of Apollo at Delphi.

Plutarch was a moralist of the old school. His ethical writings, bearing the Latin title of *Moralia*, are most valuable pictures of antique manners and thoughts; but they are surpassed by the *Parallel Lives*, in which Plutarch made a character study of illustrious Greeks and Romans in pairs, from Theseus to his own age. This book is one of our best records of antiquity.

Pocahontas (*pō'kə-hŏn'təs*), (**c. 1595-1617**), Indian princess, the daughter of Powhatan, an Indian chief of Virginia. In 1612, she was enticed aboard a British ship, taken to Jamestown, and held as a hostage for the return of white prisoners. Converted to Christianity, she was baptized in 1613. In the following year, she was married to John Rolfe, with whom, in 1616, she went to England, where she was received as the daughter of an American king.

In a letter to the Queen of England, Captain Smith related how Pocahontas, in 1607, saved him from death at the hands of the Indians. It is on account of this dramatic rescue, further elaborated by Captain Smith in his *Generall Historie*, 1624, that Pocahontas is chiefly known. Pocahontas died at Gravesend, England, leaving a son, Thomas Rolfe, who later settled in Virginia. From him several noted Virginia families trace their descent.

Poe, Edgar Allan (**1809-1849**), American poet, short story writer, and critic, was born in Boston, Mass. He was adopted by John Allan of Richmond. He entered the University of Virginia in 1826, but left after a term and became a private in the regular army. In 1827, Poe published a volume of poems, his first attempt in literature, under the title of *Tamerlane and Other Poems*. He entered the Military Academy at West Point, but was cashiered in 1831.

Thrown now upon his own resources, Poe devoted himself to literature as a profession. In the same year, he published a volume containing the poems "The Valley of Unrest," "The City in the Sea," "Lenore," "To Helen," and "Israfel." In a magazine competition in 1833, he won a prize for the best prose story. This led to his employment in connection with the *Southern Literary Messenger*. In 1837, he removed to New York, where he lived by contributing to the New York *Quarterly Review* and other periodicals. In 1839, he became associate editor of *The Gentleman's Magazine* at Philadelphia and, in 1840, published a collection of his best stories, with the title *Tales of the Grotesque and Arabesque*. The year 1845 was marked by the appearance of his famous poem *The Raven*.

While Poe's criticism was of great importance in his day and while his prose tales have become a part of the world's literature, his poems, which are marked by exquisite fancy and felicity of language, remain the most distinctive expression of his genius. He was elected to the American Hall of Fame in 1910.

Poincaré (*pwăN'kä'rā'*), **Raymond** (**1860-1934**), French statesman, was born of a distinguished family in Bar le Duc. He made a brilliant record as a law student in Paris; practiced his profession; wrote articles for political journals; and, at the age of 27, was elected to the Chamber of Deputies. Appointed prime minister in 1912, he became an energetic supporter of the alliance with Russia and of the entente with England. In 1913, he was elected president of France.

On the expiry of his term as president, Poincaré was made president of the reparations committee, from which he subsequently resigned on account of its alleged leniency to Germany. In 1922, he became premier of France and sponsored the policy of the seizure of the Ruhr. Following his defeat at the polls in 1924, the country drifted to the brink of financial ruin. He was called on to head a coalition ministry in 1926 and, by 1928, had placed French finances and credit on a stable basis.

Poitier, Sidney (**1927-**), actor, was born at Miami, Fla. and received part of his education in Nassau. After brief employment as messenger for a drug store in Miami, he entered upon an acting career which has included award-winning roles in both stage and film plays. Among the plays in which he has taken a leading part are *Anna Lucasta* and *A Raisin in the Sun*. His principal film parts were in *Cry, the Beloved Country*, and *The Defiant Ones*.

Polk (*pōk*), **James Knox** (**1795-1849**), 11th president of the United States, was born in North Carolina. He was a Democratic member of Congress from Tennessee, 1825-39; served as governor of Tennessee, 1839-41; and was elected to the presidency in 1844.

The outstanding event of Polk's administration, 1845-49, was the Mexican War, by which the United States acquired Texas, California, and New Mexico. Texas was annexed by Congress just before Polk's inauguration.

During his administration, by a compromise treaty with England, the northern boundary line of Oregon territory—now the state of Washington—was fixed at 49° north latitude despite the fact that his platform in the campaign had promised to carry the line up to 54° 41′, "with or without war with England," which was condensed into the famous

watchword "Fifty-four forty or fight." The low tariff act of 1846 was a favorite measure of Polk's, being passed in the Senate by the vote of Vice President Dallas. Other features of Polk's administration were the admission of Wisconsin as a state in 1848; the adoption of the subtreasury system, by which some portion of the government funds is kept in vaults in Washington instead of in banks; the creation of the Interior Department, its secretary being added to the cabinet of the president; and the establishment of the Naval Academy at Annapolis.

Polo, Marco (**c. 1254-1324**), Italian traveler, was born of a noble family in Venice. In 1271, he accompanied his father and his uncle to the court of the famous Kublai Khan, Tartar emperor of China, by whom he was received with favor in 1275 and was employed on several embassies as well as being given a territory to rule. After spending many years in the service of the emperor, who was unwilling to part with them, the three Europeans finally obtained permission to accompany an embassy to Iran, whence they proceeded to Venice in 1295, laden with rich presents.

In 1298, Polo was captured by the Genoese and was put in prison. There he dictated to another captive, Rustichello of Pisa, the story of his adventures. This story, later published under the title of *The Book of Marco Polo*, revealed to a wondering Europe the magnificence of the Eastern world. It was one of the most important compilations in the history of geographical discovery. A golden statue of him, erected in a temple at Soochow, China, still bears witness to his visit to the Orient.

Polybius (*pō-lĭb'ĭ-ŭs*) (**c. 205 B.C.-c. 122 B.C.**), Greek historian, was born at Megalopolis in Arcadia. He was educated for a public career and was one of the thousand distinguished Achæans carried as prisoners to Rome, 168, where he remained in exile for about 17 years. While in Rome, he moved in the society of the most distinguished citizens, being a member of the coterie known as the Scipionic circle.

After his return, Polybius undertook numerous journeys into foreign countries and spent the remainder of his life writing his celebrated *History* in 40 books. Of this work, which was a general history of Rome and adjacent countries from 266 to 146 B. C., only the first five books and some fragments remain It is, apart from the work of Thucydides, the best example in the ancient world of a history which endeavors obstinately to obtain the facts and to learn their causes. His style is one of the earliest examples of the so-called common dialect, that was used in nearly all late Greek compositions.

Pompey, known in Latin as **Gnæus Pompeius Magnus** (**106 B.C.-48 B.C.**), Roman general and statesman. He was the son of Gnæus Pompeius Strabo, under whom he served in the Italian campaigns. He was an ally of Sulla and aided him in crushing the forces of the Popular leader, Marius. These services won him the title of "The Great." He later obtained credit for suppressing the forces led by Sertorius and by Spartacus and, in 67-66 B. C., cleared the seas of pirates.

The most important of Pompey's foreign military successes were his campaign against Mithridates, which made Pontus a Roman province, and his capture of Jerusalem, which added Syria to the Empire. Shortly after this, he joined the party of Cæsar and formed with him and Crassus the First Triumvirate.

Finding his dominant position threatened by Cæsar's growing influence, Pompey headed a party opposed to Cæsar, who was driven to take up arms against his former ally. The final struggle took place at Pharsalus, 48, when Pompey was defeated and fled to Egypt, hoping for protection. But, by the order of Ptolemy, king of Egypt, a former centurion of the general slew Pompey as he was landing. His body was left on the sands, his head was taken to Cæsar, who had the murderer put to death.

Ponce de Leon (*pōn'thā dā lā-ōn'*), **Juan** (**c. 1460-1521**), Spanish explorer, was born at San Servas, Leon. He accompanied Columbus on his second voyage and, in 1500, began the conquest of Puerto Rico, of which he was governor from 1512 to 1515, enriching himself by means of gold and slaves.

Having heard of a rich land called Bimini containing a fountain which possessed the property of restoring youth, he set out in search of it in 1513 and, on Easter Sunday, discovered and named Florida. On a subsequent expedition to Florida he was wounded by the Indians and died on the return voyage to Puerto Rico.

Pons, Lily (**1904-**), French singer, was born at Cannes. She was at first a pianist and actress, then studied singing in Paris. She made her debut in 1927 at Mulhouse in *Lakme* and her New York debut three years later in *Lucia di Lammermoor*, her coloratura soprano voice winning high praise. She appeared later in *Rigoletto*, *Tales of Hoffman*, *Mignon*, and *La Sonnambula*; starred also in motion picture plays, including *That Girl from Paris*, *I Dream Too Much*, and *Hitting a New High*. She took up her residence in America, marrying André Kostelanetz.

Ponselle, Rosa Melba (**1897-**), American singer, was born at Meridan, Conn., of Italian parents (Ponzillo). She obtained her musical education in New York and made her debut as a member of the Metropolitan Opera Company in 1918 as Lenora in *La Forza del Destino*, appearing with Caruso. Possessed of a natural skill in florid music and of a soprano voice especially rich in its lower notes, she became a favorite in *Il Trovatore*, *William Tell*, *Carmen*, and *L'Africaine*. She married Carle A. Jackson of Baltimore in 1936.

Pontiac (*pŏn'tĭ-ăk*), (**c. 1720-1769**), chief of the Ottawa Indians. At an early age he won distinction fighting in the service of the French, and, at Braddock's defeat in 1755, he is said to have led the warriors of his own tribe.

After the French had surrendered Canada, his hostility to the English prompted him to organize a combined attack upon all the English garrisons and settlements from Pennsylvania to Lake Superior. The attack, which was made early in May 1763, was in most places successful; but, at Detroit, where Pontiac led in person, the English commander was forewarned, and a five months' siege ensued. Pontiac resorted to every means known to the Indians to reduce the place, but was unsuccessful. Peace was finally made in 1766, Pontiac being forced to submit to British rule. He was killed at Cahokia, Ill.

Pontoppidan (*pŏn-tôp'ĭ-тнăn*), **Henrik** (**1857-1943**), Danish novelist, was born in Fredericia. He was educated at the University of Copenhagen. His trilogy on the life of a Danish clergyman—*Soil*, *The Promised Land*, and *The Day of Judgment*—established his reputation as an outstanding figure among the contemporary writers of Europe. He produced many short stories, novels, and plays, of which his *Lucky Per*, also a trilogy, is outstanding. With Karl Gjellerup, he was awarded the Nobel prize in literature for the year 1917.

Pope, Alexander (**1688-1744**), English poet, was born in London. His father was a prosperous linen draper. Pope was of small frame and of delicate constitution. The groundwork of learning he acquired at two private schools and from two priests who were his tutors; his further education resulted from his own persevering efforts.

Pope was a poet from his earliest years. His *Essay on Criticism*, in 1711, is a poem on literary standards abounding in aphorisms that have lived on. His *Rape of the Lock* illustrates Pope's peculiar gift of satire, ingenuity, and skillful versification. From 1715 to 1726, he was engaged chiefly on his translations of the *Iliad* and the *Odyssey*. In 1728-29, he published his greatest satire, the *Dunciad*, an attack on all poetasters and pretended wits. Of his many productions, the most widely known is the *Essay on Man*.

Pope's rank as a poet has been variously estimated. To his contemporaries among whom perfection of form was highly regarded, he was considered the greatest English poet. The romanticists, however, who value sincerity of sentiment most highly, are inclined to grant him little recognition as a poet.

Pope, John Russell (**1874-1937**), American architect, was born in New York City. He was educated at the College of the City of New York and Columbia University. In 1895, he was a fellow of the American Academy in Rome and studied later at the School of Fine Arts, Paris. He began practice in New York in 1900. Among the monuments of Pope's architectural skill are the National Gallery of Art and the Scottish Rite Temple, Washington; the MacDonough Memorial, Plattsburg; the Lincoln Memorial, at Hodgenville; the Richmond, Va., Terminal Station; and many fine residences. He was elected to the American Academy of Arts and Letters in 1927.

Porter, Cole (**1893-1964**), composer and lyricist of many successful musical comedies, was born in Peru, Indiana, and was educated at Yale and Harvard. Among his more than twenty-five Broadway musical shows and motion pictures are the following, with the hit song from each: *The Gay Divorcee*, 1932 ("Night and Day"); *Anything Goes*, 1934 ("You're the Top"); *Jubilee*, 1935 ("Begin the Beguine"); *Rosalie*, 1937 ("In the Still of the Night"); *Leave It to Me*, 1938 ("My Heart Belongs to Daddy").

More recent Cole Porter successes include *Kiss Me Kate*, 1948; *Can-Can*, 1953; and *Silk Stockings*, 1955.

Porter, David Dixon (**1813-1891**), American admiral, was born at Chester, Pa. He entered the navy as midshipman in 1829. From 1836 to 1841, he was employed in the coast survey of the United States and held various other appointments until the outbreak of the Civil War.

Porter was then made commander of the sloop of war *Powhatan*; distinguished himself in the capture of New Orleans; and commanded the gunboat and mortar flotilla which co-operated with the squadron of Admiral Farragut in the first attack on Vicksburg. In the fall of 1862, as acting rear admiral, he was placed in command of all the naval forces on the river above New Orleans. At the termination of the war, he was appointed superintendent of the United States Naval Academy, Annapolis. He was made vice admiral in 1866 and admiral in 1870.

Porter, Gene Stratton (1868-1924), American novelist and ornithologist, was born in Wabash county, Ind. She was privately educated and, in 1886, married Charles Darwin Porter. In her novels, some of which attained great popularity, she reveals a remarkably intimate knowledge of the plant and the bird life of her region. Her works include *The Song of the Cardinal, At the Foot of the Rainbow, A Girl of the Limberlost, Friends in Feathers, Music of the Wild, Laddie,* and *Homing with the Birds.*

Porter, Jane (1776-1850), English novelist, was born in Durham. She was educated in Edinburgh. Her first work, *Thaddeus of Warsaw,* published in 1803, was immensely popular and continued to be reprinted for over a century. *Scottish Chiefs,* a historical romance dealing with the heroic times of Bruce and Wallace, established her fame throughout Europe. With her sister Anna Maria, she wrote *Tales Round a Winter Hearth* and *The Field of Forty Footsteps.*

Porter, William Sydney (1862-1910), commonly known by the pen name "O. Henry," American short story writer, was born in Greensboro, N. C. He spent his early life as a wandering journalist, finally settling in New York in 1901 after having served a prison term for alleged embezzlement of funds while cashier in a bank at Austin, Texas.

Porter was an exceedingly prolific author with a remarkable gift of story telling. The list of his books includes *The Trimmed Lamp and Other Stories, The Gentle Grafter, The Voice of the City, Strictly Business, Two Women, Cabbages and Kings,* and *Rolling Stones.* See *Gift of the Magi.*

Post, Emily (c. 1880-1960), née Price, American novelist and writer on etiquette, was born in Baltimore, Md. She began writing novels in European settings which contrasted European and American standards. Her *Etiquette,* published in 1922, was a handbook of American standards in social intercourse which attained to great popularity and made her name a household word.

Post, George Browne (1837-1913), American architect, was born in New York City. He was graduated in civil engineering at New York University, 1858, and studied architecture under Richard Morris Hunt. Enlisting as a volunteer in the Civil War, he rose to the rank of colonel. In 1865, he began the practice of his profession in New York.

With Hunt, Mead, McKim, and Richardson, he became prominent in the revival and advance of American architecture between 1875 and 1890. Among the structures designed by him were the original Equitable and Western Union buildings, the buildings of the College of the City of New York, and the Cornelius Vanderbilt residence, in New York.

Potter, Paul (1625-1654), Dutch painter, was born at Enkhuizen. His best pictures are pastoral scenes with animal figures, the life-size "Young Bull" being especially celebrated. His "Dairy Farm" was sold in London in 1890 for £6090. The Rijks Museum at Amsterdam possesses his widely known "Bear Hunt." His pictures of animals and landscapes show great power and fidelity.

Pound, Ezra (1885-), American poet, was born at Hailey, Idaho. After being graduated from the University of Pennsylvania, he went to Europe in 1906, traveling in Spain, Italy, and France and finally settling in London. Here he became the leading spirit in a school of poetry, members of which were known as "Imagists." The group included Amy Lowell and Richard Aldington. Pound professed himself a follower of Ovid and Confucius. His poetry, as found in the collection called *Cantos,* is chiefly esoteric. Radio broadcasts made in Italy led to a charge of treason and he was committed to an asylum in 1945. He was released in 1958.

Pound, Roscoe (1870-1964), American jurist, was born at Lincoln, Nebr. He was educated at the University of Nebraska and Harvard University. He was admitted to the bar in 1890 and practiced at Lincoln, Nebr., until 1901, when he became assistant professor of law at the University of Nebraska. After acting as dean of the law department there from 1903 to 1907, he served successively as professor of law at Northwestern University, the University of Chicago, and Harvard University, becoming dean of the Harvard Law School in 1916. He retired in 1937.

Powell, John Wesley (1834-1902), American geologist, was born at Mount Morris, N. Y. He attended Oberlin College, 1857-58, and became interested in natural science. He enlisted as a private in the Civil War; rose to the rank of major; and lost his right arm at the battle of Shiloh.

In 1865, Powell became professor of geology at Illinois Wesleyan University and, in 1867, made his first journey of exploration to the Colorado Rockies. In 1869, he made a voyage of great danger and hardship through the Grand Canyon of the Colorado River, the valuable results of which brought him into scientific prominence. Congress voted him funds to continue explorations, and, 1871-73, he made a second voyage down the Colorado River, surveying an area of 100,000 square miles. Largely upon his recommendation, Congress established, in 1879, the United States Geological Survey, of which he was director from 1881 until 1894.

Powers, Hiram (1805-1873), American sculptor, was born at Woodstock, Vt. In early youth, he was apprenticed to a clockmaker in Cincinnati; was later taught by a German sculptor to model in plaster; and was employed for several years in making wax figures for a dime museum. In 1835, he went to Washington, where he executed busts of the most distinguished persons of the day. In 1837, he established his residence in Florence, Italy, where he passed the remainder of his life. In 1838, Powers produced his statue "Eve," and, in 1843, the still more popular "Greek Slave."

Pratt, Edwin J. (1883-1964), Canadian poet and educator, was born at Western Bay, Newfoundland. After graduation from the University of Toronto he became a teacher of literature there. Beginning with *Newfoundland Verse,* '27, he has published numerous volumes of poetry, of which *Behind the Log* is an outstanding example. He has also edited the *Canadian Poetry Magazine.* A volume of his collected poems was published in 1958.

Praxiteles (*prăk-sĭt'ê-lēz*), Greek sculptor, a citizen of Athens, flourished in the 4th century B. C. He executed statues in both bronze and marble and was unrivaled in his treatment of the beauties of the human figure. His statues of gods are less august than those by earlier Greek sculptors, but they present a finer and more human type.

The most celebrated work of Praxiteles is the marble Aphrodite of Cnidus, which Pliny called the finest statue in the world. He is known also for his satyrs, one of which has been made familiar to readers of English by Hawthorne's *Marble Faun.* He executed famous statues of Eros and Apollo, which have perished. His statue of Hermes of Olympia was found during the excavation of the Heræum at Olympia in 1877.

Prescott, Orville (1906-), editor and literary critic, was born at Cleveland, Ohio. After graduation from Williams College, he engaged in newspaper work, conducting columns on sports, art, and books. He served for a time on the staff of *Newsweek* magazine, was literary editor of *Cue,* and more recently has been co-editor of the section "Books of the Times" for *The New York Times.* He is the author of *In My Opinion, An Inquiry into the Contemporary Novel.*

Prescott, William Hickling (1796-1859), American historian, was born at Salem, Mass. During his college course at Harvard, he accidentally lost the sight of an eye, the other being so seriously affected that he was nearly blind. He was then sent abroad for his health, traveling in England, France, and Italy. On his return to America, he gave his attention to literature and, in 1825, selected materials for a *History of Ferdinand and Isabella,* which appeared in 1837. He next devoted six years to the *History of the Conquest of Mexico* and four years to the *Conquest of Peru.* He left his *History of Philip II* unfinished.

Price, Leontyne (1927-), singer, was born at Laurel, Miss. She was educated at Central State College, Wilberforce, Ohio and, in music, at the Julliard School in New York. Besides appearing as soloist she has sung in opera at Vienna, Berlin, and elsewhere in Europe and with the Metropolitan Opera Company in New York.

Priestley, John Boynton (1894-), English novelist and playwright, was born in Yorkshire. He served in the British army in World War I and was an honor student at Cambridge University. His earliest writings consisted largely of essays ranging from off-hand personal opinions and preferences to more formal criticism, as in *George Meredith, The English Comic Characters,* and *The English Novel.* Following the success of his most popular novel, *The Good Companions,* he wrote several other works of fiction, best known of which is *Angel Pavement.* Later he turned his attention chiefly to the writing of plays, successful examples of which are *Dangerous Corner, Time and the Conways, I Have Been Here Before,* and *An Inspector Calls.*

Priestley, Joseph (1733-1804), English chemist and clergyman, was born at Fieldhead. He was educated at Daventry and was subsequently pastor to various congregations. In 1774, he announced the discovery of oxygen, which he called "dephlogisticated air." In 1780, he settled at Birmingham and proceeded actively with experiments, which led to the discovery of many chemicals common today. The naming of rubber is credited to him, the name being based on its erasing qualities, to which he called attention. He became the associate of Boulton, Watt, and Erasmus Darwin, grandfather of Charles Darwin; and was also pastor of a Unitarian congregation.

In 1791, Priestley's fortunes changed. His religious principles and his avowed partiality to the French Revolution excited the hatred of the High Church and Tory party, and, in the riots of July in that year, his house, library, manuscripts, and apparatus were committed to the flames. Conceiving himself to be insecure from popular

rage, he embarked for America in 1794, settling at Northumberland, Pa. His writings include more than 130 separate works, covering a vast range of subjects.

Protagoras (*prō-tăg'ō-răs*), **(c. 485 B.C.-c. 411 B.C.),** Greek educator and philosopher, was born at Abdera, Thrace. He settled in Athens and gained a reputation as a teacher of literature, sociology, and philosophy. He was the first to call himself a sophist, and he made a considerable amount of money by offering courses in general culture. He was a friend of the statesman Pericles.

As a philosopher, Protagoras is often regarded as the forerunner of pragmatism. In his famous saying "Man is the measure of all things," he crystallized the doctrine, developed in his *Truth*, that all things actually are only what they appear to each person. He wrote also a work entitled *On the Gods*. It expressed doubt regarding the existence of divinities and led to its author's banishment from Athens. Protagoras is credited with being the first to systematize grammar and to distinguish the parts of speech, the tenses, and the modes. He perished at sea.

Proust (*prōōst*), **Marcel (1871-1922),** French novelist, was born of wealthy parents in Paris, where as a young man he frequented the most aristocratic salons. Becoming bored with Parisian high society, he withdrew to apply himself to serious writing and spent seventeen years composing his multi-volume masterpiece, *A la recherche du temps perdu* (*Remembrance of Things Past*), published in France in 16 volumes between 1913 and 1927. Partly autobiographical, it deals psychologically and in the minutest detail with the decaying aristocratic society he knew. While writing it, Proust, a sufferer from asthma since boyhood, lived the life of a recluse in a small cork-lined room. His work has influenced later novelists to a remarkable degree.

Przhevalski (*pĕr-zhĕ-vàl'y'skĭ*), **Nikolai Mikhailovitch (1839-1888),** Russian explorer, was born at Kimbrovo. He was educated at Smolensk and Leningrad. During 1870-73, he made his first important journey to the west central part of China, giving the results in his *Travels in Mongolia*. In his second journey, 1876-77, described in his book *From Kulja across the Tian-Shan to Lob-nor*, he rediscovered the large lake Lobnor, until then unvisited by Europeans since the time of Marco Polo. In his third journey, he explored the sources of the Hwang and eastern Tibet, and, on his fourth, he crossed the great desert of Gobi, locating the watershed between the Hwang and Yangtze rivers.

During these explorations, he secured valuable collections of animals and plants and made many remarkable discoveries, including the wild camel and a true wild horse, now known as Przhevalski's horse.

Ptolemy (*tŏl'ĕ-mĭ*), astronomer and geographer, whose proper name is Claudius Ptolemæus, was a native of Egypt and flourished in Alexandria about 139-161. Both as an astronomer and as a geographer, he held supreme sway over the minds of almost all the scientific men from his own time down until about the 15th century.

Ptolemy collected the astronomical learning of the ancient world and, by adding improvements, arrived at the astronomical system which he described in his Greek work known best by its medieval title of the *Almagest*. This system, known as the Ptolemaic system, in which the earth is assumed to be the fixed center of the universe, was superseded by the Copernican system within the past four centuries. Ptolemy's *Geography* contains a calculation of the size of the sphere of the earth, a description of the surface of the earth as then known, a list of places, each located by its latitude and longitude and followed by a brief description with notes on interesting features. See *Astronomy*.

Ptolemy I (c. 367 B.C.-283 B.C.), king of Egypt, known by his surname Soter, "Preserver." Ptolemy was a Macedonian and acted as one of Alexander's generals in his Eastern campaigns. When Alexander's possessions were divided after his death, Egypt fell to Ptolemy.

Wars followed the partition. Ptolemy was a man of energy and valor and not only warded off danger from his own realm, but also extended his dominions by the addition of Phœnicia and made his influence paramount in the Mediterranean Sea. His capital, Alexandria, became the foremost city of the world, and its museum and library, founded by Ptolemy, attracted numerous scholars, making Alexandria a rival of Athens as a center of culture.

Ptolemy II (c. 309 B.C.-247 B.C.), surnamed Philadelphus, son of Ptolemy I. His reign, which began in 285 B. C., is remarkable for the successful cultivation of the arts of peace rather than for the practice of war. He carried on the work of his father by enriching the library of Alexandria with all the literary treasures which he could procure.

Tradition alleges that it was by his orders that the Hebrew Scriptures were translated into Greek and that the version called the Septuagint was formed. He is said to have induced Manetho to write, in Greek, a political history of Egypt and an account of the religious tenets of the Egyptians. He expended large amounts on public works and was the builder of a famous lighthouse on the island of Pharos, which became known as one of the seven wonders of the ancient world.

Puccini (*pōōt-chē'nē*), **Giacomo (1858-1924),** Italian composer, was born at Lucca. He received his musical education at Lucca and at the conservatory at Milan. Puccini's first opera, *Le Villi*, attracted much notice in Italy. The success of *Manon Lescaut* in 1893 was surpassed in 1896 by that of *La Bohème*, which immediately became favorably known throughout the musical world. In 1904, he won a still greater triumph with *Madame Butterfly*, the libretto of which is based on the novel by J. L. Long. *The Girl of the Golden West*, a typical American subject, was first produced at the Metropolitan Opera House in 1910. Puccini is the chief representative of the Italian veristic school of opera. See *Madame Butterfly*.

Pulaski, Casimir (1748-1779), Polish soldier and American revolutionary general, was born at Podolia. He assisted his father in revolts against King Stanislaus. Forced to flee, he came to America in 1777 and, joining Washington's army, distinguished himself at Brandywine. The next year he organized an independent cavalry brigade—the Pulaski legion—which fought losing battles at Egg Harbor, N. J., and Charleston, S. C. While leading a cavalry charge in an attack on Savannah, Pulaski was mortally wounded, dying shortly thereafter.

Pulitzer (*pōō'lĭt-sĕr*), **Joseph (1847-1911),** journalist, was born in Budapest, Hungary, and was educated by private tutors. He came to the United States in 1864 and served until the end of the Civil War in a cavalry regiment with the Union forces. He went to Saint Louis, where, in 1868, he became a reporter and later managing editor and part owner of the *Westliche Post*. In 1878, he bought the Saint Louis *Dispatch*, combining it with the *Evening Post*.

Having previously served as a member for the Missouri state legislature, he removed to New York and was elected to Congress in 1884 as a Democratic member. He resigned shortly, however, in order to devote himself to editing the New York *World*, which he had acquired in 1883. By appealing to popular taste in his news items and editorials, he built up a circulation unrivaled before the advent of the Hearst papers. In 1903, he endowed with $1,000,000 a school of journalism at Columbia University. He donated funds also for the Pulitzer prizes—$500 to $2000 to be awarded annually for the year's best American novel, play, book of poetry, historical work on the United States, biography, cartoon, editorial, and newspaper reporting.

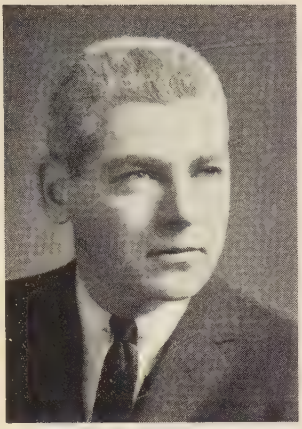
Pullman, George Mortimer (1831-1897), American inventor, was born in Chautauqua County, N. Y. For a time he worked as a cabinetmaker and, in 1853, became engaged in moving buildings which obstructed the widening of the Erie Canal. In 1859, he located in Chicago as a building contractor and, in 1863, began constructing the sleeping cars now called by his name throughout the world. A few years later he organized the Pullman Palace Car Company and, in 1880, he founded the town of Pullman, now part of Chicago, where the coaches were built. In 1887, he added the vestibule to his sleeping cars, thereby greatly increasing their comfort. He amassed a fortune from his inventions and his business enterprises.

Pupin (*pū-pēn'*), **Michael Idvorsky (1858-1935),** physicist and electrician, was born in Idvor, Hungary. He came to America in 1874; was graduated from Columbia, 1883; and studied physics and mathematics at Cambridge and at Berlin. In 1901, he was appointed professor of electromechanics at Columbia University. His researches in electrical resonance and wave propagation greatly extended the range of long-distance telephony. In 1923, he published his autobiography *From Immigrant to Inventor*.

Pusey (*pū'zē*), **Nathan M. (1907-),** educator, was born at Council Bluffs, Iowa, and was educated at Harvard University (1928). He became an assistant in history at Harvard, tutored at Lawrence College, Appleton, Wis., and from 1938 to 1940 was assistant professor of history and literature at Scripps College, Claremont, Cal. He served as assistant professor and later associate professor of classics at Wesleyan University, Middletown, Conn., 1940 to 1944. Appointed president of Lawrence College in 1944, he filled that position until he was made president of Harvard University in 1953.

Púshkin (*pōōsh'kĭn*), **Alexander Sergêievitch (1799-1837),** Russian poet, the son of a nobleman, was born at Moscow. In 1817, he became a government clerk, but, having written an *Ode to Liberty* which offended the emperor, he was banished to southern Russia. In 1825, Emperor Nicholas reinstated him and appointed him to write a history of Peter the Great. His greatest work, *Yevgény Onegin*, is a romance in verse. Among his other writings are *The Gypsies*, *Poltava*, *Dubrovsky*, and a novel entitled *The Captain's Daughter*. His drama *Boris Godounov* was used as the basis of Mussorgsky's opera. Pushkin ranks as the foremost poet of Russia. He was killed in a duel.

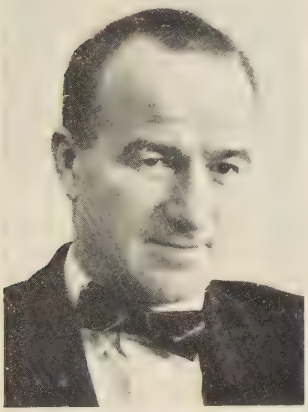
Bruce Catton, senior editor of the *American Heritage* magazine, is also a noted writer of Civil War stories.
Joe Covello from Black Star



John B. Oakes is editor of the editorial page of the *New York Times*.
N.Y. Times Studio

Melville Bell Grosvenor, editor of *The National Geographic Society*.

EDITORS AND PUBLISHERS



Left Gerard Piel, Publisher and co-founder of the new *Scientific American*.

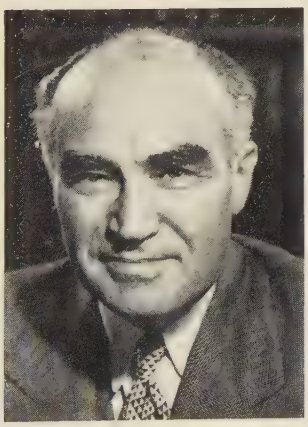
Photo by Roy Stevens

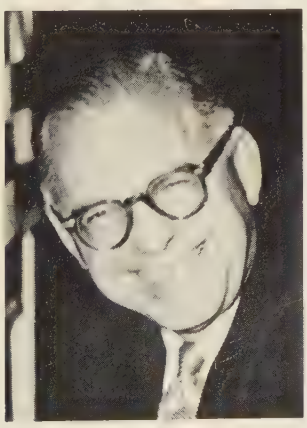
Right John H. Johnson, President and Editor of *Ebony, Tan, Jet*.

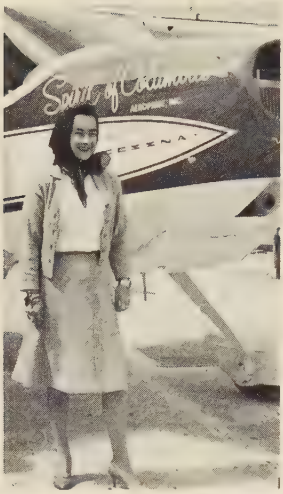
Below left Henry R. Luce, co-founder of *Time* and founder of *Fortune* and *Sports Illustrated*.

Below center Bennett Cerf, publisher, lecturer, and television panelist.

Below right Gardner Cowles, founder and publisher of *Look* magazine and president of Cowles Magazines, Inc.







Mrs. Jerrie Mock completed the first world solo flight by a woman April 17, 1964, in a single-engine plane.

Mrs. Mildred S. Fenner, Editor, *N.E.A. Journal.*

Mrs. Mary S. Roebling, President, Trenton (N.J) Trust Company.
Bradford Bachrach

PROFESSIONAL AND BUSINESS WOMEN

Mrs. Adelaide A. Field, Editor, *Child Life.*
Bradford Bachrach

Elizabeth Arden, cosmetics manufacturer.
UPI Photo

Mrs. Olive Ann Beech, President, Beech Aircraft Company.

Putnam, Amelia Earhart (1898-1937), American aviator, was born at Atchison, Kansas. She was educated at Ogontz School for Girls, Rydal, Pa., and at Columbia University. In 1926, she was the first woman to cross the Atlantic in an airplane, flying as a passenger. In 1931 she married George Palmer Putnam, publisher. The next year she made a solo flight across the North Atlantic, the first woman to accomplish this feat. In 1935, she made the first solo Pacific flight, flying from Honolulu to Oakland, Cal. in 18.5 hours. In an attempted flight around the world in 1937, she disappeared, lost, it is believed, in mid-ocean.

Putnam, Herbert (1861-1955), American librarian, was born in New York City. He was graduated from Harvard and Columbia universities and was admitted to the bar in 1886. He was librarian of the Minneapolis Public Library 1887-91 and of the Boston Public Library 1895-99. He then became librarian of the Library of Congress, serving until 1939, when he was made librarian emeritus. In 1937, he was elected to the American Academy of Arts and Letters.

Putnam, Israel (1718-1790), American soldier, was born at Danvers, Mass. Removing to Pomfret, Conn., he became a farmer and woolgrower. In 1755, he helped to repel a French invasion of New York and was present at the battle of Lake George. In 1758, he was captured by a force of French and Indians and narrowly escaped death. He was later exchanged. In 1762, he served as colonel in the West Indian campaign and, in 1764, aided in the relief of Detroit, then besieged by Pontiac.

In 1775, after the battle of Concord, Putnam took command of the forces of Connecticut; was at Bunker Hill; held the command at New York; and, in August 1776, fought at Brooklyn Heights, where he was defeated by Howe. In 1777, he was appointed to the defense of the highlands of the Hudson.

Pyle, Ernest T. (1900-1945), columnist and war correspondent, was born on a farm near Dana, Indiana. He studied for a while at Indiana University, then became a reporter, chiefly for Scripps-Howard papers. He tried desk assignments as copy reader, telegraph editor, and managing editor, but the lure of travel was irresistible. His realistic stories of London under bombardment, of American soldiers in camp, on the march, and in action in North Africa and Italy, were like letters home for countless G.I.'s and their families back in the states. The books, *Here Is Your War* and *Brave Men*, contain many of these "snapshots" from the war zone. He was doing a similar service for the American forces in the Pacific area when he was killed on the island of Ie, near Okinawa.

Pyle, Howard (1853-1911), American illustrator and author, was born at Wilmington, Del. He was educated in private schools and at the Art Students' League, New York. He became one of the foremost American illustrators, excelling in work for children. Possessing marked literary ability, he often wrote the text for his illustrations. He wrote and illustrated *The Merry Adventures of Robin Hood.*

Pyrrhus (*pĭr'ŭs*), **(c. 318 B.C.-272 B.C.),** Greek general, king of Epirus, came to the throne in 306. He was expelled a few years later, but was restored by the help of Ptolemy Soter in 295; held the kingdom of Macedonia for a short time; and, in 281, went to Italy to help Tarentum against the Romans.

He was at first successful, winning several victories. That at Asculum, in 279 B. C., gave rise to the phrase "Pyrrhic victory," meaning a victory won at great cost. The origin of the phrase is to be found in Pyrrhus's answer to congratulations on his victory, "Another such victory and Pyrrhus is destroyed." After successes against the Carthaginians in Sicily, Pyrrhus was finally defeated by the Romans in 275 B. C.

Pyrrhus is regarded as one of the ablest of Greek generals, being one of the few who ever defeated a Roman army in the field. Returning to Macedonia, he recovered that kingdom, but was killed.

Pythagoras (*pĭ-thŏg'ô-răs*), **(c. 582 B.C.-c. 500 B.C.),** Greek philosopher and mathematician, was born probably at Samos. He is said to have traveled from Persia to Gaul, and even to India, seeking wisdom, and to have resided many years in Egypt.

About 530, he settled at Crotona, in Italy, and established a theosophical sect, the members of which sought release from "the wheel of change" by an ascetic regimen and by mathematical studies. One of its doctrines was the so-called transmigration of souls, according to which the soul resides successively in different bodies of men or other animals. His mathematical interests gave rise to the proof of the geometrical proposition regarding the square upon the hypotenuse of a right-angled triangle and the discovery of the numerical relations between the musical notes. He propounded the theory that the basis of the universe is number and originated the idea of the harmony of the spheres.

Quesnay (*kĕ'nĕ'*), **François (1694-1774),** French economist and physician, was born at Mere, France. He studied medicine at Paris and rose to be first physician to the king. His chief title to fame, however, rests on his essays in political economy. Around him gathered the famous group of economists known as the physiocrats, who insisted on the folly of governmental interference with the operation of economic laws. His views are set forth in *Tableau économique.* See *Physiocrat.*

Quezon, Manuel Luis (1878-1944), Filipino statesman, was born at Baler, Tayabas Province. He was admitted to the bar in 1903. In the revolt against Spain and opposition to American sovereignty, Quezon served under Aguinaldo. He later was a provincial prosecuting attorney but did not cease to work for independence of his country while provincial governor, 1906-07, and then as resident commissioner to the United States. He was president of the Philippine senate, 1916-35. On the passage of the act granting gradual independence, he was elected the first president and was re-elected in 1941. After the Japanese invasion he removed to the United States.

Quincy, Josiah (1772-1864), American statesman, was born in Boston, Mass. He was graduated from Harvard, 1790; studied law; and entered politics. From 1805 to 1813, he was a member of Congress. He opposed the War of 1812 and was one of the first to denounce the slaveholding interest as a rising and dangerous tyranny. In 1813, he was elected to the Massachusetts State Senate, in which he remained until 1820. He was then elected to the State House of Representatives, of which he became speaker. He was mayor of Boston, 1823-28, and president of Harvard, 1829-45. He published *History of Harvard University, The Municipal History of the Town and City of Boston, The Life of John Quincy Adams,* and other works.

Quintilian (*kwĭn-tĭl'ĭ-ăn*), or **Marcus Fabius Quintilianus,** Latin rhetorician and educator, was born in Spain about 35 A. D. Going to Rome in the train of Galba, he began practice at the bar. However, he achieved fame chiefly as a teacher of rhetoric, in which, for 20 years, he instructed the foremost youth of Rome.

As the first public teacher benefited by the endowment established by the Emperor Vespasian, Quintilian received a fixed salary from the government. His famous *Institutes of Oratory,* comprising 12 books, contains all that he considered most valuable in earlier rhetorical treatises, both Greek and Latin. In addition, the work contains the only practical exposition of the whole field of education given by a Roman.

Rabelais (*răb'ĕ-lā'*), **François (c. 1490-1553),** French humorist and satirist, was born near Chinon. In 1530, he began the study of medicine at Montpellier; took his degree; and, in 1532, was appointed hospital physician at Lyons, there publishing several works on medical science.

He achieved fame through two romances, in which are narrated the adventures of *Gargantua* and *Pantagruel,* and which rank among the world's masterpieces of humor and grotesque invention. The work abounds in good sense and folly, delicate thoughts and gross obscenities; it is, in effect, a protest, in the interests of humanism, against Christian asceticism and faith and represents a return to nature. It brought him into conflict with the Church, and, on several occasions, he found it prudent to disappear. See *Gargantua, Pantagruel, Panurge.*

Rabi (*rä'bē*), **Isador Isaac (1898-),** American physicist, was born at Rymonow, Austria, and was brought to the United States in infancy. Educated at Cornell University and in Germany, he became professor of physics at Columbia University in 1937. He received the Nobel award in physics in 1944 for his resonance method of recording the magnetic properties of atomic nuclei.

Rachmaninov (*răĸ-mä'nê-nôf*), **Sergei Vassilievitch (1873-1943),** Russian pianist and composer, was born near Ilmen Lake, Novgorod. He was educated at Leningrad and Moscow and won a gold medal for composition when 19 years of age, touring Russia the same year. He gave performances at London, Vienna, Dresden, and, in 1909 and 1910, in the United States, where he appeared as pianist and as conductor of his own works. For several years following 1912, Rachmaninov was chief conductor of th Imperial Opera at Leningrad. He took up his residence in the United States. His operas include *Aleko* and *The Parsimonious Knight.* One of his best-known compositions is the Prelude in C-Sharp Minor.

Racine (*rä'sēn'*), **Jean Baptiste (1639-1699),** French dramatic poet was born at La Ferte Milon. He completed his education at the seminary of Port Royal, intending to become a priest. Abandoning this plan, he began writing plays. His tragedy *Andromache* placed him above all his contemporaries except Corneille. *Britannicus, Berenice, Iphigenia,* and other tragedies as well as his comedy *The Pleaders* increased his fame. On completion of his *Phaedra,* he experienced a reawakening of his earlier faith, which turned him from the theater. However, after a lapse of

12 years, he wrote the dramas *Esther* and *Athalie*, to be performed at the seminary of Saint Cyr. Racine usually assigned to women the principal roles. See *French Literature: The Seventeenth Century.*

Radford, Arthur W. (**1892-**), naval commander, was born at Chicago. In 1916 he was graduated from the U.S. Naval Academy. He became particularly interested in flight training and, after a tour of duty with the Bureau of Aeronautics, he was assigned to the battle fleet Aircraft squadrons. He saw varied service during World War II and later became commander-in-chief of the Pacific Fleet. From 1953 until his retirement in 1957, he was chairman of the Joint Chiefs of Staff.

Raeburn, Sir Henry (**1756-1823**), Scottish portrait painter, was born at Stockbridge. He was apprenticed to a goldsmith, but early devoted himself to art, producing first water-color miniatures and then portraits in oil. After studying in Rome, 1785-87, he settled in Edinburgh and soon attained pre-eminence among Scottish artists. His portraits, which are painted in full light, are realistic and intense, resembling in some respects the work of Frans Hals and Velasquez. See *Painting.*

Raleigh (*rô'lĭ; răl'ĭ*), or **Raleigh, Sir Walter** (**c. 1552-1618**), English courtier, navigator, and man of letters, was born at Budleigh and was educated at Oxford University. Between 1569 and 1581, he served with distinction in the army of the French Protestants, in the Netherlands, and in Ireland and accompanied his half brother, Sir Humphrey Gilbert, on a voyage to America.

Shortly after his return, he attracted the attention of Queen Elizabeth and soon rose high in her favor. In 1585, he fitted out an expedition, which resulted in the discovery and the temporary occupation of Roanoke Island, Va. It was through Raleigh that the potato and tobacco were introduced into England at this time. He held the post of admiral in an expedition against Cadiz, 1596. With the death of Elizabeth, in 1603, the brilliant and successful portion of his career ended.

From the first, King James regarded him with suspicion and dislike. Accused of complicity in a plot against the king, Raleigh was sentenced to death. He was sent to the Tower, where, for 13 years, he remained a prisoner. During his imprisonment, he devoted himself to literary and scientific pursuits and wrote a *History of the World.* In 1616, he procured his release and sailed for Guiana. Upon his return, in 1618, he was arrested and executed.

Ramée (*rà-mā'*), **Louise de la** (**1839-1908**), better known as "Ouida," English novelist, was born at Bury Saint Edmunds. Most of her life after 1860 was spent in Italy. She is best remembered for her classic childhood stories, *The Nürnberg Stove* and *A Dog of Flanders.*

Rameses I (*răm'ê-sēz*), the first king of the 19th Egyptian dynasty, ruled about 1355 B. C. and maintained the conquests of Egypt as far as Wady Halfa.

Rameses II, his grandson, usually called the Great, after defeating the Hittites at Kadesh, formed a peace with them and married a Hittite princess. He subjected Ethiopia and is known also as the builder of some of the largest of the Egyptian edifices. He had at least 162 children, the names of that number being found on monuments. His name and reputation formed the basis of the legendary Sesostris. His mummy was discovered in 1881 A. D.

Ramsay, Sir William (**1852-1916**), British chemist, was born at Glasgow. He was educated at Glasgow University and at Tübingen. He was professor of chemistry at University College, Bristol, and at University College, London. With Lord Rayleigh, he discovered argon in 1894 and, in 1895, he obtained helium from cleveite. In 1904, he was awarded the Nobel prize for chemistry. He also discovered other gaseous elements of the air, including neon, xenon, and krypton. His writings include *The Gases of the Atmosphere, Elements and Electrons,* and *Essays Biographical and Chemical.* See *Argon, Helium.*

Randolph, John (**1773-1833**), of Roanoke, American orator and statesman, was born in Chesterfield County, Va. At the age of 26, he was elected a member of Congress and at once became a leader in politics. He was United States senator, 1825-27; member of Congress, 1827-29; United States minister to Russia, 1830; and member of Congress again in 1832. He was conspicuous for his many odd ways and for a wit so sharp that he terrorized in Congress all who opposed him. Randolph prided himself on his descent from Pocahontas, and his marked Indian features bore witness to his origin. See *Quids.*

Rank, J. Arthur (**1888-**), film producer, was born at Hull, Yorkshire, and was educated at Leys School, Cambridge. Although he has spent much of his time as a business executive in two corporations (The Joseph Rank Co., Ltd. and The Rank Precision Industries), he is best known as organizer and director of several British film companies. These include Gaumont, Cinema Television, Ltd., and Rank Screen Service, Ltd.

Ranke (*räng'kē*), **Leopold von** (**1795-1886**), German historian, was born at Wiehe, Saxony. He was educated at Leipzig. At 23, he became headmaster of the high school at Frankfort on the Oder and devoted his leisure to historical studies. In 1824, he published the *History of the Roman and Germanic Peoples from 1494 to 1535,* thus winning, in 1825, the chair of history at Berlin.

Ranke was the founder of the modern historical school, and his fame rests upon his scientific method of studying history from orginal sources. One of his works has been translated several times into English under the title of *History of the Popes.* In his 84th year, he published the first volume of his *History of the World,* writing a volume annually.

Rankin, Jeannette (**1880-**), politician, was born near Missoula, Mont. and was graduated from the University of Montana. She also studied at the University of Washington. An ardent suffragist, she was the first woman member of Congress, being elected representative-at-large in 1916. She voted against war with Germany in 1917.

Raphael (*răf'â-ĕl*; *rä'fâ-ĕl*), or **Raffaelo Santi** (**1483-1520**), Italian painter, was born at Urbino. Upon the early death of his parents, Raphael found a sincere friend in his maternal uncle Simone Ciarla.

Earliest Works. It is probable that Raphael received his first instruction from his father, a poet and painter. He seems also to have studied under Timoteo Viti, and then, from 1500, at Perugia under Pietro Perugino, who was at that time engaged on the Cambio frescoes. Here Raphael adopted and carried to its highest point the tender grace and mystical development of that master, often surpassing him in beauty, simplicity, and charm. He was in some degree influenced by other Umbrian artists, particularly by Justus van Ghent and Fra Carnevale, who was one of the earliest to attempt perspective and to whom Raphael may have been indebted for a knowledge of architecture. During this period at Perugia, he produced "The Crucifixion." In 1502, he was employed at Siena in helping Pinturicchio with the library frescoes. His "Coronation of the Virgin" was finished in 1503; the celebrated "Espousal of the Virgin," in the following year.

Life in Florence. Raphael's career is usually divided into three periods, of which the first terminated with his visit to Florence in the autumn of 1504. His amiability and talents soon procured him the admiration and notice of the Florentine artists. Among his chief friends were Taddeo Gaddi, Ghirlandajo, and Fra Bartolommeo. Inspection of the works of Michelangelo and of Da Vinci increased his knowledge of form and execution, but he never imitated them as he imitated the first models he studied in his Perugian period. A picture he painted at Florence in this period, "Madonna of the Grand Duke," so called because Ferdinand III always took it with him on his travels, is almost entirely in his earlier style.

With the exception of a few months spent in Perugia in 1505 and a short interval at Bologna and Urbino in 1506, the whole period from 1504 to 1508 was spent by Raphael at Florence. His principal works executed in this period are "Saint Catherine of Alexandria," "The Beautiful Gardener," and "The Entombment."

Activity at Rome. The third and last period of his work comprises the time from his invitation to Rome by Pope Julius II, about the middle of 1508, until his death. He was first employed on the frescoes of the *Stanzas,* or lower chambers beneath the Apartamento Borgia in the Vatican. The first of these works was the "Dispute on the Sacrament," painted in his second, or Florentine, manner. His later works, including all the other Vatican frescoes, are painted in that style which peculiarly characterizes him and constitutes the Roman school at its highest development. They are distinguished for dramatic composition and expression, for correct and vigorous design, and, at least in the frescoes, for an appropriate tone of coloring. Among these later frescoes are the famous "School of Athens" and "Parnassus."

Leo X, who succeeded Julius II in 1513, continued his predecessor's patronage of Raphael. The enthusiasm for classical antiquity that prevailed among the learned men whom Leo X attracted to his court strongly influenced those productions of Raphael which date from the accession of this pope. They became more allied to the antique and less imbued with the purely religious spirit.

Under Leo X, the works in the Vatican were continued, of which "Attila" is considered to be the most perfect example of fresco painting. The celebrated "Cartoons" are the original designs executed by Raphael and his pupils, 1515-16, as copies to be used in tapestry work for the pope. Among the numerous commissions executed by Raphael for other patrons are many frescoes, a long list of portraits, many interesting designs in architecture, and some productions in sculpture. In 1517-20, he painted the celebrated "Sistine Madonna" and "Saint Cecilia." "The Transfiguration" occupied his last years.

Genius. Among all the painters of the world, none has ever been so universally popular as Raphael. Apart from

his combined merits as draftsman, colorist, and master of graceful composition, he owes the constancy of the admiration felt for him partly to the wide range of his subjects, but still more to the extraordinary varieties of his style. He was buried in the Church of the Pantheon near his betrothed bride, Maria di Bibbiena. See *Painting*.

Rasputin (*rȧs-pōō'tĕn*), **Gregory Efimovitch** (**1871-1916**), Russian monk, was born near Tyumen, Siberia. At 33 years of age, he professed conversion, left his family, and preached the doctrine that, since salvation comes through repentance from sin, sin is necessary for salvation. Possessed of phenomenal strength and great personal magnetism, he made his way into the highest circles, including the Russian court. Believing that he had cured her son when the physicians had given up hope, the empress took Rasputin into her counsels and appointments were seldom made without Rasputin's approval even during the first years of World War I. Being unable to read and ignorant of politics, he was a tool of reactionary interests. Finally, several nobles shot him to death after a draught of poison had failed to kill him.

Rawlinson, Sir Henry Creswicke (**1810-1895**), English Oriental scholar and diplomat, was born at Chadlington. He was educated in Ealing; entered the East India military service in 1827; and served in the Bombay presidency until 1833. The following six years were spent in Iran, where he began the study of the cuneiform inscriptions and made a translation of the famous Behistun inscription of Darius. Rawlinson's successful decipherment of these ancient writings paralleled in importance the reading of hieroglyphics on the Rosetta Stone. His works include *England and Russia in the East*, *The Cuneiform Inscriptions of Western Asia*, and *Outline of the History of Assyria*.

Rayburn, Samuel (**1882-1961**), American politician, was born in Rome County, Tenn. After studying law at the University of Texas, he began to practice at Bonham in that state. He was a member of the Texas House of Representatives for six years, serving as speaker for two years, and from 1913 represented the 4th Texas District in Congress. He was speaker of the U. S. House of Representatives 1940-46, 1949-53, and 1955-61. He served as Democratic leader of the House. He was often popularly referred to as "Mr. Democrat."

Rayleigh (*rā'lĭ*) **John William Strutt, Baron** (**1842-1919**), English physicist, was graduated from Trinity College, Cambridge, 1865, and became a fellow in the following year. He succeeded to the title of baron in 1873; was professor of experimental physics at Cambridge, 1879-84, and of natural philosophy at the Royal Institution, London, 1887-1905.

In 1894, with Sir William Ramsay, he discovered argon. His experimental work in physics, characterized by the most extreme care, extended to almost every branch of the science. Much of it was done in co-operation with his son Robert John Strutt, who is known especially for his researches on radioactivity. Lord Rayleigh was awarded the Nobel prize for physics in 1904.

Read, Thomas Buchanan (**1822-1872**), American poet and painter, was born in Chester County, Pa. He devoted himself chiefly to painting; visited Europe several times; and finally settled in Rome. He made many portraits, including those of Mrs. Browning, Longfellow, and George Peabody, the last named being now in the Peabody Institute, Baltimore. His best-known poem is "Sheridan's Ride," written at Cincinnati, Ohio, in 1864.

Reade, Charles (**1814-1884**), English novelist, was born in Oxfordshire. He was graduated from Oxford in 1835 and, in 1843, was admitted to the bar. He began his literary career by play writing and first made his mark as a novelist in 1852 by the publication of *Peg Woffington*. This was followed by *Christie Johnstone*, *It Is Never Too Late to Mend*, and *The Cloister and the Hearth*, his best and most popular work. His later writings include the problem novels *Hard Cash* and *Foul Play*.

Réaumur (*rā'ō'mür'*), **René Antoine Ferchault de** (**1683-1757**), French naturalist and physicist, was born at La Rochelle. He was educated at Poitiers, Bourges, and Paris and subsequently devoted himself to biological study. He discovered the method of tinning iron and invented the Reaumur thermometer still used in many countries. His most important work is *Memoires pour servir a l'histoire des insectes*.

Récamier (*rā'kà'myā'*), **Madame** (**1777-1849**), French society woman, was born at Lyons. At 15, she married Jacques Recamier and, during the Consulate and the Empire, attracted a brilliant circle to her salon at Paris. She was beautiful and possessed in rare measure a Frenchwoman's indefinable fascination and brilliancy. A record of the social triumphs of Mme. Récamier would include mention of nearly all celebrities in Paris during a period of 50 years. She was a power in France in spite of all changes of fortune.

Reclus (*rē-klü'*), **Jean Jacques Elisée** (**1830-1905**), French geographer, was born in the Gironde. He was educated at Montauban and Berlin. An extreme Democrat, he left France after the *coup d'état* of 1851 and spent seven years in England, Ireland, and America. For his share in the Commune of 1871, he was banished. Going to Switzerland, he spent 20 years writing his 19-volume masterpiece *Nouvelle géographie universelle*, translated into English under the title of *The Earth and Its Inhabitants*. He wrote also *Les phénomènes terrestres* and *La Terre*.

Red Jacket, Sa-go-ye-wat-ha (**c.1751-1830**), or "He Keeps Them Awake," a chief of the Seneca tribe of Indians, was born at Old Castle, on Seneca Lake, N. Y. In early life, he was noted for his swift running and, during the Revolution, the British officers employed him as a messenger. One of them gave him a bright red coat, hence his name Red Jacket.

He was a friend of the whites, although he wished to have the Indians keep their own lands; and, in 1784, in an eloquent speech, he strongly opposed the Treaty of Fort Stanwix, by which the six nations ceded some of their land to the United States. During the War of 1812, he several times gave advice which proved of great service to the American army. Later in life, he visited New York and Washington, and the speeches he made there are among the finest examples of Indian eloquence. Died at Seneca Village, near Buffalo, N. Y.

Reed, Philip Dunham (**1899-**), American business executive, was born at Milwaukee, Wis. He received his engineering degree at the University of Wisconsin in 1921 and his law degree from Fordham University in 1924. He became a patent lawyer, and in 1926 joined the legal department of the General Electric Company, where his rise was rapid. He was chairman of the board, 1940-42, and has been chairman again since 1945. During World War II, he held various important government positions concerned with industrial production. In 1942 he went to London as deputy chief of the U. S. Mission for Economic Affairs, and the following year became chief of the mission with ministerial rank, serving in that capacity until 1945. Reed is a director of a number of large corporations.

Reed, Thomas Brackett (**1839-1902**), American lawyer and legislator, was born at Portland, Me., and was graduated from Bowdoin College in 1860. After serving a short time as paymaster in the navy, he studied law, and began legal practice in 1865. He was a member of the Maine legislature; became attorney general of the state; and was elected to Congress in 1876.

His conspicuous ability led to his appointment as floor leader of the Republican party. He served in Congress until 1899 and was thrice elected speaker of the House of Representatives, 1889-91 and 1895-99, winning the sobriquet "Czar Reed." His ruling, as speaker, that all members present, though not voting, should be counted toward a quorum, won national attention and approval. He published *Reed's Rules* in 1894.

Reed, Walter (**1851-1902**), American surgeon, was born in Gloucester County, Va. Educated at the University of Virginia, he entered the Medical Corps of the army and, in 1893, was made professor of bacteriology in the Army Medical School with the rank of major. Six years later he was named chairman of a committee to investigate the cause of yellow fever, then prevalent in Cuba. With his associates Carroll, Lazear, and Agramonte, he proved that the disease is transmitted by the mosquito *Aedes ægypti*. This knowledge made it possible to stamp out the disease at Havana in three months and to control it throughout tropical America. A large military hospital in Washington was named in his honor. He was elected to the American Hall of Fame in 1945.

Reid, Whitelaw (**1837-1912**), American journalist and diplomat, was born at Xenia, Ohio. He was graduated from Miami University, Oxford, Ohio, 1856. He entered newspaper work; became a war correspondent; and, in 1868, joined the editorial staff of the New York *Tribune*, of which he was editor and principal owner, 1872-1905. In 1892, he was Republican nominee for vice president. During 1889-92, he was minister to France and, from 1905 to 1912, he was ambassador to England. His writings include *Schools of Journalism*, *The Scholar in Politics*, *Some Newspaper Tendencies*, *Town Hall Suggestions*, *The Monroe Doctrine*, and *The Scot in America*.

Reinhardt, Max (**1873-1943**), Austrian theatrical producer, was born at Raden, near Vienna. He studied acting at Vienna. While acting at Salzburg in 1893, his playing of elderly roles attracted the attention of the director of a Berlin theater, and he was engaged to play in Berlin. Here he began directing plays in 1903 and founded several theaters, chief of which was the Kammerspielhaus. From 1905 to 1932, this theater was the world's most famous dramatic center. Shakespearean plays, Greek dramas, and German works were produced in settings which relied uniquely on painting, lighting, mass effects, and a moveable stage. Impoverished on Hitler's rise to power, he

settled in the United States, where he produced the motion picture *A Midsummer Night's Dream.*

Remarque (*rē-märk'*), **Erich Maria** (**1898-**), German novelist, was born at Osnabrück. Having fought in World War I he came home in 1919 to face a period of maladjustment. Ten years later he wrote *All Quiet on the Western Front*—a brutally realistic war story with a pacifist bent. He wrote later *The Way Back, Three Comrades,* and *Arch of Triumph.* The Hitlerian government outlawed his books; he escaped to Switzerland and came to the United States in 1939, becoming an American citizen in 1947.

Rembrandt Harmenszoon van Rijn (**1607-1669**), Dutch painter, was born at Leiden, The Netherlands. At the age of 12, Rembrandt was placed under Van Swanenburch, a painter of moderate talent in Leiden, and there he attended the university. From Leiden he went to study at Amsterdam under Lastman, then to Haarlem, to frequent the studio of Pinas. From 1623 to 1630, he devoted himself to solitary study in his father's house.

At the age of 23, Rembrandt established himself at Amsterdam and never left that city until his death 39 years later. In his first year there, he painted the "Portrait of an Old Man." Thereafter followed in great numbers portraits, landscapes, and historical and *genre* subjects as well as hundreds of etchings that have served almost as much as his paintings to immortalize him. There are two pictures dated by him 1631, a "Portrait of a Young Man" and "Simeon in the Temple." In the following year, he finished his famous "The Anatomist Nicholas Tulp and His Pupils," which placed him in the first rank of the Dutch masters.

Commissions flowed in upon him faster than he could execute them, and, from the beginning, pupils came clamoring to his doors. In 1633, Rembrandt finished "The Naval Architect and His Wife." The next year occurred his marriage to Saskia, with whom the happiest period of his life was spent. She died in 1642, leaving a son named Titus. In the year of Saskia's death, he produced the famous "Sortie of the Civic Guard," usually known as "The Night Watch."

The decade following his wife's death brought disastrous changes in the financial fortunes of Rembrandt, though in it he produced some of his best work. "Christ at Emmaus" was painted in 1648. "The Cloth Syndics," probably his greatest work, was completed in 1661. Never before had Rembrandt achieved such perfection. He painted more than forty portraits of himself. Of his landscapes, a very characteristic specimen is his well-known work entitled "The Mill." Rembrandt is one of the most perfect of colorists; in *chiaroscuro,* or contrasts of light and shade, he has no equal. Because of his aerial gradations, the figures in his pictures appear to be raised from the canvas. Mentally he was keen to observe, assimilate, and synthesize. His conception was localized with his own people and time. He never built up the imaginary, nor followed Italy, but into types taken from the streets and shops of Amsterdam he infused his large sympathy with man. See *Painting.*

Remington, Frederic (**1861-1909**), American illustrator, sculptor, and author, was born in Canton, N. Y. He studied at Yale Art School and at the Art Students' League, New York, after which he led the life of a cowboy and stockman and became noted as an animal painter and an illustrator of Western scenes. He subsequently achieved distinction as a magazine illustrator of military subjects and ranching life and, after the Spanish-American War, of Cuban scenes and characteristics. His best-known paintings are "A Dash for the Timber," "The Last Stand," "Past All Surgery," "The Emigrants," and "Conjuring the Buffalo Back." Among his works in sculpture are "The Broncho Buster" and "The Wounded Bunkie." His writings include *Pony Tracks, Crooked Trails,* and *The Way of an Indian.*

Remsen, Ira (**1846-1927**), American chemist and educator, was born in New York City. He was graduated from College of the City of New York in 1865 and at the University of Göttingen in 1870. From 1872 to 1876, he was professor of chemistry in Williams College, and, from 1876 to 1913, he was professor of chemistry in Johns Hopkins University, of which he was president from 1901 to 1912. He founded, in 1879, the *American Chemical Journal,* which he edited for more than 40 years. Among his many contributions to chemical science is the discovery of saccharin.

Renan (*rē-näN'*; E., *rē-nän'*), **Joseph Ernest** (**1823-1892**), French philologist, historian, and critic, was born at Treguier. He began preparation for the priesthood at Paris, but, as the result of the study of Hebrew and of German criticism, he renounced traditional Christianity and, in 1845, abandoned all thoughts of the Church as a profession. At 25 he received his doctorate at the University of Paris; in 1850, he obtained a post in the Bibliothèque Nationale. In 1862, he was chosen professor of Hebrew in the Collège de France and was later elected to the French Academy.

Renan's European reputation dates from the publication, in 1863, of the *Life of Jesus,* the first in the series entitled *History of the Origin of Christianity,* in which he held that Christianity was the most beautiful of the religions and Jesus the most remarkable of men. He rejected the supernatural elements. He wrote also *The Future of Science* and several volumes of essays.

Reni (*rā'nē*), **Guido** (**1575-1642**), Italian painter of the Eclectic School, was born at Calvenzano, near Bologna. He studied under Calvaert, but subsequently followed the more refined and ideal school of the Carracci prior to originating a style for himself. In 1602 he went to Rome, where he remained for 20 years, a rival of Caravaggio.

Reni's "Aurora," a famous fresco in the Rospigliosi palace, Rome, is usually considered his masterpiece. Most of his paintings are Biblical scenes. They include "The Crucifixion of St. Peter," at the Vatican; "Massacre of the Innocents," at Bologna; and "The Penitent Magdalen," at the Louvre. See *Painting.*

Renoir (*rē-nwär'*), **Pierre Auguste** (**1841-1919**), French artist, was born at Limoges, France. He began his career as a painter by decorating porcelain in a Paris factory. Later he studied at Gleyre's Art Academy, where he met and came under the influence of the early impressionists, Monet, Sisley, and Cezanne. He exhibited at the first impressionist show in 1874, and most of the later ones, but soon developed his own style. Renoir painted portraits, landscapes, and still-life pictures, but is best known for his figure paintings, including many nudes and bathers. His early "Mme. Charpentier and Her Children" is in the Metropolitan Museum of Art, New York, "Girl Doing Her Hair" is in the Barnes Collection, Philadelphia, and "Lady Sewing" and others are in the Art Institute, Chicago. The Louvre in Paris also possesses some of his most notable pictures.

Renwick, James (**1818-1895**), American architect, was born in New York. He was graduated at Columbia in 1836. He built the distributing reservoir of the Croton aqueduct, New York City, and was for some years employed as architect for the Erie Railroad. His work shows marked versatility, his mastery of the French Gothic style being reflected in two of the noblest exteriors in New York—Grace Church, completed In 1845, and Saint Patrick's Cathedral, opened in 1879. Among other notable buildings designed by him were the original structure for Vassar College at Poughkeepsie, N. Y., and the first Corcoran Art Gallery and the Smithsonian Institution, Washington.

Repplier (*rĕp'lēr*) **Agnes** (**1855-1950**), American author and critic, of French extraction, was born at Philadelphia and was educated at Sacred Heart convent, Torresdale, Pa. She received the honorary degree of doctor of letters from the University of Pennsylvania in 1902 and, in 1912, the Lætare medal from the University of Notre Dame. She was elected to the American Academy of Arts and Letters in 1941. Her works include *Books and Men, Under Disputes, Père Marquette, In Pursuit of Laughter,* and *Decades.*

Reston, James Barrett (**1909-**), American author and newspaper correspondent, was born in Scotland, but was educated chiefly in the United States. After completing his studies at the University of Illinois, he was employed first by the Springfield, Ohio, *Daily News* and then as publicity director, by the Cincinnati Baseball Club. He has served as London correspondent for the Associated Press and as both Washington and Foreign correspondent for *The New York Times.* He is the author of *Prelude to Victory.* In 1957 he received the Pulitzer Prize for a series of articles on implications of the President's illness.

Reuther, Walter Philip (**1907-**), labor leader, born in Wheeling, W. Va. Attended Wayne University; later spent three years touring Europe and the Orient by bicycle, visiting machine shops and automobile plants. Began serving his apprenticeship as tool and die maker at 17 in Wheeling. He then became an automobile worker in Detroit for General Motors and for Ford. In 1935 he began organizing automobile workers, establishing and becoming president of the local union of United Automobile Workers, Congress of Industrial Organizations. In 1946 he became president of the International Union of Automobile, Aircraft and Agricultural Workers of America, and in 1953 president of CIO. Following the merger of CIO with the American Federation of Labor in December 1955, Reuther was, in 1956, made vice president of AFL-CIO.

Revere (*rē-vēr'*), **Paul** (**1735-1818**), American patriot and metallurgist, was born in Boston, Mass. He learned the business of a goldsmith. He was conspicuous for his zeal in behalf of the Revolutionary cause and became famous for his ride from Boston to Lexington to arouse the minutemen, April 18-19, 1775. Longfellow made this the subject of his poem "The Midnight Ride of Paul Revere."

In 1801, when he was over 65 years of age, Revere built the first copper rolling mill in America. He built also the

first gunpowder mill in New England; cast cannon from iron and brass; and engraved on copper and printed the first United States paper money.

Reymont, Wladislaw Stanislaw (1868-1925), Polish novelist. He was expelled from several schools in Russian Poland for using the Polish language, then under a ban by the Russian authorities. After working successively as a clerk, railway employee, telegraph operator, and actor, he devoted himself exclusively to literature from 1894, when his story *The Death* was favorably received. *The Promised Land* brought him national recognition, which was widened to international fame by his *Peasants*, consisting of four volumes entitled respectively *Autumn*, *Winter*, *Spring*, and *Summer*. These volumes, published in 1904-09, won for him the Nobel prize award for literature in 1924.

Reynaud (*rā′nō′*), **Paul (1878-**), French statesman, was born in Basses Alpes. Educated in Paris, he was admitted to the bar but practiced little. He made several trips around the world and, in 1918, was liaison officer in the Siberian campaign against the Russian government.

When Germany conquered Norway in 1940, Reynaud, as an uncompromising opponent of appeasement of Germany, was chosen premier. It was then too late, however, to retrieve time lost, and Germany crushed the French armies in six weeks of battle. Reynaud resigned rather than make peace. He was taken into custody by the Vichy government and tried for complicity in the French downfall. Removed to Germany after the invasion of North Africa, he was released by the German defeat. In 1948 he became finance minister. In 1952, he was made chairman of the Economic Committee of the Council of Europe.

Reynolds, Sir Joshua (1723-1792), English painter, was born at Plympton. When about 20 years of age he began his career as a portrait painter at Devonport. In 1746, he established himself in London, where, except three years in Italy, he passed the rest of his life. When the Royal Academy was instituted in 1768, he became its president and was knighted by George III.

Reynolds was especially famous for his portraits, of which he is said to have painted more than 2000. Although he preferred historical painting, his works of this class are relatively unimportant. His widely known "Angel Heads" are portrait studies. Many examples of his paintings are found in American collections. He was the friend of Johnson, Burke, Goldsmith, and other eminent literary men of his time. See *Painting*.

Rhee, Syngman (1875-), Korean political leader, was educated partly in his native country and partly in the United States. While a student at George Washington University, he became well acquainted with American history and American political traditions. As President, first of the Korean Provisional Government and later of the Republic of Korea and its successor the Republic of South Korea, he stood firmly and sometimes intransigently for Korean independence. He is the author of *Spirit of Independence*, *Neutrality as Influenced by the United States of America*, and *Japan Inside Out*.

Rhodes, Cecil John (1853-1902), South African statesman and financier, was born at Bishop Stortford, England. He was sent to Natal for his health and subsequently made a fortune at the Kimberley diamond mines. He then returned to England, entered Oriel College, Oxford, and took his degree, 1881. In 1890, he was made prime minister of Cape Colony; but before this he had become a ruling spirit in the extension of British territory, having secured in 1889, the charter for the British South Africa Company, of which, until 1896, he was managing director. This territory is now known as Rhodesia. His aim was the establishment of a federal South African dominion under the British flag.

In 1896, Rhodes resigned the Cape premiership in consequence of complications arising from Dr. Jameson's raid into the Transvaal. He was a conspicuous figure during the South African War of 1899-1902. In a remarkable will he left nearly his entire fortune to the foundation of the Rhodes scholarships at Oxford.

Rhodes, James Ford (1848-1927), American historian, was born at Cleveland, Ohio. He was educated at New York University, the University of Chicago, and the Collège de France. He engaged in coal mining and the manufacture of pig iron from 1870 to 1885, when he retired from business to devote himself to historical writing. His *History of the United States from the Compromise of 1850*, published between 1893 and 1906, placed him in the foremost rank of American historians. In 1905, he was elected member of the American Academy of Arts and Letters.

Rhondda (*rŏnd′dȧ*), **David Alfred Thomas, Viscount (1856-1918),** Welsh coal mine operator and public administrator, was born in Aberdare, Wales; was educated at Clifton College and Cambridge University; and, later, joined his father in the coal business. He soon became a leading figure in the Welsh coal industry, having organized a coal combine which produced an annual output of six million tons. From 1888 to 1910, he sat as a Liberal member of the House of Commons. At the outbreak of World War I, he aided in placing British industry on a war basis and, in 1917, as food controller, he instituted a system of compulsory rationing. Lord Rhondda was rescued from the sinking *Lusitania*.

Ribbentrop, Joachim von (1893-1946), German statesman, was born at Wesel. Having studied in England, he went to Canada and engaged in mercantile trade but returned to Germany in 1914. He was wounded during World War I and was later attached to the war ministry. Shortly before Hitler annexed Austria, Ribbentrop was appointed foreign minister. He had negotiated the Anti-Comintern pact with Japan and Italy in 1937 and, in 1939, signed for Germany the Nazi-Soviet anti-agression treaty. He was sentenced to death by the Nuremberg tribunal, October 1946.

Ribicoff, Abraham (1910-), political leader, was born at New Britain, Conn. After graduation in law from the University of Chicago, he was admitted to the bar and practiced at Hartford, Conn., where he also served as judge in the Police Court. He was a member of the House of Representatives in the 81st and 82nd Congresses and, in 1955, was elected governor of Connecticut. From 1960 to 1962 he was Secretary of Health, Education and Welfare.

Ricardo (*rĭ-kär′dō*), **David (1772-1823),** British political economist, of Jewish extraction, was born in London. After receiving a common school education he entered upon a mercantile life. He gained a large fortune, obtained a seat in Parliament, and, through his *Principles of Political Economy and Taxation*, *Essay on Rent*, and other writings, made his name second only to Adam Smith's among the classical economists. He held that wages cannot rise above subsistence level, rents are determined by prices and not vice versa, and value of goods is set by the amount of labor required for their production.

Rice, Alice Caldwell Hegan (1870-1942), American novelist and humorous writer, was born at Shelbyville, Ky. She was educated in private schools and, in 1902, married Cale Young Rice. She became interested in philanthropic work and was one of the founders of the Cabbage Patch Settlement House at Louisville, Ky. Her writings include *Mrs. Wiggs of the Cabbage Patch*, *Lovey Mary*, *Sandy*, *Captain June*, *A Romance of Billy-Goat Hill*, *The Honorable Percival*, *Calvary Alley*, *The Inky Way*, and *The Happiness Road*.

Rice, Grantland (1880-1954), journalist and poet, was born at Murfreesboro, Tenn. Following his graduation from Vanderbilt University, he went into newspaper work, supplementing the usual reporting assignments with inspirational verse and with comments on sports. Papers for which he wrote included the *Nashville News*, *The Atlanta Journal*, *The Cleveland News*, *The New York Tribune*, and *The Nashville Tennessean*. Not only participation but also experience as umpire and referee gave him a special interest in sports and a background for authoritative criticism. In his sports articles as well as in his verse, he emphasized the drama and the morale-building effects of clean competition. Popular collections of his verse are *Only the Brave*, *Songs of the Stalwart*, and *Songs of the Open*. Two books he wrote on golf are *The Duffer's Handbook* and *The Winning Shots*.

Richard I (1157-1199), surnamed Cœur de Lion, king of England, was born probably at Oxford. After his accession to the throne in 1189, he flung himself with characteristic ardor into the Crusade movement. In 1190, he joined his forces with Philip Augustus of France in the Third Crusade and upheld the claims of Tancred in Sicily. In 1191, he captured Cyprus. In the Holy Land he won great renown for personal valor, particularly by his defeat of Saladin in 1192. After shipwreck on the coast, on his way home, he was captured by Leopold, archduke of Austria, and was handed over to the emperor Henry VI in 1193. Ransomed by his subjects at a heavy price, he returned to England in 1194. His later years were spent in his French possessions warring against Philip. He died of an arrow-wound at the siege of Chaluz.

Richardson, Henry Hobson (1838-1886), American architect, was born at Priestley's Point, La. After he was graduated from Harvard in 1859, he studied architecture at the Ecole des Beaux-Arts in Paris. He began the practice of his profession in New York, but removed to Boston in 1878. He appreciated to a high degree the value of sculpture in its application to buildings, successfully established artistic adaptations of the Romanesque style, and rose to foremost rank among American architects.

Among the important structures designed by Richardson are Trinity Church and Brattle Square Church, Boston; the Law School for Harvard University; county buildings, Pittsburgh; and many public library buildings and railway stations.

Richardson, Sir Owen Willans (1879-1959), English physicist, was born in Dewsbury. Educated at Cambridge University, he came to the United States and was professor of physics at Princeton University from 1906 to 1914. He then returned to England, and held the Wheatstone chair in physics at the University of London until 1924, when he was made Yarrow research professor of the Royal Society and director of research in physics at King's College, London. He made important discoveries in the emission of electricity from hot bodies, establishing a formula, known as Richardson's law, which proved extremely valuable in the study of atomic structure. His work received recognition in the award of the Nobel prize in physics for 1928. He was knighted in 1939.

Richardson, Samuel (1689-1761), English novelist, was born in Derbyshire. He was early apprenticed to a printer in London. After some years he became a master printer, and was successively printer to the House of Commons, master of the Stationers' Company, and law printer to the king. When more than 50 years of age, Richardson published his first novel, *Pamela, or Virtue Rewarded.* In 1747-48 appeared his second work, *The History of Clarissa Harlowe,* which gave him a secure place in the history of the English novel. His works are in letter form and moralistic in tone. They excel in delineation of the character of women. See *Clarissa Harlowe, Pamela.*

Richelieu (*rē'shĕ-lyû'*; E., *rēsh'ĕ-lōō'*), **Armand Jean du Plessis, Duc de (1585-1642),** French statesman and cardinal, was born of a noble family at Paris. He was educated for the military profession at the Collège de Navarre. He then pursued ecclesiastical studies and, in 1607, was consecrated bishop of Lucon. Appointed one of the representatives of the clergy at the States-General in 1614, he attracted notice by an address which he delivered in the presence of the young king, Louis XIII. By his appointment in 1616 as secretary of war and foreign affairs, the way was opened to Richelieu's political success. In 1622 he became a cardinal and from 1624 to 1642 was the principal minister of Louis XIII.

The administration of Richelieu forms an epoch in the history of France and her relations with other countries. It is memorable for the completeness with which the absolute authority of the sovereign was established. At the close of his career, Richelieu delivered up the royal authority, which he had wielded for 18 years, almost without a single constitutional check upon its arbitrary exercise. Another of Richelieu's great enterprises was the overthrow of the Huguenot party as a political power. Richelieu was a generous patron of literature and founded the famous French Academy. See *Academy, French.*

Rickenbacker, Edward V. (1890-), aviator and air lines executive, was born in Columbus, Ohio. By the beginning of World War I, he had become well known as a winning driver in automobile races, so when he enlisted in the U. S. Army he was assigned as chauffeur to General Pershing. Later he became a member of the 94th Aero pursuit squadron, brought down 26 planes and escaped uninjured. Among the decorations he received was the Congressional Medal of Honor. After the war he organized an automobile company, then worked for the Cadillac Motor Company and was assigned by General Motors to the Fokker Aircraft Corporation of America. In 1935 he became general manager for Eastern Air Lines, Inc., and in 1938 president. He is now chairman of the board. On one of his missions for the War Department during World War II, he was forced down in the Pacific and was rescued after spending three weeks on a life raft. He is the author of *Fighting the Flying Circus* and *Seven Came Through.*

Ridgway, Matthew Bunker (1895-), army officer, was born at Fort Monroe, Virginia. On being graduated from West Point in 1917 he was commissioned a lieutenant in the U. S. Army, and between the World Wars fulfilled various overseas assignments. When World War II broke out he was in the war plans division of the War Department. He became assistant commander, later commander, of the 82nd infantry division, which was converted into an air-borne unit. He led the division in the invasion of Sicily in 1943 and Normandy in 1944. In 1950 he took command of the U. S. 8th Army and U. N. ground forces in Korea. He replaced General MacArthur in the Far East Command in 1951, and was made a general. In 1952 he succeeded General Eisenhower as supreme commander of Allied forces in Europe, and in 1953 was made U. S. Army chief of staff.

Ridley, Nicholas (c. 1500-1555), English reformer, was born in Northumberland. He was educated at Cambridge and later studied at Paris and at Louvain. Returning to Cambridge, he became in 1537 chaplain to Cranmer and, about 1540, was made master of Pembroke Hall. He was appointed bishop of Rochester in 1547, of London in 1550, and took a leading part in composing the liturgy and in drawing up the 39 articles. He favored the attempt to place Lady Jane Grey on the throne and was imprisoned in the Tower. Condemned to death for heresy, he was burned with Latimer at Oxford.

Riesel, Victor (1915-), American newspaperman specializing in labor news, was born in the crowded tenement section of New York City's lower East Side. His father, a worker in the garment trade, died in 1947 as the result of a beating attributed to labor racketeers. In 1956 Victor Riesel was himself the subject of an acid-throwing attack by labor hoodlums which blinded him for life. The motive for the attack was apparently to intimidate him from giving evidence before a Federal grand jury engaged in investigating labor rackets. Riesel is widely known as a labor writer through his syndicated newspaper column which he began writing for the New York *Daily Mirror* in the early 1940's.

Riggs, Mrs. George C. See *Wiggin, Kate Douglas.*

Riley, James Whitcomb (1849-1916), American poet, was born at Greenfield, Ind. He received a common school education. Several years of his life were spent as itinerant sign painter, actor, and musician. This experience gave him opportunity to remodel plays and to compose songs, and brought him into intimate touch with the life and the speech of the common people, whom he later portrayed in prose and in verse.

About 1873, Riley began to contribute poems to Indiana newspapers and for some time served as reporter. His many poems, partly in dialect and partly in purest English, reflect with true feeling and kindly insight the faith, humor, pathos, and sentiment of the "old folks at home." Riley is pre-eminent as an interpreter of simple life, of childhood, and of common, homely scenes. He has been styled the "poet laureate of democracy."

Riley's works include *The Old Swimmin' Hole and 'Leven More Poems, The Boss Girl and Other Sketches, Rhymes of Childhood, Home Folks, Book of Joyous Children, An Old Sweetheart of Mine, A Defective Santa Claus, Raggedy Man, Morning, Knee Deep in June,* and *Old Times.* In 1911, he was elected a member of the American Academy of Arts and Letters.

Rillke, Rainer Maria (1875-1926), Austrian poet, was born at Prague. Education received in his native city was supplemented by study at Munich and Berlin. A mystical approach to religion showed in his early writing, and during much of his life he was preoccupied with problems of life and death. A meeting with Tolstoy influenced his views of religion but close contact with Rodin gave him an appreciation of beauty which is reflected in his "Sonnets to Orpheus," in the *Duineser Elegien,* and in *Späte Gedichte,* a posthumously published collection of his latest poems. His mood of troubled questioning shows most conspicuously in his early works, *Traumgekrönt* and *Buch der Lieder.*

Rimbaud, Arthur (1854-1891) French poet, was born at Charleville. As a precocious college student, he showed a spirit of revolt against conventional poetic forms and a wanderlust that took him to England and led him to spend an interval of bohemian life in Belgium with the poet Paul Verlaine. Comparable to the English prodigy Chatterton, he produced nearly all his poetry in a brief period of intensive writing which came between the ages of 17 and 19. He is credited with having paved the way for symbolism, particularly in his epic poem *Bateau ivre* and in the collection entitled *Les Illuminations.*

Rimski-Korsakov (*rĭm'skĭ-kôr'sà-kôf*), **Nicholas Andreyevitch (1844-1908),** Russian composer, was born at Tikhvin, Novgorod. Although he displayed remarkable musical gifts at an early age, his parents sent him to the naval academy at Leningrad, where he was graduated in 1862. While a midshipman he composed his first symphony, produced by Balakirev in 1865. He then decided to leave the navy, and, devoting himself entirely to music, became the leader of the new Russian nationalistic school. In 1871, he was made professor of composition in the Conservatory at Leningrad and held this place until his death.

Rimski-Korsakov ranks among the greatest Russian masters, excelling in brilliant instrumentation and in the skillful development of folk themes. His best-known operas are *The Snow Maiden, Sadko, Mlada,* and *The Czar's Betrothed.* His compositions also include symphonies, overtures, choruses, and piano pieces. His *Bumble Bee* is an outstanding example of realistic imitation.

Rinehart, Mary Roberts (1876-1958), American author, was born in Pittsburgh, Pa. She was educated in the public schools and in the training school for nurses at Pittsburgh. In 1896 she married Dr. Stanley Marshall Rinehart. Her earlier writings, through which she won wide popularity, were chiefly entertaining mystery stories. Later, she became widely known as a novelist and as a playwright.

Among her writings are *The Man in Lower Ten, When a Man Marries, Where There's a Will, The After House, Tenting Tonight, The Amazing Interlude, Love Stories, Dangerous Days, A Poor Wise Man, Affinities, Sight Unseen, The Confession, Lost Ecstasy,* and *The Wall.*

She wrote also the one-act play *The Avenger,* with her husband; the farces *Seven Days* and *Cheer Up;* and the plays *Double Life, Tish, Bab, Spanish Love,* and *The Bat.*

Rinehart, William Henry (1825-1874), American sculptor, was born in Carroll County, Md. He received a common school education. At the age of 21 he began his career as a marble worker in Baltimore. In 1855, he went to Florence for further study and later located permanently in Rome. His best-known works are "Latonia and Her Children" and "Rebecca" in the Metropolitan Museum, New York; "Clytie," "Strewing Flowers," "Hero," "Day," and "Night" in the Corcoran Gallery, Washington; and the marble statue of Chief Justice Taney at Annapolis. While classic in tendency, Rinehart's sculpture displays poetic charm and refined technique.

Ritter, Joseph E. (1892-), Roman Catholic prelate, was born at New Albany, Indiana. After receiving his early education in the parochial schools there, he attended St. Meinard Seminary in Indianapolis. He was ordained in 1917 and began his career as an assistant pastor. Having shown unusual administrative ability in various assignments, he was made Bishop, and later Archbishop, of Indianapolis. In 1946 he was appointed Archbishop of St. Louis. His policy of non-segregation for the parochial schools and the Catholic hospitals of St. Louis dates from 1947. In 1960 he was named Cardinal by Pope John XXIII.

Rivera, Diego (1886-1957), Mexican mural painter, was born at Guanajuato. When six years of age, he was brought to Mexico City, where he studied drawing and became interested in Aztec sculpture. He studied later in Spain, Paris, and London. His sympathies always remained close to the soil and to the life of laboring people.

After a further period of study in Europe, he definitely adopted the mural fresco as the best medium for his art, which, by a candid realism, often brutal in effect, and a powerful symbolism, depicts life in its multitudinous aspects. His proletarian sympathies appear clearly in his paintings, which have often been criticized severely for this reason. Among his first large paintings were those in the M istry of Education Building, Mexico City, and in the Agricultural Academy at Chapingo.

Rizal (*rē-säl'*), **José Mercado** (1861-1896), Philippine patriot, was born in the province of Laguna, Luzon, of Tagalog parentage. He acquired a broad education in medicine, ethnology, and linguistics, studying at Manila and European universities. In 1886, he published *Noli Me Tangere*, in which he attacked the Spanish administration of the islands and the religious orders. A sequel, *El Filibusterismo*, followed in 1891. Although compelled to leave his native island a few months after entering in 1887, he returned in 1892, but was arrested and banished to Mindanao, where he continued to labor for the social improvement of the nation. Volunteering in 1896 to act as a physician in Cuba, where yellow fever was raging, he was seized, condemned, and shot as a traitor. His influence among the Filipinos is enormous.

Robbia (*rôb'byä*), **Lucca della** (1399-1482), Italian sculptor, was born at Florence. He decorated the campanile of the cathedral at Florence and also made a bronze door for the sacristy. His master creation is his series of "Singing Galleries," consisting of ten panels executed in high relief for one of the organ galleries in the cathedral of Florence. These panels represent groups of children singing, dancing, and playing musical instruments and are notable for their naturalness and grace.

Robert I, king of Scotland. See *Bruce, Robert.*

Roberts, Sir Charles George Douglas (1860-1943), Canadian poet and novelist, was born at Douglas, N. B. He was graduated from the University of New Brunswick, 1879. He taught English in King's College, Windsor, N. S., from 1885 to 1895, when he resigned to devote himself to literature. He was knighted in 1935. His reputation rests chiefly on his highly imaginative and artistically finished poetry, though his novels present exquisite descriptions of nature and some of his animal stories are masterpieces. His numerous writings include *Orion and Other Poems, The Book of the Rose, The Canadians of Old, Earth's Enigmas, Red Fox, The Secret Trails, Canada in Flanders, New Poems,* and *Eyes of the Wilderness.*

Roberts, Sir Frederick Sleigh (1832-1914), earl of Kandahar and Waterford, British general, was born at Cawnpore, India. At 19 he joined the Bengal artillery, serving through the Indian Mutiny and receiving the Victoria cross for his heroism. In the Afghan War of 1878-80, Roberts made a famous march from Kabul to Kandahar, effecting the relief of the latter place. For this military feat he was created a baronet and earned from his soldiers the familiar sobriquet of "Little Bobs" or "Bobs Bahadur." In 1895, he was made field marshal, and, in 1899, he proceeded to South Africa to take supreme command during the Boer War, where he turned the fortunes of that struggle in favor of the British.

With keen military foresight, Roberts anticipated World War I and endeavored in vain to persuade England to prepare for it. See *Roberts's March.*

Roberts, Kenneth Lewis (1885-1957), American novelist and journalist, was born at Kennebunk, Me. After being graduated from Cornell University in 1908, he joined the staff of the Boston *Post,* conducting a humorous column, and later wrote for *Life* and *Puck.* He took part in the Siberian expedition against the Russian soviet government in 1918-19 and then served as staff writer for the *Saturday Evening Post.* Meanwhile he began writing novels based on painstaking research into early American history, which included *Rabble in Arms* and *Northwest Passage.* Following these highly successful novels, he reconstructed events of the Revolutionary War showing the Tory or Loyalist side in *Oliver Wiswell.* His other works include *Black Magic, Florida, Captain Caution,* and *Boon Island.*

Robespierre (*rō'bĕs-pyâr'*; E., *rō'bĕs-pēr'*), **Maximilien Marie Isidore** (1758-1794), French Revolutionist, was born at Arras. After studying law and gaining some distinction as an advocate, he entered the States-General in 1789. As a popular leader in the Jacobin club, his influence became powerful. After the death of Mirabeau, Robespierre's biography is in effect the history of the Revolution. He was elected to the National Convention as head of the Paris deputies, and was one of the chief agents in procuring in 1792, the execution of the king. In 1793 occurred the final struggle with the Girondists, the chief men among whom he sent to the scaffold.

A period of terror followed: Marie Antoinette and the Duke of Orleans were the first victims; Danton and Camille Desmoulins were next immolated; and for months Paris was the scene of an indiscriminate quasi judicial slaughter, in which thousands of lives were sacrificed. With these atrocities the name of Robespierre remains peculiarly associated. A conspiracy was organized against "the tyrant," and, in July, 1794, Robespierre closed his career on the scaffold. See *Terror, Reign of.*

Robinson, Edwin Arlington (1869-1935), American poet, was born at Head Tide, Me. He was educated at Harvard University. Robinson's verse, which displays high intellectual quality, won him prominent rank among American poets. His other books of verse include *The Children of the Night, Captain Craig, The Town Down the River, The Man Against the Sky, Merlin, Lancelot,* and *Dionysus in Doubt.* He published also a comedy, *Van Zorn* and a tragic drama, *The Porcupine.* His *Poems, The Man Who Died Twice,* and *Tristram* won Pulitzer prizes. He was elected to membership in the American Academy of Arts and Letters in 1927.

Robinson, James Harvey (1863-1936), American historian and educator, was born at Bloomington, Ill. He was educated at Harvard and the University of Freiburg. From 1892 to 1919, he was a professor of history at Columbia University and, 1919-21, lecturer and organizer for the new School of Social Research, New York City.

Robinson's textbooks, which have profoundly influenced the teaching of history in America, emphasize the thought element in world changes and the importance of considering social, scientific, intellectual, and artistic development in connection with the study of politics and wars. His writings include *Introduction to the History of Western Europe, The New History, Medieval and Modern Times, The Mind in the Making,* and *The Humanizing of Knowledge.*

Rochambeau (*rō'shäN'bō'*), **Jean Baptiste Donatien de Vimeur, Comte de** (1725-1807), marshal of France, served in the War of the Austrian Succession; distinguished himself in the Seven Years' War; and co-operated with Washington at the siege and capture of Yorktown in the American war for independence. In 1790, he became commander of the French army of the North, but resigned in 1792. He narrowly escaped execution during the Reign of Terror.

Rockefeller, John Davison (1839-1937), American capitalist, was born at Richford, N. Y. At the age of 14, he moved to Cleveland, Ohio. He received a public school education; was clerk in a forwarding and commission house; and, at 19, became a partner in the firm of Clark and Rockefeller, commission merchants. Subsequently the firm engaged in the oil business. In 1865, the firm, then William Rockefeller and Company, built the Standard Oil works at Cleveland and, in 1870, was consolidated with others to form the Standard Oil Company. Still other interests were later acquired and the Standard Oil trust was formed in 1882, but was dissolved in 1892 pursuant to a court decision under the Sherman Antitrust Act.

Thereafter the various Standard Oil companies were operated separately with Rockefeller at the head until 1911, when he retired, without a near rival, the wealthiest man in the world. He devoted much time and money to the promotion of various educational, religious, and charitable interests. In 1892, he established the University of Chicago, to which he made gifts exceeding $46,000,000.

It is estimated that Rockefeller's total benefactions exceeded $540,000,000. About four-fifths of this amount was given in the four great philanthropic and charitable corporations founded by him which are as follows: The Rocke-

feller Foundation, $180,000,000; General Education Board, $130,000,000; The Laura Spelman Rockefeller Memorial, $73,000,000; and The Rockefeller Institute for Medical Research, $39,000,000. The Laura Spelman Rockefeller Memorial Fund was consolidated with the Rockefeller Foundation in 1929, making it one of the largest single philanthropic endowments in existence.

Rockefeller, John Davison, Jr. (**1874-1960**), capitalist, son of John Davison Rockefeller, was born in Cleveland, Ohio. He was graduated from Brown University, 1897. He was associated in various business enterprises established by his father and actively directed the work of the Rockefeller foundations until 1940. During 1913-15, a strike in Colorado against one of his mining companies led to his intervention and the establishment of the first employee representation plan. He erected Rockefeller Center, covering several blocks in New York City. Begun in 1932, this was the largest single commercial building enterprise in the world.

Rockefeller, Nelson A. (**1908-**), political leader, was born at Bar Harbor, Maine. He is a graduate of Dartmouth College. In addition to holding executive positions as director and president of Rockefeller Center, Inc., he has given a great deal of attention to philanthropic work and to public service organizations. He has served as co-ordinator of Inter-American Affairs and as undersecretary of Health, Education, and Welfare. In 1958 he was elected governor of New York.

Rockwell, Norman (**1894-**), illustrator, was born in New York City. He showed early interest in drawing and painting and left high school in the second year to study at the Art Students League. In a long and successful career as illustrator he has devoted his attention chiefly to cover designs for magazines, those done for the Saturday Evening Post being the most widely known.

Rodgers, Richard (**1902-**), composer, was born in New York City. As a sixteen-year-old freshman student at Columbia University, he submitted a score which was accepted for the annual "varsity show," an original musical play. This venture into musical composition introduced him to Lorenz Hart, with whom he later collaborated on many popular productions. Among these were *Dearest Enemy*, *The Connecticut Yankee*, and *The Boys from Syracuse*. In collaboration with lyricist Oscar Hammerstein, Rodgers produced the outstanding success *Oklahoma*. Equaling and even surpassing this popular classic have been *South Pacific* and *The King and I*, two other musical plays by the same composer.

Rodin (*rô'dăN'*), **Auguste** (**1840-1917**), French sculptor, was born at Paris. He studied under Barye and was influenced strongly by Greek and Italian masters and by the writings of Dante. Many of his most famous works were based on studies for an unfinished decoration for bronze doors, *The Gates of Hell*. They include "Adam," "Eve," "Les Bourgeois de Calais," "La Guerre," "The Kiss," "The Age of Bronze," and "The Thinker."

Rodney, George Brydges Rodney, Baron (**1719-1792**), English admiral, entered the navy as letter boy in 1732 and after 27 years of active service was made rear admiral. In 1762, he became vice admiral and, in 1764, was made a baronet. During the Seven Years' War he captured the French West India islands of Martinique, St. Lucia, and Grenada. In the American Revolution he defeated the French near Martinique; took St. Eustatius from the Dutch; and, in 1782, totally defeated the French under De Grasse off Dominica. Rodney's victory saved Jamaica, ruined the naval power of France and Spain, and dealt the final blow of the war.

Roebling (*rōb'lĭng*), **John Augustus** (**1806-1869**), American civil engineer, was born in Mühlhausen, Prussia. In 1831 he emigrated to the United States. He was the pioneer designer of large suspension bridges. Among those erected from his design were the suspension aqueduct across the Allegheny River and the Monongahela suspension bridge, both at Pittsburgh; a suspension bridge over Niagara River; the Ohio bridge at Cincinnati; and the Brooklyn bridge connecting New York and Brooklyn.

Roentgen (*rŭnt'gĕn*; *rĕnt'-*), **Wilhelm Konrad** (**1845-1923**), German physicist, discoverer of the X- or Roentgen rays, was born at Lennep, Prussia. He was educated at the University of Zurich, where he studied under Kundt. After holding professorships at Hohenheim, Strasbourg, and Giessen, he was made professor at Würzburg in 1885 and at Munich in 1899. At Würzburg, in November 1895, he announced the discovery of the X-rays, now called Roentgen rays. In honor of this important discovery, he received the Rumford medal and the Barnard medal, and, in 1901, he was awarded the Nobel prize for physics.

Rogers, Will (**1879-1935**), American actor and humorist, was born at Oolagah, Okla. After a secondary school education, he entered vaudeville in New York, 1905. In 1914 he joined Ziegfield's Follies and Night Frolics, usually taking the part of a cowboy while entertaining his audience with humorous or satirical remarks. His books of "Rogerisms" and contributions to the press gave still wider publicity to his humor and helped to win him an established reputation as America's leading political and social satirist. He wrote also *Illiterate Digest* and *Letters of a Self-made Diplomat to His President*. He was killed when the plane in which he and Wiley Post were riding crashed in Alaska. A monument to his memory, called "Shrine of the Sun," and built by Spencer Penrose, stands on Cheyenne Mountain, near Colorado Springs, Col. It is 200 feet high, a replica of the Tower of London.

Rolland (*rô'lăN'*), **Romain** (**1866-1944**), French author, was born at Clamecy. He received his education at the Ecole Normale Supérieure, Paris, in which he later became professor of the history of art. He wrote numerous biographical and critical studies, chiefly of musicians and other artists, including *Beethoven*, *Life of Michelangelo*, *Masters of Music*, and *Jean-Christophe*. Rolland was awarded the Nobel prize in literature for 1915. His pacifist attitude during World War I was expressed in his collection of essays entitled *Above the Battle*.

Romains, Jules (**1885-**), is the pseudonym of Louis Farigoule, French novelist, who was born at St. Julien-Chapteuil. He taught philosophy for ten years in various colleges and from 1919 devoted himself exclusively to writing. His trilogy *The Body's Rapture* foreshadowed in a small way the ambitious *Men of Good Will*, which is an episodic novel depicting with uncanny fidelity French life at nearly every level of society, extending down to the psychology of domestic animals. His other works include *The Boys in the Back Room* and *The Dictator*.

Romberg, Sigmund (**1887-1951**), composer, was born in Hungary. He studied to be a civil engineer but was more interested in music. After coming to America in 1909, he became very successful as a composer of operettas and musical comedies. His best-known works are *The Student Prince*, *The Desert Song*, and *Blossom Time*, which was adapted from Franz Schubert. These and many others written over a period of nearly forty years provided a repertoire of popular melodies.

Rommel, Erwin (**1900-1944**), German general, was born in Swabia. His mastery of tank warfare and the strategy of the blitzkrieg, exhibited in the German drive to the Channel in May 1940, led to his selection to command the German and Italian forces in North Africa. He achieved several brilliant victories, driving the British back into Egypt, but was defeated at El Alamein, 1942. After a brilliant retreat across Libya he was transferred, now a field marshal, to Italy, and later to northern France. Because he had shared in the conspiracy to remove Hitler, his death in the autumn of 1944 has been commonly explained as suicide under Hitler's orders and not, as officially stated, the result of wounds suffered while he was attempting to repel the Normandy invasion. See *Desert Fox*.

Romney (*rŭm'nĭ*), **George** (**1734-1802**), English painter, was born at Dalton. He studied art in London and Paris, and, during 1773-75, in Italy. On his return to London, he became the rival of Reynolds as a portrait painter. Most of his finest paintings are privately owned. His "Lady Hamilton as Daphne" is in the Metropolitan Museum, New York, and other representative examples are found in American galleries. See *Painting*.

Romulo, Carlos P. (**1901-**), U. S. Army officer, journalist, and author, was born in Manila. He studied at the University of the Philippines, to which he returned as teacher after spending some time at Columbia University. Before the attack on Pearl Harbor he was head of a chain of newspapers at Manila. When the war came he entered the U. S. service as press aide to General MacArthur. His *Voice of Freedom* broadcasts from Corregidor dramatized the desperate situation of the American troops, and he was decorated for his part in the delaying action that preceded the fall of Bataan. As interpreter of both American and Philippine public opinion, he has helped to build good will between the two countries. Recently he was president of the United Nations General Assembly and Philippines secretary of foreign affairs. He is author of *Mother America* and *I Saw the Fall of the Philippines*.

Roncalli, Angelo Giuseppe (**1881-1963**), Pope John XXIII, was born near Bergamo, Italy. He studied at the Bergamo Seminary and later at the Apollinaire Seminary in Rome. After he was ordained priest (1904) he served as secretary to the Bishop of Bergamo and spiritual director of the Bergamo Seminary. He was director general for Italy of the Congregation for the Propagation of the Faith. His assignments outside Italy were numerous and varied. He was apostolic delegate to Bulgaria, then to Turkey and Greece; apostolic nuncio to France and permanent observer for the Holy See to UNESCO. He was appointed Cardinal in 1953 and became patriarch of Venice. In 1958 he was elected sovereign pontiff of the Roman Catholic Church.

Roosevelt (*rō'zē-vĕlt*), **Anna Eleanor** (**1884-1962**), American social and political leader and wife of the 32nd president of the United States, was born in New York City. In 1905, she married her fifth cousin, Franklin Delano Roosevelt. Her public activities while in the White House were characterized by numerous personal contacts with individuals in all classes of society and the use of regular press conferences and a newspaper column to express her views on public affairs. Her advice was credited with having no small part in the shaping of the "New Deal." From 1949 to 1952 she was United States representative to the United Nations General Assembly.

Roosevelt, Franklin Delano (**1882-1945**), 32nd president of the United States and the only one to be elected for more than two terms, a fifth cousin of Theodore Roosevelt, was born at Hyde Park, N. Y. He was graduated from Harvard University in 1904 and from Columbia Law School in 1907. In 1910, he was elected to the New York State senate. He strongly supported Woodrow Wilson for president, and, in 1913, he was appointed assistant secretary of the navy. He supported the League of Nations, woman suffrage, and civil service reform. In 1920 he was a candidate for the vice presidency of the United States on the Democratic ticket, but was defeated.

In 1921, he suffered an attack of infantile paralysis which left his right leg partially paralyzed. Rising superior to this handicap, he was successful candidate for governor of New York State in 1928, and again in 1930. In 1932, he was nominated by the Democratic party for president, and in the ensuing election defeated his Republican opponent, Herbert Hoover, by an overwhelming majority.

First Administration. Roosevelt took office at a time when nearly four years of economic depression were culminating in a nation-wide bank panic. With decisive boldness, he assumed war-time powers to end the emergency and called a special session of Congress, from which he secured virtually dictatorial powers to raise price levels, cut agriculture surpluses, and impose industrial codes having the effect of increasing employment at higher wages. These powers were later ruled invalid by the Supreme Court. Many other changes introduced by his administration, popularly known as the "New Deal," remained intact. These included Federal responsibility for supporting the needy jobless, regulation of security markets, protection of collective bargaining rights, and a program of social security.

Re-election in 1936. The New Deal was made the issue in a hard-fought presidential campaign in 1936, Roosevelt's Republican opponent, Alfred M. Landon, pledging the repeal of many of the new laws and a more or less passive role for the Federal government. Roosevelt was re-elected by an electoral vote of 523 to 8.

To avert the threat of further unfavorable verdicts of the Supreme Court, Roosevelt in 1937 sought authority to enlarge its membership up to 15 if incumbents failed to retire on full salary after 70. The attempt failed by a narrow majority in Congress, but the court reversed some of its earlier positions and upheld the validity of later New Deal laws coming before it. A law requiring payment of minimum wages and also overtime for hours worked in excess of 40 weekly was passed in 1938, and the president received authority, within limits, to reorganize government agencies.

Third Term and World War II. Events abroad led to Roosevelt's decision, put off until the national convention had nominated him, to run for a third term. Germany had conquered France and threatened a complete upset of the world's balance of power if Britain should be subdued. Roosevelt took the position that American interests required British victory. A change in administration might, he thought, be highly dangerous. Accepting nomination, he defeated Wendell L. Willkie by an electoral vote of 449 to 82.

Roosevelt's leadership in the international crisis was directed toward immediate and decisive aid to Britain. A selective service draft law was passed. Appropriations of huge proportions were made to double the navy and create the world's largest air fleet. In exchange for 50 overage but fully equipped destroyers, he obtained from Britain sites for eight naval bases for protection of the Americas. By agreement with Latin American countries, he translated the Monroe doctrine from a unilateral policy to a mutual pact for defense. Congress voted him power to lease or give instruments of war to other nations so as to make the country "the arsenal of democracies."

In December 1941, Japanese attacks upon Hawaii and the Philippines brought the country fully into the war against the Axis powers. Roosevelt's task then became that of mobilizing the whole country, the civilian population as well as the army, for total war. Notable in his conduct of the war and in his planning for peace, were his personal conferences with the heads of the Allied nations, not only in Washington, but on the Atlantic, and at Casablanca, Quebec, Cairo, Tehran, and the Crimea. See *World War II*.

He was renominated in 1944 and was re-elected over Thomas E. Dewey by an electoral vote of 432 to 99.

Roosevelt died of cerebral hemorrhage at Warm Springs, Ga., April 12, 1945. After funeral services at the White House, he was buried on his estate at Hyde Park, N. Y.

Roosevelt, Theodore (**1858-1919**), American statesman and author, 26th president of the United States, was born in New York City of a distinguished family of Dutch origin. Though physically delicate in youth, he entered Harvard University at 18 and was graduated in 1880. In 1881, he began the study of law, but in the same year was elected to the New York legislature. He was twice re-elected. He spent 1884-86 in North Dakota raising cattle.

In 1886, Roosevelt was an unsuccessful candidate for mayor of New York. In 1889, President Harrison appointed him member of the United States Civil Service Commission, in which capacity he served until 1895, when he resigned to accept the presidency of the police commission of New York City. In 1897, President McKinley appointed him Assistant Secretary of the Navy. Upon the outbreak of the Spanish-American War, in April 1898, he resigned to assist in organizing a regiment of volunteer cavalry, afterwards known as Roosevelt's roughriders.

In November 1898, Roosevelt was elected governor of New York. Two years later he was elected vice president of the United States on the Republican ticket. Upon the death of President McKinley in 1901, he succeeded to the presidency. He was elected for the term of 1905-09.

Roosevelt's efforts in bringing about the treaty of peace between Japan and Russia in 1905 were important and effective, and, in 1906, he was awarded the Nobel prize for peace, the first American to be so honored. An enthusiastic hunter of big game, he led in 1909 an expedition to East Africa for the Smithsonian and National museums. In 1912, he was presidential candidate of the Progressive party, which he organized. During the campaign he was shot and slightly wounded by a fanatic at Milwaukee.

In 1914, he engaged in an exploring expedition in South America, discovering the large tributary of the Madeira River named for him the Roosevelt River. He wrote numerous books and contributed widely to periodicals and to general literature. Among his writings are *The Rough Riders*, *The Strenuous Life*, *The Winning of the West*, and *The Great Adventure*. In 1950 he was elected to the American Hall of Fame.

Roosevelt, Theodore, Jr. (**1887-1944**), American administrator and editor, was born at Oyster Bay, N. Y., son of Theodore Roosevelt, 26th president of the United States. He was graduated from Harvard in 1908 and entered commercial life, becoming identified with motor manufacturing and oil refining interests. When the United States entered World War I in April 1917, he joined the army and became a major and later lieutenant colonel of infantry in the American expeditionary forces. In 1919, he was elected member of the assembly in the New York State legislature. He was Assistant Secretary of the Navy in Harding's cabinet, 1921-24; unsuccessfully contested the governorship of New York State in 1924; in 1925 headed a Field Museum expedition into central Asia; and was governor of Puerto Rico in 1929-32 and of the Philippine Islands in 1932-33. He returned to the army in 1940 and was commissioned brigadier-general. He died on the "invasion front" in Normandy, 1944.

His publications include *Rank and File*, *All in the Family*, and *Colonial Policies of the United States*. In co-operation with his brother Kermit (1889-1943), who, in 1939, gave up his American citizenship to assist actively in British defense, he wrote *East of the Sun and West of the Moon* and *Trailing the Giant Panda*.

Root (*rōōt*), **Elihu** (**1845-1937**), American statesman and lawyer, was born at Clinton, N. Y. He was graduated from Hamilton College in 1864, taught at Rome Academy in 1865, and was graduated from the law school of New York University, 1867. Admitted to the bar in 1867, he began practice in New York City, and rose to eminence.

In 1899, Root was appointed secretary of war by President McKinley and served until 1904. After the Spanish-American War he represented the United States government in all official relations with Cuba, Puerto Rico, and the Philippine Islands. During 1903, he was member of the Alaskan Boundary Tribunal. In 1905, President Roosevelt appointed him secretary of state, and in that office he did much to unify the Pan-American countries. In 1908, he was elected U. S. senator from New York for the term 1909-15. In 1912, he was awarded the Nobel prize for peace.

Root was chairman of the Republican National Convention of 1912 and, in 1915, was president of the New York State constitutional convention. In 1917, he was appointed by President Wilson to a special diplomatic mission to Russia. He drew up, in 1920, the plan on which the organi-

zation of the World Court was based. In 1929, he aided in revising the statutes of the World Court to facilitiate the entry of the United States. In 1917, he was elected member of the American Academy of Arts and Letters.

Rorimer, James J. (**1905-**), curator and art researcher, was born at Cleveland, Ohio. Encouraged by his father, who was a teacher at the Cleveland School of Art, he began his studies early. He showed special aptitude in drawing and design, in which he received two years of training in Paris before he entered Harvard University at an undergraduate. In 1927, having finished his course at Harvard, he joined the staff of the Metropolitan Museum in New York and worked for several years in the Department of Medieval Art. He was among the first users of ultraviolet light in determining the authenticity of art works. During World War II, he was made chief of the Monuments, Fine Arts, and Archives section of the Seventh Army in the Western Military District. His book, *Survival: The Salvage and Protection of Art in War Time*, is an outgrowth of his experience in discovering and preserving art works hidden by the Nazi leaders. In 1955, Rorimer was appointed Director of the Metropolitan Museum.

Rosenwald (*rō'zĕn-wäld*), **Julius** (**1862-1932**), American merchant and philanthropist, was born at Springfield, Ill. He was educated in the public schools and, at the age of 17, became connected with a wholesale clothing firm of New York City, with which he was engaged for six years. From 1885 to 1906, he was president of Rosenwald and Weil, clothing manufacturers of Chicago. He was vice president and treasurer of Sears, Roebuck and Company from 1895 to 1910, when he was made president. Under his management, the mail order sales of this firm increased from somewhat less than $2,000,000 in 1896 to approximately $350,000,000 in 1928.

Among his many benefactions is the creation of a 30 million dollar Julius Rosenwald fund "for the well-being of mankind." He made substantial gifts for the building of Negro schools and for the colonization of Jews in Russia.

Ross, Betsy (**1752-1836**), maker of the first American flag adopted by Congress, was born in Philadelphia, Pa. She was a daughter of Samuel Griscom, who aided in building Independence Hall. In 1773, she married John Ross, a nephew of George Ross, signer of the Declaration of Independence. On June 14, 1777, the Continental Congress decided upon the design for a national flag. A committee requested Mrs. Ross to make the flag. She accepted and her suggestion that five-pointed instead of six-pointed stars be used in the design was adopted. She was awarded a contract to make all government flags. When she died the business was continued by her daughter, Mrs. Wilson, until 1857. In 1905, the Betsy Ross Memorial Association opened to the public the old home of Betsy Ross in Arch Street, Philadelphia, as the American Flag House.

Ross, Sir Ronald (**1857-1932**), British physician, was born at Almora, India. He received his medical education at Saint Bartholomew's Hospital, London, and, in 1881, he entered the Indian Medical Service. As the result of researches in malaria, which he began in 1892, he revealed the life history of the malaria-producing parasites found in certain mosquitoes. In recognition of the importance of this contribution to medical knowledge, he was awarded the Nobel prize for medicine in 1902. He became professor of tropical sanitation in the University of Liverpool and, in 1913, physician for tropical diseases at King's College hospital, London. Later he was made director in chief of the Ross Institute and Hospital for Tropical Diseases, London. His published works include *Mosquito Brigades and How to Organize Them* and *The Prevention of Malaria*.

Rossetti (*rō-sĕt'ē*), **Christina Georgina** (**1830-1894**), British poet, was born at London, the youngest of the four children of Gabriele Rosetti, an Italian poet, who settled in England, and sister of Dante Gabriel Rossetti, the painter. She was educated at home and led a life of retirement. At an early age she began writing verse. In 1848, she contributed poems to the *Athenœum*, and, in 1850, she published under the pen name Ellen Alleyne several beautiful lyrics in the *Germ*. Her published volumes of verse, *Goblin Market and Other Poems*, *The Prince's Progress and Other Poems*, *A Pageant and Other Poems*, and *New Poems*, entitle her to high rank among the English women writers of the 19th century. Her short and intense lyrics, as, for example, *After Death* and *Passing and Glassing*, are by many regarded as her most successful poems.

Rossetti, Dante Gabriel (**1828-1882**), British painter and poet, was born at London, son of Gabriele Rossetti, an Italian poet, and brother of Christina Rossetti, also a poet. He first became prominent by his association with Millais and Holman Hunt in the Pre-Raphaelite brotherhood. His chief paintings include "Girlhood of Mary, Virgin," "Boat of Love," "Dante's Dream," "Proserpina," "The Blessed Damozel," "Beata Beatrix," and "Lady Lilith." As an author he is well known by his *Early Italian Poets*, *Ballads and Sonnets*, *Dante and His Circle*, and *Hand and Soul*. See *Painting: The Pre-Raphaelites*.

Rossini (*rôs-sē'nē*), **Gioacchino Antonio** (**1792-1868**), Italian composer, was born at Pesaro. At the age of 15 he was sent by the Countess Perticari to the Lyceum of Bologna for musical instruction. In 1813, he produced the opera *Tancredi*. Three years later, he produced *Il Barbiere di Siviglia*, "The Barber of Seville." *La Cenerentola*, *Otello*, *Mose in Egitto*, *La Donna del Lago*, *Semiramide*, *Guillaume Tell*, *Stabat Mater*, and many other works followed. Rossini's music is stirring, melodious, and brilliant. He ranks as the greatest Italian composer of the *bel canto* school of opera.

Rostand (*rôs'tăN*), **Edmond** (**1868-1918**), French poet and dramarist, was born at Marseilles. He was educated at the Lycée de Marseilles and at the College Stanislas. Early in his career he settled in Paris and began to write verse. His first successful drama was *Les Romanesques*, produced in 1894. It was followed by *La Princesse Lointaine* and *La Samaritane*. *Cyrano de Bergerac*, the most notable contribution to French poetic drama since the production of Victor Hugo's *Hernani* in 1830, was presented in 1897 with Coquelin and Bernhardt in the leading roles. This romantic tragedy immediately became the success of two continents. Rostand's later dramas include *L'Aiglon* and *Chantecler*. As a poet and as the most gifted representative of the modern romantic school, Rostand occupies foremost place in recent French letters. He was elected to the Academy in 1901. See *Bergerac, Cyrano de*.

Rothschild (*rŏths'child*) is the name of a celebrated Jewish family of bankers and financiers. The founder, Mayer Anselm, named from his father's signboard, Rothschild, or "Red Shield," was born at Frankfort on the Main in 1743. He was educated for a rabbi, but founded a business as a money-lender and became financial adviser of the landgrave of Hesse. The house received a heavy commission for transmitting money from the English government to Wellington in Spain, paid the British subsidies to continental princes, and between 1802 and 1812 negotiated loans for Denmark.

At his death, in 1812, the founder left five sons, all of whom were made barons of the Austrian empire in 1822. Mayer Anselm (1773-1855), eldest son, succeeded as head of the firm at Frankfort. Solomon (1774-1855) established a branch at Vienna; Nathan (1777-1836), a branch at London; Karl (1788-1855), a branch (discontinued about 1861) at Naples; Jacob, or James (1792-1868), a branch at Paris.

The Rothschilds negotiated many of the great government loans of Europe in the 19th century, and Nathan raised the house to be first among the banking houses of the world. He staked his fortunes on the success of Great Britain in her duel with Napoleon, and, receiving the first news of Waterloo, bought and sold stock which brought him a million pounds profit. His son Lionel (1808-79) did much for the civil and political emancipation of the Jews in Great Britain.

Lionel's son Nathaniel Mayer (1840-1915) succeeded to the baronetcy conferred in 1846 on his uncle and was made Baron Rothschild in 1885. At the time of his death the aggregate wealth of the various branches of the Rothschild family was estimated at $2,000,000,000. Lionel Walter (1868-1937) and Nathaniel Mayer Victor (1910-) succeeded in the family title. Wherever German authority was in the ascendancy after Hitler's rise to power, Rothschild fortunes were confiscated because of their Jewish ownership.

Rouault, Georges (**1871-1958**), French painter, began his art career as a worker in stained glass in his native Paris, where he also studied at the *Ecole Nationale des Arts Decoratifs*. Later he studied under Gustave Moreau, and eventually he became Director of the Moreau Museum. Under Moreau's influence, he painted religious subjects, but to show the hideousness of evil he also painted brothel types and other wicked characters in coarsely realistic style. Like his paintings, his lithographs, wood engravings and etchings all show vigor and intensity. Among his best-known works are *Biblical Landscape* and *The Infant Christ Among the Doctors*. He designed settings for a ballet, *The Prodigal Son*, with music by Prokofieff.

Rouget de Lisle (*rōō'zhĕl' dĕ lēl'*), **Claude Joseph** (**1760-1836**), French soldier and poet, was born in Lons le Saunier. In 1792, when stationed as captain of engineers at Strasbourg, he wrote the *Marseillaise*, by its author called *Chant de guerre de l'armée du Rhin*, which was made known in Paris by troops from Marseilles and became the national anthem. In 1796, he left the army and devoted himself to poetry and music.

Rousseau (*rōō'sō'*), **Jean Jacques** (**1712-1778**), French social philosopher and writer, was born at Geneva, Switzerland. He was apprenticed to an engraver, but made his escape in 1728 and for many years found a home with Madame de Warens at Annecy.

In 1741, he went to Paris, whence in 1742 as secretary he accompanied the French ambassador to Venice. In 1750, he gained a prize, offered by the academy of Dijon, for an essay attacking the influence of the arts and sciences on society. Later he removed to Montmorency, to Switzerland, to England, and back to France, where he remained until his death.

Rousseau was a renewer of the force of the imagination and the feelings in an artificial time. He loved nature and praised its beauties; he broke with the arid traditions of the past and formed a new ideal for the future, with an eloquence and a warmth that had great influence in bringing on the French Revolution. He wrote on education and profoundly modified its tendencies, and, in literature, he led the way to the romantic reaction against the cold copying of classicism. His personal character is a puzzle to moralists. The vices and meannesses which stained his life are set forth with melancholy sincerity in his *Confessions.*

The most famous of Rousseau's writings are *Discourse on the Origin of Inequality among Men*; *Julie, or The New Héloise*; *The Social Contract*; and *Emile, or Education.* See *Educational Reformers.*

Rousseau, Théodore (1812-1867), French landscape painter, was born at Paris. He studied at the Ecole des Beaux-Arts. At 19 he revolted against the prevailing classicism and joined the romanticists, later becoming one of the leaders. In 1833, he settled at Barbizon, at the edge of the forest of Fontainebleau, where he was soon joined by Diaz and later by Millet, who became his intimate friend. Rousseau was the pioneer and leader of a group known as the Barbizon school of painters.

Depicting every phase of nature with remarkable harmony of the intellectual and emotional elements, Rousseau ranks as the epic poet of landscape art. His best paintings are in the Louvre, Paris, and in the Metropolitan Museum, New York.

Rowan, Carl T. (1925-), journalist, was born at Ravenscroft, Tenn. His studies at the Tennessee Agricultural and Industrial State College at Nashville were interrupted by World War II, in which he won a commission in the U. S. Navy. After the War he resumed his education, going first to Oberlin College and then to the University of Minnesota, where he received a master's degree in journalism. Besides writing extensively for newspapers, particularly *The Minneapolis Tribune,* he has written many magazine articles and several books, including *South of Freedom, The Pitiful and the Proud,* and *South to Sorrow.* In 1964 he replaced Edward R. Murrow as head of the USIA.

Rowland (*rō'lănd*), **Henry Augustus (1848-1901),** American physicist, was born at Honesdale, Pa. He was graduated from Rensselaer Polytechnic Institute. In 1876, after a brief period of study under Helmholtz at Berlin, he became the first occupant of the chair of physics at Johns Hopkins University.

Among Rowland's important contributions to science are his determination of the mechanical equivalent of heat and of the ohm, his discovery of the magnetic effect of electric convection, and especially his researches in spectroscopy, leading to his discovery of the principle of the diffraction grating.

Rowlandson, Thomas (1756-1827), English caricaturist, has been regarded as a continuator of Hogarth, though his drawings do not emphasize moral lessons and his depiction of the contemporary scene usually takes the form of political cartoons rather than sketches expressing social satire. He is remembered especially for his illustrations of *Dr. Syntax's Three Tours,* Sterne's *Sentimental Journey,* the novels of Smollett, and *The Travels of Baron Munchausen.*

Royce, Josiah (1855-1916), American philosopher, was born at Grass Valley, Cal. After he was graduated from the University of California and Johns Hopkins University, he was instructor in English literature and logic in the University of California. He was then at Harvard University from 1882 until his death.

Royce became one of the foremost American metaphysicians. He developed a philosophy of idealism in which emphasis is placed on individuality and upon will rather than upon intellect. The key to his system of ethics was loyalty, which in its ultimate form was loyalty to the world of individuals. His philosophical writings include *Religious Aspect of Philosophy, The Spirit of Modern Philosophy, The Conception of Immortality, Studies of Good and Evil, Outlines of Psychology, Herbert Spencer, Philosophy of Loyalty,* and *Sources of Religious Insight.*

Rubens, Peter Paul (1577-1640), Flemish painter, was born at Siegen, Prussia. He was educated at the Jesuit College in Antwerp. He was intended for the law, but he was allowed to enter the studio of Otto Van Veen about 1596.

In the spring of 1600, Rubens set out for Italy, where he spent eight years at Venice, Mantua, Rome, Florence, and Genoa and painted numerous pictures. He was especially attracted by the Venetian colorists. At Mantua, he was appointed court painter, and here he became familiar with the manners of courts.

In 1608, he returned to Antwerp and accepted the title of official painter to Archduke Albert. The next year, he married Isabella Bran. With the exception of the months occupied by embassies to Spain and England and some other short journeys, he dwelt in Antwerp the rest of his life.

His colorful "Adoration of the Magi" was followed in 1612 by his acknowledged masterpiece, "The Descent from the Cross." At this time, he was also teaching extensively and collaborating with Breughel and Frans Snyders. In 1621, he received a commission from Marie de' Medici to adorn the Luxembourg Palace at Paris. He visited Philip IV of Spain on a diplomatic mission in 1628. Here he met Velasquez and renewed his study of Titian, who so greatly influenced his later works. In 1630, his wife, Isabella, died, and he married Helena Fourment, whose features he never tired of painting. In 1635, he designed the decorations that celebrated the entry of the infant Ferdinand into Antwerp, and, in 1639, he completed the "Crucifixion of Peter."

In extent of range Rubens is unrivaled; history, portrait, landscape under the aspect of every season, animal life in every form—all are familiar to him. In addition to painting and etching, he made some designs for printers, silversmiths, and tapestry weavers.

Rubinstein (*rōō'bĭn-stīn*), **Anton (1829-1894),** Russian pianist and composer, was born in Russian Bessarabia. In 1840 he entered the Paris Conservatory, soon attracting the attention of Chopin and Liszt. In 1844, he began the study of composition under Dehn at Berlin. In 1848, he settled in Leningrad, studying and writing music. He founded the Leningrad Conservatory of Music in 1862 and remained its director until 1867. As a pianist he was Liszt's only rival and ranks as one of the world's greatest masters. His compositions include the operas *Ivan the Terrible, Feramors, Nero,* and *The Demon*; and the oratorios *Paradise Lost* and *The Tower of Babel.*

Rudolf I, or **Rudolph (1218-1291),** founder of the Habsburg dynasty, was born at Limburg. He was the son of Albert IV, Count of Habsburg and landgrave of Alsace, whom he succeeded in 1239. Partly by inheritance and partly by seizure, he acquired large estates in what is now Alsace and Switzerland, and became the most powerful prince in southwest Germany, In 1273, he was chosen king of Germany, the first of the Habsburg rulers.

Rudolph, Wilma (1940-), athlete, born at St. Bethlehem, Tenn., was educated at the Tennessee Agricultural and Industrial State University. Gradually overcoming the effects of a crippling childhood illness, she qualified for the 1960 Olympics at Rome, where her sprinting ability enabled her to win three gold medals.

Rumford, Benjamin Thompson, Count (1753-1814), American physicist, was born at Woburn, Mass. He began the study of medicine at 13 and later taught school. Accepting an appointment in the militia from the English governor, he innocently incurred the distrust of the colonists. Although acquitted of all charges of disloyalty, he left America in 1776 for England, where he rose to high place in the British foreign office, made notable scientific experiments, and became a fellow of the Royal Society.

With Sir Joseph Banks, in 1799, Rumford founded the Royal Institution. About 1802 he located in Paris. He founded, and was the first to receive, the Rumford medal of the Royal Society; he also established the Rumford professorship at Harvard.

Rusk, Dean (1909-), educator and diplomat, was born in Cherokee County, Ga. After graduation from Davidson College he went to Oxford as a Rhodes Scholar. Preceding World War II he taught political science at Mills College and was dean of the faculty. In the War he served in Army Intelligence and as assistant operations officer for the General Staff. After demobilization, he was director of UN affairs for the State Department and Assistant Secretary of State. Appointed 1952, he was president of the Rockefeller Foundation until named Secretary of State in 1960 by President-elect Kennedy.

Ruskin, John (1819-1900), English author, art critic, and social reformer, was born at London. He studied at Christ Church, Oxford, where he gained the Newdigate prize for English poetry in 1839 and took his degree in 1842. In the year following appeared the first volume of his *Modern Painters,* whose aim was to prove the superiority of modern landscape painters, especially Turner, to the old masters.

In 1849 appeared *The Seven Lamps of Architecture* and, in 1851-53, *The Stones of Venice,* both being efforts to introduce a new and loftier conception of the significance of domestic architecture. They were exquisitely illustrated by the author himself. At this time Pre-Raphaelitism

began to develop as a distinctive phase of modern art, and Ruskin warmly espoused its cause.

About 1860 Ruskin became deeply interested in social problems and published *Unto this Last* and *Munera Pulveris*. Among his later works are *Sesame and Lilies, The Ethics of the Dust, The Crown of Wild Olive*, and *Præterita*, a charming autobiography. In 1870, he became professor of art at Oxford. Ruskin did much to increase the appreciation of the beautiful in nature and in art.

Russell, Bertrand Arthur William, Earl (1872-), English mathematician and philosopher, was born at Trelleck, England. He was educated at Cambridge University, where he remained as lecturer and fellow until 1916. In that year, he was deprived of his appointment on account of his pacifist views and his opposition to World War I and was imprisoned for six months. He was visiting professor of philosophy at the universities of Chicago and California in 1938 and 1939.

His philosophy, designated as logical atomism, stresses the importance of the individual. In his publications he brought a clear and trenchant style to bear in criticism of social institutions. He received the 1950 Nobel prize for literature.

Rutherford (*rŭтн'ĕr-fĕrd*), **Ernest Rutherford, Baron** (**1871-1937**), British physicist, was born in Nelson, New Zealand. He was educated at Nelson College, Canterbury College, New Zealand University, and the University of Cambridge. He became professor of physics at McGill University, Montreal, in 1898 and at the University of Manchester in 1907. In 1919, he was made a fellow of Trinity College, Cambridge. Rutherford formulated the theory of the atomic nucleus, about which electrons revolved. He produced hydrogen by bombarding atoms of nitrogen with helium particles, thus transforming one element into a different one. In 1908, he received the Nobel prize for chemistry.

Rutledge, Wiley Blount (**1894-1949**), American jurist, was born at Cloverport, Ky. He was educated at the universities of Wisconsin and Colorado. He practiced law in Colorado, and taught in Washington University and the University of Iowa. After serving on the bench of the United States Court of Appeals for the District of Columbia from 1939, he was appointed in 1943 associate justice of the United States Supreme Court.

Ruysdael (*rois'dăl*), **Jacob** (**c. 1628-1682**), Dutch painter, was born at Haarlem and about 1657 removed to Amsterdam. He traveled in various parts of the Netherlands, also in Germany and Switzerland. While given scant recognition during his lifetime, he now ranks among the greatest Dutch painters of landscape. Excellent examples of his work are found in the Metropolitan Museum, New York.

Ryan, Abram Joseph (**1839-1886**), known as "Father Ryan," American priest and poet, was born at Norfolk, Va. Soon after his ordination he was made chaplain in the Confederate army and served throughout the war. His lyrics of the conflict, *The Deathless Dead, The Sword of Lee*, and especially *The Conquered Banner*, became well known.

Ryan, John Augustine (**1869-1945**), American theologian, was born in Dakota County, Minn. On being graduated from St. Paul Seminary in 1898, he was ordained a Roman Catholic priest and made professor of moral theology and economics there. In 1915, he accepted the professorship of political science at Trinity College, Washington D. C., and lectured later also on moral theology and industrial ethics at the Catholic University in Washington. He interested himself deeply in social and industrial problems and the application of Christian principles to them but took a strong position against Socialism. He wrote *A Living Wage, Distributive Justice, The Church and Labor*, and *Social Doctrine in Action: A Personal History*.

Saarinen, Eero (**1910-1961**), American architect, was born at Kirkhonummi, Finland, son of the famous Finnish architect and city planner Eliel Saarinen. He was brought to America in 1923, when the elder Saarinen joined the Cranbrook Foundation at Bloomfield Hills, Mich., where he taught in the Art Academy and designed many of the school buildings and faculty houses. The younger Saarinen was graduated from the Yale School of Architecture in 1934, and then spent two years abroad on a traveling fellowship. Not long after his return to the United States, he became associated with his father in many architectural projects. Notable among his many works are the $100-million, 25-building General Motors Technical Center near Detroit, and the auditorium and the cylindrical brick chapel on the campus of the Massachusetts Institute of Technology.

Saarinen, Eliel (**1873-1950**), architect and educator, was born in Finland. Before coming to America, in 1923, he had become well known for his work on the Finnish pavilion at the Paris World's Fair, and for his design of the National Museum at Helsinki. A book, *Munksnas-Haga*, which he wrote while still in Finland, contained advanced ideas on city planning. Some of his ideas found expression in the group of art school buildings at Cranbrook, Mich. In addition to teaching at the Cranbrook School, he designed a number of churches and museums.

Saavedra Lamas (*sä-vä'drä lä'mäs*), **Carlos** (**1880-1959**), Argentine statesman, was born in the city of Buenos Aires of a wealthy family. After attending a Jesuit School there, he studied in Paris and traveled extensively. He endowed a chair of labor legislation in the University of Buenos Aires and was its first incumbent. As foreign minister of Argentina, appointed 1932, he exerted his influence in favor of peace and, in 1935, he negotiated an armistice in the Chaco War between Paraguay and Bolivia. He was awarded the Nobel Peace Prize in 1936.

Sabin, Albert B. (**1906-**), Polish-born American virologist, was graduated from New York University's college of medicine and did research at the Lister and Rockefeller institutes. Since 1939 he has been professor of pediatrics in the medical college of the University of Cincinnati, but in addition to teaching he has given much time to research. After developing effective vaccines for dengue fever and encephalitis, he concentrated his attention upon poliomyelitis. His oral vaccine for polio, which makes use of live altered viruses, was used in more than 80 million inoculations in Russia. It has been tested successfully in other foreign countries and has been approved by the U. S. Public Health Service for use in the United States.

Sabin, Florence Rena (**1871-1953**), American anatomist, was born at Central City, Colo. She was graduated from Smith College in 1893 and later studied at Johns Hopkins University, from which she received in 1900 the degree of doctor of medicine. After long experience as teacher of anatomy and histology at Johns Hopkins, she joined the staff of the Rockefeller Institute, 1925, where she has done brilliant research in the lymphatic system, the origin of blood cells, and the physiology of blood vessels.

Sacagawea (**1787?-1812**), Shoshone Indian woman who served as guide to the Lewis and Clark expedition, was born probably in what is now eastern Montana near the headwaters of the Missouri River. She was captured as a child by the Minnetaree Indians and was sold as a slave to a Frenchman. Accompanied by her French husband and carrying a papoose on her back, she walked at the head of the Lewis and Clark forces, guiding them over difficult trails and obtaining food for them from friendly Indian tribes with whom she knew how to deal.

Sachs (*zäкs*), **Julius von** (**1832-1897**), German botanist, was born at Breslau. In 1868, he became professor of botany at Würzburg. He retained this chair for the remainder of his life, a period of nearly 40 years. He made important experiments in plant physiology, especially in determining the influence of light and heat upon plants and in investigating organic activities of vegetable growth.

Sage, Russell (**1816-1906**), American capitalist, was born at Shenandoah, N. Y. He was educated in the public schools. After several years as errand boy and grocer's clerk he held an interest in a wholesale grocery in Troy, 1839-57. He was a member of Congress, 1853-57. In 1863, he removed to New York, purchased a seat on the stock exchange in 1874, and thereafter was known as a financier, closely associated with Jay Gould in extensive railway operations. His fortune, estimated at more than $50,000,000, was bequeathed unconditionally to his wife.

St. Denis, Ruth (**1880-**), dancer and teacher, was born at Newark, New Jersey. She had rather limited schooling but showed talent and enthusiasm which led her to enter upon a career as a professional dancer. After spending two years in Europe, chiefly in Germany, she went to Los Angeles, where she and her husband "Ted" Shawn founded the Denishawn School of Dancing. Together they toured the Orient and made many tours of the United States, giving exhibitions of dancing. In the 1920's, they moved their school to New York. They built "Denishawn House" in Van Cortlandt Park, a building designed especially for dance exhibitions. Upon retirement from teaching, Miss St. Denis devoted much time to lecturing and writing. Her revealing autobiography entitled *Unfinished Life* contains a review of her long career, with reminiscences of prominent associates and with observations on the artistic significance of the dance.

Sainte-Beuve (*sănt'bûv'*), **Charles Augustin** (**1804-1869**), French literary critic, was born at Boulogne sur Mer. He chose medicine as a profession and for some years studied at Paris. In 1827, he became acquainted with Victor Hugo, whose influence drew him into the romantic movement and determined for him a literary career. In 1828, he published a critical work on French poetry of the 16th century, two volumes of poetry in 1829-30, and a psychological novel, *Volupté*, in 1834. He received an appoint-

ment in the Mazarin Library, Paris, 1840, in which year he began a history of the Jansenists, published as *Port Royal*. From 1849 to 1869 he wrote his famous *Causeries du lundi* and *Portraits contemporains*, which, for variety of human interest, critical insight, and breadth of sympathy, remain unsurpassed.

Saint-Gaudens (*sānt-gô'dĕnz*), **Augustus** (**1848-1907**), American sculptor, was born in Dublin, Ireland, and was brought to the United States in infancy. During 1861-66 he was a student at Cooper Institute and at the Academy of Design, New York. He then went to Paris and studied under Jouffroy at the Ecole des Beaux-Arts.

Beginning with the statue of Farragut in Madison Square, New York, 1880, Saint-Gaudens executed many notable works which gave him foremost rank among American sculptors. His "Lincoln" in Lincoln Park, Chicago, is considered by many the finest portrait statue in the United States. The Shaw Memorial on Boston common, regarded by many as Saint-Gaudens's masterpiece, ranks among the best relief sculptures of the 19th century. Other important works are the statue "Deacon Chapin," called also "The Puritan," in Springfield, Mass.; and the equestrian statues of General Sherman, New York, and of General Logan, Chicago.

The ideal sculptures of Saint-Gaudens, distinguished for refinement of design and poetic feeling, include "Amor Caritas," in the Luxembourg, Paris; "Peace of God," in Rock Creek Cemetery, Washington; and "Diana," formerly on the tower of Madison Square Garden, New York, since removed to Fairmount Park, Philadelphia. In low relief sculpture, Saint-Gaudens stands pre-eminent in America. He was one of the seven original members of the American Academy of Arts and Letters. He was elected to the American Hall of Fame, 1920. See *Sculpture*.

St. Laurent, Louis Stephen (**1882-**), Canadian lawyer and statesman, was born at Compton, Quebec, and was educated at St. Charles College and Laval University. He was for a time a member of the Laval University Law faculty and practiced law in Quebec, being head of the firm of St. Laurent, Gagne, Devlin and Taschereau, advocates. In 1930 he was elected president of the Canadian Bar Association. He served in the Canadian government as Minister of Justice and Attorney General, and later as Minister of External Affairs. In 1948, upon the retirement of W. L. MacKenzie King, he became Prime Minister, which position he held until 1957. After ten years as leader of the Liberal party he was succeeded, in 1958, by Lester B. Pearson.

Saint-Pierre (*săN'pyâr'*), **Jacques Henri Bernardin de** (**1737-1814**), French writer, was born in Havre. He entered the army as an engineer, but was dismissed; and for some years thereafter led an adventurous life in different countries of Europe. In 1768 he went to Mauritius. On returning to France, 1771, he published an account of his voyage and several other works. He is best known for the story *Paul and Virginia*, which has been translated into many languages. See *Paul and Virginia*.

Saint-Saëns (*săN'sāNs'*), **Charles Camille** (**1835-1921**), French composer and organist, was born at Paris. At the age of 12 he entered the Paris Conservatory, at 18 was made organist of the church of Saint-Merri, and, from 1858 to 1877, was organist at the Madeleine. After 1870, he devoted himself chiefly to composition. His works include the operas *La princesse jaune*, *Le timbre d'argent*, *Etienne Marcel*, *Henry VIII*, *Les barbares*, *Parysatis*, *Hélène*, and *L'Ancêtre*; the sacred drama *Sampson et Dalila*; the widely known symphonic poems *Le Rouet d'Omphale*, *Phaéton*, *La danse macabre*, and *Jeunesse d'Hercule*; also symphonies, chamber music, and much piano and vocal music. In 1915, he was guest conductor of concerts at the Panama-Pacific Exposition, composing the fantasia *Hail, California*. See *Sampson and Delilah*.

Saint-Simon, Claude Henri de Ruovroy, Comte de (**1760-1825**), French socialist, was born in Paris. He fought in the American Revolutionary War, was imprisoned during the Terror in Paris, and later amassed a fortune in land speculation, which he dissipated in projects designed for improvement of mankind. He advocated the adoption of a social system which industrialists and scientists should control by ownership of the means of production and should administer to abolish poverty. He founded a sect which continued until 1832 and prepared the way for the socialism of Marx and others.

Saladin (*săl'ă-dĭn*), or **Salah-ed-Din** (**1138-1193**), sultan of Egypt, was born at Tekrit, of Kurdish parents. He was one of the great conquerors of his time. In 1187, he defeated the Christians at Hittin, afterward storming and capturing Jerusalem. He was, however, defeated by Richard Cœur de Lion in 1191. The valor and magnanimity of Saladin are the subject of praise in Eastern writings and in the Christian chronicles of the Crusades.

Salazar, Antonio de Oliveira (**1889-**), premier of Portugal. A Jesuit destined for the priesthood, he became professor of economics at Coimba University. At a time of crisis he came into the government as minister of finance, balanced the budget, and set up a rigid system of controls. He has often been referred to as a dictator and a fascist, but he has been commended for skillful handling of delicate problems of neutrality and foreign trade.

Salisbury (*sôlz'bĕr-ĭ*), **Robert Arthur Talbot Gascoyne-Cecil, Marquis of** (**1830-1903**), British statesman, was born at Hatfield, England. He was graduated from Christ Church, Oxford, in 1849. He sat in Parliament for Stamford, 1853-68; was secretary for India, 1866-67, and again, 1874-76. In 1878, he was appointed foreign secretary. He was prime minister with two interruptions from 1885 to 1902.

Salk, Jonas E. (**1914-**), bacteriologist, was born in New York City. He was graduated from the College of the City of New York in 1934 and from the Medical School of New York University in 1939. In 1942 he went to the University of Michigan to study bacteriology and to work on the development of influenza vaccines. In 1947 he was named head of the new University of Pittsburgh virus research laboratory, where he succeeded in producing an improved influenza vaccine.

Following the discovery in 1949 by Dr. John F. Enders of Harvard, the 1954 Nobel prize winner, that poliomyelitis virus is capable of being grown in cultures of different tissues in test tubes, Dr. Salk saw the possibility of producing an anti-poliomyelitis vaccine. Working under a grant received in 1949 from the National Foundation for Infantile Paralysis, he developed a vaccine that was ready for testing on humans in 1952. Mass tests on an increasing scale followed, and on April 12, 1955, scientists at the University of Michigan announced the success of the inoculations. Of a cherry red color, the vaccine, which was administered in injections of one cubic centimeter each, contained a polio virus treated with formaldehyde until it remained only active enough to develop antibodies against polio infection. Since the vaccine was developed under a grant from the National Foundation for Infantile Paralysis, it was not patented and Dr. Salk derives no personal gain from its use.

Sallust (*săl'ŭst*), or **Gaius Sallustius Crispus** (**86 B.C.-34 B.C.**), Roman historian, was born at Amiternum. He rose from a plebeian to a senator, but was expelled from the Senate in 50 B. C. probably because of an intrigue with the wife of Milo. Cæsar restored him to his seat and made him successively quæstor, prætor, and governor of Numidia. In the office of governor, he amassed an enormous fortune. On his return to Rome, he built a palace on a site still known as Sallust's Garden and began writing.

With the exception of some fragments, his *History of the Roman Republic* is lost; but his masterly *History of the Jugurthine War* and the *Conspiracy of Catiline* are extant.

Sampson, William Thomas (**1840-1902**), American naval officer, was born at Palmyra, N. Y. He was graduated from Annapolis in 1861. He served six years as instructor at Annapolis, commanded successively the *Swatara*, *San Francisco*, and *Iowa*, and then became chief of the bureau of ordnance. On the outbreak of the war with Spain in 1898, he was placed in command of the North Atlantic squadron. When the Spanish fleet under Cervera took refuge in the harbor of Santiago de Cuba, Sampson established a close blockade, resulting in the destruction of the Spanish fleet when it attempted to escape from the harbor, July 3, 1898.

Sand, George (**1804-1876**), is the pen name of Amantine Lucile Aurore, Baroness Dudevant, née Dupin, French author, who was born at Paris. After receiving a conventual education, she married M. Dudevant in 1822, but separated from him in 1831. She then settled in Paris and began a literary career that brought her both fame and fortune. Among her friends were Alfred de Musset, Chopin, Liszt, Balzac, and Lamennais. Of her numerous works the best-known are *Indiana*, *Valentine*, *Rose et Blanche* (written in conjunction with Jules Sandeau), *Lelia*, *La Comtesse de Rudolstadt*, *Consuelo*, *Jacques*, *Mauprat*, *La mare au diable*, *François le Champi*, *La petite Fadette*, and *Jean de la Roche*.

Sandburg, Carl (**1878-**), American poet and biographer, was born at Galesburg, Ill. He was educated at Lombard College in his native city. Devoting himself to secretarial and editorial work, he was secretary to the mayor of Milwaukee, 1910-12; was assistant editor of the *System* magazine in 1913; and later became an editorial writer for the Chicago *Daily News*. His writings include *Chicago Poems*, *Corn Huskers*, *The Chicago Race Riots*, and *Smoke and Steel*. His poetry is characterized by great vigor. His greatest work, to which he devoted about 30 years, was a biography of Abraham Lincoln in six volumes, completed in 1939. He was elected to the American Academy of Arts and Letters in 1940. His *Collected Poems* was published in 1950, his *New American Songbag* in 1951, and *Always the Young Strangers* in 1953.

Sanger, Margaret (1883-), née Higgins, American reformer, was born at Corning, N. Y. Trained and experienced as a nurse, she came to the conclusion that limitation of families where income was inadequate was a necessary step in social progress. The courts at the time generally interpreted giving of contraceptive information as violations of state or federal laws. After several indictments, Mrs. Sanger obtained a court ruling permitting imparting of such information by physicians for health reasons. She opened the first permanent birth control clinic in New York City in 1923. In succeeding years she founded similar clinics in many foreign countries, and organized also several international conferences on population problems. She coined the term birth control.

Santa Anna (*sän'tä ä'nä*), **Antonio López de (c. 1795-1876)**, Mexican general, was born at Jalapa. In 1810, he entered the Spanish army; in 1821, he joined Iturbide but overthrew him in the following year. Santa Anna was elected governor of the city and province of Vera Cruz in 1822 and in the same year proclaimed a Mexican republic. In 1829, he expelled a Spanish army of invasion.

Santa Anna vigorously opposed the separation of Texas from Mexico. In 1836, he attacked San Antonio, captured the Alamo, and massacred the garrison. A little later, he committed another massacre at Goliad, but soon afterward, at the battle of San Jacinto, he was defeated and made prisoner by General Houston. Promising to acknowledge Texan independence, he returned to Mexico and defended Vera Cruz against the French in 1838. He ruled as dictator till 1841 and president till 1844. In the war against the United States, 1847, Santa Anna took command of the Mexican forces. He was defeated by General Taylor at Buena Vista and by General Scott at Cerro Gordo, and, after the fall of Mexico City, fled to Venezuela. After various periods of exile and recall, he died in Mexico City.

Santayana (*sän'tä-yä'nä*), **George (1863-1952)**, philosopher, was born at Madrid, Spain, and was educated at Harvard University, the University of Berlin, and Cambridge University. He became instructor at Harvard University in 1889, Hyde lecturer at the Sorbonne in 1905-06, and professor of philosophy at Harvard University in 1907. In 1912, he took up his residence in Paris. The by-products of his chief philosophic concern, the relation of reality to experience, resulted in many illuminating studies in literary criticism, esthetics, and morals. His writings are distinguished for their clear, brilliant style and for their broad, human viewpoint. They include *The Life of Reason*, *Three Philosophical Poets*, *Character and Opinion in the United States*, *Scepticism and Animal Faith*, and *The Last Puritan*, a novel.

Santos-Dumont (*sän'tôs'dü'môN'*), **Alberto (1873-1932)**, Brazilian aeronaut and inventor, was born at Sao Paulo, Brazil. He was educated chiefly in France and after the death of his father, a Brazilian coffee planter, resided in Paris. Interested from an early age in the theory of aeronautics, he began experimenting with balloons, making his first ascent in 1897. In 1898, he adapted a gasoline engine and a propeller to an elongated balloon of his own design, the first application of an internal combustion motor to an airship. He made successful flights in 1899, and, in 1901, in his sixth airship, he flew from Saint Cloud to the Eiffel Tower and back in 30 minutes, winning the Deutsch prize of 100,000 francs. When he died he received burial in Rio de Janeiro as a national hero. See *Airship*.

Sappho (*săf'ō*), lyric poetess of Greece, was a native, probably of Mytilene, in Lesbos. She flourished about 600 B. C. and was a contemporary and friend of Alcæus. The ancient writers agree in expressing the most unbounded admiration for her poetry, and the few extant fragments of her work reveal her as a genius of the highest order. Her love poems, mainly addressed to women, are almost unexampled in the intensity of feeling expressed. Her predilection for love poetry probably gave rise to the legend that, upon finding her passionate love for Phaon unrequited, she cast herself into the sea.

Sardou (*sär' dōō'*), **Victorien (1831-1908)**, French dramatist, was born at Paris. He studied medicine, but subsequently turned to literature. He won reputation by *M. Garat* and other pieces produced at the Déjazet Theater, and was admitted to the Academy in 1877. With Augier and the younger Dumas, Sardou dominated the French drama during the Second Empire, and several of his plays are among the most popular on the modern stage. Some, like *La Tosca*, have been made into grand operas; others, such as *Les pattes de mouche*, original of "The Scrap of Paper," *Divorçons*, and *La sorcière*, have become successful on the English and the American stage. Among other well-known plays are *La Taverne*, *Nos intimes*, *Candide*, *Théodora*, *Cléopâtre*, *Thermidor*, *Paméla*, *Robespierre*, *Dante*, *Madame Sans-Gêne*, *Odette*, and *Fédora*.

Sargent, Charles Sprague (1841-1927), American arboriculturist, was born at Boston. He was graduated from Harvard University in 1862, and, from 1863 to the end of the Civil War, he served in the Federal army. In 1872, he was appointed director of the Arnold Arboretum and, in 1879, was made also professor of arboriculture, Harvard University. He directed the first forest census of the United States, wrote the 14-volume *Silva of North America*, and planned the extensive Jesup collection of woods now in the American Museum of Natural History, New York City. His other writings include *The Forest Flora of Japan* and *Manual of Trees of North America*.

Sargent, John Singer (1856-1925), painter, was born in Florence, Italy, of American parents. He studied painting at the Academy of Fine Arts, Florence, and in Paris under Carolus-Duran. In 1879, he traveled in Spain, studying the work of Velasquez, which greatly influenced his style. He lived in Paris until 1884, when he removed to London.

Sargent ranks as one of the greatest modern portrait painters. His mural "The History of Religion," in the Boston Public Library, is among the most notable works of the kind. Well-known examples of his work are "El Jaleo" in the Boston Museum; "Gitana," "Hermit," "Padre Sebastiano," and portraits of W. M. Chase and Henry Marquand in the Metropolitan Museum, New York; "Carnation Lily, Lily Rose" in the Tate Gallery, London; and "Carmencita" in the Luxembourg. In 1905, he was elected to the American Academy of Arts and Letters.

Sarnoff, David (1891-), American industrial leader, was born at Uzlian, Russia, and was brought to the United States when 9 years of age. In 1906, he entered the employ of the Marconi Wireless Telegraph Co. and became manager of its station at Sea Gate, N. Y. While an operator at John Wanamaker's in New York, in 1911, he came into world-wide notice for continuing at his instrument for 72 hours in order to receive messages from the ill-fated *Titanic*, which had struck an iceberg and was sinking in mid-ocean. He rose rapidly in the radio business and was made commercial manager of the Radio Corporation of America on its formation in 1918, subsequently becoming general manager and, in 1930, president.

Saroyan, William (1908-), American playwright and author of short stories, was born of Armenian immigrant parents at Fresno, Calif. From the publication of his short story, *The Daring Young Man on the Flying Trapeze*, in *Story* magazine, in 1934, he was recognized as a new and different writer, original to the point of eccentricity. Prolific in the production of short stories, he has also been an industrious writer for the stage. His play *The Time of Your Life* received the Pulitzer award and was also chosen by the Critics Circle as best of the 1939-40 season. A by-product of his service in the United States Army in World War II was his satiric novel *The Adventures of Wesley Jackson*.

Sarto (*sär'tō*), **Andrea del (1487-1531)**, Italian painter, was born near Florence. His family name was Vanucchi, but he was named Del Sarto, "the tailor's son," from his father's business. Of numerous frescoes which he painted in Florence the best are "Birth of the Virgin," "Adoration of the Kings," and the "Madonna of the Sack." Among his most celebrated single pictures are the "Assumption," "Madonna of the Harpies," and "Saint John the Baptist." He left many portraits of his wife, Lucrezia, with whom he had fallen in love before the timely death of her former husband. Sarto ranks second only to Michelangelo and Da Vinci in accurate drawings and rivals the great Venetian masters in color. He was called "the faultless painter."

Sartre, Jean-Paul (1905-), French philosopher, novelist, and playwright, was born in Paris. After passing with high honors at the *Ecole Normal Superieure*, he taught for several years at a *lycee* in le Havre. As chief exponent, and in part originator, of the so-called "existentialist" philosophy he has been a storm center in contemporary philosophical and religious circles. Typical of his works are *The Age of Reason*, *The Chips Are Down*, *Being and Nonbeing*, and *Existentialism*.

Saud, Abdul Ibn (1880-1953), Arabian military leader and founder of Saudi Arabia, was born at Riyadh, Nejd. Grandson of a deposed sultan of Nejd, Saud recaptured the capital, Riyadh, 1901, in a bold and cunning attack with the aid of 15 followers. As sultan of Nejd and head of the Wahabi sect, he induced the Arabs in large part to live in settled colonies or villages, stabilized by agriculture, each colony being a division of a standing army. Tribal loyalties were transformed into the closest approach to a national loyalty since the days of Mohammed. With British aid he attacked the Turks during World War I and, in 1924, captured the Hejaz from King Husain, whom British aid in the World War had made powerful. In 1927 he assumed the title of King of Hejaz and Nejd. His rule united all central Arabia in a kingdom which he later named Saudi Arabia.

Saunders, Charles Edward (1867-1937), Canadian botanist and chemist. A graduate of Toronto and Johns Hopkins universities, he spent all his active life working for the Canadian government in connection with experimental farms, becoming chief cerealist for the Dominion

in 1914. He developed many strains of grain which would thrive in the Canadian climate. His greatest discovery was the marquis wheat, which combines excellent quality with early maturity. This wheat soon became the dominant variety in North America. He was knighted in 1934.

Savonarola (*säv'ô-nä-rô'lä*; It., *sä'vô-nä-rô'lä*), **Girolamo** (**1452-1498**), Italian preacher and reformer, was born at Ferrara. He became a Dominican monk in 1475, and, in 1482, he removed to Florence, where, in 1491, he was made prior of Saint Mark's. Toward the close of the 15th century, he led the democratic party in Florence and effected important reforms. He held that the mortal enemy of Christ's gospel in all ages of the world has been mammon. Accordingly, he boldly denounced the abuses of the time, the licentiousness of the great, and the corruptions of the Church. He aroused the enmity of the Arrabbiati, the party of the Medici. In 1497, Savonarola was excommunicated by the pope and, in 1498, was arrested and put to death.

Sayers, Dorothy Leigh (**1893-1957**), English novelist and translator, was one of the first women to obtain an Oxford degree. Her detective stories, such as *Murder Must Advertise* and *The Nine Tailors*, show great literary skill as well as cleverness of plotting. She has also gained wide recognition for her anthologies, or "omnibuses," of crime, known as *Great Short Stories of Detection, Mystery and Horror*. Later she concentrated her attention on the writing of religious dramas and on the translation of Dante's *Divine Comedy*. *The Inferno* (1949) and the *Purgatorio* (1955) have both been published in popular editions.

Scaliger (*skăl'i-jẽr*), **Joseph Justus** (**1540-1609**), French classical scholar, was born in Guienne. He was educated at Bordeaux. In 1593, he was made professor of literature at Leiden. In his treatise, *De Emendatione Temporum*, he laid down for the first time a complete system of chronology formed upon fixed principles. He was master of many languages and was recognized as one of the great scholars of his time.

Schacht, (Horace Greeley) Hjalmar (**1877- **), German banker was born in Schleswig. Through specialized economic studies and banking experience, he rose to leadership in the Darmstader bank, becoming president in 1916. When postwar currency inflation rendered Germany's money worthless he was asked, in 1923, to establish new currency and was made president of the Reichsbank. In this capacity and as finance minister he financed Hitler's early rearmament program, but was later removed from both positions. Tried by the Nuremburg tribunal as a war criminal, he was acquitted in 1946.

Schary, Dore (**1905- **), motion picture producer, was born at Newark, N. J. His early interest in the Drama led to his becoming director of a Little Theatre. At the same time he was busy as actor, playwright, and publicity writer. He wrote many screen plays for Columbia, Paramount, and Warner studios. As an independent producer he achieved early successes with *Joe Smith, American*, *Lassie Come Home*, and other familiar plays. As writer and coproducer he brought out *Sunrise at Cambobello*, and as coproducer and director, *A Majority of One*.

Scheele (*shā'lẽ*), **Karl Wilhelm** (**1742-1786**), Swedish chemist, was born at Straisund, Pomerania. In 1770 he settled in Upsala. He made many important chemical discoveries, among which were tartaric acid, 1770; oxygen (independent of Priestley), chlorin, and baryta, all in 1774; prussic acid, 1782; and glycerin, 1784. He discovered also the arsenite of copper, commonly known as Scheele's green.

Schelling (*shĕl'ĭng*), **Friedrich Wilhelm Joseph von** (**1775-1854**), German philosopher, was born in Württemberg. He was educated at Tübingen and at Leipzig. In 1798, he succeeded Fichte as teacher of philosophy at Jena; in 1803 he became professor at Würzburg, later at Erlangen and Munich, and, in 1841, he was called to the University of Berlin. In philosophy he began as a follower of Fichte and of Hegel, but he was later influenced by Spinoza and Böhme and adopted a philosophy recognizing purpose as a guiding principle in the universe. His works include *Inquiry into the Nature of Human Freedom*, *On the Possibility of Any Form of Philosophy*, and *The World Soul*.

Schiaparelli, Elsa, coutourière, was born in Italy, the daughter of a professor who was Dean of the University of Rome. Her education was obtained partly at a convent in Switzerland, partly at a school in England. Having established a salon and won success as a designer of clothes in Paris during the 1930's, she became a "style refugee" in the United States following the invasion of France by the Nazis. Her lectures on *Clothes and the Woman* helped to raise money for the relief of unemployed Parisian workers in the clothing industry. She has written many magazine articles on style, and an autobiography, *Shocking Life*.

Schiller, Ferdinand Canning Scott (**1864-1937**), Anglo-American philosopher. Educated at Oxford University, he taught philosophy at Cornell University, 1893-97, returning then to Oxford, where he taught until 1927. In 1929, he was appointed professor of philosophy in the University of Southern California. He developed a philosophy, which he called humanism, centering in the proposition that man is the measure of all things. In addition to philosophical works, which include *Riddles of the Sphinx*, *Logic for Use*, and *Must Philosophers Disagree?*, he wrote *Tantalus, or the Future of Man* and *Cassandra, or the Future of the British Empire*.

Schiller, Johann Christoph Friedrich von (**1759-1805**), German poet and dramatist, was born at Marbach, Württemberg. In his ninth year he was sent to school at Ludwigsburg. He early preferred nature to books. At first he was destined for the clerical profession, but this was abandoned upon his entrance to the academy in Stuttgart in his 14th year. He began the study of law, which he soon changed for that of medicine, but both were uncongenial.

In 1780, he was appointed by the Duke of Württemberg as surgeon in a regiment. The whole bent of his inclinations, however, was toward literature. The next year, he brought out *The Robbers*. This drama was a daring defiance of the artificial restraints of civilization; it was the natural rebound of his mind from what he felt to be the cramping influences of school. Schiller was present without leave at its presentation. Afterward, being arrested and condemned by the duke to write nothing but medical treatises, he escaped from Württemberg and wandered from place to place until the duke's anger subsided.

Being allowed later to reside where he pleased, Schiller went to Mannheim, where, in 1783, he was appointed poet of the theater. Here he produced his dramas *Fiesco* and *Intrigue and Love*. He strove incessantly to improve himself in dramatic art and to render the theater of Mannheim an instrument of national instruction. At this time, he was raised to the rank of councilor to the Duchy of Weimar.

Shortly afterward, he left Mannheim, and then followed another period of wandering. He stopped at Leipzig. Disappointed in love, he gave up his intention of devoting himself to a professional calling. He removed to Dresden, where he completed his historical *Don Carlos* in 1787. After two years, he shifted his residence to Weimar, then the intellectual capital of Germany; and here he met Charlotte von Lengefeld, whom he married in 1790. He was appointed in 1789 to the office of professor of history at Jena, following his publication of *Revolt of the Netherlands*. His *History of the Thirty Years' War* appeared in 1792. Both reveal a marked genius for the effective handling of facts.

From 1791 to 1799, Schiller resided principally at Jena, though incapacitated by ill health for the active duties of his professorship. During these years of pain, he executed his greatest achievements. In 1799, he completed *Wallenstein*, perhaps his greatest work and regarded by many as the finest tragedy in the German language. A period of happy intimacy with Goethe at Weimar followed in 1799-1805, during which he produced *The Maid of Orleans*, *The Bride of Messina*, *Mary Stuart*, and some minor poems. In 1804, he wrote *William Tell*, the most popular of his dramas.

Schiller has long been recognized as second only to Goethe in German literature and, in some ways, even surpassing him. As a poet, he is characterized by strong feeling and intense idealism. He stands foremost among German dramatists, and ranks among the greatest of all writers of drama. See *William Tell*.

Schleiermacher (*shlī'ẽr-mä'кẽr*), **Friedrich Ernst Daniel** (**1768-1834**), German philosopher and theologian, was born at Breslau. He was educated at the Moravian schools of Niesky and Barby and studied philosophy and theology at Halle. His first important literary work, *Discourses on Religion*, appeared in 1799. He was professor at Halle, 1804-06, and, in 1810, became first dean of the theological faculty at the University of Berlin. In 1811 appeared his *Brief Outline of the Study o Theology*; in 1817, his *Critical Essay on the Writings of Luke*; and, in 1821-22, his greatest work, *Christian Faith*. Schleiermacher exercised a great influence through his theory that science can be reconciled with theology.

Schlesinger, Arthur Meier (**1888- **), American historian and essayist, was born at Xenia, Ohio, and received his education at Ohio State and Columbia universities. In his writing and research, he has given special attention to the social history of the United States. After teaching for several years at the state universities of Ohio and Iowa, he was appointed Professor of History at Harvard University. Examples of his popular essays on history are his books, *Paths to the Present* and *The American as Reformer*. Earlier works more in the nature of textbooks are *The Colonial Merchants and the American Revolution* and *Political and Social History of the United States*.

Schley (*slī*), **Winfield Scott** (**1839-1911**), American naval officer, was born near Frederick, Md. He was graduated from the United States Naval Academy in 1860, served in West Gulf blockading squadron in 1862-63, and was in the engagements leading to the capture of Port Hudson,

La., in 1863. In 1884, he took command of the relief expedition which rescued Lieutenant Greely and six survivors of an ill-fated attempt to reach the North Pole. In the war with Spain he was in immediate command at the destruction of Cervera's fleet off Santiago, July 3, 1898. Despite the victory, a court of inquiry later found him guilty of negligence but no action was taken as a result. He wrote *Rescue of Greely* and *Forty-five Years under the Flag.*

Schnitzler (*shnĭts'lĕr*), **Arthur (1862-1931),** Austrian dramatist, was born in Vienna. He was graduated from the university of his native city in 1885 and devoted himself to the practice of medicine and to literature. He possessed high technical skill, treated his themes with grace and charm, and excelled in the one-act play and sketch. Of his numerous plays, some of the best-known are *Anatol, The Legacy, The Green Cockatoo, Paracelsus, The Companion, Living Hours, The Woman with the Dagger, Professor Bernhardi, Playing with Love,* and *Countess Mizzi.*

Schopenhauer (*shō'pĕn-hou'ĕr*), **Arthur (1788-1860),** German philosopher, was born at Danzig. He studied at Göttingen, Berlin, and Jena. He spent the winter of 1813 at Weimar, where he enjoyed the society of Goethe. In 1819, he published his greatest work, *The World as Will and Idea.* Having lived in Berlin lecturing intermittently from 1820 to 1831, he removed to Frankfort on the Main and thereafter devoted himself uninterruptedly to the elaboration of his philosophical system. Schopenhauer developed the view that reality is a blind force expressing itself through individuals as the will to live, pain is the only positive feeling, and the sole relief from unhappiness is absence of desire. He became known as the philosopher of pessimism.

Schubert (*shōō'bĕrt*), **Franz Peter (1797-1828),** Austrian composer, the son of a poor schoolmaster, was born at Vienna. At 11 he became a singer in the court choir and later leading violinist in the school band. At 14 he began writing songs and at 18 his supreme gift of lyric melody was revealed in "The Erlking," one of the world's most dramatic songs, written by him in a single day. His brief life, spent chiefly in the drudgery of teaching, was harassed by pecuniary embarrassment and embittered by the slow recognition accorded to his work. Schubert's fame rests upon his songs, some 600 in number, which constitute an imperishable monument to his genius. He originated the modern artistic song (*Kunstlied*) of which he still remains the unsurpassed master. He wrote also 8 symphonies, several of which, notably the so-called "Unfinished symphony," are among the world's greatest.

Schuman, William H. (1910-), educator and composer, was born in New York City and received his musical training there. He also earned a B.S. and an M.A. degree at Columbia University. He was a member of the faculty of Sarah Lawrence College and later transferred to the Julliard School of Music, of which he has been president since 1946. In recognition of his work as composer, he received the first Pulitzer prize for music. Climaxing his long service to UNESCO and other cultural organizations, he recently became president of New York's Lincoln Center for the Performing Arts.

Schumann, Robert (1810-1856), German composer, was born in Zwickau. He was educated at Heidelberg and studied music under Wieck at Leipzig. In 1834, he founded the *Neue Zeitschrift für Musik,* which under his editorship greatly influenced musical progress. In 1840, he married the pianist Clara Wieck, whose brilliant interpretations did much to establish his fame throughout Europe. While Schumann's early compositions were chiefly for the piano, he produced between 1840 and 1854 nearly 250 songs. During this time he wrote also his celebrated piano quintet; the choral work *Paradise and the Peri;* the opera *Genoveva;* symphonies; and various other works.

Schumann-Heink (*shōō'män-hĭngk'*), **Ernestine (1861-1936),** nee Roessler, dramatic contralto, was born at Lieben, Bohemia. She studied at Graz and made her debut at Dresden, 1878, as Azucena in *Il Trovatore;* sang in Dresden four years and, in 1883, went to Hamburg. In 1896, she sang at Bayreuth in *Der Ring des Nibelungen.* In 1926, at 64, she appeared in *Das Rheingold* with the Metropolitan Opera Company.

Schurz (*shōōrts*), **Carl (1829-1906),** American political leader and soldier, was born near Cologne, Germany. He was educated at the University of Bonn and began the publication of a Liberal newspaper. He took part in the revolutionary movement of 1848 and joined the revolutionary army, but was finally forced to flee to Switzerland.

Schurz came to the United States in 1852, settled at Watertown, Wis., in 1856, and, at the outbreak of the Civil War in 1861, he joined the Union army. He commanded a division at Chancellorsville and a corps at Gettysburg. After the war he engaged in journalistic work and in 1867 became editor of the Saint Louis *Westliche Post.* From 1869 to 1875, he was United States senator from Missouri.

An orator and writer of marked ability and an indefatigable advocate of political reform, Schurz for a quarter of a century was a prominent figure in American public life. His writings include *Life of Henry Clay, Abraham Lincoln,* and *Reminiscences.* In 1905, he was elected a member of the American Academy of Arts and Letters.

Schwab (*shwäb*), **Charles Michael (1862-1939),** American capitalist, was born in Williamsburg, Pa. He was educated in the village school and at Saint Francis College. He entered the service of the Carnegie Company as stake driver in the engineering corps and rose steadily. He was superintendent of the Homestead works, 1892-97; president of the Carnegie Steel Company, limited, 1897-1901, and president of the United States Steel Corporation, 1901-03. He then became president and manager of the Bethlehem Steel Corporation. Early in 19 8, Schwab was made director general of the shipbuilding board of the emergency fleet corporation and devoted his efforts to speeding up shipbuilding until the end of the war. He then returned to the Bethlehem Steel Corporation.

Schweitzer, Albert (1875-), theologian, philosopher, musician, missionary, and physician, was born in Alsace. A musical prodigy, his studies under Widor paved the way for his authoritative writings on Bach and the organ. He delved deeply into theology and wrote several religious works, best-known of which is *The Quest of the Historical Jesus.* He also became an authority on Kant's philosophy. After he had mastered these fields he took up the study of medicine to prepare himself for work as a medical missionary. In the midst of a busy life caring for native patients in his hospital at Lambaréné, in French Equatorial Africa, he has written such notable works as *On the Edge of the Primeval Forest, The Decay and Restoration of Civilization,* and *Civilization and Ethics.* On occasional visits to Europe he has given organ concerts to raise money for his hospital. He was awarded the Nobel peace prize for 1952.

Scipio (*sĭp'ĭ-ō*), **Publius Cornelius (c. 237 B.C. -c. 183 B. C.),** surnamed Africanus Major, Roman general. In 212, he was elected ædile and, in 211, became proconsul with command of the Roman forces in Spain.

Scipio found, on arriving, that the Carthaginians, under Hannibal, had eluded him and had invaded Italy, where they continued to win signal victories for many years. In 205, he returned to Rome and, having been elected consul, persuaded the Senate to permit him to invade the African territory of Carthage. "Carrying the war into Africa," he compelled Hannibal to return from Italy, and the two met at Zama in 202 B. C. Scipio won a complete victory, and peace was concluded in the following year. He accompanied his brother Lucius in the campaign against Antiochus in 190. Scipio is considered the greatest Roman general before Julius Cæsar.

Scipio, Publius Cornelius Scipio Æmilianus (c. 185 B. C.-129 B. C.), surnamed Africanus Minor. After distinguishing himself in Spain, he took part in the third Punic war, laid siege to Carthage, took it by storm, and leveled it to the ground in 146. He was later sent to Spain, where he captured Numantia after a stubborn resistance. After his return to Rome, he became leader of the aristocratic party. Upright and magnanimous, he was neither an uncompromising oligarch nor a servile flatterer of the people. He gathered about himself a brilliant group of intellectual and literary men, who formed what has been called the Scipionic circle. He was assassinated.

Scott, Duncan Campbell (1862-1947), Canadian poet was born in Ottawa, Ont. He was educated at Stanstead Wesleyan College. In 1893 he became an accountant in the Canadian civil service. In the same year he published his first volume of verse entitled *The Magic House,* which was followed by *Labour and the Angel, New World Lyrics and Ballads, Via Borealis, Lundy's Lane, Beauty and Life,* and *The Green Cloister.* His writings include also a collection of short stories entitled *In the Village of Viger* and *John Graves Simcoe,* a biography.

Scott, Robert Falcon (1868-1912), English antarctic explorer, was born at Outlands. He entered the navy at 14 and, in 1889, was promoted lieutenant. In 1901, he was placed in command of an antarctic expedition, during which he discovered King Edward VII land and reached latitude 82° 17′ S., then a new "farthest south." In recognition of his valuable scientific work, he was promoted captain and awarded many honors. In 1910, he set out in command of a new expedition for antarctic discovery. By a continuous sledge journey of 1842 miles, the longest made in polar regions, he reached the south pole, January 18, 1912, only five weeks later than Amundsen, but perished with his entire party some two months later while making the return journey. His writings include *Voyage of the Discovery* and the posthumous *Scott's Last Expedition.*

Scott, Sir Walter (1771-1832), Scottish poet and novelist, was born in Edinburgh. He was descended from an old family of border freebooters; and the stories of his

marauding ancestors, to which he listened, produced a deep and indelible impression upon his mind.

EDUCATION. He entered the high school at Edinburgh in 1779. There he became distinguished for his courage, his extraordinary memory, his vast store of miscellaneous information, and his skill in story telling. In the winter of 1783, he entered Edinburgh University, but he attended only one session. When 15 years of age, he was in his father's office studying law, and devouring romances, novels, histories, and old plays.

EARLY CAREER. In 1792, he was admitted a member of the Scottish faculty of advocates. In 1797, he married Charlotte Margaret Carpenter, daughter of a French emigrant, whose small fortune, together with his own income from the shrievalty of Selkirkshire, made Scott sufficiently independent to devote himself to literature. He gradually made authorship the main business of his life. To this earlier period belong several of his original ballads.

LITERARY SUCCESS. The most brilliant period of Scott's literary career extends from 1802 to 1825. In the first of those years, he published his *Minstrelsy of the Scottish Border*, which gave him a distinguished reputation for his annotations upon the old ballads and for the promise of his own ballads inserted in the collection. *The Lay of the Last Minstrel*, which appeared in 1805, is a romance of border chivalry. Its success was phenomenal. *Marmion* came in 1808 and *The Lady of the Lake* in 1810. During this time Scott contributed for a time to the Edinburgh *Review*, and assisted in establishing the *Quarterly*.

PUBLISHING ENTERPRISE. Having quarreled with his publisher, Constable, Scott became a third partner in a new publishing house with the two brothers Ballantyne. This arrangement, kept secret, was to exercise a disastrous effect upon his later fortunes.

Scott wished for fame; therefore, seeing the waning popularity of his poetry, he set to work to win laurels in a new field. He wished for gain, that he might gratify his ambition to possess an estate in land. He accepted an appointment as one of the principal clerks of the court of sessions in 1812 in order to add to his income and to enable him to buy lands. His success enabled him shortly to create a country estate at Abbotsford. For these ends at first, and, later, to avert the ruin that threatened his publishing interests, Scott turned to the writing of historical novels.

The first of the historical novels was *Waverly*, which gave its name to the series. *Guy Mannering* appeared in 1815; *The Antiquary* and *Old Mortality*, in 1816; *Rob Roy* and *The Heart of Midlothian*, in 1818; *The Bride of Lammermoor*, in 1819; *Ivanhoe*, in 1820; *Kenilworth*, in 1821; *The Pirate*, in 1822; *St. Ronan's Well*, in 1824. Few writers have been so prolific as Scott. He was created a baronet in 1820 for his distinguished work.

In 1826, the Ballantyne's firm failed; Scott's concealed partnership was revealed, and he pledged himself to devote the labor of his subsequent life to the payment of the liabilities. Breaking up his establishment at Abbotsford, he hired a lodging in Edinburgh, and, for some years, he toiled at his prodigious work. His *Life of Napoleon* and *The Fair Maid of Perth* belong to this period. He made amazingly large payments to his creditors; but the limits of endurance were reached, and, in 1830, he was smitten with paralysis. A brief trip to Italy failed to restore his health, and he returned to Abbotsford.

PLACE IN LITERATURE. It is one of the most melancholy thoughts in the history of English literature that Scott was prematurely sacrificed. No writer ever exercised a greater influence over the public mind or led to so much imitation. His writings never foster a base feeling nor throw ridicule on good and generous impulses. His unfailing wholesomeness and freshness, the variety and richness of his range, his Homeric simplicity and charm, place him second only to Shakespeare in English imaginative literature. The greatness of Scott's heart, the loyal and sympathetic affection of his nature, are as remarkable as his astonishing genius. In an important sense, he was the greatest of peaceful conquerors in the world of letters. See *Literary Plots, Characters, and Allusions* under titles of chief works.

Scott, Winfield (1786-1866), American general, was born near Petersburg, Va. He studied at William and Mary College and became a lawyer; but in 1808 he entered the army as captain. In the War of 1812 he fought at Queenston, Chippewa, and Lundy's Lane, and, in recognition of his services, he was made major general. As commander in chief of the United States army, 1841-47, he led the expedition invading Mexico. He captured Vera Cruz and defeated Santa Anna at Cerro Gordo, taking Jalapa and Puebla. After capturing the Castle of Chapultepec by storm, he led his army, on September 14, 1847, into the city of Mexico, where he commanded until the treaty of peace was signed in February 1848. In 1852, he was a candidate for the presidency, but was defeated.

Scribe (*skrēb*), **Augustin Eugène (1791-1861),** French dramatist, was born in Paris. He was educated for the law, but early turned his attention to the stage. Beginning with his first successes in 1816, he produced, alone or in collaboration, about 400 plays, remarkable for their mastery of stagecraft. He tried every form of dramatic composition—tragedies, comedies, vaudevilles, and opera librettos—often doing little more than editing the ideas of others. Dumas the Younger, Augier, and especially Sardou gained from Scribe that mastery of theatrical technique which gave France undisputed leadership in 19th-century drama. He was elected to the French Academy in 1834. Among his best plays are *Valérie*, *Le mariage d'argent*, *Le verre d'eau*, *Bataille de dames*, and *Les doigts de fée*. His librettos include *Robert le Diable*, *La Juive*, and *L'Africaine*.

Scripps, Robert Paine (1895-1938), American journalist and editor, was born at San Diego, Cal., a son of Edward Wyllis Scripps, the founder of the Scripps newspapers and also of Science Service, Washington, D. C. He was educated privately and at Pomona College. At the age of 16, he became a reporter and newspaper correspondent. He also traveled and studied, fitting himself for the management of the properties, known as the Scripps-Howard newspapers, a controlling interest in which he inherited from his father in 1926.

Scudder, Janet (1873-1940), American sculptor, was born at Terre Haute, Ind. She studied art at Cincinnati, Chicago, and Paris. She became known for her fountain and garden figures, usually featuring joyous children or small animals. Among her best known are "Frog Fountain" at the New York Metropolitan Museum, "Tortoise Fountain" at the Peabody Museum, Philadelphia, and "Fighting Boys Fountain" at the Chicago Art Institute. She was the first American woman to have an example of her work purchased by the Luxembourg Gallery in Paris.

Seaborg, Glenn Theodore (1912-), American chemist and physicist, was born at Ishpeming, Mich. He was educated at the University of California, with which institution he has been connected since he earned his doctorate there in 1937. Known for his research in nuclear chemistry and physics, Seaborg was codiscoverer in 1940 of plutonium (element 94); in 1944 of americium (element 95) and curium (element 96); in 1949 of berkelium (element 97), and in 1950 of californium (element 98). Professor of chemistry at the University of California since 1945, Seaborg during World War II worked for four years on the atomic energy project at the University of Chicago. In 1951 he and Edwin M. McMillan shared the Nobel prize in chemistry for their discoveries. In 1958 he became chancellor of the University of California at Berkeley. In 1961 he was made chairman of the Atomic Energy Commission. Seaborg has been a contributor to *The Lincoln Library of Essential Information*.

Seaton, Frederick Andrew (1909-), newspaper publisher and government official, was born at Manhattan, Kansas, and was educated at Kansas State College. Beginning as reporter, sports publicity director, and radio sports announcer, he advanced to become publisher successively of several newspapers in Kansas and Nebraska. He was appointed interim senator from Nebraska following the death of Senator Wherry and became a member of General Eisenhower's personal staff of advisers in 1952, during the presidential campaign. In 1956 he was appointed Secretary of the Interior.

Sedgwick, Henry Dwight (1861-1957), American biographer and historian, was born at Stockbridge, Mass. Admitted to the bar in 1884, he practiced in New York for 13 years. The rest of his life was spent chiefly in writing, his works including *Samuel Champlain*, *Dante*. *Short History of France*, *The Art of Happiness*, and *Vienna*. He was elected to the American Academy of Arts and Letters in 1933.

Seeger, Alan (1888-1916), American poet, was born in New York City, of New England parentage. In 1906, he entered Harvard University, where he displayed much interest in literary studies and contributed verse to the *Harvard Monthly*. Following graduation, he spent two years in New York, and, in 1912, he went to Paris, where he wrote most of the poems entitled *Juvenilia*. In August 1914, he enlisted in the foreign legion of France. While in service at the front he produced some excellent verse, including the famous poem "I Have a Rendezvous with Death." He was killed in battle near Belloy en Santerre.

Segni, Antonio (1891-), Italian political leader, lawyer, university professor. Early interest in problems of land reform affecting his native Sardinia led him to specialize in agrarian law while studying at the University of Rome. He became a professor of law at the universities of Perugia, Cagliari, Pavia, Sassari, and Rome and was active as a leader of the Christian Democracy Party. Particularly while holding the cabinet post of Minister of Agriculture and Forestry from 1946 to 1951, he exerted a profound influence on Italy's postwar policies relating to the distribution and use of land. Author of several land reform bills, he has shown that redistribution of land held in large estates need not depend upon confiscation by Communists, but can be brought about equitably by orderly

legal procedure. Named Premier of Italy in 1955, he has gained support for an anti-Communist, anti-Fascist policy dedicated to stability and prosperity.

Selden, George Baldwin (1845-1922), American inventor, was graduated from Yale University in 1869, studied law for a time, and then turned his attention to experimenting with engines for propelling light vehicles. For many years he was president of the Selden Motor Company of Rochester, N. Y.

In 1879, he filed the first patent for a gasoline motor-propelled vehicle. This later resulted in protracted litigation, which is said to have cost Selden nearly all of the financial returns realized from the invention. In 1900, he sued Ford and Winton for infringement of his basic patent. He was successful in the lower courts, but appeals were taken to higher courts, where a decision upheld his patent, but ruled that the Ford engine was of the Otto type, not Selden. See *Automobile.*

Seltzer, Louis Benson (1897-), American journalist, was born at Cleveland, Ohio, where he began his newspaper career as an office boy in 1911. In 1916 he became a reporter on the staff of the Cleveland *Press,* the newspaper with which he has since been associated. His advancement was rapid and in 1928 he was made editor. Since 1937, he has also been editor in chief of the Scripps-Howard newspapers in Ohio—the Cincinnati *Post,* the Columbus *Citizen,* and the Cleveland *Press.* Outstanding among American newspapermen, Seltzer's book of reminiscences, *The Years Were Good,* was published in 1956.

Selznick, David O. (1902-), motion picture producer, was born in Pittsburgh, Pa., the son of Lewis Selznick, who was himself a motion picture producer. David's education at Hamilton Institute and Columbia University was effectively supplemented by the training he received in his father's studio. After working as reader, story editor, and associate producer for Paramount, RKO, and MGM, he formed his own company. Of his many pictures, perhaps the best remembered are *Gone With the Wind, Rebecca, Anna Karenina, Intermezzo, The Prisoner of Zenda, Jane Eyre, Duel in the Sun,* and *Portrait of Jennie.*

Seneca, Lucius Annæus (c. 4 B.C.-65 A.D.), Roman Stoic philosopher, was born at Cordoba, Spain. He was educated at Rome and became a successful advocate in the courts of justice. Accused of intrigue, he was exiled to Corsica, but, on the marriage of the emperor Claudius to Agrippina, Seneca was recalled and made instructor to Agrippina's son Nero, who ascended the throne five years later.

Seneca became one of Nero's chief advisers, attaining great power and immense wea[th. Seneca's influence, however, failed to restrain the vicious propensities of Nero. On the latter's murder of his own mother, Seneca offered to return all his rich gifts, craving only permission to retire. Nero refused but soon afterward attempted to poison Seneca.

His extant writings are chiefly moral and philosophical. Ten tragedies ascribed to Seneca by Quintilian have also come down to us. While not intended for the stage, these plays are important on account of their influence upon the classical French drama. Following the conspiracy of Piso in 65 A. D., Seneca received an order from Nero to put himself to death, which he promptly acted upon with the traditional Stoic contempt for life.

Senefelder (*zā'nĕ-fĕl'dĕr*), **Aloys (1771-1834),** Bohemian inventor, the son of an actor, was born at Prague. After studying the art of printing, he determined to invent a process of his own and, in 1798, made his discovery of lithography. Constructing a suitable press and obtaining a patent, he soon was successfully established as a lithographic printer in Munich, which became the center of the lithographic art.

Serra (*sĕr'rä*), **Junipero** (*Hōō-nē'pâ-rō*), **(1713-1784),** Franciscan missionary, founder of early Indian missions in California, was born at Petra, Island of Majorca. He was graduated from the Lullian University at Palma, where he became professor of philosophy. In 1749, he joined the missionary college of San Fernando, Mexico. For nine years he served in Indian missions north of Queretaro and meanwhile translated the catechism into the Pame language. Returning to Mexico City, he became a zealous and effective preacher of missions.

In 1767, Serra was made superior of a band of 15 Franciscans for the missions of Lower California, and, in 1769, he accompanied Portola's overland expedition to Upper California. En route he established at San Diego, July 16, 1769, the first of the 21 California missions extending along the coast as far north as Sonoma. During the last three years of his life he visited all the missions from San Diego to San Francisco and confirmed over 5000 Indians who had been converted during his 14 years of service. He died at San Carlos mission, near Monterey, where a monument was erected to his memory by Mrs. Leland Stanford. See *California Missions.*

Service, Robert William (1874-1958), Canadian poet and novelist, was born at Preston, England. He was educated in Glasgow, where he served an apprenticeship in a bank. He then went to Canada, first settling on Vancouver Island, B. C. Later, he spent eight years in the Yukon region, during which he traveled extensively. Following the success of his *Songs of a Sourdough,* 1907, he devoted himself to writing poems and novels. On account of his vigorous, descriptive style, he has been called the "Kipling of Canada." For two years during World War I, he drove an ambulance in France, and, as war correspondent, he wrote a series of letters entitled *Rhymes of a Red Cross Man.* His writings include *Ballads of a Cheechako, The Trail of '98, Rhymes of a Rolling Stone, The Pretender,* and *Why Not Grow Young?*

Sesostris. See *Rameses I.*

Seton (*sē'tŭn*), **Ernest Thompson (1860-1946),** artist, author, and lecturer, was born at South Shields, England. In childhood he lived in the forests of Canada and, later, on the western plains. He was educated at Toronto Collegiate Institute and at the Royal Academy, London. From 1890 to 1896 he studied art in Paris. As official naturalist to the government of Manitoba, he published *Mammals of Manitoba* and *Birds of Manitoba.* He became widely known as a writer and illustrator of animal stories and as a lecturer. He was one of the originators of the Boy Scout movement in America and started the outdoor life organization known as the Woodcraft League. Among works written and illustrated by him are *Wild Animals I Have Known, Trail of the Sandhill Stag, The Biography of a Grizzly, Lives of the Hunted* and *Two Little Savages.*

Sevareid, Eric (1912-), news analyst, was born at Velva, N.D. While a student at the University of Minnesota, he worked for the Minneapolis *Journal,* for which he later became reporter. In Europe he was city editor of the N.Y. *Herald Tribune's* Paris edition and correspondent for the Columbia Broadcasting System, with which he is still connected. His writings include *In One Ear* (1952) and *Sounds in the Night* (1956).

Seversky, Alexander P. de (1894-), test pilot and consulting engineer, was born in Russia and fought in his country's air force in World War I. He was shot down and lost his right leg in a bombing expedition but resumed flying and was credited with shooting down 13 enemy planes in 1917. He came to America during the Russian revolution, using a French passport which accounts for the "de" in his name. As consulting engineer and test pilot for the U. S. Air Force, and later as a member of the Air Corps Reserve, he has been closely identified with the progress of military aviation in the United States. A tireless experimenter, he has worked on such inventions as retractable landing gears, pontoons for amphibian planes, automatic bombsights, and mechanisms for refueling planes in the air.

Sévigné (*sā'vēn'yā'*) **Marquise de (1626-1696),** née Marie du Rabutin-Chantal, was born at Paris. At 18 she married the Marquis de Sévigné, who left her a widow at 25. To her children, especially to her daughter, Madame Sévigné devoted the rest of her life. Her beauty, vivacity, and social tact attracted many distinguished friends, among them Turenne and Prince de Conti. Her fame rests upon her *Letters,* written chiefly to her daughter. Unrivaled for freshness, vividness, and wit, these letters form an intimate chronicle of the court and the high society of the time, 1669-95.

Seward (*sū'ĕrd*), **William Henry (1801-1872),** American statesman, was born in Florida, N. Y. He was graduated from Union college in 1820, was admitted to the bar in 1822, and settled in Auburn, N. Y., 1823. He was elected state senator as an Antimason, in 1830, and governor of New York as a Whig, in 1838. In 1849, he was elected to the United States Senate, where he became the acknowledged leader of his party. A strong candidate for the Republican nomination in 1860, Seward became secretary of state in Lincoln's cabinet and rendered services of great value. At the time of Lincoln's assassination, an unsuccessful attempt was made upon Seward's life also. He continued as secretary of state throughout the administration of President Johnson. He negotiated the purchase of Alaska from Russia. He published *Speeches and Orations* and *Life of John Quincy Adams.* See *Alaska Purchase, Seward Whigs, Trent Affair.*

Sforza (*sfōr'tsä*), **Carlo (1872-1952),** Italian statesman was born at Lucca. A cousin of the king of Italy, he entered the diplomatic service, was sent to China, Turkey, and France. When Mussolini came into power he resigned and came to the United States. On Mussolini's fall he returned to Italy, took part in the reorganization, and later became foreign minister. He wrote *The Chinese Enigma, Fifty Years of War and Diplomacy,* and *The Real Italians.*

Shackleton, Sir Ernest Henry (1874-1922), British naval officer and antarctic explorer, was born at Kilkee, Ireland. He entered the navy and was lieutenant in the ant-

arctic expedition of Captain R. F. Scott in 1901-04. During 1907-09, he commanded an expedition which ascended Mt. Erebus and reached for the first time the south magnetic pole. After an unsuccessful attempt to cross the antarctic continent in 1914-16, he perished on a third expedition, near South Georgia Island. He published *The Heart of the Antarctic*, *The Diary of a Troopship*, and *South*.

Shaftesbury (*shăfts'bĕr-ĭ*), **Anthony Ashley Cooper, Earl of (1801-1885)**, English statesman and philanthropist, was born in London. He was graduated from Oxford in 1822. In 1826, he entered Parliament as a Conservative, serving until 1851, when he succeeded his father in the peerage. His fame lives by reason of his lifelong philanthropy, which took shape in numerous acts of Parliament, such as the Mines and Collieries Act, excluding women and boys under 13 from working in the mines; the Factory Acts, and the Workshop Regulation Act. Outside of Parliament he worked in behalf of benevolent and religious movements, notably the ragged school movement and for the better housing of the London poor.

Shah Jehan (*shä jĕ-hän'*), **(c. 1592-1666)**, fifth of the Mogul emperors of Delhi, succeeded his father in 1627. He was a man of great administrative ability and a skilled warrior; he conquered Bijapur and Golconda, and raised the Mogul empire to its zenith. He founded the city of Delhi, where he constructed the famous peacock throne, valued at 30 million dollars, and built the Taj Mahal and other magnificent edifices at Agra. A victim of the perfidy of his usurping son, Aurangzeb, he died in prison.

Shakespeare, William (c. 1564-1616), English dramatist and poet, was born at Stratford-on-Avon, Warwickshire, England, where his baptism was registered April 26, 1564. His mother's name was Mary Arden. "Born at Stratford-on-Avon, married and had children there; went to London, where he commenced as an actor, and wrote poems and plays; returned to Stratford, made his will and died—this," says Steevens, "is all that is known, with any degree of certainty, about Shakespeare." His real biography lies in a critical estimate of his writings.

There was a free grammar school at Stratford, and the probabilities are that here Shakespeare received his education,—English, besides "small Latin and less Greek." We have no trace of his employment in the interval between his school days and manhood. Some hold that he was an attorney's clerk. The tradition is that he was a wild young fellow, stealing deer. The certainty is that he was treasuring up that store of knowledge and cultivating that range of genius which made him what he became.

Private Life. Shakespeare married Ann Hathaway in 1582, and to them were born three children—Susanna, Hamnet, and Judith. In 1586, Shakespeare became connected with the Blackfriars Theater in London. In 1589, he was a joint proprietor of that theater. The players of the Blackfriars were the lord chamberlain's company, who acted under royal patronage. We know nothing of the date of the production of his first play. Shakespeare became rich in connection with the theaters. In 1597, he purchased the principal house in Stratford and also some lands in that parish.

It is supposed that he ceased to be connected with the theaters in 1609. His father died in 1601, and it is more than probable that Shakespeare succeeded him as a practical farmer in his native place. At any rate, he is known to have brought action in the bailiff's court there to collect money for corn sold and delivered.

Dramas and Poems. In the 20 years between 1590 and 1610, Shakespeare wrote and produced most of his plays. To the first decade belong chiefly the histories and comedies; to the second, the tragedies. Some or all of them were performed before the royal court as well as elsewhere. In 1623, his stage companions, Heminge and Condell, having affectionately preserved his plays, gave them to the world in what is known as the *First Folio*. Prefixed to this edition was a half-length portrait, engraved by Droeshout and regarded as an authentic likeness of the poet.

The evidence by which the chronology of Shakespeare's works is inferred is of various kinds: entries of publication in the stationers' registers; statements about the plays and poems; allusions to them; quotations from them by contemporary writers; facts connected with the history of dramatic companies that presented plays of Shakespeare; allusions in the plays to historical events; and quotations made by Shakespeare from publications of the day. There are not many instances of the mention of Shakespeare's name during his lifetime.

In 1593 appeared Shakespeare's first work, the narrative poem "Venus and Adonis," dedicated to the earl of Southampton, the poet's friend and patron. "Lucrece" followed in 1594, and this also became very popular. Of his many comedies, tragedies, historical dramas, and farces, the following are perhaps the most widely known: *Merchant of Venice*, 1596; *Romeo and Juliet*, 1598; *Twelfth Night* and *Julius Cæsar*, both 1601; *Hamlet*, 1602; *Othello*, 1604; *King Lear*, 1605; *The Tempest*, 1610.

Character and Genius. His dramas and his poems furnish a full record of Shakespeare's mental endowments. The peculiar quality of his mind has been expressed in three words, *a complete imagination*. His favorite books were those of Plutarch and Montaigne; his hero was Julius Cæsar; his aversion was the Puritan spirit; his greatest creation was Hamlet. In reality, that which we think of first and last in connection with Shakespeare is his *creation* of characters.

Place in Literature. A full appreciation of Shakespeare's extraordinary genius was not reached until the 19th century, and his place in the intellectual development of mankind was even less appreciated. He belonged to what has been called the modern transition,—that general movement which issued out of the decaying feudal society and led confusedly toward a new era of literary art. For centuries before his time, particularly during the middle ages, whatever there was of art belonged to the feudal world, and its dominant notes were the Church and chivalry. The ideals created by these two forces were sacramental ceremonies, gracious manners, and worship of women.

At the beginning of the 14th century, the system gave signs of decay. The artistic mind gradually receded from religious themes and sought secular objects. Shakespeare was the luminous chief of a band of poets of the secular drama, whose subject was mankind. He took the human soul to be his province, and he made it both web and woof of art and worship, without rival and without disguise.

By the whole civilized world, Shakespeare is now recognized as a creative genius unique in all literature. In imagination, fancy, knowledge of man, wisdom, humor, pathos, strength, and versatility, in the music of his verse and the felicity of his language, and also in that mysterious power which fuses all these separate gifts into one, he stands unapproached and apparently unapproachable. Died, April 23, 1616, and was buried in the chancel of the parish church at Stratford. See *Literary Plots, Characters, and Allusions* under titles of plays and names of characters.

Shapley, Harlow (1885-), American astronomer, was born at Nashville, Mo. Educated at the University of Missouri and Princeton University, he went to the Mount Wilson Observatory as astronomer in 1914 and was chosen director of the Harvard Observatory in 1921. From 1940 he was also professor of practical astronomy at Harvard. His analysis of stellar data in the light of the most recent findings of physics led him to formulate the theory of "island universes," of which the milky way is the one to which the solar system is held to belong.

Shastri, Lal Bahadur (1904-), political leader, was born at Banaras, India, the son of a schoolteacher and minor official. The family name Srivastava is seldom mentioned. The surname Shastri, which was applied to the young man by his associates, refers to a course he took in college. He received part of his education in the Gandhi-sponsored Kashi Vidyapeeth, or National College, at Banaras. In the government formed by Nehru, Shastri played an unobtrusive but very important part. As minister of home affairs he supplied a unifying influence that did much to bind the scattered provinces into a nation. Following the death of Nehru in 1964, Shastri succeeded him as head of the government.

Shaughnessy (*shô'nĕ-sĭ*), **Thomas George Shaughnessy, Baron (1853-1923)**, Canadian railway executive, was born at Milwaukee, Wis. He received his training in railway administration in the service of the Chicago, Milwaukee, and Saint Paul Railroad, 1869-82. He then became identified with the Canadian Pacific Railway, serving successively as purchasing agent, assistant general manager, assistant to the president, vice president, director, and, beginning with 1898, president. In 1901, he was knighted and, in 1916, was created baron.

Shaw, George Bernard (1856-1950), English dramatist and critic, was born in Dublin, Ireland. Self-educated after his 15th year, he went to London at 20 to devote himself to a literary career. He did unremunerative hack work, wrote unsuccessful novels, and became an ardent socialist. Finally, he won recognition as a critic on art, musical, and dramatic subjects for London newspapers. As a critic, he championed Whistler, the impressionists, Wagner, Ibsen, the drama of ideas, and other at first unpopular but later victorious causes.

In 1892, Shaw produced *Widowers' Houses*, his first play, which was followed almost yearly by other little-noticed plays until 1904, when he scored a notable triumph with *John Bull's Other Island*. By the increasing popularity of his earlier plays and by the success of many new productions, he attained eminent rank among British dramatists. His plays are clever, witty, and pregnant with ideas. Among his best plays are *Candida*, *Man and Superman*, and *Arms and the Man*. He was awarded the Nobel prize in literature for 1925, but refused to accept the money payment.

His dramas include also *The Philanderer*, *Mrs. Warren's Profession*, *The Man of Destiny*, *The Devil's Disciple*,

Cæsar and Cleopatra, The Doctor's Dilemma, Androcles and the Lion, Pygmalion, Back to Methuselah, The Apple Cart, In Good King Charles's Golden Days, and *Saint Joan.*

He wrote also many remarkably effective prefaces and essays, such as *The Quintessence of Ibsenism, The Perfect Wagnerite, The Sanity of Art,* and *Fabian Essays.* See *Man and Superman.*

Shaw, Henry Wheeler (1818-1885), American humorist, was born in Lanesborough, Mass. He entered Hamilton College but soon after went West, where for more than 20 years he worked on farms and steamboats, finally becoming an auctioneer. In 1859, he began writing and, in 1860, sent to a New York paper "An Essay on the Mule, by Josh Billings," which was extensively copied. His most successful literary venture, however, was his *Farmers' Alliminax,* a travesty on the *Old Farmers' Almanac.* His best writings are collected in *Josh Billings's Complete Works.*

Shawn, (Ted) Edwin M. (1891-), American dancer, teacher, and writer, was born at Kansas City, Mo. At Los Angeles, Calif., he joined Ruth St. Denis in organizing a school for the training of professional dancers. Later the school was moved to New York City. In tours through America, Europe, and the Orient, he has conducted exhibitions of dancing. In addition to teaching, he has written extensively on the art of dancing. His books include: *Ruth St. Denis, Pioneer and Prophet; The American Ballet; Fundamentals of a Dance Education;* and *Every Little Movement: A Treatise on Francois Delsarte.*

Sheean, James Vincent (1899-), American writer, was born at Pana, Ill. After being graduated from the University of Chicago, he became a foreign correspondent, contributing articles to various newspapers and magazines and gathering material which appears in such books as *An American Among the Riffi, The New Persia,* and *Personal History.* Other books written by him are *A Day of Battle, Not Peace but a Sword,* and *Bird of the Wilderness.* During World War II, he served for two years with the United States Air Force.

Sheeler, Charles (1883-), American artist, was born in Philadelphia, Pa. He studied at the local School of Industrial Art and at the Pennsylvania Academy of Fine Arts, where he was a pupil of William M. Chase. In addition to still-life studies of flowers and city "scapes," the latter being done in his "reversed perspective" style, he has painted many industrial scenes, including six illustrations for *Fortune* magazine. Examples of subjects used for his interpretation of industrial America are *River Rouge Plant, Rolling Power,* and *Amoskeag Mills No. 2.*

Sheen, Fulton John (1895-), writer and educator, was born in El Paso, Illinois. Educated in this country and abroad, he was ordained a priest in the Roman Catholic Church in 1919. Since 1926 he has been a member of the faculty of the Catholic University of America. From 1930 to 1945 he was preacher on the Catholic Hour of the National Broadcasting Company, and during the same period preached at St. Patrick's Cathedral, New York. His numerous books have achieved wide circulation. his *Peace of Soul* being a best seller of 1949-50. In 1951 he became an auxiliary bishop of New York.

Sheldon, Edward Brewster (1886-1946), American dramatist, was born in Chicago. He was graduated from Harvard in 1907, and devoted himself to play writing. With the production of his first play, *Salvation Nell,* by Minnie Maddern Fiske, in 1908, his reputation as a dramatist was established. His plays include also *The Nigger, The Boss, The High Road, Princess Zim-Zim, The Song of Songs, Romance, The Garden of Paradise,* and *Dishonored Lady.*

Shelley, Mary Wollstonecraft Godwin (1797-1851) English author, was born in London. She married Percy Bysshe Shelley in 1816. In 1818, she produced the novel *Frankenstein,* which captured the imagination of the English-speaking world. Among her other novels are *Valperga, The Last Man, Lodore,* and *The Fortunes of Perkin Warbeck.* She wrote also *Rambles in Germany and Italy* and edited her husband's poems. See *Frankenstein.*

Shelley, Percy Bysshe (1792-1822), English poet, was born near Horsham. In 1810, he entered Oxford, but, in 1811, a pamphlet entitled *The Necessity of Atheism,* which he had published and circulated, caused his expulsion. A few months later he married Harriet Westbrook, from whom he separated in 1814, and, after her suicide, he married Mary Godwin in 1816. His poem, *Queen Mab,* appeared in 1813. In 1816, he wrote his *Alastor,* one of the most finished and characteristic of his works, which are chiefly passionate lyrics of ethereal beauty. This was followed by *The Revolt of Islam,* a poem dedicated to the cause of political freedom.

In 1818, Shelley left England and spent the remainder of his life in Italy. While a resident at Rome he produced two of his finest poems—the lyrical drama, *Prometheus Unbound,* and the tragedy, *The Cenci.* At Venice, in 1820, he wrote *Julian and Maddalo.* Other important works are *Rosalind and Helen, The Witch of Atlas, Epipsychidion, Adonais,* and *Hellas.* He was drowned while sailing in a small boat.

Shepard, Helen Miller Gould (1868-1938), American philanthropist, was born in New York, eldest daughter of Jay Gould. She was identified with philanthropic work for many years. Her gifts included the library building with the widely known Hall of Fame to New York University and numerous donations for educational and charitable purposes. She also established a home for children. During the Spanish-American War, she was an active member of the Women's National War Relief Association, and, at Camp Wikoff, gave her personal care to sick and convalescent soldiers. In 1913, she married Finley J. Shepard.

Shepilov, Dmitri Trofimovich (1905-), Soviet editor and diplomat, was born in Krasnodar Territory in Southern European Soviet Russia, a son of a Don River town metal worker. After he was graduated from Moscow University in 1926, he joined the Communist party, with which he has been associated ever since, chiefly as a political propagandist. It was in this capacity that he served in the Soviet forces during World War II, from which he emerged a major general and Deputy Chief of Agitation and Propaganda of the Armed Services. He was then assigned to the party newspaper, *Pravda,* the most influential mouthpiece of the Kremlin, as propaganda editor, and in 1952 became editor in chief. In 1956 he was named Molotov's successor as foreign minister, and was, in turn, replaced by Andrei Gromyko in 1957.

Sheraton, Thomas (1751-1806), English cabinetmaker and furniture designer, was born at Stockton-on-Tees and spent his working years in London. Because he was known chiefly as a draftsman and writer rather than a cabinetmaker, it has been difficult to find authentic examples of his work. However, his books on furniture are illustrated by designs representing a style with which his name has been identified. At their best, examples of his style are distinguished for slenderness and grace, but in his later period his name is associated with some eccentric experiments in form and decoration. His drawings and recommendations are found in *The Drawing Book, The Cabinet Dictionary,* and *The Cabinet Maker, Upholsterer and General Artists' Encyclopedia.*

Sheridan, Philip Henry (1831-1888), American general, was born at Albany, N. Y. He was graduated from West Point in 1853. At the beginning of the Civil War he was a captain, and rapidly rose to major general of volunteers. He performed brilliant service in the battles of Perryville, Murfreesboro, Chickamauga, Chattanooga, Winchester, Cedar Creek, Five Forks, Appomattox Courthouse.

Sheridan's dashing ride of 20 miles from Winchester to Cedar Creek to rally his army and rout the enemy was a notable exploit. For this victory he was promoted to major general in the regular army and received the thanks of Congress. Rejoining the army of the Potomac in 1865, he was conspicuous under Grant in the operations before Petersburg. His masterly handling of his forces at Five Forks resulted in a decisive victory. Lee was thereby compelled to give up Petersburg and soon afterward began his disastrous retreat ending in surrender at Appomattox.

When Sherman was made general, following the election of Grant to the presidency, Sheridan was raised to the rank of lieutenant general and, when Sherman retired in 1883, Congress conferred the further rank of general upon Sheridan. See *Sheridan's Ride.*

Sheridan, Richard Brinsley (1751-1816), British dramatist and statesman, was born in Dublin, Ireland. He was educated at Harrow and studied law, although he was never called to the bar. In 1773, he married and for a time devoted himself to literature. In 1775, he produced *The Rivals* at Covent Garden, and, in 1776, he became part proprietor of Drury Lane theater, for which he wrote *The School for Scandal* and also *The Critic,* one of the wittiest farces in the language.

In 1780, through the influence of Fox, Sheridan was elected to Parliament and soon became distinguished as a speaker on the side of the opposition. During the entire period of Pitt's ascendancy, the talents of Sheridan were displayed in combating that great statesman. His most notable speeches were against Warren Hastings.

For his powerful speeches against the American war the Continental Congress desired to present him with £20,000 but he declined to accept. Sheridan's *Rivals* and *The School for Scandal* rank among the best prose comedies in English. See *Rivals, The.*

Sherman, John (1823-1900), American statesman, brother of William Tecumseh Sherman, was born at Lancaster, Ohio. He was admitted to the bar in 1844; was elected to Congress in 1855; and soon rose to prominence. He entered heartily into the movement for the formation of the Republican party, and ardently supported Frémont in 1865. As the recognized leader of the Republicans, he served in the House until 1861. He was United States senator continuously from 1861 until 1897, except during

1877-81, when he was secretary of the treasury. During 1897-98 he was secretary of state.

In the Senate, Sherman was prominently identified with all measures for the prosecution of the Civil War. He supported the reconstruction measures, defended the protective tariff, and took a leading part in the legislation for the restoration of specie payments and refunding of the national debt. He was author of the Sherman Antitrust Law.

Sherman, William Tecumseh (1820-1891), American general, was born in Lancaster, Ohio. He was graduated from West Point in 1840. During the war with Mexico he obtained the rank of captain, resigning in 1853. In 1861, he offered his services to the Federal government and was appointed colonel of infantry. Raised to the rank of brigadier general, he succeeded Anderson in the department of Ohio, from which he was removed for declaring that it would require 200,000 men to end the war in the West.

In 1862, he distinguished himself at the battle of Shiloh and, in 1863, as major general in the siege of Vicksburg. He took an active part under Grant in the successful operations around Chattanooga, 1863, and forced Longstreet to abandon the siege of Knoxville. Placed in command of the army of Georgia, 1864, he fought Johnston at Dalton, Resaca, and Kenesaw Mountain, and forced Hood to evacuate Atlanta. He then began a march to the sea and captured Savannah and Charleston. The surrender of the army of General Johnston to Sherman in North Carolina, 1865, shortly after the surrender of Lee and that of General Kirby Smith, west of the Mississippi, closed the war.

Sherman was appointed lieutenant general in 1866 and in 1869 became general and head of the army. In point of daring, originality of design, fertility of resource, brilliant strategy, and untiring energy, Grant pronounced him the best field officer that the Civil War produced. In 1875, he published his *Memoirs*. Elected to the American Hall of Fame, 1905. See *Sherman's March*.

Sherwood, Robert Emmett (1896-1955), American dramatist, was born at New Rochelle, N. Y. Interrupting his course at Harvard University, he served in the Canadian army in France 1917-19. He then served as dramatic editor of *Vanity Fair* and, in 1924-28, was editor of *Life*. Sherwood's first successful play was *The Road to Rome* in 1927. His *Idiot's Delight* and *Abe Lincoln in Illinois* received Pulitzer prize awards in 1936 and 1939. His plays are inspired by democratic and humanitarian ideals. They include, in addition to the above, *Reunion in Vienna*, *Acropolis*, *Revelation*, and *There Shall Be No Night*, and *Roosevelt and Hopkins*, a biography.

Shevchenko, Taras (1814-1861), Russian poet, was a native of the Ukraine. Recognizing his merit, a group of his countrymen bought him out of serfdom. His poetry, sometimes compared with that of Robert Burns, was influential in encouraging the Ukrainian national movement.

Sholes, Christopher Latham (1819-1890), American inventor, was born in Columbia County, Pa. At 18 years of age, he went to Wisconsin, where he became an editor, and, in 1848, was elected to the state legislature. He removed to Milwaukee in 1860 and was engaged in various departments of government service. In 1866, he began to devote his leisure hours to the devising of a machine that became, after six years' work, the first practical typewriter. In 1868, he won the financial aid of James Densmore, who was instrumental in selling the manufacturing rights to the firm of E. Remington and Sons. Sholes parted with his patent rights for $12,000. See *Typewriter*.

Shostakovich, Dmitri (1906-), composer, was born in Leningrad. He received his training at the Conservatory there and composed several pieces, including his First Symphony, while still in his teens. In 1925 he became a member of the Union of Soviet Composers, and was soon hailed as a musical laureate of the U.S.S.R. Among many honors he received was the Soviet Union's 100,000-ruble award for highest achievement in arts and sciences. Although his symphonies and some of his operas have found admirers in the United States and other non-Russian countries, both his political overtones and his musical innovations have made his works the subject of controversy.

Sibelius, Jean Julius Christian (1865-1957), Finnish composer, was born at Tavastehus. Having studied at Helsinki, Berlin, and Vienna, he returned to Helsinki and taught at the Conservatory there, later becoming principal. Through his compositions and teaching, he created a Finnish national type of music, leading examples of which were his symphonic poems *Finlandia*, *Oceanides*, and others based on Finnish myths. His other works include the well-known *Valse Triste* and incidental music to *As You Like It*, *The Tempest*, and *Scaramouche*.

Siddons, Sarah (1755-1831), English tragic actress, was born at Brecon, Wales. In 1773, she married William Siddons, an actor, and, in 1775, made her first appearance in London as Portia, but was unsuccessful. She reappeared at Drury Lane in 1782 in the character of Isabella in *The Fatal Marriage*. In 1785, she appeared as Lady Macbeth, her greatest role, and in 1788 as Queen Catherine. Thenceforth, until her retirement in 1812, her course was a continual triumph. In 1783 Sir Joshua Reynolds painted her as "The Tragic Muse."

Sidney, Sir Philip (1554-1586), English writer and soldier, was born in Kent. He was educated at Oxford; traveled throughout Europe; and, upon his return, became a favorite at the court of Elizabeth, who called him "the jewel of her dominions." For the entertainment of his sister, he wrote his celebrated *Arcadia* and several minor poems. Among his works are also *Apologie for Poetrie* and *Defense of Poesie*. He was mortally wounded at the battle of Zutphen. The singular beauty of his character is evidenced by an incident which occurred when he was being carried from this field of battle. Seeing a common soldier lying wounded near by, Sidney handed him his bottle of water, saying, "Thy necessity is greater than mine."

Sienkiewicz (*shĕn-kyā'vĭch*), **Henryk (1846-1916),** Polish novelist, was born at Wola Okrzejska, Lithuania, and was educated at the University of Warsaw. He wrote *The Deluge*, *Pan Michael*, *Without Dogma*, and *Children of the Soil*, which are remarkable for vigorous characterization, historical truth, and psychological analysis. In 1896 appeared his masterpiece, *Quo Vadis?*, which gave him world-wide fame. In 1905, he was awarded the Nobel prize for literature. See *Quo Vadis?*.

Sigsbee, Charles Dwight (1845-1923), American naval officer, was born in Albany, N. Y., and was graduated from the United States Naval Academy in 1863. He was present at the battle of Mobile Bay and at both attacks on Fort Fisher. In 1865-69, he was attached to the Asiatic squadron, and, during 1874-78, sounded and explored the Gulf of Mexico.

Sigsbee introduced numerous inventions and new methods in deep-sea exploration. In 1897, he took command of the battleship *Maine*, which was blown up and sunk in Havana Harbor, February 15, 1898. He commanded the battleship *Texas*, 1898-1900, and was made rear admiral in 1903. He wrote *Deep Sea Sounding and Dredging* and *Personal Narrative of the Battleship Maine*.

Sikorsky, Igor (1889-), airplane designer, was born in Kiev, Russia. After being graduated from the Naval College at Leningrad he decided to take up engineering and studied at the Polytechnic in Kiev. From the age of 12, when he built a rubber-powered helicopter that did not fly, he continued to experiment with airplanes. By 1911 he was able to stay in the air half an hour at 1000 feet altitude with his S-5. From a four-motor plane which he developed came the bombers he built for the Russian government during World War I. After the revolution he came to America, where, with the help of friends, he was able to organize the Sikorsky Manufacturing Corporation. His amphibian planes proved particularly successful. His company was purchased by United Aircraft and Transport, and he became engineering manager for the company's Vought-Sikorsky Aircraft Division. He gave much attention to the design and manufacture of helicopters. He produced a practical plane of this type in 1939, and his helicopters were used extensively by the U. S. government and private organizations during World War II.

Simms, William Gilmore (1806-1870), American poet and novelist, was born at Charleston, S. C. He studied law, which he soon abandoned for literature. His chief poetical production, *Atalantis*, a story of the sea, published in 1832, established his reputation. He became a very prolific writer, producing numerous volumes of verse and short stories, novels, historical and biographical books, and dramas. For many years he was the leader of a Southern literary coterie, of which Timrod and Hayne were prominent members.

Simonson, Lee (1888-), American scenic designer, was born in New York City. After he was graduated from Harvard University, Simonson studied painting in Paris and specialized in scene painting for the stage. He was designer for the Washington Square Players, 1912-16, and was a director of the Theatre Guild from 1919. Among the plays for which he designed the setting are *Peer Gynt*, *Back to Methuselah*, *Dynamo*, *The Apple Cart*, *Idiot's Delight*, and *Jane Eyre*.

Simpson, Sir James Young (1811-1870), Scottish physician, was born at Gathgate. He was graduated in medicine from the University of Edinburgh, 1832, and was appointed to the chair of obstetrics, 1840. In 1846, he introduced into England the use of ether as an anesthetic and, in 1847, first employed chloroform for the same purpose. In 1856, he was awarded the Montyon prize for his discovery of chloroform as an anesthetic and for introducing its use into obstetrics.

Sims, William Sowden (1858-1936), American naval officer, was born at Port Hope, Ont. In childhood, he was brought to Pennsylvania, and, in 1880, was graduated from the United States Naval Academy. After some years spent in naval service on the sea and in the American embassy at Leningrad, he came into notice through recommending, in a personal letter to President Roosevelt, that

improved methods of gunnery should be introduced into the navy. He rose rapidly in rank and, when the United States entered World War I in 1917, he was made rear admiral with command of the American fleet in European waters. His management of the fleet throughout the remainder of the war won high praise both in America and abroad. As a result of outspoken criticism which he directed against the secretary of the navy, he was retired in 1919 from his command, and he resumed duties in which he had previously been engaged as president of the Naval War College at Newport.

Sinclair, Upton Beall (1878-), American author and socialist, was born in Baltimore, and was graduated from the College of the City of New York. His writings include *The Jungle*, *Between Two Worlds*, and *Dragon's Teeth*, which received the Pulitzer prize for 1942.

Sinding (*sĭn'ding*), **Christian** (**1856-1941**), Norwegian composer, was born at Königsberg. He studied under Reinecke at Leipzig, 1874-77, and, after further preparation at Dresden, Munich, and Berlin, settled in Oslo as organist and teacher. In 1921, he joined the faculty of the Eastman School of Music at Rochester, N. Y. His piano compositions are notable for their brilliancy and for their reflection of Norwegian characteristics. He wrote the opera *Der Heilige Berg*.

Sinnott, Edmund W. (**1888-**), botanist, was born at Cambridge, Mass. After graduation from Harvard he did research in Australasia and taught botany and genetics at Harvard. He was professor of botany at Barnard and Columbia and later at Yale, where he was also dean of the graduate school. In addition to textbooks and scientific papers, he has written several books which appeal to the general reader. Among these are *Cell and Psyche*, *The Biology of the Spirit*, *Two Roads to Truth*, and *Matter, Mind and Man*.

Sitting Bull (**c. 1837-1890**), Sioux Indian "medicine man," was influential with various chiefs and was an obdurate foe of the whites. He was a leader in the outbreaks of 1876; and directed operations in the battle of the Little Big Horn, in which General Custer and his entire force were killed. He escaped into Canada but, in 1880, returned to South Dakota and surrendered to General Miles. In attempting to resist arrest after inciting new outbreaks, he was killed.

Sitwell, Sir Osbert (**1892-**), poet and critic, was born in London, England. He is perhaps the leading member of a famous British family of writers, the other members being his sister Edith and his brother Sacheverell. All three show marked originality, with more than a trace of literary snobbishness. Sir Osbert says in *Who's Who* that he advocates "compulsory Freedom everywhere, the suppression of Public Opinion in the interest of Free Speech." His family memoirs contained in *Left Hand, Right Hand!* and *Noble Essences* are stimulating reading, as are also his poems, *Four Songs of the Italian Earth*; *Demos the Emperor*: *A Secular Oratorio*; and *England Reclaimed*: *A Book of Balearics*.

Sixtus V (**1521-1590**) (Felice Peretti), pope, was born in Ancona, Italy. He was professor of theology at Rimini and Siena; became known as an eloquent preacher; was made vicar-general and cardinal; and, in 1585, succeeded Gregory XIII in the pontifical office. His pontificate was notable for a vigorous administration. He built the Library of the Vatican; authorized a new edition of the Septuagint and the Vulgate; and carried out a general policy of aggrandisement for the Church.

Skinner, Otis (**1858-1942**), American actor, was born at Cambridge, Mass. He was an amateur reader and actor at Hartford, Conn., prior to 1877, when he made his professional debut as Jim in *Woodleigh*. He appeared at different times with Edwin Booth, Lawrence Barrett, and Mme. Modjeska. Under the management of the producer Augustin Daly, he played in New York, London, Paris, Berlin, and other cities. The later plays in which he was seen include *Sire*, *Kismet*, *Uncle Tom's Cabin*, *Merry Wives of Windsor*, and *Merchant of Venice*. He wrote *Mad Folks of the Theatre* and *One Man in His Time*.

Slater, Samuel (**1768-1835**), American manufacturer, was born in Derbyshire, England. Having acquired a thorough knowledge of cotton spinning under a partner of Richard Arkwright, he emigrated secretly to the United States in 1789 and, in the following year, founded a spinning factory at Pawtucket, R. I., the first in America. With his brother John, he built extensive cotton mills on the site of the present town of Slatersville, R. I., in 1806 and others at Oxford, Mass., in 1812. In 1815-16 he erected woolen mills. To these activities of Slater, the present textile industry of New England owes its origin.

Smiles, Samuel (**1812-1904**), British biographer, was born at Haddington, Scotland. At 20, he was graduated in medicine from Edinburgh and began practice in his native town. Subsequently he became editor of the Leeds *Times* and was, for some years, secretary of the Leeds and Thrisk Railway and of the South-Eastern Railway, retiring in 1866.

Smiles became the biographer of self-made men and a glorifier of industry. His book of practical talks to young men, *Self-Help*, met with extraordinary success. Among his other books are *Life of George Stephenson*, *Character*, *Thrift*, *Duty*, *Life and Labor*, *Industrial Biography*, and *Josiah Wedgwood*.

Smith, Adam (**1723-1790**), Scottish political economist, was born at Kirkcaldy. He was educated at Glasgow University and at Oxford. In 1751, he was elected professor of logic in Glasgow, and, in the following year, he became professor of moral philosophy. In 1759, he published his *Theory of Moral Sentiments*, still well known in the history of ethics. After a period of travel and study, he produced, in 1776, his *Wealth of Nations*, on the basis of which he is frequently called the father of economics. This work is the standard source for arguments in favor of free enterprise. Its conclusions are based on developments antedating the industrial revolution and the corporate form of business enterprises.

Smith, Alfred Emanuel (**1873-1944**), American statesman, was born in New York City of humble parentage. Elected to the state assembly in 1903 as a Democrat, he served continuously until 1915, being Democratic floor leader during the later years. He took a prominent part in the insurance and factory investigations ordered by the legislature and in amending the constitution to permit the passage of a Workmen's Compensation Law. He was elected governor of New York State for terms extending over 1919-20 and 1923-28. At the Democratic National Convention in 1924, Smith was a prominent candidate for the presidential nomination, receiving a maximum of 364 votes. In 1928, he was chosen on the first ballot as Democratic candidate, but was defeated by his Republican opponent, Herbert Hoover, in the ensuing election. In 1936, he opposed the election of the Democratic candidate, Franklin D. Roosevelt, from whom he had become estranged. He headed the company which built the Empire State Building, tallest in the world.

Smith, Francis Hopkinson (**1838-1915**), American author, artist and engineer, was born at Baltimore and was educated as a mechanical engineer. He built the government sea walls at Governors Island and at Tompkinsville, Staten Island, the Race Rock Lighthouse off New London, Conn., and the foundation for the Bartholdi Statue of Liberty.

He became known also for his water-color paintings, charcoal sketches, and illustrations. His work is represented in the public art collections of Baltimore, Washington, and Buffalo.

Smith traveled extensively and wrote many novels, of which *Colonel Carter of Cartersville* and *Caleb West*, *Master Diver* rank among the most successful. As a writer, he excelled in depicting Southern life and manners. He was made a member of the American Academy of Arts and Letters in 1908.

Smith, Goldwin (**1823-1910**), publicist, historian, and educator, was born in Reading, England. He was graduated from Magdalen College, Oxford, 1845, and was called to the English bar, 1847. He was professor of modern history at Oxford, 1858-66; was a champion of the North during the American Civil War; visited the United States, 1864; and was lecturer, 1868-71, at Cornell University.

After 1871, he lived in Toronto. A skeptic in religion and humanitarian in politics, he favored Anglo-American friendship and predicted Canada's destiny to be union with the United States. Among his numerous writings are *Rational Religion*, *The Civil War in America*, *The Political Destiny of Canada*, *Commonwealth or Empire*, and *No Refuge But in Truth*. He left most of his fortune to Cornell University and bequeathed his Toronto estate to be used by the city as an art gallery and art school.

Smith, John (**1580-1631**), English adventurer and colonist, was born at Willoughby, England. In 1606, he sailed with an expedition of three vessels and 105 men to found a colony in Virginia. On the voyage he was accused of conspiracy to make himself king and was kept a prisoner. The expedition founded Jamestown in May 1607.

After being tried and acquitted, Smith was made a member of the council and for a time was the head of the colony, to which he rendered valuable service by reason of his familiarity with Indian characteristics. On one of his journeys into the country for corn, he was captured by Indians under chief Powhatan, but his life was saved through the intercession of the chief's daughter Pocahontas.

Having been superseded as governor of the colony by Lord Delaware in 1609, Smith returned to England. In 1614, he explored the coast of New England and, in 1615, undertook the founding of a colony in New England, but his vessel was captured by a French warship. He wrote, among other works, *True Relation*; *Generall Historie of Virginia, New England, and the Summer Isles*.

Smith, Joseph (**1805-1844**), founder of Mormonism, was the son of a farmer in Vermont state. He claimed to

have been divinely directed in 1823 to a place in Wayne County, N. Y., where he should find golden plates on which were engraved "the fullness of the everlasting gospel." Their text was orally translated by Smith, according to his own account, and the alleged translation was called the "Book of Mormon." Seven years later, the Mormon religion was founded under Smith's leadership. Persecution induced the sect to migrate to Illinois, where Smith was instrumental in founding Nauvoo. His last "revelation," dated in 1843, sanctioned polygamy, although this was publicly denied and its publication was withheld until 1852, eight years after Smith's death at the hands of a mob.

Smith, Margaret Chase (**1897-**), congresswoman, was born in Skowhegan, Maine, where, after attending public schools, she became a teacher. Later she began a successful business career in Skowhegan and entered politics. She was a member of Congress from 1940 to 1949. In 1948 she was elected United States Senator from Maine, and was re-elected in 1954 and in 1960.

Smith, Sydney (**1771-1845**), English humorist, essayist, and clergyman, was born at Woodford. He was graduated from Oxford and was ordained to the Anglican Church. In 1802, he resided in Edinburgh. There he assisted in establishing the *Edinburgh Review*, of which he edited the first three issues. In 1803, he removed to London, where, 1804-06, he delivered *Lectures on Moral Philosophy*. In 1807-08, he published *Letters on the Subject of the Catholics* advocating Catholic emancipation, which had an immense success, and later wrote a number of political speeches and pamphlets, all characterized by brilliant wit and forceful argument. Many of his epigrams have had frequent repetition, and his denunciation of all things American has been called the most famous sneer in history. He was a canon of Saint Paul's, London, 1831-1845.

Smollett (*smŏl'ĕt*), **Tobias George** (**1721-1771**), British novelist, was born near Dumbarton, Scotland. After a meager schooling at Dumbarton, he was apprenticed to a physician in Glasgow, where he attended lectures at the university and acquired some knowledge of languages. At 18, he went to London. Failing to find a publisher for his play *The Regicide*, he became a surgeon's mate in the navy and served in the Carthagena Expedition, 1740-41. Quitting the navy, he set himself up as a surgeon in London, but lived chiefly by his pen. An autobiographical novel *Roderick Random*, published in 1748 and containing realistic pictures of life in the navy, was a notable success. Of his subsequent novels, the best known are *Peregrine Pickle* and *Humphrey Clinker*. Smollett is regarded as the founder of the satirical novel. See *Peregrine Pickle, Roderick Random*.

Smoot, Reed (**1862-1941**), American legislator, was born at Salt Lake City. He was graduated from Brigham Young Academy, Provo, Utah, 1879. In 1900, he was made an apostle of the Mormon Church. He became president of numerous banks and other corporations and accumulated a large fortune. He was elected to the United States Senate in 1903, the first Mormon to be a senator, and was re-elected for terms extending to 1933. He was a conservative, and opposed the League of Nations.

Smuts (*smŏōts*), **Jan Christiaan** (**1870-1950**), statesman, was born at Cape Town and was educated at Victoria College and at Cape and Cambridge universities. He practiced law at Cape Town and Johannesburg. During the Boer War, he was an outstanding military leader, and at its close he took a prominent part in negotiating the peace treaty and in establishing the Union of South Africa as a British dominion. In World War II he was commander of the British forces in German East Africa. He represented South Africa in the Imperial War Cabinet and at the Paris Peace Conference. He was premier of South Africa 1919-24 and 1939-48. In all those years he was accorded foremost rank as a world statesman.

Smyth, Henry Dewolf (**1898-**), physicist and educator, was born at Clinton, N. Y. Following graduation from Princeton and studies at Cambridge University, he joined the faculty of Princeton as instructor in physics. In 1941 he became director of the Office of Scientific Research and Development and had charge of research in isotopes and chain reaction. At the close of World War II he was asked by the War Department to write a report, which was entitled *Atomic Energy for Military Purposes*. Because of its completeness it has been referred to as "a textbook on nuclear physics."

Snow, Charles Percy (**1905-**), novelist and science writer, was born at Leicester, England. He was educated at University College, Leicester, and at Christ's College, Cambridge. For a time he was fellow and tutor at Cambridge. He has lectured extensively on science, both in England and at several American universities. Among his novels are *Death under Sail, Strangers and Brothers, The Masters, The New Men, The Conscience of the Rich*, and *The Affair*. He has also written a play *View over the Park*.

Snowden, Philip Snowden, Viscount (**1864-1937**), English socialist writer and politician, was born at Cowling, Yorks. In 1886, he entered the civil service from which, in 1893, he retired. He then devoted himself to journalism and politics, becoming well known for his advocacy of socialistic views. From 1906 to 1918, he sat in Parliament as a Socialist, and was again elected to Parliament in 1922. He was chancellor of the exchequer in 1924 and again in 1929-31; minister of finance in 1929. He was made a peer in 1931. His writings include *Socialism and Syndicalism, Socialism and the Drink Question*, and *The Living Wage*.

Sobieski (*sō-byĕs'kē*). See *John III, Sobieski*.

Sockman, Ralph Washington (**1889-**), clergyman and writer, was born at Mt. Vernon, Ohio. He was educated at Ohio Wesleyan and Columbia universities and at the Union Theological Seminary. He was minister of Christ Church in New York City and for several years was a radio preacher for the National Council of Churches of Christ in America. He is the author of numerous books, including *Suburbs of Christianity and Other Sermons, Paradoxes of Jesus, Date with Destiny, The Higher Happiness, How to Believe*, and *The Whole Armor of God*.

Socrates (**c. 469 B.C.-399 B.C.**), Greek philosopher, was born at or near Athens, Greece. He was the son of Sophroniscus, a sculptor, and he himself followed this profession in the early part of his life. Socrates saw Athens at its zenith, and he lived to witness its fall.

Character and Public Life. He received the usual education of the Athenian citizen, which included the study of the Greek poets and the elements of the sciences then known. He had an ungainly figure, a bald head, prominent eyes, and a snub nose. His wife, Xanthippe, possibly nursing a grievance against her husband for his indifference to wealth, has passed into history as the typical scold. Socrates distinguished himself for his courage at the battles of Potidæa, Delium, and Amphipolis. He was remarkable for his endurance in hardships and his self-control in pleasures. On two occasions he risked his life rather than consent to an unworthy deed—once when, having been selected by lot as president of the assembly of citizens, he refused to yield to their angry clamor and permit an illegal execution of the city's military leaders; and once when, commanded by the so-called 30 tyrants, he refused to slay one of their enemies.

Socrates found no satisfaction in the vast and vague speculations of the physical philosophers. He turned his attention exclusively to the study of man and of morals. He believed that it was his divinely appointed mission to test the reputed wisdom of the great and the accepted opinions of the average man and, by means of skillful questioning, to force upon all a consciousness of ignorance as the first step toward self-improvement. In his questioning, he sought to arrive at definitions of the different virtues. He is credited with having originated the scientific definition and formal inductive reasoning as aids in thought and investigation. The basis of his ethics is the principle or paradox that all vice is ignorance and that no one is willingly bad.

It is not clear what was the exact position of Socrates as to the religion of the state, but it is probable that he believed in the traditional dieties. That he believed in one supreme God, the ruler of the universe, is clear. He constantly asserted that he was guided by an inner voice, which warned and restrained him when he contemplated any action that might have an undesirable issue.

Condemnation. Socrates' habit of questioning together with his own avowal of ignorance, known as Socratic irony, made him many enemies. As early as 423 B. C., the satirist Aristophanes voiced in *The Clouds* the hostile feeling already existing. Some feared Socrates for his seemingly ambiguous position in religion; others bore grievance because he questioned the traditional morality and proposed to substitute reason for custom in the conduct of life. Association with Alcibiades and Critias, who were justly hated by the Democratic party, helped also to bring him into disfavor with the dominant faction at Athens. In 399 B. C., he was formally charged with impiety and the corruption of the youth. He defended himself in a simple speech in which he maintained that, so far from meriting any penalty, he deserved to be supported at the state's expense. He was condemned to death by a jury of Athenian citizens.

Influence. Socrates left no writings. Few men, however, have so powerfully influenced the world's thought. Through the works of Plato, Socrates may be said to have been the originator of idealistic philosophy. His words were made the basis both for the Stoic and for the Epicurean system of philosophy. In the decay of the old beliefs, he became the chief religious type of the ancient world. He was executed in the manner customary at Athens, being compelled to drink a cup of poison hemlock. See *Educational Reformers*.

Soddy, Frederick (**1877-1956**), English chemist, was born at Eastbourne. After he was graduated from Oxford University, Soddy taught at McGill University from 1900

to 1902 and, having worked in the laboratory with Rutherford and Ramsay, he became, in 1904, lecturer in radioactivity at Glasgow University. In 1914 he was made professor of chemistry at Aberdeen University, from which he went in 1919 to Oxford University as professor of inorganic and physical chemistry. For his work on radioactivity, he was awarded the Nobel prize in chemistry for 1921. This work led to his formulation of the theory of isotopes. His scientific publications include *Radioactivity*, *The Interpretation of Radium*, and *Matter and Energy*. He advocated modifications in the economic system in his *Cartesian Economics*, *Money versus Man*, and *Wealth, Virtual Wealth and Debt*. See *Isotopes*.

Solon (*sō'lŭn*) **(c. 639 B.C.-c. 559 B.C.),** Athenian legislator and one of the seven sages of Greece, was born of an ancient family at Salamis. After acquiring a fortune by commerce and gaining much knowledge by travel, he turned his attention to writing and to public affairs, making a practice of expressing his political opinions in elegaic verse.

Solon first came into notice as a leader in the war by which Athens wrested Salamis from Megara. In an economic crisis, he was chosen to devise remedial measures, and his statesmanlike measures led to his being clothed with full powers to remodel the constitution. He framed a new code of laws containing great advances directed toward individual liberty and democracy.

According to tradition, Solon bound the citizens by oath to observe these laws for ten years, during which he withdrew from Athens, but, upon his return, he found the tyranny of Pisistratus established.

Solvay (*sōl'vā*), **Ernest (1838-1922),** Belgian manufacturing chemist, by some styled the Carnegie of Belgium, was born at Rabeck, near Brussels. He was educated at Liège and early in life began the manufacture of chemicals. His greatest achievement was the development of the ammonia process, commonly called the Solvay process, for the manufacture of soda. In 1863, at Couillet, Belgium, he built a plant for utilizing this process. The enterprise was eminently successful and was extended throughout Europe and America. In 1880, he manufactured about one-half, and in 1913 nearly all, of the world's supply of soda. See *Soda, Solvay Process*.

Solyman II (*sŏl'ĭ-măn*) **(1496-1566),** surnamed "The Magnificent," sultan of Turkey, was the greatest of the Turkish sultans, and was scarcely less remarkable for the wisdom and justice of his internal administration than for the extent of his conquests. He encouraged literature and was himself a poet of no mean rank. He died of fever while besieging the town of Szigeth, in Hungary.

Sophocles (495 B.C.-406 B.C.), Greek dramatist, was born at Colonus near Athens. From his father, Sophilus, he received a liberal education in all the literary and personal accomplishments of his age. He was proficient in poetry and music and was handsome in person. At 15, he was chosen to play on the lyre an accompaniment to the pæan that celebrated the battle of Salamis. At 27, in the festival of the Dionysia, he was awarded the first prize in tragedy over Æschylus. In the following 32 years, he won the first prize about 20 times and never fell below second place. His first recorded contest with Euripides was in 438 B. C., when the latter came off second best.

As a result of the success of *Antigone*, presented in 440 B. C., Sophocles won an appointment as colleague of Pericles and Thucydides in the Samian war. His greatest laurels, however, were won in literary rather than in political and military fields.

Sophocles' tragedies mark the transition from the drama as a religious institution to the drama as a work of pure art. He added the third speaker to the second already introduced into tragedy by Æschylus. The dramas of Sophocles hold an even balance between the titanic symbolism of Æschylus and the sentimental realism of Euripides. A slight plot sufficed him for a masterpiece because his subtle dramatic art and his exhaustive psychological analysis could elicit from a simple situation a complete revelation of character and destiny. Fate is, with him, not a capricious power, but an inevitable outcome of given characters and situations. His dramas are written in a concise, elegant style and are rich in deep poetic sentiment

His *Œdipus the King* is regarded as the most perfect Greek tragedy. Of about 120 plays composed by him, only 7 are extant in their entirety; namely, *Œdipus the King*, *Œdipus at Colonus*, *Antigone*, *Philoctetes*, *Ajax*, *Maidens of Trachis*, and *Electra*. He was remembered as a man of sweet temper, consummate grace, and rare balance of mind. See *Œdipus Tyrannus*.

Sorolla y Bastida, (*sō-rōl'yà ê bà-stē'dà*), **Joaquin (1863-1923),** Spanish painter, was born in Valencia and studied art in the Academy there and later in Paris. His first successes were "Another Marguerite," 1892, now in the Saint Louis Museum, and "The Fishing Boats' Return," in the Luxembourg, Paris.

Producing landscapes, figure paintings, and portraits with great rapidity, he soon became one of the foremost modern impressionistic painters. His subjects are chiefly out-of-door scenes in brilliant sunlight, rendered with remarkable vigor and sure technique. The Metropolitan Museum, New York, contains his "Swimmers." "The Bath," "After the Bath," "Beaching the Boat," and the portrait "Señora de Sorolla in Black." For practically the whole of the decade 1910-20, he was engaged on work for the Hispanic Society of America, for which he produced portraits of Spanish writers and a "Panorama of the Forty-nine Provinces of Spain."

Sothern (*sŭTH'ĕrn*), **Edward Hugh (1859-1933),** American actor, was born in New Orleans, La. He received an academic education in England; first appeared on the stage in New York, 1879; and won his first real success in *One of Our Girls*, 1885. During the ensuing ten years, his most popular plays were *If I Were King*, *The Highest Bidder*, *The Three Musketeers*, and *The Adventure of Lady Ursula*. In 1904, with Julia Marlowe, whom he married in 1911, he began presenting Shakespearean plays and attained first rank among Shakespearean actors of his time in America. His roles included Hamlet, Macbeth, Jacques, Petruchio, Malvolio, Shylock, and Romeo.

Soto, Hernando de (c. 1500-1542), Spanish explorer, was born in Estremadura. He joined the expedition of Pizarro, under whom he served in Peru. About 1536, he was made governor of Cuba. In 1539, he explored and took possession of Florida, and, in the same year, he conducted an expedition from there and discovered the Mississippi River, on the banks of which he died.

Soult (*sōōlt*), **Nicolas Jean de Dieu (1769-1851),** marshal of France, was born at Saint Amans la Bastide. In 1785, he entered the army; was appointed general of a division in 1799 by Masséna; became an ardent Napoleonist; and was made marshal of France in 1804.

He achieved brilliant success at the battle of Austerlitz, which he decided by piercing the Russian center. He took part in the Russian campaign of 1806-07, after which he was created duke of Dalmatia.

He became a Royalist after the abdication of Napoleon; but, on the return of the latter from Elba, he abandoned Louis XVIII and became major general of the Imperial army. After Waterloo, he was banished from France, 1816-19, but later served as minister in various cabinets and was made marshal-general of France in 1847.

Sousa (*sōō'zà*), **John Philip (1854-1932),** American bandmaster and composer, was born at Washington, D. C. He studied music and became first violin in Jacques Offenbach's Orchestra. He was bandmaster of the United States Marine Corps, 1880-92, and, after 1892, was director of Sousa's Band. His ability as a composer of marches won him the title of "The March King " His most famous ones include "Washington Post" (1889), "El Capitan" (1896), and "Stars and Stripes Forever" (1897). His compositions include the operas *The Smugglers*, *The Queen of Hearts*, and *The Free Lance*. His publications include *The Fifth String*, *Dwellers in the Western World*, and *Transit of Venus*.

Southey (*souTH'ĭ*; *sŭTH'ĭ*), **Robert (1774-1843),** English author, was born at Bristol. He was educated at Oxford, but he left without a degree in 1794 and traveled in Spain and Portugal. In 1803, he settled at Greta Hall, Cumberland, where he devoted the remainder of his life to literature.

In addition to his formal works, he wrote extensively for periodicals, notably the *Quarterly Review*. On the death of Pye, 1813, Southey was made poet laureate. His chief poetical works are *Madoc*, *Thalaba*, *The Curse of Kehama*, and *Roderick*. As a prose writer, Southey is well represented by his *Letters from England by Don Manuel Alvarez Espriella*, *The Doctor*, and *The Life of Nelson*. His prose style is easy, lucid, and agreeable.

Spahn, Warren (1921-), baseball player, was born in Buffalo, N.Y. He began by playing in a "midget" league. Unable to gain a place as first baseman, he made pitching a second choice and developed a skill that has made him a legendary figure. Since he joined the Boston (later Milwaukee) Braves in 1946, after military service, his record of 20 or more games a year was climaxed by the coveted 300th win in 1961, with success still continuing.

Spalding, Albert (1888-1953), American composer and violinist, was born in Chicago. Educated in New York, Florence, and Paris, he toured the principal cities of Europe. His debut in America took place in 1908 at Carnegie Hall, New York, with the Damrosch Orchestra. He was elected in 1937 to the American Academy of Arts and Letters.

Sparks, Jared (1789-1866), American historian, was born at Willington, Conn. He was graduated from Harvard, 1815; was a Unitarian minister at Baltimore; and finally became editor of the *North American Review*. For ten years, he was professor of history at Harvard and, for four years, was its president. His writings include *Life of John Ledyard*,

Life of Gouverneur Morris, and *Library of American Biography*. He edited *The Works of Benjamin Franklin, Writings of George Washington*, and *Correspondence of the American Revolution*.

Spartacus (?-71 B.C.), Thracian revolutionary leader, who, having been captured by the Romans and placed in a Roman gladiatorial "school," escaped in 73 B. C. and headed a revolt of the slaves. He defeated army after army of the Romans and threatened the city itself, but was finally defeated by Crassus and, being trapped, died fighting bravely. His 6000 captured followers were crucified.

Speke (*spēk*), **John Hanning (1827-1864)**, English explorer, was born at Jordans, Somersetshire. At the age of 17, he entered the Indian army, made several trips to the Himalayas, and reached Tibet. In 1854, he accompanied Captain Burton to Somaliland, and, in 1857-59, from Zanzibar into the interior of Africa. They discovered Lake Tanganyika in 1858 and, in the same year, Speke reached Lake Victoria. He then believed this lake to be one of the sources of the Nile, and in 1862 verified his belief. He wrote *Journal of Discovery of the Source of the Nile*.

Spellman, Francis Joseph (1889-), American prelate, was born at Whitman, Mass. He studied at Fordham College, and at the University of the Propaganda at Rome and was ordained priest there in 1916. He held several pastorates, was attached to the office of the papal secretary of state, 1925-32, and was auxiliary bishop of Boston, 1932-39. He was made archbishop of New York in 1939. In February 1946, Pope Pius XII made him cardinal.

Spencer, Herbert (1820-1903), English philosopher, was born at Derby, England. Ill health in childhood necessitated a home education.

Taking up civil engineering in 1837, he still found time for much miscellaneous reading. From 1845 to 1853 he was employed on the London *Economist*. This position gave time for his studies, and made him acquainted with such brilliant thinkers as George Henry Lewes, "George Eliot," and John Stuart Mill.

Spencer published in 1850 his *Social Statics*. This work was of a decidedly *a priori* character and did not show the inductive spirit of his later writings. It reveals, however, his tendency to reconcile opposing influences and to discover closeness of relations where others did not suspect them. In 1855, he published a work on psychology, which he afterward revised and expanded into a part of his *Synthetic Philosophy*. Over-application brought on a serious attack of nervous prostration, in consequence of which he was obliged, for the rest of his life, to abridge his hours of study.

Meanwhile, Spencer had conceived a system of philosophy that should embrace the general principles of all existing knowledge. He brought out a prospectus indicating his intention to give 20 years to its development. He published the *First Principles* in 1862. Then, fearing that he would not live to complete the system, he wrote *The Data of Ethics*, which had been the object of the whole system and in which it was intended to culminate. Fortunately, he was able to complete the undertaking and to revise an important part of it. It consists of two volumes on biology, two on psychology, three on sociology, and two on ethics. His later years were devoted to his *Autobiography*.

Spencer's philosophy is a philosophy of evolution. Beginning with the first principles of all we know, he proposed to trace how the law of evolution was realized in life, mind, society, and morality. Few men have ever dominated contemporary thought more completely or have succeeded to such a degree in popularizing a scientific point of view. See *Educational Reformers*.

Spender, Stephen (1909-), English poet and critic, was educated at Oxford. Widely known as a writer of poems, some of them rather leftist in point of view, he has served also as co-editor of *Horizons* and as editor of *Encounter*. In 1953 he was Elliston Lecturer and poet in residence at the University of Cincinnati and he has been called upon to lecture at several other American colleges and universities. Collections of his poems, published at intervals, include: *20 Poems*, *Poems of Dedication*, and *Collected Poems*. His autobiography is contained in *World Within World*.

Spengler, Oswald (1880-1936), German philosopher, was born at Blankenburg. He studied mathematics, history, and art, from which fields he drew extensively for material in support of the thesis set forth in his best known work, *The Downfall of Western Civilization*. He maintained that civilizations rise and fall according to definite laws, and that the present Western civilization is now in the declining stage of its cycle. This work was translated into many languages and attracted a great deal of attention.

Spengler was engaged as a teacher in Hamburg and later in Munich. He wrote also *Prussianism and Socialism*, *Pessimism*, and *The Rebuilding of Germany*.

Spenser, Edmund (c. 1552-1599), English poet, was born of humble parentage in London. He studied at Pembroke College, Cambridge, and was brought under the notice of Queen Elizabeth by the Earl of Leicester. In 1579, he published *The Shepherd's Calendar*, which marks an epoch in the development of English poetry. Through the influence of Leicester, he was appointed chief secretary to the lord lieutenant of Ireland. Queen Elizabeth conferred on him an estate at Kilcolman, where he wrote *The Faery Queen*, his greatest work. His other works include *Tears of The Muses*, *Epithalamion*, *Astrophel*, *Hymns*, and *Visions*.

In 1598, a rebellion broke out; Spenser's Castle at Kilcolman was burned, and an infant child of the poet perished in the flames. Spenser returned to London, impoverished and broken-hearted. He was buried near Chaucer in Westminster Abbey. See *Faery Queen*, *Shepherd's Calendar*.

Sperry, Elmer Ambrose (1860-1930), American electrical engineer and inventor, was born at Cortland, N. Y., and was educated there and at Cornell University. He founded the Sperry Electric Company in Chicago in 1880, engaging in the manufacture of arc lamps, dynamos, and other electrical appliances. He invented the gyrocompass and instruments for stabilizing airplanes, ships, and aerial torpedoes. He became president of the Sperry Gyroscope Company in 1910. See *Compass*.

Spinoza, Baruch (1632-1677), Dutch philosopher, was born of Jewish parentage at Amsterdam, the Netherlands. From childhood, Spinoza was physically delicate and was inclined to retired and studious habits. He received his early education from the rabbis. His extraordinary talents coupled with his penetrating studies of the physical sciences and of the writings of Descartes resulted in his excommunication from the synagogue in 1656.

He was later exiled from Amsterdam. In 1661, he settled at Rhynsburg near Leiden, where he became a master craftsman in lens polishing and devoted his spare time to abstruse studies. In 1663, Spinoza brought out an abridgment of the *Meditations* of Descartes under the general title *Descartes's Principles of Philosophy*. He attached an appendix, which was the first draft of his own *Ethics*.

In 1664, Spinoza removed to Voorburg, a few miles from The Hague. About 1668, he received a small pension from the statesman Jan de Witt and settled in The Hague. There, in 1670, he completed his great work, the *Tractatus Theologico-Politicus*. His *Ethics* was written about 1674, but was published posthumously because of his dislike of controversy. In this period, the elector of the Palatinate offered Spinoza the vacant chair of philosophy at the University of Heidelberg. This he refused, as well as all other honors and offers which he considered would endanger his independence and integrity of thought.

The attainment of truth was the one object of Spinoza's life. For this he sacrificed all natural ties of affection and endured want and persecution. He was stigmatized as an atheist and Epicurian in his day, but his abstemious life and the profoundly religious nature of his writings indicate how erroneous was this opinion.

Spinoza endeavored to found a system that should deduce the fundamental principles of moral life by strictly mathematical demonstrations founded on the knowledge of God. He held that existence consisted of extension, or the material world, and thought. Each of these realms was independent of the other: thought did not influence matter, and matter did not influence thought. Nevertheless the movements of one were parallel or analogous to the movements of the other, and the movements of each depended on an all-pervading essence, which was equivalent to God. The system is thus a thoroughgoing pantheism. Spinoza, though not a voluminous writer, has had an extensive and enduring influence on modern thought.

Sproul, Robert Gordon (1891-), American educational administrator, was born at San Francisco, Cal. After he was graduated from the University of California, he engaged in real estate and banking. He was made comptroller of his alma mater in 1920, vice president in 1925, and president in 1930. He lent his support to a large number of public and humanitarian causes.

Spurgeon, Charles Haddon (1834-1892), English preacher, was born at Kelvedon, Essex. In 1850, his sympathies drew him toward the Baptists, and, removing to Cambridge in 1851, he began to deliver cottage sermons. In 1854, he entered upon the pastorate of the New Park Street chapel, London, where his preaching proved so popular that finally his followers built for him the Metropolitan Tabernacle, opened in 1861.

Until 1891, Spurgeon continued to preach in the Tabernacle every Sunday to thousands of hearers. His sermons were published weekly, and yearly volumes were issued. He also wrote *John Ploughman's Talk*, *The Treasury of David*, and *The Saint and His Saviour*.

Staël (*stä'ĕl*; F., *stäl*), **Madame de** (Anne Louise Germaine de Staël-Holstein), **(1766-1817)**, French writer, was born at Paris. She was the daughter of Jacques Necker, minister of finance under Louis XVI. In 1786, she married Baron de Staël-Holstein, Swedish minister to Paris. In 1788, she

published *Letters on the Works and Character of Rousseau*, which attracted attention. Compelled by the Revolution to leave France and later exiled by Napoleon, she traveled in Germany and Italy, making the acquaintance of Goethe, Schiller, and other eminent men and gathering the material for her novel *Corinne* and for her widely known work *De l'Allemagne*. She also visited England, where she wrote *Ten Years of Exile*. After the fall of the Empire, she returned to Paris. Besides the foregoing, her works include *Thoughts on the French Revolution* and *Delphine*, a novel. Madame de Staël notably influenced the romantic movement in France.

Stalin, Joseph Vissarionovitch (1879-1953), Russian revolutionary and dictator, was born at Gori, Georgia, son of a peasant shoemaker named Dzhugashvili in the Caucasus. The name Stalin, "Steel," was given him as a sobriquet by Lenin. Expelled from a religious seminary in 1898 for "unreliability," he joined a revolutionary group. After the unsuccessful uprising of 1905, he robbed a government money transport to secure funds for his party. He was banished to Siberia four times, escaping three times and finally returning to Europe in February 1917 after the Revolution. Lenin made him a member of the all-powerful Politbureau.

With no advantages of appearance or oratory, Stalin consolidated his power by winning the support everywhere of the most ruthless foes of capitalistic social ideals. He shrank from neither hardship, danger, nor cruelty necessary for his purposes. Although merely secretary of the Bolshevik party, he broke with Lenin shortly before the latter's death, and overthrew Trotzky and secured his banishment. He was now strong enough to force through the so-called five-year plans for industrial development and collective agriculture. In World War II, by agreement with Germany, he seized the opportunity to consolidate Russian power on the Baltic and to obtain part of Poland.

When Germany attacked Russia in 1941, Stalin surprised the world by the quality of his resistance. He traded space for time, held Leningrad and Moscow, turned back the German invasion at Stalingrad, and, in 1945, after liberating Russia and Poland, overran all eastern Germany and occupied Berlin. At Yalta and Potsdam he obtained advantageous concessions from his allies. After the surrender of Germany his policies toward them became less co-operative and even unfriendly.

Standish, Miles (c. 1584-1656), New England colonist, was born in Lancashire, England. He served in the army in the Netherlands and sailed with the Pilgrims in the *Mayflower* in 1620. On reaching Massachusetts, he was chosen captain and led expeditions against the Indians. He settled finally at Duxbury, Mass., where he died. The story of his unsuccessful effort to secure a wife is told by Longfellow in his *Courtship of Miles Standish*.

Stanford, Leland (1824-1893), American capitalist and philanthropist, was born in Watervliet, N. Y. Early in life, he studied law and was admitted to the New York bar. Attracted to California by the gold discoveries, he engaged in mercantile business in San Francisco, 1856. He was one of the organizers and became president of the Central Pacific Railroad Company. Entering political life, he was Republican governor of California, 1861-83, and United States senator from California, 1885-93. He gave property to the value of $20,000,000 to found at Palo Alto, in memory of his deceased son, a university to be known as Leland Stanford Junior university.

Stanley, Sir Henry Morton (1841-1904), African explorer, was born near Denbigh, Wales, of obscure parentage. He went to Louisiana at an early age, served first in the Confederate army, then in the Federal navy during the Civil War, and subsequently went to Turkey as a newspaper correspondent. In 1867, he made a reputation as war correspondent in Ethiopia.

Sent by James Gordon Bennett to find Livingstone, he reached Zanzibar early in 1871; organized a large expedition; and found Livingstone, November 10, 1871, at Ujiji, on Lake Tanganyika.

In 1874, he set out on a second African expedition for the New York *Herald* and the London *Daily Telegraph*. He reached Lake Victoria in 1875; proceeded to Lake Tanganyika; pushed westward to the Lualaba, which he descended; and finally reached the Atlantic coast in 1877, proving the identity of the Lualaba and the Congo. During this notable journey, Stanley crossed equatorial Africa from east to west and traveled more than 7000 miles.

Stanley's next expedition to Africa was made under the auspices of the African International Association and it led to the foundation of the Congo Free State, now Belgian Congo. In 1886, Stanley undertook an expedition for the relief of Emin Pasha, who had been cut off in the interior of Africa by the Mahdi rebellion. Stanley left England in 1887 and returned in 1890 after escorting Emin and a large troop of followers from the interior to the coast. This was his last journey in Africa; it occupied 1012 days, replete with peril and tragic incident. Stanley wrote, among other works, *Congo and the Founding of Its Free State* and *In Darkest Africa*. He was a member of Parliament, 1895-1900, and was knighted in 1899.

Stanton, Edwin McMasters (1814-1869), American statesman, was born in Steubenville, Ohio. He practiced law in his native town until 1847, when he settled in Pittsburgh, Pa., and there became a leader of the bar. In 1860, he was made attorney general of the United States and, in 1862, secretary of war. The latter post he filled throughout the Civil War with ability, energy, and industry. He retained office until 1867, when he was suspended by President Johnson. Stanton was reinstated by the Senate in January 1868. In December 1869, he was appointed associate justice of the U. S. Supreme Court and died the same month.

Stanton, Elizabeth Cady (1815-1902), American reformer and suffragist, was born in Johnstown, N. Y. She married Henry B. Stanton, Antislavery reformer. She signed the call for the first Woman's Rights Convention at Seneca Falls, N. Y., 1848, and became president of the National Woman's Suffrage Association formed there, retaining the office until 1893. After 1848, she devoted much time to traveling and lecturing in behalf of woman's rights. She wrote *A History of Woman Suffrage* and an autobiography.

Stanton, Frank Lebby (1857-1927), American poet and journalist, was born at Charleston, S. C. From 1889 he was editor and column writer for the Atlanta *Constitution*. His poetry is largely lyrical and in Southern Negro dialect. Many of his poems have been put to music and have become very popular. These include "Just A-Wearyin' for You," "Li'l Feller," and "Mighty Lak a Rose." He was proclaimed poet laureate of Georgia in 1925.

Stark, Harold Raynsford (1880-), American naval officer, was born at Wilkes-Barre, Pa. After he was graduated from the United States Naval Academy in 1903, he entered the navy and rose through the grades to rear admiral in 1934. During World War I he was aide on the staff of Admiral Sims. He was advanced to chief of naval operations in 1939, when the fleet was being expanded to a "two-ocean navy." In 1942 he was placed in command of the American naval forces in Europe. He retired in 1946.

Stark, John (1728-1822), American soldier, was born at Londonderry, N. H. He served in the French and Indian War; at Bunker Hill, was colonel of a regiment raised by himself in one day; and was in the attack on Trenton and in the battle of Princeton. He raised a regiment in 1777 and took command of the New Hampshire troops sent against the British forces from Canada. On August 16, 1777, he won the battle of Bennington, which brought him the thanks of Congress and the rank of brigadier general. With a force recruited by him in New Hampshire, he cut off Burgoyne's retreat from Saratoga.

Stassen, Harold Edward (1907-), American politician, was born in West St. Paul, Minnesota, and was educated at the state university. He engaged in law practice, and was elected governor of Minnesota in 1939, resigning in 1943 to join the navy. He saw service in the Pacific. In 1944 he was a delegate to the San Francisco conference, holding advanced internationalist views. In 1948 he was a candidate for the Republican nomination for president, representing the liberal wing of the party. He was president of the University of Pennsylvania from 1948 until 1953, when he was appointed U. S. mutual security director. He was later made administrator of the Foreign Operations Administration, and in 1955 was given a special cabinet post dealing with disarmament.

Steele, Sir Richard (1672-1729), British essayist and playwright, was born in Dublin, Ireland. He was educated at Oxford. Leaving college without a degree, he entered the army and rose to the rank of captain. In 1702, he wrote the comedy *The Funeral, or Grief á la mode*, followed by *The Tender Husband* and *The Lying Lover*.

In 1709, Steele founded the *Tatler*, a tri-weekly periodical containing short essays on life and manners, which was succeeded by the *Spectator*, a daily literary journal of a higher tone and character. To both of these Addison, whom Steele had met at Charterhouse, contributed extensively and became the more important figure. Preceding the more finished work of Addison, Steele originated the essay describing contemporary manners which was later developed into the novel. In 1722, he produced his successful comedy *The Conscious Lovers*.

Stefánsson (*stō'fäns-sôn*), **Vilhjálmur (1879-1962)**, arctic explorer, of Icelandic descent, was born at Arnes, Manitoba. He was graduated from the University of Iowa, 1903, and studied anthropology at Harvard, where he became an instructor. In 1904-05, he made archeological researches in Iceland. He spent the winter of 1906-07 with the Eskimo of the Mackenzie delta and returned alone by way of the Porcupine and Yukon rivers.

Between 1908 and 1912, Stefánsson was engaged in the ethnological survey of the central North American Arctic

Coasts, exploring Coronation Gulf and discovering the so-called blond Eskimo. During 1913-16, he conducted explorations for the Canadian government. In 1921, he was instrumental in having Wrangell Island claimed for Canada, although the claim was later relinquished. From 1932, he was adviser to Pan-American Airways for northern routes. His writings include *My Life with the Eskimo*, *The Friendly Arctic*, and *Ultima Thule*.

Steffens, Joseph Lincoln (1866-1936), American journalist and author, was born at San Francisco, Cal. Educated at the University of California and at Heidelberg, Leipzig, and Paris universities, he worked as reporter and later as city editor for the New York *Evening Post*, beginning in 1892. While on the editorial staffs of the *American Magazine* and other periodicals he wrote a series of articles depicting the corruption of American city governments, later published more fully in *The Shame of the Cities* and *The Struggle for Self-Government*. His *Autobiography* is a valuable documentation of a period when municipal corruption frequently ran riot.

Steichen, Edward (1879-), photographer and painter, was born at Hancock, Mich. His first art work was the designing of advertising posters for a lithographing firm in Milwaukee. Later he became interested in the possibilities of photography as a fine art, and examples of his work were shown at salon exhibitions in Philadelphia, New York, London, and Paris. He specialized in portrait studies and had many prominent people as subjects, among them Shaw, Rodin, Maeterlinck, Theodore Roosevelt, and William Howard Taft. In collaboration with his brother-in-law, Carl Sandburg, he prepared the "Road to Victory" exhibit, which was shown in 1942 by the Museum of Modern Art in New York. As lieutenant commander in the U. S. Naval Reserve he directed many photographic projects during World War II.

Stein, Gertrude (1874-1946), American author, was born at Allegheny, Pa. After studying medicine at Johns Hopkins University, she took up her residence in Paris in 1903, where she became a friend of the leading artists and writers of the time, particularly those who were experimenting in new forms or opening up new fields of artistic expression. She developed and used in some of her writings a style in which words were used to evoke feelings quite apart from ideas which they might or might not express. Besides a long novel, *The Making of Americans*, her works include *Useful Knowledge*, *Before the Flowers of Friendship Faded*, *Poems*, *The Autobiography of Alice B. Toklas*, *The World Is Round*, and *Wars I Have Seen*.

Steinbeck, John Ernst (1902-), American novelist, was born at Salinas, Cal. After studying at Stanford University, he spent ten years at various jobs before the publication of his first novel *Cup of Gold*. This was followed by *Tortilla Flat*, *In Dubious Battle*, *Of Mice and Men*, and *Grapes of Wrath*, in which were depicted in swift realistic narrative moving dramas of characters, both weak and strong, embattled against the impersonal force of an economic system of which they were victims. *Grapes of Wrath* was honored by an award of the Pulitzer prize in 1939. Several of his works were no less successful as motion picture dramas than as novels. Works since then include *The Moon Is Down* (1942), *Cannery Row* (1944), *The Wayward Bus* (1947), *East of Eden* (1952), and *Sweet Thursday* (1954). He is a member of the American Academy of Arts and Letters.

Steinmetz (*stīn'mĕts*), **Charles Proteus (1865-1923)**, electrical engineer, was born in Breslau, Germany and was educated at Breslau, Berlin, and Zurich. He came to America and, in 1893, became consulting engineer for the General Electric Company. In 1902, he began also to serve as professor of electrical engineering in Union University. He became widely known as an authority on electric currents and particularly on problems of electrical measurements, in which he was reputed to be a genius. His publications include *Theory and Calculations of Alternating-Current Phenomena*, *Theoretical Elements of Electrical Engineering*, and *Engineering Mathematics*. He was a socialist and refused to accept more for his services than a very modest salary.

Steinway, Henry (1797-1871), piano manufacturer, was born at Wolfshagen, Germany. He was known as Heinrich Steinweg until 1850, when he emigrated to America and adopted the English equivalent of his name. As a maker of musical instruments in Brunswick, he produced many guitars and zithers and some "claviers," preparatory to his principal work for the future. In 1853, together with four sons, he established the firm of Steinway and Sons, manufacturers of pianofortes in New York City. Careful workmanship and some improvements in design, such as the "double-overstrung scale," gave this firm a reputation which has made the name a trade-mark of excellence for more than a century.

Stephen, Sir Leslie (1832-1904), English biographer and critic, was born at Kensington. He was educated at Eton, King's College, and Trinity Hall, Cambridge, where he was fellow and tutor. He was editor of the *Cornhill Magazine*, 1871-82, and of the first 26 volumes of the *Dictionary of National Biography*. His works include *The Playground of Europe*, *Hours in a Library*, *The English Utilitarians*, *An Agnostic's Apology*, and *Studies of a Biographer*.

Stephens, Alexander Hamilton (1812-1883), American statesman, was born in Georgia. He was graduated from the University of Georgia in 1832 and was admitted to the bar in 1834. In 1843, he was elected to Congress by the Whig party, and he retained his seat until 1859, during which period he supported the annexation of Texas, promoted the passage of the Kansas-Nebraska Act of 1854, and joined the Democratic party in upholding the measures of President Buchanan.

In 1860, he opposed the secession of his state, but, in the following year, expressed his adherence to sectional views and was elected vice president of the Confederate States of America. In 1866, he was elected United States senator, but was not allowed to take his seat. He was, however, a member of the House of Representatives 1873-82, and governor of Georgia, 1882-83. In 1869, he published *A History of the War of Secession* and, in 1870, *A Constitutional View of the War Between the States*.

Stephenson, George (1781-1848), English engineer and inventor, was born near Wylam, Northumberland. He was poor in early life, worked on a farm and at a colliery, and at 17 became engineman at Throckley Bridge. Although a grown man he went to night school to learn the elements of English and mathematics.

In 1806, Stephenson had charge of an engine in a large spinning mill near Montrose, Scotland, and, in 1812, he became enginewright at Killingworth. There he began his own experiments with the engine. Watt had shown the practicality of fixed steam engines. Trevathick had invented, in 1804, the first self-acting steam carriage. Blackett, in 1811, on the Wylam Railway, proved that engines running with smooth wheels on smooth rails could draw heavy loads up a moderate incline. The means for imparting speed, however, had not yet been devised.

Stephenson had the happy thought of using the escaping steam to blow his fire. This increased the ascending current of air so much that the speed of the engine was more than doubled. In 1815, he took out a patent, with Dodds, for this improved engine. In the same year he invented a colliery safety lamp, the "Geordie."

In 1821, Stephenson became constructing engineer for the Stockton and Darlington Railway. In 1826, he accepted a similar position with the Liverpool and Manchester Railway, and, upon the completion of the line in 1829, he astonished every one, even himself, by the success of his "Rocket" in a celebrated competitive trial of locomotives over the Liverpool and Manchester Railway. The "Rocket" attained a speed of 44 miles a hour.

The subsequent career of Stephenson was rapid and smooth. He was principal engineer on the North Midland, York and North Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham Railways. In 1845, he visited Belgium and Spain for professional purposes. He was created a Knight of Leopold of Belgium and was made a fellow of the Royal Society in England. He was the founder and first president of the Society of Civil Engineers. Stephenson was offered knighthood by the sovereign of England, but declined the offer.

Stern, Otto (1888-), American physicist, was born at Sohrau, Germany. A former professor in the University of Hamburg, he came to the United States in 1933 and continued his researches at the Carnegie Institute of Technology, Pittsburgh. In 1944, he received the 1943 Nobel prize in physics for his contributions to atomic ray method and his discovery of the magnetic moment of the proton.

Sterne, Laurence (1713-1768), British novelist, was born at Clonmel, Ireland. He studied at Cambridge and became a clergyman. In 1759, he wrote two volumes of *Life and Opinions of Tristram Shandy*, to which additional volumes were added later. The work brought him lasting fame for its whimsical humor and memorable characters of "Corporal Trim," "Yorick," and "My Uncle Toby." He wrote also *Sentimental Journey*.

Steuben (*stū'bĕn*), **Friedrich Wilhelm von, Baron (1730-1794)**, general in the American Revolutionary army, was born at Magdeburg, Prussia. When only 14, he was a volunteer at the siege of Prague, and he steadily rose until, in 1752, he was on the staff of Frederick the Great.

Steuben came to America in 1778 and served with Washington during the dark days of Valley Forge. He was appointed inspector general, remodeled the army, and took part in the siege of Yorktown. In 1790, Congress voted him $2400 yearly and a township of land near Utica, N. Y., where he died. A monument to his memory was unveiled at Utica in 1914.

Stevens, John (1749-1838), American inventor, was born in New York. He was graduated from King's College, 1768, and was admitted to the bar in 1771. He secured the

establishment of the American patent system in 1790 and obtained patents for his own inventions in connection with steam engines.

In 1807, he constructed the *Phœnix*, a paddle-wheeled steamer, which he operated successfully on the Delaware River for several years. The *Phœnix* was completed but a short time after Fulton finished the famous *Clermont*. In 1811, Stevens established between Hoboken and New York the first steam ferry in the world. In 1815, he secured a charter for the first American railroad and, in 1824, obtained a charter for the first part of what is now the Pennsylvania system.

Stevens, Risë (1913-), American soprano, was born in New York. She made her debut at the Metropolitan Opera in 1938, appearing in *Mignon*. In 1941 she appeared with Nelson Eddy in the film *The Chocolate Soldier* and later in *Going My Way* with Bing Crosby. One of her most successful operatic roles has been as Carmen. She has sung with leading opera companies in this country and abroad and is one of America's most popular singers, whether in opera, at concerts, or on radio or television.

Stevens, Thaddeus (1792-1868), American statesman, was born at Danville, Vt. He was graduated from Dartmouth College, 1814; studied law; practiced at Gettysburg, Pa.; and served in the Pennsylvania legislature. He was a member of Congress, 1849-53 and 1859-68, and rose to prominence at the bar. In 1850, he opposed the Clay Compromise Measure and the Fugitive Slave Law. He was regarded as the most radical Antislavery advocate in Congress and was the most powerful opponent of President Johnson's plan of reconstruction.

Stevens, Wallace (1879-1955), American poet, was born in Reading, Pa. Educated at Harvard and New York Law School, he was in the general practice of law in New York City from 1904 to 1916, when he joined the legal staff of an insurance company in Hartford, Connecticut, of which he later became an executive officer. His published poems, sought after by collectors of modern first editions, include *Harmonium*, originally published in 1924. This was followed by *Ideas of Order*, *Owl's Clover*, *Man with the Blue Guitar*, *Parts of a World*, and *Notes Towards a Supreme Fiction*.

Stevenson, Adlai Ewing (1900-), statesman, was born in Los Angeles. His grandfather, Adlai Ewing Stevenson (1835-1914), was a congressman from Illinois and vice president of the United States during Grover Cleveland's second term, 1893-1897. Following his graduation from Princeton University in 1922, Stevenson studied law at Northwestern University and was admitted to the Illinois bar in 1926. He worked briefly on the family newspaper, the Bloomington, Illinois, *Daily Pantagraph*, and then practiced law in Chicago. During and after World War II he fulfilled a number of important government missions in the field of international relations. In 1948 he was elected governor of Illinois. In 1952 and in 1956, he was Democratic nominee for president of the United States but lost both elections to Dwight D. Eisenhower. In 1960, he was named by President-elect John F. Kennedy as U. S. ambassador to the United Nations.

Stevenson, Robert Louis Balfour (1850-1894), British novelist and essayist, was born at Edinburgh. Educated at Edinburgh University, he was admitted to the bar in 1875, but soon abandoned law for literature.

In 1878 appeared his first book, *An Inland Voyage*, which was quickly followed by *Travels with a Donkey*, *Virginibus Puerisque*, and *Familiar Studies*. As a writer of adventure and romance, he won permanent fame with *Treasure Island*, *Kidnapped*, *The Master of Ballantrae*, and *Dr. Jekyll and Mr. Hyde*. His versatility was further revealed in *A Child's Garden of Verses*, *Ballads*, *Memories and Portraits*, and *A Footnote to History*.

Stevenson's fiction and essays, written in an exquisite and finished style, reveal the charming personality which made him one of the best-loved writers of his time. Failing health led him to settle in the island of Upolu, Western Samoa, where he died. A fine monument has been erected to his memory on the estate which he had owned there.

Stevenson, William Edward (1900-), American lawyer and educator, was born at Chicago, Ill. After he was graduated from Princeton (1922), he was a Rhodes Scholar at Oxford University. He was admitted as a barrister-at-law at the Inner Temple, London, in 1925. On his return to America, he was assistant U. S. attorney for the Southern District of New York (1925-27). He then engaged in the practice of law in New York City until 1946, when he was made president of Oberlin College, Ohio.

Still, Andrew Taylor (1828-1917), founder of osteopathy, was born near Jonesboro, Va. He farmed in Missouri, studied medicine at Kansas City, fought along with John Brown in the border warfare, and saw considerable service in the Civil War. In 1864, when three of his children died with spinal meningitis, he devised the treatment known as osteopathy and practiced as an itinerant physician for some years. In 1875, he settled in Kirksville, Mo., and developed a large practice. In 1892, he opened the American School of Osteopathy at Kirksville.

Stillwell, Joseph W. (1883-1946), American army officer, was born at Palatka, Fla., and was graduated from West Point in 1904. After serving in World War I, he began a special study of China and its languages, spending most of the next 20 years in Peiping and Tientsin. In 1942, as lieutenant general he commanded the fifth and sixth Chinese armies in Burma. After the fall of Burma, he was placed in command of the American forces in China. Recalled in 1944 because of differences with Chiang Kai-shek, he was made general and, in 1945, was placed in command of the 10th Army, Pacific theater.

Stimson, Henry Lewis (1867-1950), American statesman, was born in New York City. After he was graduated from Yale and from the Harvard Law School, he was admitted to the bar and began practicing law in 1893. He was Republican candidate for governor of New York in 1910 and secretary of war in Taft's cabinet, 1911-13. President Coolidge sent him in 1927 as his representative to Nicaragua, then torn by civil war. On his return he was made governor general of the Philippines, from which post President Hoover called him in 1929 to accept the port folio of secretary of state. He was called again to public life in 1940, when he accepted the secretaryship of war in the Democratic administration of Roosevelt. He headed the War department through World War II, retiring in 1945.

Stokowski, Leopold Anton Stanislaw Boleslaw (1882-), musical conductor, was born in London, Eng., of Polish and Irish parentage. He was graduated from Oxford University and studied also in France and Germany. He was organist at St. James's Church, London, and, 1905-08, at St. Bartholomew's Church in New York. Returning to England, he conducted orchestral concerts and was invited in 1909 to conduct the Cincinnati Orchestra. From 1912 to 1934 he conducted the Philadelphia Symphony Orchestra with great success. Later he conducted orchestras in San Francisco and Los Angeles, the orchestra of the National Broadcasting Company in New York, and the New York City Symphony in New York.

Stone, Edward D. (1902-), American architect, was born at Fayetteville, Arkansas. Trained chiefly in the architectural schools of Harvard and M.I.T., he has practiced in Boston and New York and has taught design at New York and Yale universities. Either as co-designer or as designer, he has worked on such varied structures as the Museum of Modern Art building, the Hotel El Panama, the U.S. Embassy building at New Delhi, and his most celebrated creation, the U.S. building at the 1958 World's Fair in Brussels, Belgium.

Stone, Melville Elijah (1848-1929), American journalist, was born at Hudson, Ill., and received a high school education. He was editor of several Chicago dailies, 1871-74, and, in 1875, established the Chicago *Daily News*. In 1881, in partnership with Victor F. Lawson, he started the Chicago *Morning News*, which became the Chicago *Record*. Withdrawing in 1888, he organized the Globe National bank, of which he was president, 1891-98. In 1893, he removed to New York and acted until 1921 as general manager of the Associated Press. While he managed it, the service grew to become the chief supply of news for the American press.

Story, Joseph (1779-1845), American jurist and legal writer, was born at Marblehead, Mass. He was graduated from Harvard College in 1798; rapidly rose to eminence at the bar; and, in 1808, was elected to Congress. In 1811, he was appointed associate justice of the United States Supreme Court and, after 1829, was professor of law at Harvard. His decisions practically created patent law, and he shares with John Marshall the credit for an extension of federal authority over states through constitutional interpretations. He was elected to the American Hall of Fame in 1900.

Stowe, Harriet Elizabeth Beecher (1811-1896), American novelist, sister of Henry Ward Beecher, was born at Litchfield, Conn. She married Professor Calvin Ellis Stowe in 1836. She became a frequent contributor to periodicals; published a volume of stories; and, in 1851, commenced, in *The National Era*, an Antislavery paper at Washington, D. C., a serial entitled *Uncle Tom's Cabin*. When issued in book form, 1852, this unnoticed serial immediately became one of the most successful and influential novels in American literature.

By its emotional appeal, dramatic force, and intense human interest, *Uncle Tom's Cabin* aroused the conscience of the nation and made the slavery question an imperative moral issue. It has been translated into 40 languages and, in dramatized form, has been widely presented on the stage in America and in other countries.

A prolific writer for a half century, Mrs. Stowe produced many other novels, the best of which are *Oldtown Folks*,

The Minister's Wooing, and *The Pearl of Orr's Island*. She was elected to the American Hall of Fame in 1910. See *Topsy, Uncle Tom.*

Strabo (*strā'bō*), **(c. 64 B. C.-c. 21 A. D.)**, Greek geographer, was born at Amasia, in Pontus. He spent much of his life in travel and study, settling about 20 B. C. in Rome, whence he is believed to have made extensive journeys over most of the world as then known.

His *Geography*, in 17 books, describing Europe, Asia, Egypt, and Libya, is a work of great value, based partly on his own observations and partly on the geographical writings of Eratosthenes and other earlier authorities. He wrote also a history of Rome to 27 B. C., but this work has not survived.

Strachey (*strā'chĭ*), **Giles Lytton (1880-1932)**, English author, was educated at Trinity College, Cambridge. His first published work was *Landmarks in French Literature*. His realistic methods of biographical treatment, as exemplified first in *Eminent Victorians* and *Queen Victoria* may be said to have set a new fashion. He wrote later *Books and Characters*, *Pope*, and *Elizabeth and Essex*.

Stradivari (*strä'dē-vä'rē*), or **Stradivarius, Antonio (1644-1737)**, Italian violin maker, was born at Cremona. His instruments are known for their finish and fine tone. The great care with which he selected and cut his wood, the study he gave to the shape and the proportions, and the quality of the varnish used combined to make an unrivaled instrument. Of 2000 violins made by him, only a few now exist, and they are valued at fabulous prices.

Strathcona (*străth-kō'nà*), **Donald Alexander Smith, Baron (1820-1914)**, Canadian railway builder and statesman, was born at Forres, Scotland. He went to Canada in 1838; entered the Hudson's Bay Company's service; and rose to the position of resident governor and chief commissioner. He was a special commissioner during the first Riel rebellion in the Red River settlements, 1869-70; represented Winnipeg and Saint Johns in the Manitoba legislature, 1871-74; and was, for many years, a member of the Dominion House of Commons.

Lord Strathcona was the chief promoter and builder of the Canadian Pacific Railroad, of which he became a director. In 1889, he was elected chancellor of McGill University and, in 1899, lord rector of Aberdeen University. He made large donations to McGill University and other Canadian educational institutions, and, with Lord Mount-Stephen, gave an endowment to the Royal Victoria Hospital at Montreal, to which he also bequeathed $1,000,000. He was raised to the peerage in 1897.

Straus (*strous*), **Nathan (1848-1931)**, merchant and philanthropist, was born in Bavaria, Germany. He was brought to the United States in 1854 and resided at Talbotton, Ga. He afterward went to New York, where, in 1866, he joined his father's firm, L. Straus and Sons, which was engaged in the importation of pottery and glassware. From 1888 to 1914, he was a partner in the firm of R. H. Macy and Company, conducting a department store. He retired in the latter year in order to devote himself to philanthropy.

Straus originated and maintained a laboratory and system of distribution for pasteurized milk to the poor of New York City. He was one of the most active exponents of pasteurizing milk and contributed equipment for the process to various cities. He established a welfare center in Jerusalem for use by people of all races; also a smaller one in Tel Aviv.

Strauss (*shtrous*), **Johann (1825-1899)**, Austrian composer and conductor, was born at Vienna, of an eminently musical family. He became an orchestra conductor, toured in many European countries, and composed dance music and operettas. Of nearly 500 pieces of dance music, many of which became immensely popular and led to his being called the Waltz King, the best-known is *The Beautiful Blue Danube Waltz*. His operettas, several of which are classics in their field, include *Indigo, Cagliostro, Die Fledermaus, Der lustige Krieg, Simplicius, Eine Nacht in Venedig, Ninetta, Waldmeister*, and *Der Zigeunerbaron*.

Strauss, Joseph Baermann (1870-1938), American bridge builder, was born at Cincinnati and was educated at the University of Cincinnati. He designed and built over 225 bascule bridges in America and other parts of the world. These include the Canadian Pacific Railway bridge at Sault Sainte Marie, one of the longest two-lead bascule bridges in the world; a bridge at Copenhagen, the design of which was chosen in an international competition; a bridge at Tientsin, China, built in the Chinese style of architecture. He was chief Engineer for the Golden Gate bridge at San Francisco Bay.

Strauss, Lewis Lichtenstein (1896-), director of nuclear research, was born at Charleston, W. Va. His education included training in medicine, in addition to study at Dickinson College, Columbia University, and the Case Institute of Technology. Associated for more than twenty years with the New York firm of Kuhn, Loeb & Co., he also has been financial adviser to the Messrs. Rockefeller. He was a member of the United States Atomic Energy Commission from 1946 to 1950, and from 1953 to 1958 was Chairman of the Commission. He holds the rank of Rear Admiral in the United States Navy.

Strauss, Richard Georg (1864-1949), German composer, was born at Munich. He studied music at Munich and, in 1885, became conductor at Meiningen. From 1889 to 1894, he was chapelmaster at Weimar; was later conductor at the Munich opera house; and, in 1898, became conductor of the Royal Opera, Berlin.

By compositions which display great power of invention and originality, Strauss became a commanding figure in modern music. His works include the tone poems *Don Juan, Tod und Verklärung, Macbeth, Till Eulenspiegel, Also Sprach Zarathustra, Don Quixote*, and *Ein Heldenleben* and the operas *Guntram, Feuersnot, Salome*, and *Daphne*.

Stravinsky, Igor (1882-), composer and conductor, was born at Oranienbaum, Russia, and studied under Rimski-Korsakov. His early compositions came to the attention of Serge Diaghilev, who commissioned him to write the music for *The Fire Bird*, a ballet performed by Nijinsky in 1910. One composition of this period, *Le Sacre du Printemps*, has been revived recently as the basis for Walt Disney's *Fantasia*. Stravinsky's musical creations, at first novel and audacious and later more restrained, have aroused much discussion because of their originality. As holder of the Norton chair at Harvard University and as guest conductor of the New York Philharmonic and Boston Symphony Orchestras, he has gained an influential position in American musical circles. Many of his musical and personal memories are found in his *Autobiography*.

Streit, Clarence (1896-), journalist and author, has become identified with the widespread movement for an organization of all the democracies of the world into a union similar to the United States of America. Born at California, Mo., and educated chiefly in Montana, he was a soldier in World War I, Rhodes scholar, student at the Sorbonne, foreign correspondent, first for the Philadelphia *Public Ledger* and then for the *New York Times*. His conviction that the democracies must unite has found expression in several books, including *Union Now* and *Union Now with Britain*.

Strindberg (*strĭnd'bĕr-y'*), **Johan August (1849-1912)**, Swedish dramatist was born at Stockholm. He studied at the University of Upsala. He became successively schoolmaster, journalist, and author of scientific and political treatises. In 1883, he began a period of travel, during which he wrote many stories, novels, and plays. In 1897, he returned to Stockholm and published a large number of plays, which established his position as Sweden's most eminent dramatist. Of his plays, the following were among the first to be translated into English: *The Father, The Dance of Death*, and *The Spook Sonata*.

Stritch, Samuel Alphonsus (1887-1958), American prelate, was born at Nashville, Tennessee. He was educated at St. Gregory's College, and at the American College at Rome, where he was ordained priest in 1910. After pastorates in Memphis and Nashville he was appointed bishop of Toledo in 1921. He became archbishop of Milwaukee in 1930; and of Chicago in 1939. In 1946 Pope Pius XII named him cardinal. He was called, in 1958, to be Pro-prefect of the Vatican's Sacred Congregation for the Propagation of the Faith, being the first American prelate to be so honored. Becoming gravely ill on the way to Rome, he died soon after his arrival.

Stuart, Gilbert (1755-1828), American portrait painter, was born in Rhode Island. In 1775, he went to London, where his talent was recognized by Benjamin West. In 1781, he opened a studio in London and painted the portraits of George III, Mrs. Siddons, Sir Joshua Reynolds, and many other celebrated characters. At the height of his fame, he returned to America, 1792. His later portraits included those of the first five presidents of the United States.

Among the most celebrated of Stuart's portraits are those of Washington. The best of these include the "Gibbs-Channing" portrait, in the Metropolitan Museum, New York; the "Athenæum" portrait, in the Boston Museum; and the full-length portrait painted for the Marquis of Lansdowne. He was elected to the American Hall of Fame in 1900. See *Painting*.

Stuart, James Ewell Brown, "Jeb" (1833-1864), American cavalry officer, was born in Patrick County, Va. After he was graduated from the United States Military Academy in 1854, he served in the United States army and was made captain in 1861, but he resigned in order to join the Confederate forces. Bravery displayed as a cavalry commander in the first battle of Bull Run won him the rank of brigadier general, and, in July 1862, he became major general of cavalry. Among his exploits was the capture of part of General Pope's staff with the staff documents. He distin-

guished himself at Antietam, Fredericksburg, and other well-known battles. At Chancellorsville, Stuart took over "Stonewall" Jackson's command temporarily after the latter had been killed. When Sheridan advanced on Richmond, Stuart met him at Yellow Tavern but was defeated and mortally wounded.

Stuart, Jesse Hilton (1907-), American writer and educator, was born near Riverton, Ky. He was educated at Lincoln Memorial and Vanderbilt universities, but much of the preparation for his writing was gained from his life in rural sections of his native state. He has lectured on literature at several universities and has taught in the public schools, having been Superintendent of Schools for a time at Greenup, Ky. Folklore and homespun philosophy treated with literary skill give his works wide appeal and lasting influence. Examples of his writings are *The Man with a Bull-tongue Plow* (poetry), *Beyond Dark Hills* (autobiography), and *Taps for Private Tussie* (novel).

Stubbs, William (1825-1901), English historian and prelate, was born at Knaresborough. He was graduated from Oxford, 1848, and was ordained to the Church the same year. In 1866, he was appointed professor of modern history at Oxford; in 1884, was made bishop of Chester; and, in 1889, became bishop of Oxford.

By his profound learning and rare impartiality, Stubbs exercised a great influence upon the study of history. His *Constitutional History of England*, published In 1874-78, immediately took rank as an authoritative work. His other historical works include *The Early Plantagenets* and *Germany in the Middle Ages*.

Stuyvesant (*stī'vĕ-sănt*), **Peter (1592-1672)**, director general of the New Netherlands, 1647-64, and last Dutch governor of New York, was born in the Netherlands. He served first in the West Indies and arrived at New Amsterdam, 1647. He made peace with the Indians; settled the English and Dutch boundary question; recaptured, 1655, the fort on the Delaware River, taking possession of the Swedish colony at the same time; but was forced to surrender the city of New York to the English, 1664. He then retired to his farm, the "Bouwerij," which gave the name to the modern Bowery.

Sudermann (*zōō'dĕr-măn*), **Hermann (1857-1928)**, German dramatist and novelist, was born in Matzicken, East Prussia. He studied in the universities of Königsberg and Berlin, and was a teacher and journalist, 1881-89. In 1888, he won European fame by a play entitled *Die Ehre*, and a novel, *Frau Sorge*, which reached its 125th edition in 1912. Among Sudermann's other dramatic works are *Sodoms Ende*, *Die Schmetterlingsschlacht*, *Morituri*, *Johannes*, *Johannisfeuer*, and *Es Lebe das Leben*, which was translated as *The Joy of Living*. His novels include *Katzensteg*, *Iolanthes*, *Hochzeit*, and *Es War*.

Sue (*sū*), **Marie Joseph,** known as **Eugène (1804-1857)**, French novelist, was born in Paris. He studied medicine and served as surgeon in the army and afterward in the navy. Having inherited wealth, he resigned in 1829 and devoted himself to literature. His reputation as a writer rests mainly on *The Wandering Jew* and *The Mysteries of Paris*. both of which attained a world-wide reputation. See *Jew, The Wandering*.

Sukarno (*sōō kär nō*) **(1901-)**, political leader, was born at Surabaya, Java. He studied civil engineering at the Technical Institute of Banbung. Active as a rebel against the Dutch government, he was imprisoned several times. In 1942, the Japanese invaders released him from exile in Sumatra. As president of the Republic of Indonesia since 1945, he has sought territorial expansion for his country in defiance of world opinion. His attitude toward the new state of Malaysia is avowedly hostile.

Sulla, Lucius Cornelius (138 B.C.-78 B.C.), Roman general and dictator, was born at Rome. He acquired military fame in the armies of Marius and Catulus. His great popularity among the soldiers incited him to aspire to the sovereign power of dictator; and, though opposed by Marius, he gained his end, proscribing and putting to death all who opposed him. He used his power to establish a constitution of a thoroughly oligarchic type. After holding the dictatorship for about two years, he resigned his office in 79, and retired to his estate at Puteoli, where he died.

Sullivan, Sir Arthur Seymour (1842-1900), British composer, was born in London, of Irish parents. He studied in London and at Leipzig, and, in 1861, composed incidental music for *The Tempest*. He wrote a grand opera entitled *Ivanhoe*, cantatas, overtures, oratorios, church music, and ballads, but is best known for his comic operas written in collaboration with W. S. Gilbert, who contributed inimitable librettos. The most famous of these operas are *H.M.S. Pinafore*, *Pirates of Penzance*, *Patience*, *Iolanthe*, *The Mikado*, and *The Yeomen of the Guard*. Essentially lyric in quality, Sullivan's music abounds in melody and dainty orchestration. See *Mikado, The*; *Pinafore*.

Sullivan, Edward Vincent (1902-), television master of ceremonies and newspaper columnist, was born in New York City. His career as a news writer began early in the 1920's, when he wrote short stories for the *New York Evening Mail*, *The World*, and *The Morning Telegraph*. While he was working as sports editor on *The Evening Graphic*, he was asked to write a "Broadway" column. This was the beginning of a series that was soon afterward syndicated and has appeared in newspapers all over the country. Varied experience in conducting radio programs was followed, in 1948, by the introduction of the television show, *Toast of the Town*, which brought him nationwide acclaim.

Sully, Thomas (1783-1872), portrait painter, was born in Horncastle, England. While a boy, he emigrated to America and studied at Charleston, S. C., afterward residing in Richmond, New York, and Philadelphia. He enjoyed a great reputation as a portrait painter, executing portraits of Jefferson, Lafayette, Madison, Jackson, and other prominent personages.

Sully-Prudhomme (*sū'lē' prü'dôm'*), **René François Armand (1839-1907)**, French poet, was born in Paris. He was educated for the law and studied also science and philosophy.

Encouraged by the success of his *Stances et poèmes*, 1865, he devoted his efforts entirely to poetry. Soon afterward he published *Les épreuves* and *Les solitudes*, worthy forerunners of his great philosophical poems, *La justice* and *Le bonheur*, which rank among the most notable efforts in French poetry since Hugo. *Impressions de la guerre* gave some aspects of the Franco-Prussian War and was followed by *Les destins*, *Vaines tendresses*, and *Le prisme*. In 1905, he produced *La vraie religion selon Pascal*. He was elected to the French Academy in 1881 and, in 1901, he was awarded the Nobel prize for literature.

Sulzberger, Arthur Hays (1891-), American newspaper publisher, was born in New York City, and was educated at Columbia University. Both a family connection and a natural inclination toward newspaper work have kept him active on the staff of *The New York Times*, of which he has been publisher since 1935. His many active interests include The Interstate Broadcasting Company, The Times Facsimile Corporation, and The Spruce Falls Power and Paper Company, Ltd., of Toronto, Canada.

Summerfield, Arthur Ellsworth (1899-), American political leader, was born near Bay City, Mich. and began work as a lad in an automobile factory. While still a young man, he engaged in several lines of business, including real estate and automobile sales and oil distribution. In 1952 he was elected Chairman of the Republican National Committee and, after the election, was appointed Postmaster General in President Eisenhower's cabinet.

Sumner, Charles (1811-1874), American statesman, was born at Boston; was graduated from Harvard, 1830; studied law; and was admitted to the bar, 1834. He became a writer and lecturer on law, taking no part in politics until 1840, when he identified himself actively with the Anti-slavery movement.

In 1845, he delivered a notable Fourth of July oration on "The True Grandeur of Nations," which offended the Whig leaders and led to Sumner's withdrawal from their party. He then became a leader of the Free-Soil party and, in 1850, was elected successor to Daniel Webster in the United States Senate.

Sumner's first important speech in the Senate was in opposition to the Fugitive Slave law. His speech delivered in 1856 under the title "The Crime against Kansas," greatly incensed the members of Congress from South Carolina, one of whom, Preston S. Brooks, assaulted Sumner at his desk in the Senate chamber. Sumner supported the election of Lincoln, urged upon him the proclamation of emancipation, and became the leader of the Senate as chairman of the committee on foreign relations.

Sumner, William Graham (1840-1910), American sociologist and economist, was born at Paterson, N. J. Following his graduation from Yale University, he was ordained as a Protestant Episcopal minister, but, after preaching until 1872, he was made professor of political and social science at Yale University. His trenchant lectures and writings exercised much influence in supporting the view that individual initiative free of all governmental action in economic life conduces to the best social order. As a sociologist, he did much to clear the way for the study of the social order as a complex of customs. His *Folkways* became a standard text. His other publications include *Earth Hunger*, *Forgotten Man*, and *Challenge of Facts*.

Sunday, William Ashley (1863-1935), American evangelist, popularly known as "Billy" Sunday, was born at Ames, Iowa, and was educated in the public schools. In 1883, he became a professional baseball player, and, for seven years, made a notable record with the Chicago, Pittsburgh, and Philadelphia teams. From 1891 to 1895, he was assistant secretary of the Y. M. C. A. in Chicago.

In 1896, Sunday began evangelistic work and, in 1903, was ordained to the Presbyterian ministry. His unconventional methods aroused great diversity of opinion, from the severest criticism to enthusiastic admiration.

Sun Yat Sen (**1867-1925**), Chinese revolutionary leader, was born of native Christian parentage in Kwangtung Province. He was educated in Hongkong as a physician. Shortly after 1892, he devoted himself to secret activities aiming at the overthrow of the Chinese monarchy. Following the Chinese revolution in 1911, he was chosen provisional president of the Chinese Republic, but resigned the following year. In 1921, he was elected president by the Southern Parliament and led a military campaign against the Northern government at Peiping.

Suttner (*zōōt'nĕr*), **Bertha, Baroness von** (**1843-1914**), Austrian writer and peace advocate, was born at Prague. She was a prolific writer of stories, novels, and books on social science. Her novel entitled *Die Waffen nieder*, "*Lay Down Your Arms*," ran through many editions. In 1905, she was awarded the Nobel prize for peace.

Swarthout, Gladys (**1904-**), American mezzo-soprano, was born at Deepwater, Mo. and received her musical education at the Bush Music Conservatory, Chicago. She began as a church singer. After an audition with the Chicago Civic Opera, she became at the age of twenty the youngest member of that company, and five years later appeared with the Metropolitan Opera in New York. She is particularly known for her interpretation of the role of Carmen.

Swedenborg (*swē'dĕn-bôrg*), **Emanuel** (**1688-1772**), Swedish scientist and theologian, was born at Stockholm. He studied at Upsala and traveled abroad for four years. In 1716, Charles XII appointed him assessor of mines. He was ennobled in 1719; took a prominent part in the House of Peers; and wrote on many scientific subjects, publishing *Opera Philosophica et Mineralia* and *The Animal Kingdom*.

In 1743, Swedenborg claimed a divine commission to disclose the internal or spiritual sense of Scripture by the correspondence existing between natural and spiritual things. He taught that all angels were formerly human beings and that, in heaven, they live together in societies and marry, although only in a spiritual sense.

Among his chief theological works are *Arcana Cœlestia*, his most extensive and valuable treatise; *Heaven and Hell; Divine Love and Wisdom;* and *The True Christian Religion*. He died in London. The New Church, which accepts Swedenborg's mission and general views, held its first public services in 1778.

Swift, Jonathan (**1667-1745**), British satirist, was born in Dublin, of English parents. After he was graduated from Trinity College, he removed to London and, in 1689, became secretary to Sir William Temple. At this time, he first met Esther Johnson, then eight years old, whom he subsequently immortalized as "Stella."

Entering the Church, he became established in a parsonage at Laracor, near Dublin, 1700, but spent much time in London. In 1704 appeared *The Battle of the Books* and *The Tale of a Tub*, which brought him into notice as the most powerful satirist of his time. In politics, he became an important figure by his effective attacks upon the Whigs. Retiring to Ireland upon the fall of the Tory ministry, he became dean of Saint Patrick's Cathedral, Dublin, 1713. In 1726, he wrote *Gulliver's Travels*, the most famous of all his works. His later life was embittered by failure to realize his ambitions and by the death of Esther Johnson, to whom he wrote the *Journal to Stella*. He had previously lost by death a second sweetheart, whom he called Vanessa.

The most original writer of his time, Swift was one of the great masters of English prose, and, in vigor, directness, and convincing power, he has never been surpassed. His *Gulliver's Travels* has the unique distinction of being, at the same time, a charming tale for children and, for the discerning reader, perhaps the most savage satire on mankind that has ever been written. See *Gulliver, Lilliput*.

Swinburne, Algernon Charles (**1837-1909**), English poet, was born in London. He was educated at Eton and at Oxford, and afterward traveled on the continent, visiting Landor at Florence in 1864. Upon returning to England, he became intimately associated with William Morris and Dante Gabriel Rossetti. In 1865, he published a lyric tragedy *Atalanta in Calydon*, which is regarded as his masterpiece. This was followed by *Poems and Ballads, Songs before Sunrise*, and other works which revealed great originality, passionate intensity, and an unusual power of melodious versification.

At the death of Tennyson, Swinburne was the greatest living English poet, but his radical views prevented his appointment as poet laureate. His works include also *Bothwell, Songs of Two Nations, Songs of the Springtides, Mary Stuart, A Study of Victor Hugo, Astrophel and Other Poems*, and *Rosamund*.

Symington, William Stuart (**1901-**), U. S. government official, was born at Amherst, Mass. After serving briefly in the U. S. Army in World War I he studied at Yale University, then entered a railroad equipment plant owned by his family. Eventually he became president of the Emerson Electric Company. At the close of World War II he was appointed chairman of the Surplus Property Board. In 1947 he was named secretary of the U. S. Air Force which position he held until April, 1950, when he resigned to become chairman of the National Security Resources Board. He has been U. S. senator from Missouri, since 1953.

Symonds (*sĭm'ŭnz*), **John Addington** (**1840-1893**), English literary historian and critic, was born at Bristol. He was graduated from Oxford and began the study of law, which ill health compelled him to abandon. For several years, he lived chiefly in Switzerland, where he wrote extensively on Italian history and literature.

Symond's chief writings are *Introduction to the Study of Dante, Studies of the Greek Poets, The Renaissance in Italy, Italian Byways, Shakespeare's Predecessors*, and lives of Shelley, Ben Jonson, Sir Philip Sidney, Boccaccio, Benvenuto Cellini, and Michelangelo. His work is marked by accurate learning and much critical insight.

Synge (*sĭng*), **John Millington** (**1871-1909**), Irish dramatist and poet, was born at Newton Little, near Dublin. He was educated at Trinity College from which he was graduated in 1892. Always an ardent nature lover, with a passion for languages and music, he went to Germany to study music and later to Paris to do literary criticism.

In 1898, William Butler Yeats induced Synge to return to Ireland and join the movement for the revival of the ancient Irish language and drama. His first plays, *Riders to the Sea* and *The Shadow of the Glen*, immediately established his reputation as a dramatist of a high order. He wrote also *The Well of the Saints*, which was followed by *The Playboy of the Western World*, his most remarkable drama. Among his other productions are *The Aran Islands, The Tinker's Wedding*, and *Deirdre of the Sorrows*. Synge possessed unusual imagination, perfect mastery of words, and delicacy of style.

Szell, George (**1897-**), pianist and conductor, was born at Budapest. He received most of his training at the State Academy of Music in Vienna, where he was acclaimed as a child prodigy. At the age of 17 he was guest conductor for the Berlin Philharmonic Orchestra. An American citizen since 1946, in which year he became director of the Cleveland symphony orchestra, he has made return visits to Europe as guest conductor at Vienna, Salzburg, Milan, and elsewhere. He has composed several pieces, including a piano quintet, and has made many recordings.

Szent-Györgyi, (*sĕnt-dyûr' dyĭ*) **Albert** (**1893-**), biochemist, was born at Budapest, Hungary, and was educated in his native city. He later carried on laboratory research at several universities, including those in Berlin, Prague, Hamburg, and Liége. He also studied in England at Cambridge, and in the United States at the Mayo Clinic at Rochester, Minn. He won the Nobel prize for medicine in 1937. His research has dealt with various aspects of the physiology of muscles. Having experienced difficulty in continuing his work in Communist-controlled Hungary, he came to America in 1947 and established the Institute for Muscle Research at the Marine Biological Laboratory at Woods Hole, Mass. The possibility that his pioneer research may help in combating muscular dystrophy has attracted much attention to his work. In addition to articles he has written three books, titled as follows: *On Oxidation, Fermentation, Vitamins, Health and Disease; Chemistry of Muscular Contraction;* and *Chemical Physiology of Contraction in Body and Heart Muscle*.

Tacitus (*tăs'ĭ-tŭs*), **Publius Cornelius** (**c. 55 A.D. -c. 120 A. D.**), Roman historian and orator. In 78, he married the daughter of the general Agricola; was quæstor, 79; became prætor in 88; and was elected consul in 97. He attained distinction as an orator and, in 99, was appointed, with the younger Pliny, to conduct the prosecution of Marius, then proconsul of Africa.

After his consulship, Tacitus devoted himself chiefly to literature. His works include *Dialogue on Orators; Agricola*, a biography; *Germania*, describing the German peoples; *Annals*, covering the period from 14 to 68; and *Histories*, which narrates events from 68 to 96. He possessed a remarkably forceful style and many of his maxims have become proverbial.

Tadema, Alma. See *Alma-Tadema, Sir Laurence*.

Taft, Lorado (**1860-1936**), American sculptor, was born at Elmwood, Ill. After being graduated from the University of Illinois in 1879, he studied sculpture at the Ecole des Beaux-Arts, Paris, 1880-83. Returning to America, he settled in Chicago, and, in 1886, became an instructor at the Art Institute. In this capacity and as a lecturer, he exercised a marked influence upon the development and appreciation of sculpture.

Taft also undertook to carry out an extensive plan of sculptural decoration for Chicago which had been made possible by the Ferguson bequest of 1905. "The Spirit of the Great Lakes" was completed in 1912 and the colossal "Fountain of Time" was finished in 1920. He published *The History of American Sculpture* and *Recent Tendencies in Sculpture*. In 1920, he was elected member of the American Academy of Arts and Letters.

Taft, Robert Alphonso (1889-1953), American politician, was born at Cincinnati, Ohio, the son of President Taft. A graduate of Yale University, he practiced law in Cincinnati from 1913. Entering politics as a Republican, he served in the Ohio legislature, 1921-26 and 1931-32. In 1939, he was elected to the United States Senate and was a prominent contender for the presidential nomination on the Republican ticket in 1940, 1948, 1952. In the Republican controlled Congress elected in 1946 he was the Republican leader in the Senate, and sponsored the Taft-Hartley Labor Bill. He was re-elected to the Senate, 1950.

Taft, William Howard (1857-1930), 27th president of the United States, was born in Cincinnati, Ohio. He was graduated from Yale in 1878 and from the Law School of Cincinnati College in 1880. He practiced law from 1883 to 1887; was judge of the superior court of Ohio, 1887-90; and solicitor general of the United States, 1890-92. He was dean and professor in the Law Department, University of Cincinnati, 1896-1900; United States circuit judge, 1892-1900; president of the United States Philippine commission, 1900-01; first civil governor of the Philippine Islands, 1901-04; secretary of war, United States, 1904-08; and President of the United States, 1909-13.

As member of Roosevelt's cabinet, Taft ably represented the administration on important missions to Cuba, Japan, China, and Russia. Although elected president by an overwhelming majority, he lost popularity by reason of his attitude in the Ballinger-Pinchot controversy and by his defense of the Payne-Aldrich Tariff Act of 1909. His final alignment with the reactionary group as against the progressive element divided his party. While renominated by the Republicans in 1912, he received only eight electoral votes at the ensuing election.

In 1913, Taft was made professor of law at Yale. In 1918, he was made a member of the National War Labor Board. In 1921, he was appointed Chief Justice of the United States Supreme Court, from which he resigned early in 1930 because of ill health. His writings include *The Anti-Trust Act and the Supreme Court* and *The Presidency: Its Duties, Opportunities, and Limitations.*

Tagore (*tä-gôr'*), **Rabindranath (1861-1941),** Hindu poet, was born at Calcutta. He spent his childhood in his native city but at 17 was taken to Europe for further education. Returning to India, he became a successful journalist and well-known also as an educator, philosopher, and religious teacher, having founded a school in Bolpur, Bengal, known as the Visva-Bharati. His early productions were romantic and sensuous, but his later work reveals a change to idealism and spirituality.

Tagore's poetry exerted a remarkable power over the masses in Bengal. He acquired a fine English style so that his influence extended readily to the Western world. In 1913, he was awarded the Nobel prize for literature. He wrote and set to music over 3000 songs. At the age of 68 he took up painting and exhibited in leading cities.

Among Tagore's works available in English are *The Crescent Moon* (child poems), *The Gardener*, *The King of the Dark Chamber*, *Nationalism*, *Mashi*, *Lover's Gift*, *The Home and the World*, and *The Religion of Man.*

Taine (*tān*), **Hippolyte Adolphe (1828-1893),** French literary historian and critic, was born at Vouziers. He went to Paris in 1841, studied at the Collège Bourbon, and, in 1848, entered the Ecole Normale. In 1851, he was appointed professor of philosophy at Toulon. He immediately resigned, however, and devoted himself to the study of medicine and the sciences in order to bring himself in touch with the growing scientific spirit of the time. In 1864, he was made professor of the history of art and of æsthetics in the Ecole des Beaux-Arts.

Among his important works is *History of English Literature*, a valuable criticism brilliantly written. His monumental achievement, *Origins of Contemporary France*, engaged his efforts for more than 20 years. His other writings include *Voyage in Italy*, *The Ancient Régime*, *Notes on England*, and *The Ideal in Art*. In 1878, Taine was elected to the French Academy.

Tallchief, Maria (1925-), ballerina, was born at Fairfax, Okla. Her family having moved west, she received her early education at Beverly Hills, Calif., where she studied piano music and obtained training in ballet dancing from some famous professional teachers, one of whom was a sister of the great Nijinsky. Her versatility and remarkable genius for interpretive dancing may be aided in part by her study of the piano, possibly even by a tribal dancing inheritance which could have come through her Osage Indian father. Among her classic interpretations are *Chopin Concerto*, *Sheherazade Etude*, and *Firebird*. She has appeared as a member of the Ballet Russe de Monte Carlo and the New York City Ballet, and as guest star with the Paris Opera.

Talleyrand-Périgord (*tăl'ĭ-rănd*; Fr., *tä'lĕ'rän' pā'rē'-gôr'*), **Charles Maurice de, Prince de Benevento (1754-1838),** French statesman and diplomat, was born at Paris. He was educated for the Church, becoming in 1775 abbot of Saint Denis and, in 1788, bishop of Autun. He was a member of the States-General in 1789 and took a leading part in the proceedings of that assembly and also of the National Assembly. He was soon afterwards excommunicated by the pope, and then devoted himself entirely to politics.

The excesses of the Revolution led to his withdrawal to England and afterward to America. After the fall of Robespierre, he returned to Paris, and, through Madame de Staël's influence with Barras, he was appointed foreign minister, an office which he retained until 1807. In return for notable services, Napoleon made Talleyrand grand chamberlain and prince. After the fall of Napoleon, he was for a time prime minister under Louis XVIII, whose restoration he had brought about, and secured favorable terms for France at the Congress of Vienna. He was then sent as ambassador to London.

Tamerlane. See *Timur.*

Taney (*tô'nĭ*), **Roger Brooke (1777-1864),** American jurist, was born in Calvert County, Md. He was graduated from Dickinson College, studied law, and entered politics as a Federalist. He afterward became a Democrat and was made attorney general in President Jackson's cabinet, 1831. Two years later he was appointed secretary of the treasury, and, in 1836, succeeded John Marshall as Chief Justice of the United States Supreme Court. His famous decision in the Dred Scott case, 1857, denying the right of citizenship to Negroes, and also the authority of Congress to keep slavery out of the territories, may be said to have brought on the Civil War.

Tarbell, Ida Minerva (1857-1944), American author and editor, was born in Erie County, Pa. and was graduated from Allegheny College in 1880. She was associate editor of the *Chautauquan* from 1883 to 1891, of *McClure's Magazine* from 1894 to 1906, and of the *American Magazine* from 1906 to 1915.

In addition to many contributions to magazines, her writings include *Short Life of Napoleon Bonaparte*, *Life of Lincoln*, *History of the Standard Oil Company*, *The Business of Being a Woman*, and *New Ideals in Business.*

Tarkington, (Newton) Booth (1869-1946), American novelist and playwright, was born at Indianapolis, Ind. He was educated at Phillips Academy, Purdue University, and at Princeton. His first story, *The Gentleman from Indiana*, was published in 1899. This was followed in 1900 by *Monsieur Beaucaire*, which established his reputation. In 1919 he was awarded the Pulitzer prize for his novel *The Magnificent Ambersons.*

Among his other stories are *Cherry*, *The Conquest of Canaan*, *Penrod*, *Women*, *Image of Josephine*, and *Alice Adams.* His plays include *Clarence*, *Poldekin*, and *The Wren.*

Tasso (*tăs'ō*; Ital., *täs'sō*), **Torquato (1544-1595),** Italian poet, was born at Sorrento, the son of a nobleman of Bergamo. He studied law at Padua and philosophy at Bologna. In 1562, he published his earliest poem, *Rinaldo.* In 1565, he entered the service of Cardinal Luigi d' Este and, in 1570, accompanied him to Paris. In 1572, Tasso was invited to the court of Alfonso II, Duke of Ferrara. While there he produced his most important works. His *Aminta*, a pastoral drama of exquisite lyrical charm, was published in 1573. In the following year, he completed *Jerusalem Delivered*, one of the great epic poems of modern times.

For some years Tasso lived on intimate terms with the Duke of Ferrara and his sisters, the Princesses Lucrezia and Leonora. About 1577, Tasso's mind began to fail and, in 1579, he was confined as insane in a hospital of Ferrara. A theory that he was imprisoned because of his aspirations for the hand of the Princess Leonora gained wide acceptance. While now generally discredited, this legend formed the basis for Goethe's *Tasso* and Byron's *Lament of Tasso.*

Following his release in 1586, Tasso led a broken and wandering life, residing for brief periods in various Italian cities. In these last years he wrote the tragedy *Torrismondo* and several poems as well as a revised version of his *Jerusalem Delivered*, which he called *Jerusalem Conquered.* All these are inferior to his earlier works. At Rome, whither he had been summoned by Pope Clement VIII to be crowned poet laureate at the Capitol as Petrarch had been, Tasso was striken with a fatal illness and the ceremony was never performed. See *Jerusalem Delivered.*

Taylor, (James) Bayard (1825-1878), American author and traveler, was born at Kennett Square, Pa. In 1844 he published a volume of poems, *Ximena.* Soon afterward he set out on a pedestrian tour of Europe, and, in 1846, published *Views Afoot, or Europe Seen with Knapsack and*

Staff. After his return he settled in New York, wrote for the *Tribune*, and, as its correspondent, made extensive travels in various countries. In 1878, he was appointed United States minister to Berlin.

Taylor wrote many volumes of verse, fiction, sketches, essays, translations, and criticisms, besides several books of travel. Among his best poems are "Bedouin Song," "The Song of the Camp," and "The Quaker Widow." Of his novels *The Story of Kennett* and *Hannah Thurston* were in greatest favor. Taylor made an excellent translation of Goethe's *Faust*.

Taylor, (Joseph) Deems (1885-), American composer and musical critic, was born in New York City. After he was graduated from New York University in 1906, he studied music and became musical editor for several encyclopedias, periodicals, and newspapers. Beginning in 1910, he composed many suites, operas, and symphonic poems, the better known of which include *The Chambered Nautilus*, *The King's Henchman*, and *Peter Ibbetson*. He wrote *The Well Tempered Listener* for the guidance of radio audiences and *Pictorial History of the Movies*.

Taylor, Jeremy (1613-1667), English divine, was born at Cambridge. He was graduated from Cambridge; was admitted to Holy Orders about 1633; and shortly attracted the attention of Archbishop Laud, who, in 1636, procured him a fellowship at Oxford. He was soon afterwards made chaplain to Charles I, and from 1638 to 1642 was rector of Uppingham. About 1645 he withdrew to Wales, where he had charge of a school, and, in 1658, he removed to Ireland. After the Restoration he was made bishop of Down and Connor. His chief works are *Holy Living*, *Holy Dying*, *Liberty of Prophesying*, *Ductor Dubitantium*, and *Sermons*.

Taylor, Maxwell (1901-), military leader, was born at Keytesville, Mo. After graduation from the U.S. Military Academy, he added special training in engineering and field artillery and in foreign languages. At one time he taught French and Spanish at West Point. In World War II he was commander of the 101st Airborne division, which he led in the invasion of Normandy, and had various other assignments. He was superintendent of the U.S. Military Academy 1945-49 and commanded the 8th Army in Korea. He was U.S. Army Chief of Staff, 1955-59. Having served as President Kennedy's special representative in the Far East and in Europe, he was appointed, 1962, as chairman of the Joint Chiefs of Staff. He is the author of the Book *The Uncertain Trumpet* (1960).

Taylor, Zachary (1784-1850), American general and 12th president of the United States, popularly known as "Old Rough and Ready," was born in Orange County, Va. He was educated in Kentucky, entered the army as lieutenant in 1808, became major in the War of 1812, and served as colonel in the Black Hawk War, 1832. After defeating the Seminoles at Okechobee in 1837, he received the chief command in Florida. He led the army which entered Mexico in 1846; gained the battles of Palo Alto, Resaca de la Palma, and Buena Vista, and, in 1847, successfully closed the campaign. As Whig candidate, he was elected to the presidency in 1848, and was inaugurated in 1849. Important questions under discussion during his term of office were the admission of California, the boundary between Texas and Mexico, and the extension of the slave power. He died in office and was succeeded by Vice-President Millard Fillmore.

Tchaikovsky (*chī-kôf'skĭ*), **Peter Ilyitch (1840-1893)**, Russian composer, was born in the Ural mining region. He studied law at Leningrad, and, in 1859, secured a place in the ministry of justice but soon resigned to study music under Rubinstein at the Conservatory. In 1866, he became teacher of harmony at the Moscow Conservatory.

Eugene Onyegin is the best of his ten operas, which, however, are overshadowed by his great orchestral works. These include the world-famous *Symphonie Pathétique*, *Nutcracker Suite*, and his symphonic poems *Manfred*, *Romeo and Juliet*, and *Francesca da Rimini*. He wrote also overtures, concertos, chamber and piano music, and songs. Tchaikovsky ranks as the greatest composer that Russia has produced.

Teale, Edwin Way (1899-), naturalist, writer, and photographer, was born at Joliet, Ill. Not long after he was graduated from Earlham College, Richmond, Ind., in 1922, he became a science writer. He was on the staff of *Popular Science Monthly* from 1928 to 1941, and since then he has been a free-lance writer and contributing editor of the *Audubon Magazine*. Mr. Teale is an ornithologist, entomologist, and a botanist, and has illustrated many of his nature publications with his own remarkable photographs. Outstanding among the numerous books he has written or edited are the immensely popular *North with the Spring* (1951) and *Autumn Across America* (1956).

Tecumseh (*tē-kŭm'sē*), **(1775-1813)**, Shawnee chief, was born near Springfield, Ohio. He headed an Indian alliance against the whites in the Northwest, but was defeated by the American general Harrison at Tippecanoe, 1811. In the War of 1812, he became an ally of the English, obtained the rank of brigadier general, and in 1813 commanded the right wing in the battle of the Thames, where he fell mortally wounded.

Teisserenc de Bort, Léon Philippe (1855-1913), French meteorologist, was born at Paris. Joining the staff of the weather bureau at Paris in 1880, he was advanced to chief meteorologist in 1892, but resigned to carry on investigations into the upper atmosphere from a private observatory he had constructed at Trappes, near Versailles. By means of balloons sent up in different latitudes he discovered and, in 1898, described the stratosphere. This discovery was later to become of extreme value for aviation. See *Stratosphere*.

Teller, Edward (1908-), physicist, was born at Budapest. He studied at the Institute of Technology at Karlsruhe and at the University of Leipzig. After further experience in Europe as research assistant at Göttingen, Rockefeller fellow at Copenhagen, and lecturer in London, he became professor of physics at George Washington University. He conducted nuclear studies at the University of Chicago and assisted with the Manhattan project which produced the first atomic bomb. In 1956 he became professor of physics at the University of California, and since 1958 he has directed the University's radiation laboratory. He is co-author of *The Structure of Matter* and *The Nuclear Future*.

Tennant, Smithson (1761-1815), English chemist, was born at Selby, Yorkshire. He studied botany, chemistry, and medicine at Cambridge, where he was graduated in medicine in 1790. In 1813, he was appointed professor of chemistry at Cambridge. His most notable achievement was the discovery of the metals iridium and osmium, both of which have unique uses in the arts.

Tennyson, Alfred Tennyson, Baron (1809-1892), English poet was born at Somersby, Lincolnshire. He was educated at Cambridge, gaining the chancellor's medal by his poem entitled "Timbuctoo." His literary career dates from the appearance of *Poems, Chiefly Lyrical* in 1830, after which his reputation slowly increased until the publication, in 1842, of *Poems, by Alfred Tennyson* raised him to supremacy among contemporary English masters of verse. In 1847, *The Princess* appeared and, in 1850, the elegies entitled *In Memoriam*.

On the death of Wordsworth in 1850, Tennyson was made poet laureate. In 1852, he issued his magnificent *Ode on the Death of the Duke of Wellington*. *Maud, and Other Poems* appeared in 1855. The *Idylls of the King*, published in 1859, at once took rank among the noblest poems of the language. Next followed *Enoch Arden, Aylmer's Field*, and *Tithonus*. In 1875, he published the poetic drama *Queen Mary*, which was followed by *Harold* and *Becket*. Other works were *Locksley Hall Sixty Years After*; *Demeter, and Other Poems*; *Robin Hood*; and *Maid Marian*.

Tennyson was the representative poet of the Victorian era, as Spenser was of the Elizabethan court, Milton of the Protectorate, and Pope of the reign of Queen Anne. In 1884, he was created baron. See *Arden, Enoch*; *Idylls of the King*; *Locksley Hall*.

Terence (*tĕr'ĕns*), or **Publius Terentius Afer (c. 190 B.C.-c. 159 B.C.)**, Roman writer of comedies, was born in Carthage, of African origin. He was the slave of a Roman senator, who educated him in Rome and finally gave him his freedom. The success of his first play, *Andria*, in 166, won him the patronage of Lælius and the younger Scipio. Terence's plays served as a model for Molière and other modern dramatists. His extant plays include also *Hecyra*, *Heautontimoroumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. He died while on a trip to Greece made for the purpose of studying the comedies of Menander.

Terry, Ellen Alice (Mrs. James Carew), **(1848-1928)**, English actress, was born at Coventry. She made her first appearance on the stage in 1856, as the boy Mamillius in *The Winter's Tale*. In 1867, she appeared for the first time with Henry Irving, with whom, after 1878, she was associated for 24 years, rising to foremost rank among English actresses. Her notable roles include Portia, Hermione, Juliet, Mistress Page, and Viola, in Shakespearean plays; Fair Rosamund in Tennyson's *Becket;* and Madame Sans-Gêne in a Sardou adaptation. Her writings include *The Russian Ballet* and *The Story of My Life*.

Tertullian (*tĕr-tŭl'ĭ-ăn*), **Quintus Septimius Florens (c. 150 A.D.-c. 230)**, a father of the Latin Church, was born at Carthage. He practiced law in Rome and later returned to his birthplace, where he became a presbyter and spent the rest of his life. Well versed in Greek and Roman literature, he was remarkable for his impassioned eloquence, which was given full sway in his most famous work, *Defense of the Christian Religion*.

Tesla (*tĕs'lä*), **Nikola (1857-1943)**, American electrical inventor, was born in Smiljan, Yugoslavia. He studied engineering in Graz. In 1884, he came to the United States and for several years was employed in the Edison establishment at Orange, N. J. Subsequently he devoted himself to electrical research and invention, discovering

the principle of the rotary magnetic field, and applying it to the induction motor. Tesla's inventions include dynamos, transformers, induction coils, oscillators, and arc and incandescent lamps. He devoted many years to an attempt to solve the problem of wireless transmission of electric power.

Tetrazzini (*tā'trät-sē'nē*), **Luisa (1874-1940),** Italian coloratura soprano, was born in Florence. She studied under Signor Cecherini and, in 1895, made her operatic debut as Inez in *L'Africaine.* She sang in Rome and other cities, everywhere increasing her fame. In 1907, she won a great triumph at Covent Garden, London. Upon appearing at the Manhattan Opera House, New York, in 1908, she was recognized as a dramatic singer of the first rank. From 1910 to 1913, Tetrazzini made extended concert tours in the United States, and, in 1913-14, she was a regular member of the Chicago Opera Company. Possessing a voice of remarkable purity and beauty, Tetrazzini ranked among the greatest modern coloratura singers.

Thackeray, William Makepeace (1811-1863), English novelist, was born at Calcutta, India. He was educated at the Charterhouse and at the University of Cambridge. After working unsuccessfully as an illustrator, he abandoned art for literature and rose to share with Dickens foremost rank among British novelists of his time. His earlier writings, which appeared under the pseudonym "Michael Angelo Titmarsh," included contributions to *Punch* and several volumes of wit and satire. *Vanity Fair,* which appeared in 1847-48, established his reputation. Then followed *Pendennis, Henry Esmond, The Newcomes, The Virginians,* and *The Adventures of Philip,* which have become classics of English fiction. Thackeray's last novel, *Denis Duval,* was left unfinished at his death. See *Barry Lyndon; Sedley, Mr.; Sharp, Rebecca; Vanity Fair.*

Thales (*thā'lēz*), **(c. 640 B.C.-c. 546 B.C.),** Greek philosopher and scientist, was born in Miletus. Thales is universally recognized as the founder of Greek geometry, astronomy, and philosophy. His claim to be the founder of mathematics rests upon his proofs of some of the elementary propositions of geometry. In astronomy, his most notable achievement was his prediction of an eclipse of the sun, which occurred May 28, 585. In philosophy, he sought a single constituent element, or principle, out of which the world is formed; this he declared to be water, or moisture.

Thaxter, Celia Laighton (1836-1894), American poet and juvenile writer, was born at Portsmouth, N. H. She spent much of her girlhood and later life on the Isles of Shoals, where her father was the lighthouse keeper. In 1851, she married Levi Lincoln Thaxter, a Browning scholar. Her poetry is reflective of her quiet life and the gentler aspects of nature. Her works include *Among the Isles of Shoals, Idylls and Pastorals,* and *Stories and Poems for Children.*

Themistocles (*thē-mĭs'tō-klēz*) **(c. 514 B.C.-449 B.C.),** Athenian general and statesman, was born at Athens. He fought at Marathon, and devoted the succeeding years to the upbuilding of the Athenian navy, greatly adding to its power when he was chief archon in 481. On the invasion of Greece by Xerxes, he was appointed commander of the Athenian fleet, and the great naval victory of Salamis was due to his courage, his foresight, and his astute diplomacy. Accused of peculation about 471, he was ostracized and retired for a time to Argos. In 465, he went to the Persian court, where he was received by Artaxerxes, and thereafter lived securely in Magnesia until his death.

Theocritus (*thē-ŏk'rĭ-tŭs*), Greek bucolic poet, flourished about 310-245 B. C. He was reputed to be a native of Syracuse, but very little is known of his personal history. Of his writings about 30 idyls and a number of epigrams are extant. In his poems Theocritus united popular and artistic elements with marvelous skill and is justly called the father of pastoral poetry. Virgil in Latin poetry and Spenser and Milton in English have imitated his style.

Theodoric (*thē-ŏd'ō-rĭk*) **the Great (c. 454-526),** founder of the Ostrogothic kingdom in Italy, was born in Pannonia. For ten years during his youth he was a hostage at Istanbul. In 474, he succeeded his father as king of Pannonia. In 489, he advanced upon Italy, overthrew Odoacer, and became sole ruler. He was then the most powerful of the Gothic kings, with an empire embracing Italy, Sicily, and Dalmatia, besides German possessions. Proving himself a wise and strong ruler, he became one of the great heroes of German legend and figures in the *Nibelungenlied.*

Theodosius (*thē'ō-dō'shĭ-ŭs*) **the Great (c. 346-395),** Roman emperor, was born near Segovia. He accompanied his father, a celebrated Roman general also named Theodosius, on successful campaigns in Britain and elsewhere. His father was beheaded at Carthage in 376 and the son thereupon retired to his patrimonial estates in Spain. Upon the death of Valens, Gratianus called Theodosius from retirement, made him co-ruler, placing, in 379, Egypt and the East under his administration and intrusting him with the protection of the empire against the Goths.

In four years Theodosius pacified the Visigoths, and, in 386, he conquered the Ostrogoths. In 388, he restored Valentinian II to the throne of the Western empire. In 394, Theodosius overthrew the armies of Valentinian's successor, Arbogastes, and reunited the Eastern and the Western empire for a few months preceding his death.

Theophrastus (*thē-ō-frăs'tŭs*) **(c. 372 B. C.-287 B. C.),** Greek philosopher and naturalist, was born at Eresus, in Lesbos. He became a pupil of Plato at Athens and later of Aristotle, at whose death he was made head of the Peripatetic School, which he conducted for 35 years. He maintained the high character of the school, which for a time enrolled more than 2000 students and won distinguished reputation in Greece and in other countries. Aristotle also made Theophrastus guardian of his children and bequeathed to him his library and the original manuscripts of his works.

While in philosophy Theophrastus closely adhered to the teachings of his great master, he was more devoted to natural history than to metaphysics and his chief fame rests upon his botanical works. In his *History of Plants* and in his *Theoretical Botany,* he describes about 500 species then made use of in treating diseases. He wrote treatises *On Mineralogy, On Fire, On the Senses,* and *On Metaphysics.* His famous book of sketches called *Ethical Characters* was widely popular and has often been imitated by modern writers.

Thespis, Greek poet, generally regarded as the father of tragic drama, flourished in the 6th century B. C. Before his time, choruses sang hymns in honor of Bacchus or other dieties, relating to their exploits. According to Diogenes Laërtius, Thespis introduced into the chorus an actor to play the part of the deity or hero. By his dialogue with the leader of the chorus this actor gave dramatic vigor to the story.

The plays of Thespis were usually given under his direction on a rude stage, the paraphernalia for which were transported by wagons and were set up at different places suitable for giving performances. He is said to have lived, however, to see the drama established as a state institution by Pisistratus, 535 B. C.

Thiers (*tyâr*), **Louis Adolphe (1797-1877),** French statesman and historian, was born at Marseilles. He was educated for the law, but discarded it for journalism. During 1823–27 appeared his *History of the French Revolution.* Active in promoting the revolution of 1830, he became minister of the interior in 1832, served in various offices in several cabinets, and, for a brief period in 1840, was premier. Withdrawing from politics, he then wrote his *History of the Consulate and the Empire.* He entered the *corps législatif* in 1863 and, in 1870, resolutely opposed the impending war against Germany. In 1871, he succeeded in effecting peace on the best terms possible, and was elected president of the new republic. He resigned this office in 1873. Thiers was one of the most influential political leaders of France, and, on the collapse of the Empire, was the foremost figure in reconstructing the nation.

Thomas (*tô'mà'*), **Ambroise (1811-1896),** French composer, was born at Metz. He received his education in music at the Paris Conservatory. His first opera, *La Double Echelle,* published in 1837, was followed by *Betty, Le Caïd, Le Songe d'une Nuit d'Eté, Le Carnaval de Venise, Mignon, Hamlet,* and *Françoise de Rimini.* His *Hamlet* was very successful in France and his *Mignon,* which appeared in 1866, won world-wide popularity. He wrote also many canatas, part-songs, and choral pieces. See *Mignon.*

Thomas, Augustus (1857-1934), American playwright, was born at Saint Louis, Mo. He dramatized Mrs. Burnett's story *Editha's Burglar* in 1887; produced his first original play, *A Man of the World,* in 1889; and soon rose to first rank among American dramatists. The masterly dramatic technique of Thomas is well exemplified in *Arizona* and in *The Witching Hour,* while in *Alabama* his earlier, and in *As A Man Thinks* his later, method is revealed. In 1912, he was elected a member of the American Academy of Arts and Letters. See *Witching Hour, The.*

Thomas, Dylan (*dĭl'un*) **Mariais (1914-1953),** Welsh-born British poet, won immediate acclaim in the mid-thirties with his first two volumes of verse, *Eighteen Poems* and *Twenty-five Poems.* With the publication in 1946 of his *Deaths and Entrances,* he established himself as one of the major British poets of this century. His *Collected Poems,* which appeared in 1952, contained only a few poems written after 1946. Of his small prose output, the semi-autobiographical volume of sketches, *Portrait of the Artist as a Young Dog,* is the best known. A characteristic of all Dylan Thomas's poetry is the rich beauty of its word music. He died in the United States.

Thomas, George Henry (1816-1870), American general, was born in Southampton County, Va. He was graduated from West Point in 1840 and served with distinction in the Mexican War. In 1861, he was appointed brigadier general of volunteers, and, in January 1862, he won the battle of Mill Springs. As major general in command of the center, he saved the battle of Stone River. At Chickamauga, he

rendered the victory a barren one for the Confederates and gained the title of "the rock of Chickamauga." In November 1863, at the battle of Chattanooga, he captured Missionary Ridge. In 1864, he commanded in Sherman's advance on Atlanta. Later the same year, he crushed Hood's army at Nashville.

Thomas, Lowell (1892-), traveler, news commentator, historian, and producer, was born at Woodington, Ohio. He spent his boyhood at Cripple Creek, Colo., where his father was a physician. A graduate of the University of Denver and Princeton University, he became professor of oratory at Kent College of Law and later was instructor in English at Princeton. He was chief of a civilian mission sent by President Wilson to make a historical record of World War I. In this connection he was with the Allied armies in Europe and with General Allenby in Palestine, where he met the fabulous T. E. Lawrence. Popular books resulting from his war investigations were *With Lawrence in Arabia* (1924) and *Count Luckner, The Sea Devil* (1927).

Since 1930, as news commentator for radio and for movie reels, he has become known to millions as an interpreter of current history, local and world-wide. More recently, as producer of Cinerama, he has demonstrated the satisfying realism possible in wide-screen travel pictures. Between broadcasting assignments he has traveled much and lectured extensively. In 1949 he was injured while making a Tibetan expedition on horseback over Himalayan trails, but recovered and brought back much information from that isolated country. Among his recent writings are *The Seven Wonders of the World* (1956), *History As You Heard It* (1957), *The Vital Spark* (1959), and *Sir Hubert Wilkins: His World of Adventure* (1961).

Thomas, Norman Mattoon (1884-), American Socialist leader, was born at Marion, O. He was graduated from Princeton university in 1905 and from Union Theological Seminary in 1911. Ordained to the Presbyterian ministry in the latter year, he occupied several pastorates in New York City. His sympathies being deeply engaged in the interest of social betterment, he founded *The World Tomorrow* in 1918. As a Socialist candidate, he ran for governor of New York State in 1924, for mayor of New York City in 1925, and for president of the United States in 1928, 1932, 1936, 1940, 1944, and 1948.

Thomas, Theodore (1835-1905), American orchestral conductor was born at Esens, East Friesland, Germany. At the age of 14 he came with his parents to New York City, where he joined the orchestra of the Italian Opera. Thomas was director of the College of Music at Cincinnati, 1878-80, and conductor of the New York Philharmonic Society, 1880-90. He then went to Chicago, where he developed one of the world's great orchestras. He exercised a deep influence upon the development of musical taste in America.

Thomas à Becket. See *Becket, Thomas à.*

Thomas à Kempis. See *Kempis, Thomas à.*

Thompson, Dorothy (1894-1961), American journalist was born at Lancaster, N. Y. After being graduated from Syracuse University in 1914, she engaged in social work until 1920 and then went to Europe as foreign correspondent for certain New York and Philadelphia newspapers. She was the wife of Sinclair Lewis, the novelist, from 1928 to 1943. Beginning in 1936, she began writing syndicated articles, mainly interpreting foreign events.

Thompson, Ernest Seton. See *Seton, Ernest Thompson.*

Thomson, Elihu (1853-1937), American electrician and inventor, was born in Manchester, England. After being graduated from Central High School, Philadelphia, 1870, he was a teacher of chemistry and mechanics there until 1880. He then became electrician for the Thomson-Houston and General Electric companies, which manufactured his inventions, covered by more than 700 patents. He invented the process of electric welding which bears his name, many devices in electric lighting and electric motor systems, and a technique for making fused quartz.

Thomson, Sir Joseph John (1856-1940), English physicist, was born near Manchester. He was graduated from Trinity College, Cambridge, 1880. In 1884, he became professor of experimental physics, Cambridge, and, in 1905, professor of physics at the Royal Institution, London. In 1918, he was made master of Trinity College, Cambridge. Thomson's researches on the ionic theory of electricity, on radioactivity, and on the electrical theory of inertia of matter led him to the discovery of the electron, a central event in the history of modern science. He was awarded in 1906 the Nobel prize for physics.

Thomson, Sir William. See *Kelvin, Lord.*

Thoreau (*thō'rō; thō-rō'*), **Henry David (1817-1862)**, American naturalist and author, was born at Concord, Mass. He was graduated from Harvard in 1837, and devoted himself to the study of nature and to writing. Emerson says of him: "He was bred to no profession; he never married; he lived alone; he never went to church; he never voted; he refused to pay a tax to the state; he ate no flesh; he drank no wine; he never knew the use of tobacco; and, though a naturalist, he used neither trap nor gun." This "poet naturalist" built with his own hands a small cabin on the banks of Walden Pond, near Concord, and lived there alone for two years. He gave an account of his experiences in his *Walden*, published in 1854. Among his other works are *Cape Cod, The Maine Woods, Excursions*, and *A Yankee in Canada*. Elected to the American Hall of Fame in 1960. See *Walden.*

Thorndike, Edward Lee (1874-1949), American psychologist, was born at Williamsburg, Mass., and was educated at Wesleyan, Harvard, and Columbia universities. After a year spent as instructor in education at Western Reserve University, he was appointed to the faculty of Teachers College, Columbia University, and became professor of educational psychology in 1904. From 1921 to 1940, he was professor and director of the Division of Psychology of the Institute of Educational Research. His published works include *Principles of Teaching, Animal Intelligence, The Original Nature of Man, The Measurement of Intelligence*, and *Human Nature and the Social Order.*

Thornton, Sir Henry Worth (1871-1933), British railway manager, was born at Logansport, Ind. Educated at the University of Pennsylvania, he entered the service of the Pennsylvania Railroad in 1894, rose to the post of division engineer in 1899, and was superintendent of various divisions from 1901 to 1911, when he was made general superintendent of the Long Island Railroad.

In 1914, Thornton became general manager of the Great Eastern railway of England. In 1917, he was made also deputy director of inland waterways and docks, and, in the following year, he became inspector general of movements and railways. In 1919, becoming a British subject, he was appointed inspecto general of transportation, with rank of major general. In 1922, he was made general manager of all government-owned railways in Canada.

Thorvaldsen (*tôr'vál-sĕn*), **Bertel (1770-1844)**, Danish sculptor, was born at Copenhagen. He studied at the Academy of Copenhagen; in 1793, gained the gold medal in sculpture; and, in 1797, went to Rome for further study. His first great work was the colossal statue "Jason." Except for a visit to Denmark, 1819-20, when he executed the statues of Christ and the twelve apostles, he remained in Rome until 1838. Thorvaldsen's masterpieces include "Entry of Alexander into Babylon," "Cupid and Psyche," "St. John Preaching in the Wilderness," "Christus Consolator," the statue of "Prince Poniatowski," the medallions "Night" and "Morning," and the "Lion of Lucerne." Approaching the purity and repose of Greek art, Thorvaldsen's work is the best which the so-called classicist school has produced in modern sculpture. See *Sculpture.*

Thucydides (*thû-sĭd'ĭ-dēz*) **(c. 454 B. C.-c. 399 B. C.)**, Greek historian, was born at Athens, of a noble Athenian family, and possessed great wealth and influence. Failing in an expedition which he commanded during the Peloponnesian War, he was banished from Athens in 423. During his exile he wrote *History of the Peloponnesian War*, remarkable for the fullness and the exactness of its details and for its philosophical spirit. Thucydides is universally regarded as the first critical historian and the greatest historian of antiquity.

Thurber, James Grover (1894-1961), American humorist and cartoonist, was born at Columbus, Ohio, where he began journalistic work in 1920. In 1926, he became a contributor to *The New Yorker* magazine, in which most of his drawings and sketches have appeared prior to publication in book form. His publications include *The Owl in the Attic* (1931); *The Seal in the Bedroom* (1932); *My Life and Hard Times* (1934); *The Thurber Carnival* (1945); *The Beast in Me and Other Animals* (1948); *The Thirteen Clocks* (1950); and *Thurber Country* (1953). In 1929, he collaborated with E. B. White in writing the book *Is Sex Necessary?* and in 1940 with Elliott Nugent in the play *The Male Animal.*

Thurman, Howard (1900-), Negro clergyman and educator, was born at Daytona Beach, Fla. From the public schools he entered the Florida Baptist Academy and studied later at Morehouse College at Atlanta, Ga. After completing his studies at the Colgate-Rochester Divinity School, he taught at Morehouse College, and at Howard University in Washington. In 1953, he was appointed professor of Spiritual Resources and Disciplines in the School of Theology at Boston University. His best-known books are *Jesus and the Disinherited, Deep Is the Hunger, Meditations of the Heart*, and *Deep River: An Interpretation of Negro Spirituals.*

Tibbett, Lawrence Mervil (1896-1960), American baritone singer, was born at Bakersfield, Cal. After a junior college course in Los Angeles, he studied singing in Los Angeles and New York. He first appeared on the concert

stage in 1917 and had his operatic debut in Hollywood Bowl in the role of Amonasro in *Aïda*, 1923. Later the same year he sang the part of Valentine in *Faust* with the Metropolitan Opera Company.

Tiffany, Charles Lewis (1812-1902), American merchant, was born at Killingly, Conn. In 1837, in partnership with John B. Young, on a borrowed capital of $1000, he established a stationery and fancy-goods store in New York City. The jewelry part of the business grew rapidly. In 1847, Tiffany began the manufacture of gold jewelry and, in 1848, made immense profits in the diamond trade. The firm became Tiffany and Company in 1851; later it established branches in several European centers, and became the leading importing and manufacturing jewelry firm in the United States. Tiffany adopted the sterling silver standard, .925 fine, which has since become standard throughout the country.

Tiffany, Louis Comfort (1848-1933), American artist, son of Charles Lewis Tiffany, was born in New York City. He studied under George Inness and Samuel Coleman, New York, and under Léon Bailly, Paris, and devoted himself chiefly to decorative art, particularly mosaics, stained glass, and enamels. His best-known invention is the Tiffany favrile glass, which possesses refractive powers capable of iridescent effects. Among his oil paintings are "Algerian Shops" and "The Pool."

In 1918, he established at Oyster Bay, N. Y., the Louis Comfort Tiffany Foundation for art students. To this he deeded his entire art collection, his country home known as Laurelton Hall, a museum, and Tiffany Chapel, together with a substantial endowment for maintenance.

Tilden, Samuel Jones (1814-1886), American statesman, was born at New Lebanon, N. Y. He was educated at Yale and at New York University, and, in 1841, was admitted to the bar. He was a member of the New York legislature in 1846 and of the constitutional convention in the same year. In 1886, he was leader of the Democrats in the state, and attacked and vigorously aided in destroying the "Tweed Ring." In 1874, he became governor of New York; in 1876, he was Democratic candidate for the presidency, and received a majority of the popular vote, but on final count lacked one of a majority in the electoral vote. He left a large part of his fortune of 5 million dollars to found a Free Library in New York City.

Tilly, Johann Tserklaes, Count of (1559-1632), Belgian general, one of the great leaders of the Thirty Years' War, was born near Gembloux, Belgium. He was educated for the priesthood but abandoned the church for the army, receiving his military training under Parma and Alva. Devoted to the Catholic cause, he was given command of the Catholic army at the outbreak of the Thirty Years' War, during which he won many notable battles. In 1630, he succeeded Wallenstein as commander in chief of the Imperial forces. In 1631, he sacked with merciless cruelty the town of Magdeburg, a deed which Gustavus Adolphus avenged by crushing Tilly's forces in two successive battles, at Breitenfeld and at the river Lech, in the latter of which Tilly was mortally wounded.

Timoshenko (*tyĭ-mō'shĕn-kō*), **Semion (1895-),** Russian general was born at Furmanska, Bessarabia. He served in World War I and afterwards in the Red Army. In 1939-40 he commanded in Finland and Poland, and was made marshal and commissar for defense. In 1941 he successfully defended Moscow against the first German attacks, and in the next two years led powerful offensives which reconquered much of Russia.

Timrod, Henry (1829-1867), American poet, was born at Charleston, S. C. He was educated at the University of Georgia, and after some study of law became a tutor, devoting his leisure to writing. In 1860, he published a volume of poems which marked him as one of the most gifted poets of the South. He was ruined by the Civil War. His poetry was published after his death by his friend P. H. Hayne. Among his best poems are *Charleston, At Magnolia Cemetery*, and *The Cotton Boll*.

Timur (*tī-moor'; tē-moor'*) **(c. 1336-1405),** Oriental conqueror, sometimes called Tamerlane, was born at Sebz, near Samarkand. In 1361, he succeeded his father as chief of the Turkish tribe af the Berlas. In 1369, he conquered Balkh, and made Samarkand the seat of his empire. He afterward overran Turkestan, subdued Iran, penetrated Russia as far as Moscow, and then, turning to India, captured Delhi. He subsequently invaded Syria, and defeated and captured the Turkish Sultan Bajazet I. This defeat forced the Turks to raise the siege of Istanbul, and prolonged the independence of that city by fifty years.

Tintoretto (*tĕn'tō-rĕt'tō*) **(1518-1594),** Venetian historical painter, whose real name was Jacopo Robusti, but he was called Tintoretto—"little dyer"—from his father's trade. He was self-taught except for a few lessons from Titian. He took as his motto "The design of Michelangelo and the coloring of Titian." His work is notable for its mastery of light and shade, vigorous, dramatic action, and rich color. Tintoretto was an exceedingly prolific painter. Among his famous pictures are "The Last Supper," "The Last Judgment," "Paradise," "The Presentation of the Virgin," and "Miracle of Saint Mark."

Tirpitz (*tĭr'pĭts*), **Alfred von (1849-1930),** German admiral, was born at Kustrin on Oder. He became lord high admiral in 1911. In World War I he carried out the German policy of submarine blockade and advocated the "unrestricted marine warfare," which later brought the United States into the war. He retired as head of the navy after the sinking of the *Lusitania*.

Tischendorf (*tĭsh'ĕn-dôrf*), **Lobegott Friedrich Konstantin von (1815-1874),** German biblical scholar, was born at Lengenfeld, Saxony. In 1845, he became professor of theology at Leipzig. His labors in search of the best and most ancient manuscripts of the New Testament resulted in the discovery of the 4th century *Sinaitic Codex* at the monastery on Mount Sinai. His works include editions of the Sinaitic and other manuscripts, critical editions of the New Testament, and the *Monumenta Sacra Inedita*.

Titchener (*tĭch'ĕn-ĕr*), **Edward Bradford (1867-1927),** American educator, was born at Chichester, England. He was graduated from Brasenose College, Oxford, in 1890 and studied under Wundt at Leipzig. He became assistant professor of psychology in 1892, professor in 1895, and research professor in 1910, Cornell University. Titchener developed the laboratory of experimental psychology at Cornell to a point of great efficiency, making extensive original investigations in the field of general as opposed to individual psychology. His *Experimental Psychology* became a standard work.

Titian, or **Tiziano Vecelli (c. 1477-1576),** the greatest painter of the Venetian school, was born at Capo del Cadore, Venetia, Italy. His early disposition toward art was fostered at Treviso under the Zuccatis, who were masters in drawing and mosaics; but, as he was more inclined to painting, Titian was placed under the tuition of Gentile Bellini at Venice. Again he changed; this time, to Giovanni Bellini, whose less labored manner he preferred. Guided by his own genius, the study of nature, and the example of Giorgione, his older fellow pupil, he soon acquired a bolder touch and more vigorous execution.

It is probable that Titian first employed his talents as decorator of the palaces of the great Venetian nobles. His "Pope Alexander VI Commending Jacopo Pesaro to the Madonna," an alterpiece at Antwerp, was painted in 1502 or 1503.

With Giorgione, in 1507-08, he was occupied in the decoration of the Venetian Exchange. In 1512, he produced "Sacred and Profane Love"; in 1514, "The Tribute Money." "The Assumption of the Virgin," begun in 1516 and finished two years later, has been rated among oil paintings as second only to Raphael's "Sistine Madonna."

Titian's reputation soon spread throughout the whole of Italy. While employed by the Duke of Ferrara from 1518 to 1523, he produced three famous mythological pictures, "Worship of Venus," a "Bacchanal," and "Bacchus and Ariadne." His "Death of Peter, Martyr," the most celebrated of his numerous productions, was finished about 1530. In this year he met Charles V. During their intimate, lifelong friendship, Titian executed countless commissions for the emperor. Perhaps the most remarkable portrait extant is his "Emperor Charles V on Horseback."

Accepting an invitation from Paul III to visit Rome, Titian resided there for three years and painted many potentates and men of distinction. The latter part of his life was occupied in working in Venice, chiefly for Philip II of Spain, for whom he painted portraits and various religious and mythological subjects.

Very little is known of his domestic life, save that he married in 1525 and had three children. His beautiful daughter Lavinia has been immortalized by her father.

The works of Titian are said to number more than 600. As a portrait painter and a master of color, he has never been surpassed. His draftsmanship, however, at times is defective. He is noteworthy for the complete, harmonious perfection of his method and for his mastery of all subjects, whether in the realm of nature or of man. He died in Venice, at 99 years of age. See *Renaissance, The*.

Tito (*tē'tō*), **Marshal, (Jozip Brazovich) (1892-),** Yugoslav partisan leader, was born near Zagreb, Croatia. Conscripted into the Austrian army in World War I, he deserted to the Russians and participated in the Revolution. Returning to Croatia in 1923, he took part in the Communist underground labor movement. In August 1942 he became leader of the Yugoslav partisans resisting the Nazi armies. With assistance from Russia, Great Britain, and the United States, Yugoslavia was liberated and a federated republic established. Tito became the first premier of the new government in January 1946. Having been president of Yugoslavia since 1953, he was made president for life in 1963.

Tocqueville (*tŏk'vĭl;* Fr., *tôk'vēl'*), **Alexis Charles Henri Clérel de (1805-1859),** French statesman and writer, was born at Verneuil. He studied at Metz and at Paris, and in 1825, was admitted to the bar. He was sent in 1831 to

America to report on the penitentiary system and wrote *Democracy in America*, which made a profound impression in Europe. He became a member of the Academy of Moral and Political Sciences and of the French Academy. In 1849 he became vice president of the Assembly and for a short time was minister of foreign affairs. After the *coup d'etat* of 1851, he retired to his Norman estate. He published in 1856 *L'Ancien régime et la révolution.*

Todd, Sir Alexander (**1907-**), chemist and 1957 Nobel Prize winner, was born in Glasgow, Scotland. He was graduated from the University of Glasgow and carried on further studies at the University of Frankfurt and Oxford University. Interested especially in the fundamental structure of vitamins, he has worked on the staff of the University of Edinburgh in medical chemistry and at the Lister Institute of preventive medicine in London. He has been professor of chemistry and director of laboratories at the University of Manchester and, since 1952, chairman of the advisory council on scientific policy to the British government.

Tolstóy (*tŏl-stoi'*), **Liov (Leo) Nikolaievitch, Count** (**1828-1910**), Russian novelist and social reformer, was born in the government of Tula. He studied at the University of Kazan. In 1851, he entered the army, and served in the Caucasus and at Sebastopol. Leaving the army soon after the close of the Crimean War, he devoted himself to literature. His *War and Peace* is regarded as his masterpiece; but his *Anna Karenina*, largely autobiographical, is better appreciated.

Tolstoy wrote much on education, and in his later years devoted himself to religious teaching. He made "Resist not evil" the keystone of the Christian faith. His religious views are set forth in *My Confession.* His writings include also *The Kingdom of God Is Within You, The Four Gospels Harmonized and Translated, The Cossacks, The Kreutzer Sonata, Master and Man*, and *Ivan Ilyitch.*

Torrey, John (**1796-1873**), American botanist, was born in New York. He was graduated from the New York College of Physicians and Surgeons in 1818. In 1824, he gave up medical practice to become professor of chemistry and geology at West Point. From 1827 to 1855 he was professor of chemistry at the College of Physicians and Surgeons, serving also as professor of chemistry at Princeton, 1830-54. From 1853 until his death, he was chief assayer in the United States Assay Office, New York. Torrey's numerous scientific publications were chiefly on botany. With Asa Gray he began the publication of the *Flora of North America*, a monumental work of great value.

Torricelli (*tŏr'rē-chĕl'lē*), **Evangelista** (**1608-1647**), Italian physicist and mathematician, was born probably at Piancaldoli, in the Romagna. He was a pupil of Galileo at the University of Florence, and succeeded him as professor of natural philosophy and mathematics in 1642. He invented the barometer and made improvements in lenses for telescopes.

Toscanini, Arturo (**1867-1957**), Italian musical conductor, was born at Parma and received his musical education at the Conservatory of Music there. His brilliant musical gifts secured him the conductorship of the orchestra at La Scala Opera House in Milan in 1898. In 1908, he came to New York and was principal conductor at the Metropolitan Opera House until 1915. From 1926 to 1932, he conducted the Philharmonic Symphony Society at New York. He was guest conductor at the musical festival in Bayreuth, Germany, in 1930 and later years. In 1937, he organized the National Broadcasting Company's symphony orchestra and conducted it until 1954. Toscanini directed without score some hundred operas. In the building of tremendous climaxes, he had few equals.

Toulouse-Lautrec Monfa, Henri de (**1864-1901**), French artist, was born in Paris, and received his training in the studio of Cormon. He was strongly influenced by Degas and the Japanese artists, but showed much originality in treating his favorite subjects. His pictures of ballets and circus acts are full of spirit and action, of what might be called "realism with a light touch." Besides innumerable sketches and a large group of circus pictures, he is remembered for such lithographs as "Moulin-Rouge" and "Japanese Divan," and for his paintings of "The Promenade" and "The Dancing Women." To quote a French estimate, "More designer than painter, his style is cruel but sure and vigorous." It is particularly the sureness of line that makes a collection of his sketches an ideal instruction book for art students.

Toussaint L'Ouverture (*tōō'săN' lōō'vĕr'tür'*), **François Dominique** (**1743-1803**), Haitian soldier and statesman, son of African slaves, was born near Cape Français. He led the insurrection of 1791-92, which resulted in the emancipation of all slaves in the island. In 1796 he was appointed by the French Directory chief of the army, and gained control of the whole island. When Napoleon tried to re-establish slavery in 1801, Toussaint was arrested and sent to a prison in France, where he died.

Toynbee, Arnold Joseph (**1889-**), British historian, was born in London, and received a classical education at Winchester and Oxford. During the World Wars he served in the Intelligence and Research department of the Foreign office. From 1919 he taught at the University of London and the Royal Institute of International Affairs. While Toynbee has written largely of Greece, Turkey, and international relations, his principal work is *A Study of History*, an explanation of the rise and decline of civilizations in terms of their successful or unsuccessful reactions to challenge from within or without. *An Historian's Approach to Religion* was published in 1956.

Trajan (*trā'jăn*), or **Marcus Ulpius Traianus** (**53 A.D.-117 A. D.**), Roman emperor, was born near Seville, Spain. After winning distinction in Parthian and German campaigns, Trajan was adopted by Nerva in 97 as his colleague and successor, and, in 98, became emperor. In civil affairs he ruled wisely, and in his military character he sustained the glory of Rome by defeating the Dacians, Parthians, and Persians. The column of Trajan in Rome was erected to commemorate his victory over the Dacians.

Traubel, Helen (**1905-**), American soprano, was born at St. Louis, Mo. While still in her teens, she sang with the St. Louis Symphony Orchestra. In 1939 she became a member of the Metropolitan Opera, continuing with that organization until 1953. She soon became the Metropolitan's leading Wagnerian singer, the first American-born and completely American-educated soprano to achieve such a status.

Trevelyan (*trē-vĕl'yăn*; *-vĭl'-*), **Sir George Otto** (**1838-1928**), English statesman and author, was born at Rothley Temple, Leicestershire. He was graduated from Cambridge in 1861. He was elected to Parliament in 1865 and held his seat until 1897. He was a lord of the Admiralty in 1868, and held other positions. Trevelyan did much for the abolition of purchase in the army, and for the enfranchisement of agricultural laborers. He wrote *The Early History of Charles James Fox, The American Revolution*, and *The Life and Letters of Lord Macaulay* (his uncle).

His son, George Macaulay Trevelyan (1876-1962), regius professor of modern history at Cambridge and master of Trinity College, holds high rank among English historians. His works include *England in the Age of Wickliffe, Garabaldi and the Thousand, England under the Stuarts*, and *England under Queen Anne.*

Tripler, Charles Eastman (**1849-1906**), American physicist and inventor, was born in New York City, and was privately educated. In his private laboratory he conducted extensive experiments in electricity and mechanics. His greatest achievement was the production of liquid air, obtained in 1895 by a machine which compressed atmospheric air at a temperature of about 200° below zero. Linde in Germany and Hampson and Dewar in England also accomplished this at about the same time.

Trollope (*trŏl'ŭp*), **Anthony** (**1815-1882**), English novelist, was born in London. He was educated at Winchester and at Harrow, and for many years thereafter held a place in the London Post Office. He produced a long series of entertaining novels, noteworthy for their pleasing realism and truthfulness of detail. Among these are *Barchester Towers, Doctor Thorne, The Bertrams, The Claverings, Castle Richmond*, and *The Golden Lion of Granpere.* He wrote also several volumes of travel and an autobiography.

Tromp (*trŏmp*), **Martin Harpertzoon** (**1597-1653**), Dutch admiral, was born at Brielle. He entered the navy in 1624, and as lieutenant admiral defeated a superior Spanish fleet off Gravelines in 1639. In May 1652, he was beaten by an English fleet under Blake but, in November following, severely defeated Blake off Goodwin Sands. In February 1653, Blake, with Monk and Penn, defeated Tromp off Portland. In June, a terrific battle, in which the Dutch were defeated, took place between Tromp and Dean. In the final battle with Monk, in 1653, off the coast of the Netherlands, the Dutch lost 30 men-of-war, but their greatest loss was the heroic admiral, victor in 33 sea-fights.

Trotzky (*trŏt'skē*), **Leon** (**1879-1940**), Russian revolutionary statesman, was born of Jewish parentage at Odessa. His real name was Leon Bronstein. Imprisoned for revolutionary activities in 1901 and 1905, he fled from Russia, and carried on propaganda work in other countries, finally in New York. Returning to Russia in 1917, he rose to power with Lenin, organizing the Red army and negotiating the treaty of Brest-Litovsk. After the death of Lenin in 1924, Trotzky, favoring world revolution, was defeated for party leadership by Stalin, who placed national development first. Trotzky in 1929 took refuge in Turkey, and lived later in France and in Mexico, where he wrote *The Revolution Betrayed.* He was assassinated.

Trowbridge, John Townsend (**1827-1916**), American novelist, juvenile writer, and poet, was born at Ogden, N. Y. After receiving a common school education, he became a journalist. Settling in Boston in 1848, he devoted

himself to authorship. Among his writings are *Father Bright, Cudjo's Cave, The Three Scouts, The Silver Medal,* the *Jack Hazard* series, and the *Tide Mill* series. Of Trowbridge's verse, the poem entitled *Darius Green and His Flying Machine* is best known.

Truman, Harry S. (**1884-**), 33rd president of the United States, was born at Lamar, Mo. and grew up on a farm. He served in World War I as captain in the 129th field artillery. From 1922 to 1934 he was judge and presiding judge of the Jackson County (Mo.) Court.

He was elected United States senator from Missouri in 1934 and re-elected in 1940. As chairman of the special Senate committee to investigate the defense program, he was responsible for investigating and correcting waste and mismanagement in defense organizations. In 1944 he was nominated for vice-president with Franklin D. Roosevelt, and was elected.

The unexpected death of President Roosevelt made Truman president, April 12, 1945. Among the many problems thrust upon him were the decision to use the A-bomb to shorten the War, negotiations after victory with Premier Attlee and Marshal Stalin at the Potsdam Conference, support for the United Nations charter, and the handling of reconversion and labor troubles following the War.

A Republican Congress, elected in 1946, supported his foreign policy but opposed him and overrode some of his vetoes on domestic issues. In 1948 he was elected president, defeating Thomas E. Dewey, and Congress again came under Democratic control. Declining to run for re-election, he retired in January, 1953. Though still interested in politics, he has been concerned mainly with preparing a record for posterity. His *Memoirs,* in two volumes, appeared in 1955–56. In 1957, at Independence, Mo., the comprehensive Harry S. Truman Library was dedicated and turned over to the U.S. government.

Trumbull, John (**1756-1843**), American historical and portrait painter, was born at Lebanon, Conn. He was graduated from Harvard in 1773 and studied art at Boston and with Benjamin West in London. He served as aide-de-camp to Washington during the Revolution. In 1817, he was employed by Congress to paint four pictures for the rotunda of the Capitol and, in 1824, completed "The Signing of the Declaration of Independence," "Surrender of Burgoyne," "Surrender of Cornwallis," and "Resignation of Washington." See *Painting.*

Tschaikovsky. See *Tchaikovsky.*

Tshombe, Moise (**1919-**), political leader, was born at Musumba in the Katanga province of Belgian Congo. He attended a Mission school, but European travel and experience in business and politics did much to round out his education. As the time approached for freedom of the Congo, he advocated a loose federation in which Katanga province would have virtual autonomy. In this he was opposed by the UN. He was defeated and forced into exile, but was recalled in 1964 to attempt the salvage of a disunited and bankrupt republic of Congo.

Tucker, Sophie (**1884-**), American jazz singer, was born in Poland, while her mother was en route to join Sophie's father who had emigrated to America. As a child she sang to the patrons of the small restaurant which her parents operated in Hartford, Conn. Later she sang for her supper in a New York restaurant, and became a vaudeville performer. When in 1914 she organized her own orchestra called "The Five Kings of Syncopation," she soon won the nickname of "The Queen of Jazz," but today she is better known as "The First of the Red Hot Mammas." The autobiography she wrote was named for her most famous song "Some One of These Days."

Tupper, Sir Charles (**1821-1915**), Canadian statesman was born in Amherst, Nova Scotia. He studied medicine at Edinburgh University and practiced in his native county. In 1855, he was made a member of the provincial legislature, and he was prime minister of Nova Scotia in 1864-67.

Tupper was among the strongest supporters of Confederation. After its consummation, he was for many years a member of the cabinet in the Dominion Parliament and, as minister of railways and canals, promoted the construction of the Canadian Pacific Railway. In 1896, he became prime minister, but was defeated in the same year.

Turenne (*tü'rĕn'*), **Henri de la Tour d'Auvergne, Vicomte de** (**1611-1675**), French general, was born in Sedan, and was brought up in the Protestant faith. In 1630, he entered the French army. He served with distinction under Bernhard of Weimar in 1637-38. In 1642, he conquered Roussillon from Spain, for which service he was made a marshal of France. Commanding an army in Germany in 1643, he defeated the Bavarians, but was himself defeated by their general, Mercy, at Marienthal in 1645. With Condé, he avenged this defeat at Nordlingen, where Mercy was slain. In 1646, he joined the Swedes to complete the conquest of Bavaria and by his victories hastened the close of the Thirty Years' War.

Turgéniev (*tōōr-gĕn'yĕf*), **Ivan Sergeyevitch** (**1818-1883**), Russian novelist, was born in Orel, Russia. After studying at Moscow, Leningrad, and Berlin, he obtained a governmental position at Leningrad. On account of his liberal ideas he was banished, but later was permitted to return to Russia. After 1855 he lived chiefly in Paris. His literary fame rests upon the powerful novels *Fathers and Children, Liza, Smoke, Rudin, Faust, On the Eve, Virgin Soil,* and *Clara Militch.* Turgéniev ranks as one of the greatest prose artists in Russian letters and enjoyed a great reputation throughout Europe.

Turgot (*tür'gō'*), **Anne Robert Jacques** (**1727-1781**), French statesman and economist, was born at Paris. He was educated for the Church, but later turned to the law and to political economy. He identified himself with the philosophical and liberal thought of the time, contributed to the *Encyclopédie,* and was a member of the physiocratic school of economists. In 1761, he was made intendant of Limoges, where he introduced many reforms, such as abolishing the method of mending the roads by the compulsory labor of the poor. Under Louis XVI he was put in charge of the finances of the country, and, if his plans had been received with favor by the nobility and the statesmen, France might have been spared the horrors of the Revolution. Among his writings are *Reflections upon the Formation and Distribution of Wealth* and a work on *Usury.*

Turner, Joseph Mallord William (**1775-1851**), British landscape painter, was born at London. His genius for art was revealed very early, and, at 15, he exhibited a drawing at the Royal Academy. His industry was almost as unexampled as his genius. To the exhibitions of the Royal Academy he contributed over 250 pictures. Among his most celebrated paintings are "Dido Building Carthage," "Sun Rising in the Mist," and "The Fighting *Téméraire,*" in the National Gallery, London; "The Slave Ship," in the Boston Museum; "The Castle of Indolence" and "Grand Canal," in the Metropolitan Museum, New York. Turner surpassed all other English landscape artists of his time. His most striking quality is a splendid, brilliant, though sometimes unrealistic, coloring, combined with an element of subtle mystery.

Twain, Mark. See *Clemens, Samuel Langhorne.*

Tweedsmuir, John Buchan, Baron (**1875-1940**), British administrator and writer, the 14th governor general of Canada, was born at Perth, Scotland. Educated at Glasgow and Oxford universities, he served as private secretary to Lord Milner, 1901-03, then high commissioner to South Africa. He then joined the publishing firm of Thomas Nelson and Sons. In 1916-17, he was attached to the headquarters staff of the British army in France. The next year he was director of information under the prime minister.

From 1927 to 1935 he represented the Scottish universities in the House of Commons. He was raised to the peerage in 1935 and appointed governor general of Canada. He traveled throughout the Dominion, and won the respect and confidence of its people. His writings include a *History of the Great War;* biographies of Montrose and Cromwell; and his autobiography, *Pilgrim's Way.* Among his works of fiction are *Prester John, The Thirty-Nine Steps, Greenmantle, Witch Wood,* and *Huntingtower.*

Tycho Brahe. See *Brahe, Tycho.*

Tyler, John (**1790-1862**), 10th president of the United States, was born in Greenway, Va. He was graduated from William and Mary College in 1807, studied law, and, in 1809, was admitted to the bar. He was elected five times to the state legislature and three times to Congress. He sympathized with the States'-Rights party, and opposed the United States bank, the protective tariff, and all restrictions of slavery. After serving as governor of Virginia, 1825-27, he was then elected United States senator. From this time he acted with the Whig party, and, in 1840, was elected vice president of the United States.

The death of President Harrison, a month after his inauguration in 1841, made Tyler president. The annexation of Texas and the passing of a protective tariff law were among the important acts of his administration. In 1861, Tyler was president of the peace convention which met at Washington to effect a compromise between the North and the South. He afterward joined the Southern cause and was a member of the Confederate Congress.

Tyndale (*tĭn'dăl*), **William** (**1486-1536**), English divine, was born in Gloucestershire. He studied at both Oxford and Cambridge, where he acquired a knowledge of Greek. Impressed with the importance of giving to the people the Bible in their own language, he determined to translate the New Testament into English. Failing to obtain support in London, he went to Germany. In 1525, the New Testament was printed at Worms and was carried to England.

Tyndale remained on the continent, associated with Luther and other reformers, and wrote tracts advocating the reform doctrine. In 1530, he published a translation of the Pentateuch. He separated himself from the other

English reformers by opposing the divorce of Henry VIII from Catherine of Aragon. In 1535, he was arrested and, after a year's imprisonment at the castle of Vilvorde, near Brussels, was publicly executed as a heretic.

Tyndall (*tĭn'dăl*), **John** (**1820-1893**), British physicist, was born in County Carlow, Ireland. He began his career as surveyor and railway engineer. He studied in Germany from 1848 to 1851, and in 1853, was made professor of natural philosophy in the Royal Institution, London. Tyndall achieved a great reputation as a populizer of science and for his researches in heat, light, and sound. He donated for the benefit of American science the very substantial proceeds of a lecture tour in the United States in 1872-73. Among his writings are *Faraday as a Discoverer*, *The Forms of Water*, *Notes on Light*, and *The Glaciers of the Alps*.

Udall, Stewart Lee (**1920-**), political leader, was born at St. Johns, Arizona. He was graduated from the University of Arizona, studied law, and, in 1948, was admitted to the bar. During World War II, his studies were interrupted by a period of service in the U.S. Air Force. As Representative from the 2nd District, he was a member of Congress in the 84th, 85th, and 86th sessions. In 1960 he was named Secretary of the Interior by President-elect John F. Kennedy.

Ulfilas (*ŭl'fĭ-lăs*), (**c. 311-c. 383**), translator of the Bible into Gothic, was born in Dacia. He was made bishop in 341; was expelled by his heathen compatriots seven years later; and sought refuge, together with a number of newly converted Christians, in lower Mœsia, where he remained for 30 years. Familiar with Latin, Greek, and Gothic, he undertook to translate the whole Bible, with the exception of *Kings*, into Gothic. The chief manuscript of this work, the *Codex Argenteus*, in silver letters on purple parchment, is now in the University Library at Upsala.

Undset, Sigrid (**1882-1949**), Norwegian novelist, was born in Kallundborg, Denmark, of a Norwegian father, who took her at an early age to reside in Oslo, Norway. She was educated in a business college and was a municipal clerk at Oslo until 1909, when she began to support herself by her writings. These include *Kristin Lavransdätter*, a trilogy comprising *The Bridal Wreath*, *The Mistress of Husaby*, and *The Cross*. She wrote also *The Axe*, *The Snake Pit*, and *Madame Dorothea*.

Untermeyer (*ŏŏn'tĕr-mī'ĕr*), **Louis** (**1885-**), American poet and journalist, was born in New York City. He received a high school education and entered a firm of manufacturing jewelers, of which he later became vice president and the manager of a factory at Newark. In addition to his other duties, he joined the editorial staff of *The Masses* and, in the Chicago *Evening Post*, conducted a column under the head "and Other Poets." His poems, noted for their lyric quality are of a high order. Among his writings are *First Love*, *Challenge*, *The Younger Quire*, *These Times*, *The Burning Bush*, *Selected Poems and Parodies*, and *From Another World*.

Urey, Harold Clayton (**1893-**), American chemist, was born at Walkerton, Ind. He taught in rural schools of Montana before studying at the universities of Montana and California. After he was graduated, he worked two years as an industrial chemist, 1917-19, and then engaged in academic work, first at the University of Montana and later at Johns Hopkins, 1924-29, and at Columbia University, where he was made professor of chemistry in 1934. Specializing in the study of molecules and atoms, he won renown for his discovery of an isotope of hydrogen having an atomic weight of 2, double that of the form already known. Water having a large concentration of molecules including the heavier hydrogen atom is known as "heavy water." His work was crowned by an award of the Nobel prize in chemistry for 1934.

Ussher (*ŭsh'ĕr*), **James** (**1581-1656**), British theologian and scholar, was born in Dublin. He was graduated from Trinity College, Dublin, 1600; was ordained deacon and priest, 1601; and was professor of divinity in the University of Dublin, 1607-20. In 1624, he was made archbishop of Armagh. Among his best-known works are *Annals of the Old Testament* and *Chronologia Sacra*. These contain the chronological calculations by Ussher which long appeared in the inner margin of the Bible in the authorized version. According to his calculations, the world was created in the year 4004 B. C.

Van Allen, James A. (**1914-**), physicist, was born at Mt. Pleasant, Ia. and was educated at Iowa Wesleyan College and the State University of Iowa. He did research in terrestrial magnetism at the Carnegie Institute in Washington and directed an applied physics laboratory at Johns Hopkins University. He led a scientific expedition for the study of cosmic radiation in Peru and made similar studies in Alaska, Greenland, and Antarctica. Meanwhile he had become professor of physics at the State University of Iowa. Although his work in developing the proximity fuze and the Aerobee rocket have won him acclaim, he is best known as the discoverer of the "Van Allen Belt," a radioactive layer surrounding the earth, which needs to be considered in all plans for space travel.

Van Alstyne, Mrs. Frances Jane. See *Crosby, Fanny*.

Van Buren, Martin (**1782-1862**), eighth president of the United States, was born of Dutch ancestry, in Kinderhook, N. Y. After becoming a member of the bar, he was elected by the Democratic party to the New York State senate in 1812 and became attorney general in 1815. In 1821, Van Buren entered the United States Senate; was reelected in 1827; but resigned in 1828 to accept the governorship of New York. In 1829, he became secretary of state in President Jackson's cabinet, resigning in 1831. Following the Senate's rejection of his nomination as minister to England, he was elected vice president of the United States in 1832 and, in 1836, was elected president.

On account of the financial crisis of 1837 and the suspension of specie payments by the banks, he recommended to Congress the establishment of an independent treasury, a measure carried into effect in 1840. Renominated by the Democrats, he was defeated by William Henry Harrison and, in 1841, temporarily retired to private life. His third candidacy for the presidency, in 1844, was frustrated by Southern opposition. Subsequently he joined the Free-Soil party and was its unsuccessful nominee for president in 1848. See *Albany Regency*, *Barnburners*, *Free-Soil Party*.

Vancouver, George (**1758-1798**), English naval officer and explorer. He served with Captain Cook in his second and third voyages and, in 1791, was sent to Nootka Sound to take possession of disputed territory. Proceeding by way of the Cape of Good Hope, he surveyed and mapped portions of the coasts of Australia and New Zealand and then sailed by way of Tahiti to Nootka. In 1792, he explored the Strait of San Juan de Fuca and discovered the Gulf of Georgia and Vancouver Island. He described his explorations in *A Voyage of Discovery to the North Pacific Ocean and Round the World in the Years 1790-95*.

Vandenberg, Arthur Hendrick (**1884-1951**), American politician, was born at Grand Rapids, Mich. After studying law at the University of Michigan he worked for *Collier's Weekly*, and edited the Grand Rapids *Herald*. In 1928 he was appointed to the United States Senate, and was later elected for the terms from 1929 to 1952. He took part in the formation of the United Nations, and sat in its first assembly. When the Republicans gained control of Congress he became president pro tem. of the Senate, and helped to carry through the bipartisan foreign policy embodied in the Marshall plan. He wrote *Alexander Hamilton, the Greatest American* and *The Trail of a Tradition*.

Vanderbilt, Cornelius (**1794-1877**), American capitalist, was born near Stapleton, Staten Island, N. Y. He early engaged in steamboat transportation between Staten Island and New York and gained control of the New York and Staten Island lines. Later he established steamship and transfer connections between New York and California. In 1864, he withdrew his capital from shipping and invested it in railroads. In 1867, he secured control of the New York Central Railroad; became its president; and, in 1869, consolidated it with the Hudson River road. By securing the Lake Shore and other railways, he established a trunk line to Chicago. At his death he left a fortune estimated at $100,000,000. A bequest of $1,000,000 founded Vanderbilt University at Nashville, Tenn.

Van Doren, Carl Clinton (**1885-1950**), American editor and literary critic, was born at Hope, Ill. Educated at the University of Illinois and Columbia University, he taught English at Columbia from 1911 to 1930. He acted also as literary editor of the *Nation*, 1911-22, of the *Century Magazine*, 1922-25, and of the *Literary Guild* in 1934, his judgment of writers being accorded high value. Among his writings are *The American Novel*, *Many Minds*, *Sinclair Lewis*, *Benjamin Franklin* (Pulitzer prize, 1939), and *Secret History of the American Revolution*.

His brother, Mark Van Doren (b. Hope, Ill., 1894), collaborated with him in writing *American and British Literature since 1890*. Mark also wrote *Edwin Arlington Robinson*, *A Winter Diary*, *The Transparent Tree*, *Liberal Education*, and *Autobiography*.

Van Druten, John (**1901-1957**), playwright and novelist, was born in London, the son of a Dutch father and an English mother. He studied law, but his chief interest was in writing, and when his play *Young Woodley* proved a success on Broadway he was well started on his career as a playwright. He dramatized Rebecca West's *The Return of the Soldier* and wrote two novels. Probably his best-known plays are *The Voice of the Turtle* and *I Remember Mama*.

Van Dyck, or **Vandyke, Sir Anthony** (**1599-1641**), Flemish painter, was born at Antwerp. He was a pupil of Rubens, and subsequently studied in Venice, Genoa, and Rome. Returning to Antwerp, he painted in the next five years many religious works, including "St. Martin Dividing the Cloak" and "Crucifixion," his greatest work of this type. In 1632, he became court painter to Charles I of England. His full-length picture of "Charles I on Horseback" is his best example of portraiture, the type of

painting for which he is especially celebrated. Most of his later years were spent in England where he amassed a fortune by painting members of the aristocracy. These portraits are characterized by natural pose, elegance, and nobility.

Van Dyke, Henry (1852-1933), American clergyman, educator, diplomat, and author, was born in Germantown, Pa. He was educated at Princeton University and the University of Berlin. He was pastor of the Brick Presbyterian Church, New York City, from 1883 to 1900, when he became professor of English literature at Princeton University. From 1913 to 1917, he was minister to the Netherlands and Luxemburg. Among his works are *The Reality of Religion, The Poetry of Tennyson, The Other Wise Man, The Lost Word, The Ruling Passion,* and *Golden Stars.*

Van Dyke, John Charles (1856-1932), American art historian and critic, was born in New Brunswick, N. J. and studied at Columbia and in Europe. He was admitted to the New York bar, 1877, but turned his attention to literature. In 1878, he was made librarian of Sage Library, New Brunswick, N. J., and, in 1889, professor of the history of art at Rutgers College. Among his works are *How to Judge a Picture, Art for Art's Sake, Nature for Its Own Sake, Grand Canyon of the Colorado,* and *In Java.* He also edited many valuable art histories.

Van Gogh, Vincent (1853-1890), Dutch artist, was born at Groot-Zundert in the Netherlands, the son of a Lutheran minister. After working for a firm of art dealers, he became a teacher and preacher in the mining community of Le Borinage. Here he began to paint the works which were to bring him no money but much posthumous fame. His realistic pictures of peasants were depressingly somber, but after coming in contact with the impressionist group of painters in Paris, he used brilliant colors, intense reds and yellows, for his later pictures. Confinement for insanity, and eventual suicide, cut short his painting career. In recent years there has been a growing appreciation of the originality and powerful intensity of his art, and he has had a vogue which might almost be described as sensational.

Vanier, George P. (1888-), lawyer, soldier, and political leader, was born in Montreal and was educated at Loyola College and Laval University. He had begun the practice of law, but on the outbreak of World War I he enlisted in Quebec's Royal 22nd regiment. He lost a leg in the fighting at Cherisy and was decorated for gallantry by both the British and French governments. Among his peacetime activities were those of director of the Bank of Montreal and of the Standard Life Assurance Company. He was Canadian Minister to France at the beginning of World War II. In 1959 he was appointed Governor-General of Canada by Queen Elizabeth II.

Van Loon, Hendrik Willem (1882-1944), author and lecturer, was born in Rotterdam, the Netherlands, and was brought at an early age to America. He was educated at Harvard University and the University of Munich; served as a correspondent of the Associated Press in Washington and during the political disturbances in Russia in 1906 and during World War I. His publications are remarkable for their clarification and humanizing of difficult subjects. They include *The Fall of the Dutch Republic, Ancient Man, The Story of Mankind, Van Loon's Geography, Songs of America,* and *Van Loon's Lives.*

Van't Hoff (*vänt hôf'*), **Jacobus Henrik (1852-1911),** Dutch chemist, was born at Rotterdam. In 1878, he was appointed professor of chemistry, mineralogy, and geology at Amsterdam and, in 1896, became professor of chemistry at Berlin. He was the founder of stereochemistry, in which the structure of molecules is shown by the relation of atoms composing them. In 1901, he received the Nobel prize for chemistry.

Vargas, Getulio (1882-1954), Brazilian political leader, was born in Sao Borja, Rio Grande do Sul. Expelled from Military College for participating in a student uprising, in succession he served as a private in the army, studied law, edited a newspaper, became prosecuting attorney, and was elected to the state legislature. Vargas became a member of the Brazilian Congress and, in 1926, was named minister of finance.

In 1930 he was a candidate for the presidency of Brazil. Congress declared him defeated, whereupon he pronounced the count fraudulent and seized the government. He instituted a long series of political and social reforms. A proposed constitution was superseded in 1937 by presidential decrees which made Vargas a virtual dictator. After the outbreak of World War II, Vargas opposed pro-Axis elements and supported our policy of inter-American solidarity.

Vasari (*vä-zä'rē*), **Giorgio (1511-1574),** Italian art historian, painter, and architect, was born at Arezzo. He studied under Michelangelo and Andrea del Sarto, and entered the service of Duke Cosimo de' Medici, with whom he remained throughout his life. Vasari was one of the most versatile artists of the later Renaissance and an architect of ability. His greatest service to art is his world-renowned *Lives,* which furnishes our chief knowledge of the artists of the Italian Renaissance. Vasari has been termed the founder of modern art history and art criticism.

Vassar, Matthew (1792-1868), American philanthropist, was born in Norfolk, England. At four years of age, he came to America with his father, who settled on a farm near Poughkeepsie and established a brewery in that city. The son subsequently succeeded to his father's interests and amassed a fortune. In 1861, he donated $400,000 to the institution in Poughkeepsie later known as Vassar College. By his will he provided for a further donation of about $400,000 to Vassar.

Veblen (*vĕb'lĕn*), **Thorstein B. (1857-1929),** American economist and author was born on a Wisconsin farm. He was educated at Carleton College and at Yale University, and taught political economy at the University of Chicago and Stanford University. In 1918, he became a teacher in the New School for Social Research, New York. His publications include *The Theory of the Leisure Class, The Theory of Business Enterprise, The Higher Learning in America, The Vested Interests,* and *The Engineers and the Price System.*

Vedder, Elihu (1836-1923), American painter, was born in New York, studied in Paris and Florence; and, in 1867, settled in Rome. Gifted with a weird and powerful imagination, Vedder rose to distinction by his original, virile, intellectual style. In 1884, he won world-wide reputation with his series of striking illustrations for Fitzgerald's *Omar Khayyām.*

Among Vedder's best-known paintings are "Roman Girls on the Seashore," "Cumæan Sibyl," "Lair of the Sea Serpent," all in the Boston Museum; "The African Sentinel" and "The Pleiades," in the Metropolitan Museum, New York; "Storm in Umbria," Art Institute, Chicago; and "The Keeper of the Threshold," Carnegie Institute, Pittsburgh.

Vega (*vā'gä*), **Garcilaso de la (1503-1536),** Spanish soldier and poet, was born at Toledo. Early adopting the profession of arms, he gained a distinguished reputation for bravery in the wars carried on by Emperor Charles V against the French and the Turks. He wrote a number of sonnets, eclogues, and other poems, and is sometimes called "the Spanish Petrarch." His poems rank high in European literature for delicacy of expression and place him among the most gifted and artistic of Spanish poets. He was mortally wounded while storming a castle near Frejus, France.

Vega, Garcilaso de la (c. 1540-1616), Spanish historian, known as "the Inca," was born at Cuzco, Peru. He was the son of a Spanish conquistadore who had married a niece of the last Inca emperor of Peru. At the age of 20, he went to Spain and never again visited America. He lived at Cordoba throughout most of his life. His first work was a *History of Florida,* containing an account of the conquest of the country by Hernando de Soto, and was followed by his largest work, *Royal Commentaries of Peru,* which was a history of the royal Incas.

Vega Carpio (*vā'gä kär'pyō*), **Lope Felix de (1562-1635),** generally known as Lope de Vega, Spanish dramatist, was born at Madrid. He was a student of Alcala; served in the Portuguese campaign and in the Armada in 1588; was secretary to the Duke of Alva, the Marquis of Malpica, and the Marquis of Sarria; was banished from Madrid because of a quarrel; and, about 1614, took priest's orders.

The mere list of Lope's books presents a picture of unparalleled mental activity. Of his numerous works, 431 plays and 50 religious pieces are extant. His plays, both in comic and in tragic vein, cover a vast range of historical, legendary, religious, and everyday subjects.

Lope de Vega first emphasized the *pundonor,* or point of honor, as a controlling principle of Spanish cultured life. By ignoring the restrictions of the so-called classic unities, he did for Spain what Shakespeare did for England—created a National Theater. A few of his many noted plays are *El castigo sin venganza, Porfiar hosta morir, Si no vieran las mujeres,* and *La fuente Ovejuna.*

Velásquez (*vā-läs'kāth*), **Diego Rodriguez de Silva y (1599-1660),** Spanish painter, was born at Seville, Spain. He was intended for some liberal profession; but, on account of his unmistakable bent toward art, he was placed as a pupil with Herrera the Elder, with Pacheco, and later with Luis Tristan of Toledo.

In 1618, Velásquez married Pacheco's daughter, Juana. In April 1622, he visited Madrid, where he was presented by Fonseca, canon of Seville, to Olivares, the minister. In the first months of 1623, he received a letter recalling him to the capital. A portrait of Fonseca, which he had painted, met with such favorable recognition that he was commissioned to paint Don Ferdinand, the king's brother, and later Philip IV himself. In the autumn, Philip's portrait was finished; and, from that time, the life of Velásquez was spent in the service of the king. He was formally installed with a studio in the palace, a residence in the

city, and a monthly stipend. The interest and admiration of the king continued through 40 years of growing intimacy.

In 1627, Velásquez completed the "Expulsion of the Moriscos," and, in August 1628, Rubens arrived in Madrid just as Velásquez was finishing his famous "Topers." No direct echo from Rubens can be traced in the work of the Spaniard; but, through his advice, Velásquez made his first journey to Italy in 1629. His time there was spent in studying the Italian masters and in completing the "Forge of Vulcan" and "Joseph's Coat."

Early in 1631, Velásquez was again in Madrid. In 1634, he was permitted to hand down to his son-in-law, Mazo-Martinez, his court appointment, but was himself continued as an honorary attaché. In 1638, probably, he painted "The Crucifixion." The great equestrian portrait of Philip in the Prado was executed in 1644. To these years, also, belong the portraits of dwarfs, fools, and other eccentric members of Philip's household. "The Surrender of Breda," perhaps the finest purely historic picture in the world, was painted in 1647.

In January 1649, Velásquez embarked on his second visit to Italy. At Rome, he painted the portrait of Innocent X, now considered one of his finest works. He returned to Madrid in 1651. In 1652, he was appointed marshal to the king. His "Tapestry Weavers," "Maids of Honor," "Portrait of Alonzo Cano," "Æsop," "Mœnippus," and the later portraits of Philip and his family belong to this period.

Not only was Velásquez the greatest of Spanish painters, but his impressionism has constituted him the foremost master of modern painting. He is the most objective of painters; the subject itself tells the whole story. His draftsmanship is firm, his modeling is delicate, and his subdued color scheme enables him to use occasional patches of bright color with telling effect. He has been termed the painter's painter.

Venizelos (*vĕn'ĕ-zā'lŏs*) **Eleutherios** **(1864-1936),** Greek statesman and diplomat, was born near Canea, Crete. He was graduated in law from the University of Athens, 1886.

He attracted notice first in 1897 as one of the leaders of the Cretan insurrection that resulted in the removal of Turkish rule from Crete. In 1908, he led the movement for the union of Crete and Greece. In 1910, he was premier of Crete, but was invited to Athens, where he carried out a revision of the constitution. reorganized the army and the navy, and laid the foundation for the Balkan League, which made war against Turkey in 1912. In the second Balkan war, Venizelos led in forming an alliance against Bulgaria.

In 1914, as premier of Greece, Venizelos became a champion of the Allies and urged the nation to join them. He was vigorously opposed by King Constantine, and, in March 1915, he resigned the premiership. Upon the abdication of King Constantine in June 1917, Venizelos became virtually the ruler of Greece. Under his direction, Greece joined the Allies and gained great advantages at the Paris Peace Conference. In 1920, however, he was defeated at the polls and retired until 1928, when he was elected premier. He was again defeated in 1933. Venizelos led an unsuccessful revolt in 1935, after which he fled to the Italian Isle of Casos and later to France.

Verdi (*vâr'dē*). **Giuseppe** **(1813-1901),** Italian composer, was born at Roncole. He began his musical training at seven, attended the Academy at Busseto, and later studied at the Conservatory of Milan. His first opera, *Oberto*, appeared in 1839, and was followed by *Nabucco*, *I Lombardi*, and *Ernani*, 1842-44. Thereafter Verdi was regarded as the foremost composer in Italy. In 1851, he produced *Rigoletto* and, in 1852, *Il Trovatore* and *La Traviata*, whose phenomenal success won him international fame.

Changing from his earlier melodic style to his later dramatic method in *Aïda*, 1871, Verdi began his final and greatest period. His celebrated *Manzoni Requiem* followed in 1874 and *Otello* in 1887. In 1892, he closed his productive career with *Falstaff*. See *Italian Opera*, *Stories of the Leading Operas*.

Verhaeren (*vĕr-hä'rĕn*), **Emile** **(1855-1916),** Belgian poet, was born at Saint Amand, near Antwerp. He was educated at Ghent and at the University of Louvain. In 1881, he was admitted to the bar at Brussels, but soon decided upon a literary career, at first devoting his energies to the cause of "Young Belgium" and impressionistic art.

In his early poetical works, *Les Flamandes*, 1883, and *Les Moines*, 1886, he displays great strength. His pictorial method is applied to psychological studies, to descriptions of the cities, villages, and fields of Belgium; to the tragedies of farms deserted for the towns; and to the constant destruction of the fields by growing cities.

In 1898, he wrote the lyric drama *Les Aubes*, which has been widely translated, followed by *Le cloître* and *Philippe II*.

Verne (*vĕrn*), **Jules** **(1828-1905),** French novelist, was born at Nantes. He studied law, but turned to literature, producing his *Cinq semaines en ballon* in 1863. In this work, Verne struck the rich and then unexplored vein of scientific adventure. His fertile imagination anticipated some of the later discoveries in aerial and submarine navigation, and his work to some extent influenced the writings of Rider Haggard and H. G. Wells. Among his other works are *Twenty Thousand Leagues Under the Sea*, *The Mysterious Island*, *Around the World in Eighty Days*, *Michael Strogoff*, *From the Earth to the Moon*, *The Adventures of Captain Hatteras*, and *The Purchase of the North Pole*.

Verrazano (*vĕr'rät-sä'nō*), **Giovanni da** **(c.1480-c.1527),** Florentine navigator, sailed in 1524 on a voyage of discovery in American waters and, on sighting Cape Fear, coasted along the shore until he reached what is now New York bay, continuing his explorations as far as Rhode Island and New Hampshire.

Vesalius (*vē-sā'lĭ-ŭs*), **Andreas** **(1514-1564),** Belgian anatomist and physician, was born in Brussels. He lectured on anatomy at Basel, Padua, and elsewhere, 1537-44, and was appointed physician to Charles V and later to Philip II of Spain. Vesalius was the pioneer of comparative anatomy, which he studied by dissection of the human body. He performed several operations involving removal of the breast. His great work was *De Corporis Humani Fabrica*. He died in Zante, where he had been shipwrecked on his return from Jerusalem.

Vespasian (*vĕs-pā'zhĭ-ăn*), or **Titus Flavius Vespasianus** **(9 A.D.-79 A.D.),** Roman emperor. His father was of humble origin but his mother was the sister of a Roman senator. In the reign of Claudius, he was appointed to a military command in Britain, 43, when he conquered the Isle of Wight, and was afterward governor of Africa under Nero, who sent him to the East to conduct the war against the Jews.

After the death of Vitellius, 69, he was proclaimed emperor by the soldiers and ruled with wisdom, moderation, and firmness. The most important events of his rule were the destruction of Jerusalem by Titus and the conquest of North Wales by Agricola. The Colosseum was built in his reign.

Vespucci (*vĕs-pōōt'chē*), **Amerigo** **(1451-1512),** Italian navigator, was born at Florence. He was first employed in the commercial house of the Medici; in 1492, went to Spain; and, about 1495, became a member of a commercial firm in Seville.

In 1497, Vespucci embarked at Cadiz in one of a fleet of five ships commanded by Alonso de Ojeda; after 37 days' sailing, reached America; coasted along the continent for several hundred leagues; and returned to Spain, 1498. Columbus had previously landed on the mainland of America, so that to him doubtless belongs the honor of being the discoverer of the continent; but the discovery had been kept a state secret, and the prior publication of Vespucci's narrative led to his name being given to the continent. He made several other voyages, first in the service of Spain and afterward of Portugal.

Many scholars doubt the authenticity of Vespucci's narratives of discovery, since the extant abridged translations of them contain many statements difficult to reconcile with known facts.

Viaud (*vyō*), **Louis Marie Julien** **(1850-1923),** "Pierre Loti," French writer of Huguenot ancestry, was born at Rochefort. He entered the navy in 1867, became a lieutenant in 1881, and resigned in 1898.

Viaud traveled extensively and, in 1879, produced *Aziyadé*, picturing life on the Bosporus. This was followed by a long series of novels displaying remarkable power of impressionistic description. In 1891, he was elected to the French Academy. His works include *Le mariage de Loti*, *Le roman d'un enfant*, *Fantôme d'orient*, *Le désert*, *Figures et choses*, and *Le pèlerin d'Angkor*.

Victor Emmanuel II **(1820-1878),** first king of modern Italy, was born in Turin. After serving gallantly in the army, he became king of Sardinia by the abdication of his father, 1849. From the Austrian conquerors of his country he succeeded in obtaining the withdrawal of their demand that the Sardinian constitution should be abolished. This liberal constitution, granted by his father, he faithfully maintained, thereby winning the confidence of the Italian nation. On the advice of Cavour he made many reforms and took part in the Crimean War.

With the help of the French, the battles of Solferino and Magenta were fought against Austria, but the peace of Villafranca between Austria and France left Italy still far distant from its hoped-for unity. But Tuscany, Modena, Parma, and the Romagna voted for annexation to Sardinia, and the Prussian alliance in 1866 gave Venice to Italy. Following the withdrawal of the French after Napoleon's overthrow in 1870, the people of Rome voted for union with Italy and, July 2, 1871, Victor Emmanuel formally entered Rome, the capital of a united Italy.

Victor Emmanuel III **(1869-1947),** king of Italy, was born at Naples, 1869. In 1887 he entered the army, and became commanding general in 1897. In 1896 he married

Princess Helena, daughter of Prince Nicholas of Montenegro, and ascended the throne after the assassination of his father, King Humbert, in 1900. When Italy entered World War I in 1915, he took nominal command of the army. On Mussolini's rise to power, the king prudently adhered to a purely formal role. His studies on coins resulted in his monumental *Corpus nummorum italicornum.*

After Italian defeats in World War II, Victor Emmanuel was able to demand Mussolini's resignation in 1943. A new ministry under Marshal Badoglio obtained an armistice. After the fall of Rome, the king delegated all his powers to Crown Prince Humbert as Lieutenant General of the Realm and retired from the throne on June 5, 1944. He formally abdicated May 9, 1946.

Victoria, Alexandrina (1819-1901), queen of Great Britain and Ireland, was born at Kensington Palace. She was the only child of Edward, Duke of Kent, fourth son of George III, and, on the death of William IV, she succeeded to the throne in 1837 and was crowned queen in 1838.

In 1840, she married Albert, Prince of Saxe Coburg Gotha, by whom she had nine children. He died in 1861. The jubilee of her reign was celebrated in 1887 and her diamond jubilee in 1897.

The chief events of her reign were the establishment of the penny post; the repeal of the Corn Laws; the annexation of the Punjab; the Crimean War; the Indian Mutiny, followed by the assumption of sovereignty over India; wars in Afghanistan, China, South Africa, and Egypt; and the Fenian and Home Rule agitations in Ireland.

Queen Victoria was strictly impartial in the party politics of her reign. The strict standard of propriety which she set for her court had a wide social influence and was reflected in the literature of the period, which has become known as the Victorian period.

Vigée-Lebrun (*vē'zhā'lē-brŭn'*), **Marie Anne Elisabeth (1755-1842),** French painter, was born in Paris, daughter of a painter. In 1776, she married Jean B. P. Lebrun, picture dealer and grandnephew of Charles Lebrun. Her great beauty and the charm of her painting speedily made her very popular. Her portrait of Marie Antoinette, in 1779, led to a lasting friendship with the queen. She painted numerous portraits of the royal family. At the outbreak of the Revolution, she left Paris for Italy, and, after a tour through Europe, arrived in London in 1802. There she painted portraits of the Prince of Wales, Lord Byron, and others, and later returned to France.

Her figures are well posed, well drawn, and always admirably presented. She is best known by her portraits of herself and her daughter.

Vigny (*vēn'yē'*), **Alfred, Comte de (1799-1863),** French poet and novelist, was born at Loches, France. He entered the French army at 16 and served 12 years. In 1822, he published a small volume of verse, followed in 1824 by *Eloa,* an exquisite piece of mystic fantasy. He then issued his collected *Poèmes antiques et modernes*; *Cinq-Mars,* a notably popular historical romance; a translation of *Othello*; and a drama, *La maréchale d'Ancre.* After 1830, he published chiefly prose works, including *Stello, Servitude et grandeur militaires,* and a drama entitled *Chatterton.* A volume of verse under the name *Destinées* and his *Journal d'un Poète* were published after his death. In 1845, he was elected to the Academy.

Villon (*vē'yôN'*), **François (1431-c.1463),** French lyric poet, thief, and vagabond, was adopted as a waif by a relative, Chaplain Guillaume de Villon, who gave him his name and provided as much education for him as an undisciplined student could absorb. In the time of Louis XI, when underworld crime was paralleled by upper-class intrigue, Villon had more than his share of exciting adventures. Consorting with a band of ruffians called "the Coquillards," he engaged in thievery and worse forms of rascality, spent some time in prison and lived dangerously, with the threat of banishment or the gallows constantly hanging over him. Nevertheless he found time for literature and became the first of the modern French poets. He took the old and artificial verse forms such as the ballade, the rondeau, and the lay, and made them fresh and vital. His writings were brought together in two collections, designated respectively as *Petit Testament* and *Grand Testament.*

Vincent de Paul (*vĂN'sĂN' dē pōl'*), **Saint (c.1576-1660),** French philanthropist and ecclesiastical reformer, was born at Pouy, Gascony. After two years of slavery among Tunisian pirates, he escaped and went to Paris, where he became curate of Clichy and preceptor to Cardinal de Retz. He established a foundling hospital at Paris in 1640, organized the congregation of the Missions, and instituted the order of Sisters of Charity. He was canonized in 1737.

Vinci (*vēn'chē*), **Leonardo da (1452-1519),** Italian painter, sculptor, architect, scientist, and engineer, was born at Castello da Vinci, near Florence. His father placed him, at the age of 18, with Verrocchio, a versatile Florentine artist. In this early period Leonardo produced several religious and mythological works, and showed talent for architecture and engineering.

From 1482 to 1499, which may be considered the most active and glorious period of his life, Leonardo was at Milan, in the service of the duke, Ludovico Sforza, constantly inventing arms and war machinery. He was engaged in the architecture of the cathedral; he supervised all the pageants and masques; he improved the neighborhood by canals and irrigation; he produced a colossal statue of the duke.

As the founder of the Milanese Academy, Leonardo composed his *Treatise on Painting,* which was first published in Paris in 1615, and contained his studies in optics, perspective, anatomy, libration, and proportion. He did little painting during these years, but in 1496 he began his greatest work, "The Last Supper," in the refectory of the Dominican Convent of Santa Maria delle Grazie. It was painted on the wall in tempera, and it soon partly decayed, but about 1907 Cavaliere Cavanaghi succeeded in restoring it, with remarkable skill and effectiveness.

In 1500, Leonardo returned to Florence; two years later, he entered the service of Cesare Borgia, Duke of Romagna, as architect and engineer. To this period belong many fine paintings, one of which, his portrait of Mona Lisa, is probably the most famous portrait in the world.

In 1514, Leonardo went to Rome at the invitation of Pope Leo X; but friends of Michelangelo and Raphael prejudiced the pope against him. He again visited Milan in 1516 and supervised the pageant produced in celebration of the victory of Marignano. Leonardo then went to France to plan canals in the department of Cher and Loire. While engaged in this task, he painted little.

It may be laid to Leonardo's gigantic conceptions, his unattainable ideals of perfection, and his insatiable thirst after new achievements that he left only three or four works of supreme beauty and perfection. Every art and almost every science engaged his attention; in all, he anticipated in various points the discoveries of later philosophers and scientists. It is to his eternal honor that he first dissipated the film of ignorance that impeded the progress of the arts. He was, unquestionably, the founder of the Italian process of oil painting, and he effected, by his exquisite taste and profound knowledge of nature, a nearer approach to perfection than had ever been attained.

Vinson, Frederick Moore (1890-1953), American administrator and jurist, was born at Louisa, Ky., and was educated at Centre College, Kentucky. He practiced law, and served seven terms in the House of Representatives, paying particular attention to finance and taxation. From 1937 to 1943 he was associate justice of the Court of Appeals for the District of Columbia. In 1943 he was named director of economic stabilization, with the duty of holding down rising wages and prices. In 1945, after serving as federal loan administrator, and director of war mobilization, he was appointed by President Truman secretary of the treasury. In June 1946 he was appointed chief justice of the Supreme Court.

Virgil, or **Publius Virgilius Maro (70 B C.-19 B. C.),** Roman poet, was born at Andes, a small village near Mantua. His father, a well-to-do farmer, sought to give his son the best education that could be obtained. Accordingly, Virgil was sent in turn to Cremona, Milan, Naples, and Rome. Of frail physique and of delicate health, the boy shrank from the ruder avocations of oratory and arms which appealed to his more robust companions. Instead, he devoted himself with zealous intensity to study, thus laying the foundation of a rich and varied knowledge scarcely less remarkable than was his extraordinary poetic genius.

Returning subsequently to his paternal home, the youthful poet found that his father's farm had been sequestrated in the confiscations after Philippi. Virgil succeeded in regaining it, however, through the influence of his patron Asinius Pollo, who, later, introduced him to Mæcenas and the Emperor Augustus.

Several minor works are ascribed to Virgil's youth, but their authenticity has not been satisfactorily proved. The first important work through which his genius shines was the *Eclogues,* or *Bucolics,* a series of pastorals written in 42-37 B. C., when he was still young and under the influence of Theocritus. They are full of delightful pictures of the country of his boyhood. To one of these pastorals a special significance was attached by the early Christians, inasmuch as the poet prophesies the birth of a wondrous child, which was interpreted to mean that of Christ. This poem is still called the *Messianic Eclogue.*

The *Georgics,* written in 37-30 B. C., are four books dealing with husbandry. The purpose of these, perhaps the most finished poems in Latin literature, was to win the Romans back to the soil.

The *Æneid,* Virgil's great masterpiece, written at the instance of Augustus in 29-19 B. C., remained unrevised at the time of the poet's death. It is said that Virgil desired

to burn it, but, happily, it was saved to posterity. This great national epic profoundly impressed the entire Roman world. In it was beheld the highest expression of Roman genius and the embodiment of the idealized spirit of Roman nationality. For commentators, it was the source of all wisdom and morality, and Christian writers regarded its author as an inspired prophet. Thus Dante in his *Divine Comedy* represented Virgil as his guide through the greater part of the abode of the dead.

In character, Virgil was shy and retiring, courting seclusion and, as far as possible, shunning publicity. His personal friends who had access to him in his privacy at Campania were won by his graciousness and charm of manner. Earnest and sincere in all his dealings, he was known as one with deep religious feelings toward the gods. The influence of the *Æneid* on subsequent Roman writers cannot be overestimated. The greatest Roman epic ever written, for purity of style and transcendency of expression, it remains today unsurpassed.

The Italian government took steps in 1924 to purchase Virgil's burial place near Naples and to construct there a garden in the Greco-Roman style. See *Æneas, Æneid.*

Vishinsky, Andrei (1883-1954), Soviet lawyer and diplomat, was born in Odessa and studied law at Kiev University. Like other members of the Social Democratic Party who engaged in revolutionary activities under the czar's regime, he was constantly in trouble with the police. In 1920 he joined the Communist party. As prosecutor for the state in the Moscow trials of 1936 and 1938, and as one of the fathers of the Soviet judicial system, he received many official honors. In the latter part of World War II, he was Russia's representative on the Allied Mediterranean commission, after which Vishinsky gave increasing attention to foreign affairs. He served as vice premier, deputy commissar for foreign affairs, and delegate to the United Nations.

Vittoria Colonna. See *Colonna, Vittoria.*

Vizetelly (*vĭz'ĕ-tĕl'lĭ*), **Frank Horace (1864-1938),** editor and encyclopedist, was born in London, Eng., and was educated in France and at Arnold College, Eastbourne, Eng. He was connected with his father's publishing firm from 1882 to 1891, when he sailed for America and joined the editorial staff of Funk and Wagnalls Company, New York, becoming general editor of Funk and Wagnalls *New Standard Dictionary* in 1913. His editorial activities were instrumental in the production of numerous reference works, including the *Jewish Encyclopedia.* He was editor also of "The Lexicographer's Easy Chair" in the *Literary Digest* and office editor of more than 100 miscellaneous publications on English, public speaking, medicine, history, social reform, travel, and other subjects. Among the works written by him are *A Dictionary of Simplified Spelling* and *Words We Misspell in Business.*

Vladimir (*vlăd'ĭ-mĭr*; R., *vlá-dyē'mēr*) **the Great (?-1015),** Russian emperor, who reigned from 980 to 1015. He added largely to the kingdom by conquest, but is best known for the introduction of Christianity into the Empire. He embraced the doctrines of the Greek Church and was baptized at Kherson in 988 at the time of his marriage to Anna, sister of Constantine IX of Istanbul.

Volstead, Andrew Joseph (1860-1947), American legislator, was born in Goodhue County, Minn., and was educated at Saint Olaf's College and Decorah Institute. He was admitted to the bar in 1894 and developed a practice at Granite Falls, Minn., of which he was at one time mayor. He was elected to Congress in 1903 and continued to sit until 1923. He was the author of the Volstead Act, which gave effect to the amendment to the Constitution regarding the prohibition of intoxicating liquors.

Volta (*vōl'tä*), **Alessandro, Count (1745-1827),** Italian physicist, was born at Como. In 1774, he became professor of physics in the Royal School at Como, and, 1779, in the University of Pavia. He devised the electrophorus, the electroscope, and various experiments, such as that resulting in the ignition of gases in a closed vessel by means of the electrical spark. In 1800, he announced his important discovery of the voltaic battery. The volt, the unit of electric pressure, was named for him.

Voltaire (*vōl'târ'*), **Jean François Marie Arouet (1694-1778),** French writer and critic was born at Chatenay near Paris. To the influence of his godfather and first teacher, the Abbé de Chateauneuf, may be traced his first acquaintance with the skeptical literature then in vogue in France.

His further education was obtained in the Jesuit College of Louis-le-Grand. Following his return from the Netherlands, where he had acted as secretary to the French ambassador, he entered an attorney's office; but he found this calling uncongenial. A satire on the deceased French monarch sent Voltaire to the Bastille in 1717.

In 1722, he made the acquaintance of Rousseau in Brussels, but they separated with enmity. The publication of *La Henriade* in 1724 attracted general attention to Voltaire's genius; but he was soon in disgrace on account of a satire against a courtier; and he was again thrown into the Bastille in 1726. Liberated on condition that he quit Paris, he went to England. The three years spent there were important for the friendships and knowledge gained and for their influence upon his *History of Charles XII* and his *Letters on the English* published on his return to Paris. Shortly afterward came his *Zaire.*

He retired in 1734 to Cirey in Lorraine. During his five years' residence there, he wrote his dramas *Merope* and *Mahomet,* his *Treatise on Metaphysics,* much of his *Age of Louis XIV,* and his *Elements of the Philosophy of Newton.* The appearance of his *Princess of Navarre* won him the favor of Louis XV, various appointments at court, and his election to the French Academy in 1746. To this period belong *Zadig* and other Oriental tales.

In 1743, Voltaire had been successful in a mission to Frederick the Great to secure Prussia's alliance with France. Many invitations from Frederick followed, and, in July 1750, Voltaire was at Berlin as the king's chamberlain. Here he completed his *Century of Louis XIV.* In 1753, a rupture came between the two, and Voltaire returned to France.

About 1755, he wrote his mock-heroic poem "The Maid." Five years later, he established himself at Ferney near Geneva. Here he finished his *Essay on the Manners and Spirit of Nations,* a philosophy of history. His *Candide,* the most remarkable of his prose fictions, appeared in 1758. He now became the founder of a new group of thinkers, who, under Diderot and D'Alembert, embodied their ideas in the *Encyclopedia.* At the age of 84, Voltaire went to Paris for the presentation of his new play *Irene.*

Voltaire was the sovereign writer of his century. He had no equal in power of simplification and popularization, in keen metaphors and ready satire. He placed the greatest discoveries and theories of science within the reach of the people. His name is still a rallying point for critics of Christianity and the Church.

Von Braun, Wernher. See *Braun, Wernher.*

Von Bülow (*fŏn bü'lō*), **Hans Guido (1830-1894),** German pianist and conductor, was born in Dresden. He began to study law at Leipzig, but soon devoted himself to music. He studied under Wagner and Liszt. In 1864, he became conductor of the Royal Opera at Munich and produced there the first performances of Wagner's *Tristan und Isolde* and *Die Meistersinger.* From 1880 to 1885, he conducted the Meiningen Orchestra, which he made the most celebrated in Germany.

Von Karman, Theodore (1881-1963), engineer and aerodynamicist, though American by adoption, was born at Budapest, Hungary. His basic training at the Budapest Royal Technical University was supplemented by practical experience in the employ of a firm manufacturing machinery and by further study at the University of Göttingen. Having served for several years as Director of the Aeronautical Institute of the University of Aachen, he was appointed in 1928 as research associate at the California Institute of Technology, and in 1930 he settled permanently in California. He served as Director of Research at the Guggenheim Airship Institute at Akron, Ohio, as adviser to the Wright-Patterson Air Force Base at Dayton, Ohio, as a member of the scientific advisory committee of the Ballistic Research Laboratory at the Aberdeen, Md. Proving Ground, and as chairman of NATO's aeronautical research group. In addition to writing numerous articles, he collaborated on two books: *General Aerodynamic Theory,* with J. M. Burgers, and *Mathematical Methods,* with M. A. Biot.

Wagner, Robert Ferdinand (1877-1953), American legislator, was born at Nastatten, Germany. He was brought to New York as a child and received his schooling there, being graduated from the New York Law School in 1900. His law practice led him into politics, in which he vigorously sponsored labor and social welfare legislation. He was one of the chief proponents of Workmen's Compensation Laws, factory inspection measures and laws for the limitation of the hours of labor. After serving in the New York legislature from 1905 to 1918, he was appointed to the New York Supreme Court and later to the Appellate Division, from which he resigned in 1925 to take a seat in the United States Senate. Legislation which he sponsored in that body includes the National Industrial Recovery Act, the Social Security Act, the National Labor Relations Act, the Railroad Pension Act, and the United States Housing Act. In 1941, he urged legislation to meet anticipated economic consequences of a cessation of World War II.

Wagner, Robert Ferdinand, Jr. (1910-), American public official, was born in New York City, a son of United States Senator Robert F. Wagner (1877-1953) of New York. He was educated at Yale, where he received his academic degree in 1933 and his law degree in 1937. He also attended the Harvard School of Business Administration. He was for several years a member of the New York

State Assembly (1937-41), and during World War II served with the U. S. Army Air Force (1942-45), from which he was discharged with the rank of lieutenant colonel. In 1946 he was made a member of the New York City Tax Commission, and then became successively commissioner of housing and buildings, chairman of the City Planning Commission, and borough president of Manhattan. A Democrat in politics, Robert F. Wagner, Jr. has been mayor of New York City since 1954.

Wagner (*väg'nĕr*), **Wilhelm Richard** (**1813-1883**), German composer, romantic poet, and philosopher, was born at Leipzig, Prussia. After the death of his father, from whom Wagner inherited his love for the theater, his mother remarried and removed to Dresden, Saxony. There, in 1821, Wagner was sent to the Kreuzschule. The bent of his tastes and his passion for poetry early found expression in translations from Homer and in the writing of a tragedy based on *Hamlet* and *King Lear*.

Earlier Works. In 1827, the family removed to Leipzig. Weber, then conductor of the Leipzig Opera, and Beethoven's music so captivated the boy's artistic temperament that he decided to set his youthful tragedy to music. In 1830, he entered the University of Leipzig, where his career was marked both by individuality and by brilliant talents. For the next three years, he composed many works after standard models; in 1833, he began his long career as an operatic composer with *The Fairies*.

In 1836, Wagner married an actress, Minna Planer. During the years 1837-39, spent in Riga, he completed the libretto and first two acts of the opera *Rienzi*, and, with this, he resolved to try his fortune in Paris. He sailed first, however, to England, experiencing an exceedingly tempestuous voyage from which he gained his first inspiration for *The Flying Dutchman*.

The years in Paris were filled with bitter experiences; he left in 1842 with *Rienzi* unperformed. This was first produced in October 1842, at Dresden, and the performance led to his appointment as chapelmaster there in 1843. *The Flying Dutchman* was produced in 1843. *Tannhäuser*, two years later, proved a complete failure in Dresden, but it was produced in Weimar by Liszt in 1849 with better results. This event led to a lifelong friendship between Wagner and Liszt.

Years of Exile. *Lohengrin*, which had been suggested during his stay in Paris, was finished early in 1848 and was about to be performed in Dresden the following year, when Wagner became an active leader in the revolutionary outbreak there. Shortly after the suppression of the movement, news reached Wagner in Weimar that a warrant had been issued for his arrest. He fled to Paris, then to Zurich; and, for nearly 12 years, the bitterness of exile was added to the hardship of poverty. In 1850, he was appointed director of the Zurich Musical Society and of the orchestra of the theater. During these years, Liszt was Wagner's most faithful friend and benefactor. Liszt first produced *Lohengren*, in 1850, at Weimar. This performance started the historic "Wagner question" in art circles.

Life in Munich. Wagner went to London in 1855 for one ill-fated season as conductor for the Philharmonic Society. In 1861, he received permission to return to Germany. For three years he struggled, and he was about to give up the unequal contest with fortune when Ludwig II of Bavaria induced him to settle in Munich. *Tristan und Isolde* of 1865 was followed by *Die Meistersinger* three years later. *Siegfried* was completed in 1869. In the following year, Wagner married Cosima, the daughter of Liszt.

In 1870, the pianist Tausig sent an appeal to the admirers of the new Wagnerian music throughout the world; and, in 1876, Wagner's hopes were attained in the erection at Bayreuth of the theater where the ideas of his later operas could be carried out. Wagner had settled at Bayreuth in 1872, and here he produced his *Nibelungen* trilogy. In July 1882, his stormy career was crowned by the first performance of *Parsifal*, which, with its sacred allegory, its lofty nobility of tone, and pure mysticism, stands above criticism, praise, or blame.

Operatic Innovations. Wagner was a musician of the highest type and a poet of supreme eminence in romantic drama. He aimed to reform the whole structure of opera. He used the Beethoven development of instrumental music as a basis and introduced his own radical developments in vocal music and poetry. By locating his operas in the dreamland of myth and legend, he endeavored to remove all sense of dramatic inconsistency. The orchestra was, for him, no longer a mere accompaniment to the singer; it became a running parallel of the play, heightening its dramatic effect; and he utilized all the arts of painting, sculpture, and architecture to further the visible unfolding of the opera. See *Flying Dutchman, Lohengrin, Meistersinger, Parsifal, Ring of the Nibelung, Tannhäuser*.

Wald, Lilian D. (**1867-1940**), American social worker, was born at Cincinnati, Ohio. Receiving a nurse's training in New York, she founded Henry Street Settlement there to provide nurses where needed at private homes in the district. From this grew the institution of visiting nurses later established in numerous localities. She originated the idea of the Federal Childrens' Bureau, organized the first city school nursing, and originated the country nursing work of the Red Cross. She wrote *The House on Henry Street*.

Walker, Horatio (**1858-1938**), Canadian painter, was born in Listowel, Ont. After studying miniature painting at Toronto, he located in New York, where he devoted himself chiefly to animal, figure, and landscape painting. While influenced by the Barbizon painters, he was practically self-taught. He chose his subjects largely from French Canadian types, portraying them somewhat in the style of Millet. Among his works are "The Harrower," in the Metropolitan Museum, New York; "Oxen Drinking" and "Ave Maria," Corcoran Gallery, Washington; "Sheepshearing," Albright Gallery, Buffalo; and "The Woodcutter," in the Saint Louis Museum.

Walker, Nellie Verne (**1874-**), American sculptor, was born at Red Oak, Iowa, the daughter of a marble cutter. She studied under Lorado Taft and at the Art Institute, Chicago, where she later became an instructor. Her artistic efforts were devoted chiefly to portrait busts and to ideal groups for memorials. One of her finest works is "Her Son," at the Art Institute, Chicago. Other examples are the statue of Chief Keokuk, overlooking the Mississippi River at Keokuk, Iowa; the Decker Memorial at Battle Creek, Mich.; and the Stratton Monument at Colorado Springs, Colo.

Walker, William (**1824-1860**), American adventurer, was born at Nashville, Tenn. He was graduated from the University of Nashville; studied law; and was admitted to the bar. Later he studied medicine at Edinburgh and Heidelburg, and afterward engaged in journalism in New Orleans and San Francisco. He then became a soldier of fortune.

In 1858, he attempted to lead a band of adventurers against Honduras, but was foiled by shipwreck. In 1860, he conducted a second expedition against Honduras and captured Truxillo, but was soon compelled to flee. Subsequently he surrendered himself to the captain of a British warship, by whom he was turned over to the Honduran government. Condemned by court-martial, Walker was shot at Truxillo.

Wallace, Alfred Russel (**1823-1913**), English naturalist and traveler, was born in Monmouthshire. He was educated as a surveyor and an architect, but devoted his attention to natural history after 1845. He visited South America and the Malay Archipelago; on his return published the results of his observations; and, simultaneously with Darwin, announced the theory of natural selection. Among his works are *Contributions to the Theory of Natural Selection, Geographical Distribution of Animals, The World of Life*, and *Letters and Reminiscences*.

Wallace, DeWitt (**1889-**), publisher, was born at St. Paul, Minn. After graduation from the University of California he returned to Minnesota and was employed in the book department of the Webb Publishing Company. His other employment, also in St. Paul, was with the Brown & Bigelow Company. In 1921 he founded the *Reader's Digest*, which he has since served continuously as editor.

Wallace, Henry (**1836-1916**), American agricultural editor and author, was born at West Newton, Pa. He was graduated from Jefferson College and attended also Allegheny Theological Seminary and Monmouth Theological Seminary. He entered the United Presbyterian ministry and held pastorates in Illinois and Iowa, 1863-80. After editing the *Iowa Homestead*, 1883-95, he established and became editor of *Wallace's Farmer*, which rose to prominence among the agricultural journals of the Mississippi Valley. He wrote, among other books, *Plymouth Brethren, Clover Culture, The Skim-Milk Calf*, and *Letters to the Farm Folk*.

Wallace, Henry Agard (**1888-**), American agricultural economist and statesman, was born in Adair County, Iowa. After he was graduated from Iowa State College in 1910, he helped edit *Wallace's Farmer*, founded by his grandfather, Henry Wallace, and became editor on the death of his father in 1924. As a result of a merger in 1929, this journal became the *Iowa Homestead and Wallace's Farmer*.

Although a Republican, Wallace supported Roosevelt, the Democratic candidate in the presidential election in 1932. Roosevelt chose him as secretary of agriculture in 1933, and it fell to his lot to administer the Farm Relief Act of 1933 and succeeding acts which were designed to stabilize agriculture while providing an "ever normal granary."

In 1940, upon Roosevelt's insistence, Wallace was nominated by the Democrats as vice president. The ticket was elected and Wallace served, 1941-45. He was chairman of the Board of Economic Warfare, 1941-43, and of the Supply Priorities, and Allocation Board. In 1945, President Roosevelt nominated him as secretary of commerce, to which office had been joined control of the Reconstruction Finance Corporation. Conservative opposition led to the

separation of the financial powers from the cabinet post before his confirmation. In September 1946 a difference of opinion on foreign policy caused President Truman to ask for his resignation. In 1948 he ran for the presidency as the candidate of a third "Progressive" party.

Among Wallace's publications are *Agricultural Prices, Corn and Corn Growing,* and *The Price of Freedom.*

Wallace, Lewis (1827-1905), American soldier and novelist, was born at Brookville, Ind. He was first lieutenant in the Mexican War; began the practice of law in Indiana, 1848; entered the Union army in the Civil War, becoming a brigadier general in 1861 and serving until the close of the struggle. He was governor of New Mexico, 1878-81, and, from 1881 to 1885, he was United States minister to Turkey. His novel *Ben Hur,* 1880, achieved remarkable success. Among other well-known works from his pen are *The Fair God* and *The Prince of India.*

Wallace, Robert Charles (1881-1955), Canadian geologist, was born at Orkney, Scotland, and was graduated from Edinburgh and Gottingen universities. In 1910, he was appointed a lecturer in geology in the University of Manitoba and, in 1912, became professor and head of the department of geology there. He undertook many investigations on the geology of Manitoba, aiding materially in the development of the province's mineral resources. In 1918-21, he was commissioner of northern Manitoba and, in 1927-28, commissioner of natural resources for Manitoba. He was president of Alberta University from 1928 to 1936, when he became principal of Queens University. He is the author of *Dolomitization Processes* and *A Liberal Education in a Modern World.*

Wallace, Sir William (c. 1270-1305), Scottish patriot, headed the uprising of 1297, against the English and won a victory at Stirling Bridge, after which he crossed the border, devastated northern England, and, on his return, was named the guardian of Scotland. The next year, however, he was defeated by Edward I at Falkirk, after which, deserted by the nobles, he carried on a guerilla warfare for several years. He was declared an outlaw in 1304 and was captured, sent to London, and was hanged.

Wallenstein (*wŏl'ĕn-stīn*; G., *väl'ĕn-shtīn*), **Albrecht Wenzel Eusebius von (1583-1634),** duke of Friedland, German military leader, was born in Bohemia. At the head of a formidable army raised by him for the service of the emperor and paid for from his own resources and from unlimited plunder, he distinguished himself during the Thirty Years' War by his successes in Moravia, Bohemia, and northern Germany, and was rewarded with the dukedoms of Mecklenburg and Friedland. His enemies succeeded in procuring his dismissal in 1630, and he retired to Prague, where he lived with all the state of a sovereign.

The successes of Gustavus Adolphus compelled the emperor in 1632 to place Wallenstein again in command with almost regal authority. He foiled Gustavus at Nuremberg, but was defeated at Lutzen. At length he was accused of treason; his commission was revoked; and he was assassinated by some of his own officers. A famous trilogy by Schiller is based on Wallenstein's career.

Walpole, Horace (1717-1797), Earl of Orford, English author, son of Sir Robert Walpole, was born in London. He was graduated from Cambridge, and entered Parliament in 1741. Although he remained a member of the House of Commons until 1768, he devoted himself chiefly to literary and artistic pursuits. In 1747, Walpole purchased the estate of Strawberry Hill, Twickenham, the building and the adornment of which occupied him throughout much of his life. In this house he collected many works of art and curiosities and established a private printing press, at which several of his own works and some others were printed.

He is now remembered chiefly for his *Letters,* which are of great literary value. These extend over a period of 60 years and are remarkable for their wit and humor and for their delineations of the society of the time.

Walpole, Sir Hugh Seymour (1884-1941), British novelist, was born in New Zealand. He was educated at Cambridge, and, during World War I, he served with the Russian Red Cross. Many of his novels have settings in earlier periods of history, which are reproduced in a very convincing manner. He excels in describing scenes which verge on horror. Among his best known novels are *The Wooden Horse, The Dark Forest, The Secret City, The Young Enchanted, The Cathedral, Rogue Herries, The Fortress,* and *The Inquisitor.* He was knighted in 1937.

Walpole, Sir Robert (1676-1745), English statesman, was born at Houghton, Norfolk. He was educated at Cambridge, and entered Parliament in 1701 as a Whig. He held various cabinet offices and was prime minister from 1721 to 1742, the first to exercise in that office power based on party loyalty. As chancellor of the exchequer, he had to deal with the difficulty resulting from the collapse of the South Sea Company, and he was one of the first to urge the establishment of a sinking fund for the purpose of reducing the national debt. He was an enemy of war and a strong supporter of the Protestant succession. On his retirement in 1742 he was created Earl of Orford.

Walter, Thomas Ustick (1804-1887), American architect, was born in Philadelphia. In 1833, he made the designs for the Girard College Building, which, on its completion in 1847, was pronounced the finest specimen of classic architecture in the United States. In 1848, his design for the extension of the Capitol at Washington, D. C., was adopted. Appointed government architect, he removed to Washington and remained there uotil the completion of the work. He designed also the extensions of the patent-office, treasury, and post-office buildings, and the dome of the Capitol.

Walton, Izaak (1593-1683), English writer, was born at Stafford, England. He was a linen draper in the city of London. At 50 years of age, he retired from business and thenceforward devoted himself to literary pursuits and to angling, the latter of which seems to have been his passion. His *Compleat Angler* is still a popular book, especially pleasing for its quiet and quaint dialogue and for its glimpses of rural scenery, manners, and pastimes. See *Compleat Angler, The.*

Wanamaker, John (1838-1922), American merchant, was born at Philadelphia. He was educated in the public schools and, for a time, was an errand boy. Entering mercantile life in Philadelphia, 1856, he developed an enormous retail business. He also reopened in New York in 1896 the department store founded by A. T. Stewart. He was an organizer and director of the Merchants' Bank and was a director of the Philadelphia and Reading Railway.

Wanamaker was the first salaried Y. M. C. A. secretary, and he erected many Y. M. C. A. and college buildings in India, China, Japan, and Chosen. He was also the founder and, for many years, the superintendent of the Bethany Sunday School. From 1889 to 1893, he was postmaster general in President Harrison's cabinet. He sent two relief ships to Belgium in 1914. A bronze monument was erected to his memory by the school children of Philadelphia.

Ward, Aaron Montgomery (1843-1913), American merchant and originator of mail order merchandising, was born at Chatham, N. J. At the age of five, he was taken to live at Niles, Mich., where he attended the public schools. He acquired his first experience in merchandising at Saint Joseph, Mich., beginning as a clerk in a general store, of which he was made manager in three years. In 1866, he obtained employment with Field, Palmer, and Leiter, later Marshall Field & Company, Chicago, and, after two years' experience, became traveling salesman for a Saint Louis firm.

In 1872, with his brother-in-law, G. R. Thorne and with the assistance of one clerk, he established the mail order house of Montgomery Ward and Company. Under Ward's management, this firm developed a vast business extending to all parts of the world, employing 6000 persons and handling sales amounting to $70,000,000 annually. In civic affairs, he was noted for his persistent and successful efforts to preserve Grant Park to the city of Chicago.

"Ward, Artemus." See *Browne, Charles Farrar.*

Ward, Barbara (1914-), English economist, editor, and writer, is the wife of Commander Robert A. Jackson. Her education included study in France and Germany, as well as in England, and the point of view expressed in her articles on economics is that of a person with a broadly international perspective. She has been a University Extension Lecturer on Economics and has served on the staff of *The Economist.* Her books include *Turkey, 1941; The West at Bay;* and *Policy for the West.* In *Faith and Freedom* her interpretation of history takes a serious view of Western civilization, not only from an economic standpoint but also on the basis of religious and philosophical considerations.

Ward, Mrs. Humphry (1851-1920), née Mary Augusta Arnold, English novelist and writer, niece of Matthew Arnold, was born at Hobart, Tasmania. In 1872, she married Thomas Humphry Ward, a well-known critic and writer. Her first notable success was *Robert Elsmere,* 1888, a religious problem novel defending the "higher" criticism of the Bible. Among her subsequent works are *Marcella, The Testing of Diana Mallory, Marriage á la Mode, Canadian Born, Eltham House, The War and Elizabeth,* and *A Writer's Recollections.*

Ward, John Quincy Adams (1830-1910), American sculptor, was born at Urbana, Ohio. He began the study of law, but, in 1850, turned his attention to sculpture. His first work was done in Washington, where he executed busts of Alexander Stephens and others. After 1861, his home was in New York. His "Indian Hunter," "A Private of the Seventh Regiment," "Pilgrim," and "Shakespeare" are in Central Park, New York; his colossal statue of Washington is on the steps of the Subtreasury Building, New York; and his statue of Henry Ward Beecher stands in Brooklyn.

Strong, virile, and broadly but simply conceived, Ward's

work ranks high in contemporary American sculpture. He was elected a member of the American Academy of Arts and Letters in 1905.

Warming (*vär'mĭng*), **Johannes Eugenius Bülow (1841-1924)**, Danish botanist, was born in the Island of Mano, in the North Sea. After study in Bonn, and travel in Brazil, he was graduated from the University of Copenhagen in 1871. He became professor there in 1876, and taught there and at Stockholm until 1911. Warming established the position of plant ecology, and made valuable researches in Arctic botany, morphology, and taxonomy. He wrote *Systematic Botany* and *Ecology of Plants*.

Warner, Charles Dudley (1829-1900), American author, was born at Plainfield, Mass. He was graduated from Hamilton College in 1851 and practiced law in Chicago, 1856-60, when he settled at Hartford, Conn., engaging in editorial work. He became associate editor of the Hartford *Courant* in 1867 and, in 1884, coeditor of *Harper's Magazine*, in which appeared his papers on the South, on Mexico, and on the West. In 1873, he wrote, with Mark Twain, *The Gilded Age*. His other works include *My Summer in a Garden, Back-log Studies, Being a Boy, Captain John Smith,* and books of travel, such as *In the Levant*.

Warren, Earl (1891-), American politician, was born in Los Angeles, and was educated at the University of California. He practiced law in Oakland from 1914 to 1938, when he was elected attorney general. In 1943, he was elected governor of California and in 1946 was re-elected, with both the Republican and Democratic nominations. He accepted the Republican nomination for vice president in 1948, but his party was defeated. In 1953 President Eisenhower appointed him Chief Justice of the U. S. Supreme Court.

Warren, Joseph (1741-1775), American soldier, was born at Roxbury, Mass. He was graduated from Harvard in 1759 and became a physician in Boston, 1764. He associated himself with Samuel Adams and other ardent Whigs and, in 1772, became a member of the committee of correspondence. In 1774, he was a member and president of the Massachusetts Congress and chairman of the Committee of Public Safety. He had much to do with the success at Lexington and, in 1775, was commissioned major general. Overruled by a majority of the council, which resolved to fortify Bunker Hill, he went there as a volunteer, refusing to take the chief command offered to him by both Prescott and Putnam. He was killed during the battle.

Warren, Robert Penn (1905-), American novelist and educator, was born at Guthrie, Kentucky. A graduate of Vanderbilt University, he studied also at the University of California and at Oxford, England, where he was a Rhodes Scholar. He has been Professor of English at the University of Minnesota and at Yale University, but has devoted a considerable part of his time to writing. Besides poetry he has written criticism, textbooks, and fiction. His novel *All the King's Men* was awarded the Pulitzer prize and was widely commended for its appraisal of contemporary American life and its political and social problems. *World Enough and Time* is a work of historical fiction.

Warwick, Richard Neville, Earl of (1428-1471), surnamed "the king-maker." Wealthy, powerful, and of royal blood, he was the most prominent figure in the Wars of the Roses. With his support the Yorkists, in 1461, placed Edward, Duke of York, on the throne as Edward IV. After a quarrel with Edward, Warwick, in 1470, joined the Lancastrians and, with French assistance, reinstated Henry VI. Edward, however, returned with assistance from Burgundy, and at the battle of Barnet, in 1471, the Lancastrians were defeated and Warwick was killed. Warwick is the hero of Lytton's novel *The Last of the Barons*.

Washington, Booker Taliaferro (c. 1858-1915), American educator of the Negro, was born near Hales Ford, Va., the son of a mulatto slave and of a white man. He was graduated from Hampton Institute, Va., Harvard, and Dartmouth. He was a teacher at Hampton Institute until elected by the state authorities, 1881, as head of Tuskegee Institute, which he organized and made highly successful. He became a well-known and able writer and speaker on racial and educational subjects. His publications include *Sowing and Reaping, Up From Slavery, Future of the American Negro, Character Building, Story of My Life and Work, Working with Hands* and *The Negro in Business*. He was elected to the American Hall of Fame in 1945, and in 1957 his birthplace was officially designated as a national monument.

Washington, George (1732-1799), first president of the United States, was born in Westmoreland County, Virginia, February 22, 1732. He was the son of Augustine Washington, a planter, and of Mary Ball, his second wife. His ancestors belonged to an old English family, traceable as far back as the 13th century.

Education. The province of Virginia offered but scanty opportunities for education. Reading, writing, arithmetic, and some other branches of mathematics alone were within the reach of Washington. It is said that he was a diligent student, but that his passion for active sports and military exercise was displayed at a very early age. Another tradition states that, while he was at school, his reputation for truth and judgment was so well established that his fellow pupils were accustomed to make him the arbiter of their disputes, seldom failing to be satisfied with his decision.

Early Career. After leaving school in the autumn preceding his 16th birthday, Washington went to reside with his brother Lawrence at Mount Vernon. There he became acquainted with the Fairfax family, from whom he obtained employment as a surveyor of large tracts of territory in the rich valley of the Allegheny Mountains. In this service, at which he was engaged during the summer months of the years 1748-1750, Washington established a high professional reputation by his skill and accuracy. The acquaintance which he gained with the wilderness and its inhabitants was of great use to him later in military expeditions. By the practice of economy he saved money and purchased property before reaching his majority.

In 1751, Washington entered the military service. The frontiers were threatened at that time by the French and Indians, and the militia was put in a condition for defense. The province was divided into districts, and Washington received charge of one of these districts as adjutant general with the rank of major. He entered into his duties with zeal and alacrity and applied himself to the study of tactics.

Military and Political Activities. After the outbreak of the French and Indian War, Washington made himself so prominent a figure by his brave but unsuccessful defense of Fort Necessity in 1754 that he was commissioned commander in chief of all the Virginia forces in 1755. He served in the same year as an aide to General Braddock. In the attempt to take Fort Duquense, which, because of Braddock's refusal to take advice, resulted in disaster, Washington's clothing was riddled with bullets, but he escaped unhurt. The war in Virginia was soon at an end. Washington resigned his post, married Mrs. Martha Custis in 1759, and settled at Mount Vernon.

His life for the next 15 years was that of a typical Virginia planter, a consistent member of the Episcopal Church, a large slaveholder, a strict but considerate master, and a widely trusted man of affairs. He was repeatedly elected to the legislature and, in 1774, was sent as a delegate to the Continental Congress. With this appointment his national career began.

Washington's associates in Congress recognized his military ability at once, and most of the details of the work looking toward preparations for armed resistance against England were left by common consent to him. War broke out in Massachusetts, and, after the affairs at Lexington and Concord, Washington was unanimously elected commander in chief of the armed forces of the united colonies. Refusing any salary, he accepted the office despite his skepticism as to his fitness for it. He was commissioned June 15, 1775, and reached Cambridge, Mass., July 2, taking command of the levies there assembled against the British garrison of Boston.

Washington drove the British out of Boston in March 1776, and, from that time until his death, he was the foremost man on the continent. The military operations of the remainder of the war are familiar to all readers of American history. The war was actually over when Washington received the surrender of Cornwallis at Yorktown; but not until December 23, 1783, did he resign his commission and retire to Mount Vernon.

Presidency. When the Federal Convention met at Philadelphia in May 1787 to frame the present Federal Constitution, Washington was present as a delegate from Virginia, and a unanimous vote soon made him the presiding officer. After the Constitution had been ratified and the time had come to elect a president, in 1789, there was no hesitation. The unanimous vote of the electors made Washington the first president of the United States and re-elected him in 1793. The success of the new system of government was due mainly to the presence at that time of such a character as Washington; for he prevented party contest until the new government was firmly established. Refusing a third term of office, Washington left the presidency in 1797 and resumed his life as a planter.

Character. Washington was distinguished less by the brilliancy of his talents than by his moral strength, sound judgment, and plain, but excellent, understanding. Of all great men in history he was perhaps the most invariably judicious and evenly poised. A resolution introduced in the House of Representatives five days after his death and passed unanimously states exactly, if a trifle rhetorically, the position of Washington in American history: "First in war, first in peace, and first in the hearts of his countrymen."

He died on December 14, 1799, when commander in chief of a provisional army raised in the expectation of open war with France. His remains were laid in a private vault at Mount Vernon, where his tomb has since been converted into a national shrine. He was elected to the American Hall of Fame in 1900.

Waters, Ethel (1900-), singer and actress, was born at Chester, Pa. She had already become well known as a singer when she made her dramatic debut in *Mamba's Daughters*, 1939. She has starred in several other plays, notably *A Member of the Wedding*, and has sung frequently in concerts and in radio and television appearances.

Watson, John (1850-1907), better known by his pseudonym "Ian Maclaren," British preacher and writer, was born of Scottish parents at Manningtree, Essex. He was educated at Edinburgh University and at Tübingen; was ordained a minister of the Free Church of Scotland; and had important pastorates in Glasgow and Liverpool.

In 1894, Watson acquired wide fame by a series of Scottish prose idyls entitled *Beside the Bonnie Brier Bush*. This work portrayed humble and pious Scottish life and scenes. The volume was followed by *The Days of Auld Lang Syne*, *Rabbi Saunderson*, and other stories. His religious writings embrace *The Mind of the Master*, *The Potter's Wheel*, and *The Pure of Souls*.

Watson, John Broadus (1878-1958), American psychologist, was born at Greenville, S. C.; was educated at Furman University and the University of Chicago, where he was an instructor, 1903-08; and was professor of psychology at Johns Hopkins University, 1908-20. He was regarded as the founder of the School of Behaviorism, that is, the branch of psychology which ignores consciousness and studies psychic activity solely in terms of observable behavior. He resigned his professorship in 1920 and joined an advertising agency in 1924. His writings include *Animal Education*, *Homing and Related Activities of Birds*, and *Behaviorism*.

Watt, James (1736-1819), Scotch engineer and inventor, was born at Greenock on the Clyde, Scotland. He was educated mainly at the Greenock Grammar School, which he was unable to attend regularly on account of poor health. He early showed an exceptional mechanical ingenuity and acquired skill in drawing and in carpentry.

In 1755, Watt placed himself under a maker of mathematical instruments in London. He went to Glasgow in 1756 and was soon employed by the university there in fitting up the instruments in the Macfarlane Observatory. His constant intercourse with the professors of the university and his ready access to books enabled him to acquire a considerable knowledge of science.

During the winter of 1763-64, Watt repaired a working model of the Newcomen engine, kept for the use of the natural science class in the college. He was impressed with its contrivance, but he soon perceived its defects. It was worked by means of atmospheric pressure, steam being used only in producing, by its condensation, a vacuum in a cylinder into which a piston was forced by the pressure of the air. Watt found that about four-fifths of the steam, and consequently of the fuel, was wasted. At length, in 1765, he hit upon the expedient of the separate condenser. He did not rest content, but resolved to make steam his motive power. This done, he received a patent for his engine in 1769.

In 1774, Watt entered into partnership with Matthew Boulton at Soho, near Birmingham, and laid the foundation of one of the principal establishments in England for the construction of steam engines. He continued also to prosecute his scientific investigations. In 1782, he invented a double-acting engine, in which steam was admitted into the cylinder on each side of the piston alternately instead of on one side only. To his first three distinct inventions—the condenser, the employment of steam above and below the piston, and parallel motion—Watt later added the crank, the flywheel, and the governor. By 1785, his engine had become available for the most delicate, as well as for the most laborious, forms of industry. See *Steam Engine*.

Watteau, Antoine (1684-1721), French painter, was born in Valenciennes. He learned painting as assistant to various artists. In 1708, he entered the studio of the keeper of the Luxembourg, where he painted "The Departing Regiment" and other camp pictures. His "Embarkment for Cythera" and "The Seasons" illustrate the style for which he is chiefly noted, a light hearted gracefulness in pronounced contrast to the classical severity which prevailed at the time. His gay groups, often fanciful, in charming out-of-door settings, set a fashion in French art.

Watterson, Henry (1840-1921), American journalist and orator, was born at Washington, D. C. He was privately educated; entered journalism in Washington as a reporter; served in the Confederate army; and subsequently founded, 1868, the Louisville *Courier-Journal*. Under his brilliant editorship, this newspaper rose to foremost rank.

He is said to be the author of the phrase "tariff for revenue only." He opposed Bryan and the Democratic platform in 1896 and the nomination of Wilson in 1912. He published a *History of the Spanish-American War*, *Oddities of Southern Life and Character*, *Abraham Lincoln*, and *The Compromises of Life*.

Watts, George Frederick (1817-1904), English painter and sculptor, was born at London. He studied in the Royal Academy and later in Italy. Watts's art is didactic, many of his works symbolize the power of love and the danger of riches. His best paintings are in the Tate Gallery, London. Among these are "Love and Life," of which a replica is in the White House, Washington; "Love and Death," "Love Triumphant," "Faith," and "Hope." Other well-known works from his brush are "Sir Galahad" and "Orpheus and Eurydice." Among his many noted portraits are those of Gladstone, Tennyson, Browning, Swinburne, Matthew Arnold, William Morris, Carlyle, Meredith, Leighton, Rossetti, and Burne-Jones. His sculpture is distinguished for its boldness and nobility of style.

Watts, Isaac (1674-1748), English hymn writer and theologian, was born at Southampton. From 1696 to 1701, he was tutor in the family of Sir John Hartopp. He became minister of the independent church at Mark Lane, London, 1702, resigning in 1712 because of ill health. Watts is generally regarded as the founder of hymnology in English. His *Hymns* includes the well known sacred songs "Oh God, Our Help in Ages Past" and "When I Survey the Wondrous Cross." He wrote also *Psalms of David* and *Divine and Moral Songs for Children*, the latter containing "How Doth the Little Busy Bee." His other writings include *Logic*, theological treatises, and books on geography.

Waugh, Evelyn Arthur (1903-), English novelist, has written critical works on Rossetti and Campion but his reputation rests on his fiction. Perhaps his best-known novel is *Brideshead Revisited*, but his satiric novels of war experience, such as *Men at Arms* and *Officers and Gentlemen* are considered by some readers to be examples of his best work, so far.

Wavell, Field Marshal Archibald Percival, Earl of Cyrenaica and of Winchester (1883-1950), British soldier. Trained at Sandhurst Military College, he served in the South African War. During World War I he was wounded in France, was attaché with the Russian army in the Caucasus, and was with Allenby's army operating from Egypt. In World War II he was sent again to Egypt to defend it against the Italian invasions from the west and south. Here he organized a mechanized force which at the end of 1940 drove the Italians from Cyrenaica and threatened the collapse of the Italian empire. The detachment of a large part of his forces to resist the German invasion of Greece enabled the Germans, now in control of Libya, to counterattack and again threaten Egypt. In June 1941 Wavell was sent to India, where he remained as viceroy until 1947, in charge of Indian defense and readjustment. He was raised to the peerage as viscount in 1943, and was made an earl in 1947.

Wayne, Anthony (1745-1796), American general, was born at Easttown, Pa. At the outbreak of the Revolutionary War, he raised a regiment of volunteers, of which he was appointed colonel, and was sent on an expedition to Canada. He commanded at Ticonderoga until 1777, when he was made brigadier general and joined Washington in New Jersey; led the attack at Germantown; captured supplies for the distressed army at Valley Forge; distinguished himself at Monmouth, was defeated at Paoli; but achieved a brilliant victory in the storming of Stony Point, 1779. His courage and skill greatly assisted Lafayette in Virginia, 1780. He aided in the siege of Yorktown and commanded in Georgia. By his dash and audacity, he acquired the sobriquet of "Mad Anthony." He became major general and commander in chief in 1792.

Weaver, Robert C. (1907-), economist, was born at Washington, D.C. After graduation from Harvard and post-graduate work there, he became adviser on Negro affairs in the Department of the Interior and special assistant to the U.S. Housing Authority. He has served as rent administrator in New York and as vice chairman of the Housing and Redevelopment Board. Since 1961 he has been head of the federal Housing and Home Finance Agency.

Webb, Sidney (1859-1947), English socialist writer and politician, was born in London. He was educated at private schools in London and Switzerland and at the City of London College. After seven years in the civil service, he was called to the bar in 1885. He was one of the early members of the Fabian Society. In 1892, he married Beatrice Potter (1858-1943), a writer on sociology and economics.

Webb became a member of the city council of London in 1892 and served on several government commissions concerned with economic conditions. He and his wife were active in founding the *New Statesman* and the London School of Economics and Political Science.

Besides several works published by himself, he is co-author, with his wife, of *Industrial Democracy*, *English Poor Law History*, *The Prevention of Destitution*, and *Soviet Communism: A New Civilization?*

Weber (*vā'bĕr*), **Ernst Heinrich (1795-1878)**, German physiologist and anatomist, brother of Wilhelm Eduard Weber, was born at Wittenberg. Educated in medicine at Wittenberg and Leipzig, he was made professor of com-

parative anatomy at Leipzig, 1818; professor of human anatomy, 1821; and professor of physiology, 1840. Weber's fame rests chiefly upon his pioneer researches on the sense organs. His investigations upon the ear, upon the tactile senses, and upon what was then designated as the "space sense" initiated the experimental movement in psychology. His formula expressing the relation of sensation to intensity of stimulus, now universally known as Weber's law, was the first notable generalization in psychophysics.

Weber, Karl Maria von (1786-1826), German composer, was born at Eutin. He early gave proof of musical talent; studied at Salzburg and Munich; and became director of the German Opera at Dresden. His first great production was *Der Freischütz*, 1821, which established his fame. It was followed by his masterpiece, *Oberon*, produced in London in 1826. Weber founded the Romantic School of German Opera and exercised a profound influence upon Wagner. He wrote also some excellent piano and orchestral music and songs. See *Freischütz, Der*; *Oberon*.

Weber, Wilhelm Eduard (1804-1891), German physicist, was born at Wittenberg. He was educated at Halle. In 1825, with his brother, E. H. Weber, be began the publication of *Die Wellenlehre*. Weber became assistant professor of physics at Halle, 1827, and professor at Göttingen in 1831, but was removed for political reasons in 1837. He was professor of physics at Leipzig from 1843 to 1849, when he regained his former position at Göttingen.

Weber's most notable contribution to electrical science was the introduction of an absolute system of electrical units based on the work of Gauss in magnetism. In 1881, Weber's system, with some modifications, was adopted by the international electrical congress in Paris, and the values of the practical working units—the volt, the ampere, the coulomb, the farad—were defined.

Webster, Daniel (1782-1852), American statesman, lawyer, orator and publicist, was born at Salisbury, N. H. He gained the rudiments of education at home and was sent to Phillips Exeter Academy in 1796; the next year he entered Dartmouth College, where he was graduated in 1801. He then began to study law in the office of Thomas Thompson of Salisbury, and, in 1805, he was admitted to the bar. He removed to Portsmouth, N. H., where he soon acquired distinction.

In 1812, he was elected as a Federalist to the House of Representatives. He was re-elected to the 14th Congress, which met in 1815 and in which he rendered important services in financial legislation. In 1816, he resolved to withdraw from public life and devote himself to his profession. He removed to Boston, where his reputation grew constantly, and he was soon the foremost lawyer of New England. He exhibited great skill in his presentation of important cases, and the effect of his arguments was enhanced by his deep-toned, musical, and powerful voice.

In 1820, Webster was a member of the convention that met to revise the constitution of Massachusetts, and, in December of the same year, he pronounced at Plymouth a memorable oration on the anniversary of the landing of the Pilgrims. In 1822, he was elected by the voters of Boston as a member of the Congress that met in December 1823, and he was subsequently re-elected by a nearly unanimous vote. Several of his famous patriotic orations belong to this period. Webster continued to serve in the House of Representatives until he was transferred to the Senate in 1827.

In January 1830, he made his great argument in defense of the Union and the Constitution. In September, 1837, as a member of the Senate, he opposed the subtreasury bill in an elaborate speech, considered to have been the most effective of all his arguments on the subjects of finance and currency. In 1839, Webster visited France, Scotland, and England, where he particularly won the admiration of Carlyle.

President Harrison appointed Webster his secretary of state in 1841. Three years later, Webster was again returned to the Senate, as the successor of Rufus Choate. In December 1845, he made a speech against the admission of Texas as a slave state, and, in 1847, he declared that he was opposed to the prosecution of the Mexican war for the conquest of territory to form new states of the Union. He was again an unsuccessful candidate for presidential nomination in 1848.

As a result of his support of Clay's "compromise measures" in 1850, Webster was widely criticized by many of his admirers and by the opponents of slavery. Later in the same year, he became secretary of state under Fillmore. In 1852, his desire for the presidential nomination was again frustrated. He was elected to the American Hall of Fame in 1900.

Webster, John (c. 1580-c. 1625), English dramatist. Little of his life is known. He collaborated with a number of writers of the period, and then produced unaided, about 1610, the tragedy *The White Devil*, one of his masterpieces. *Appius and Virginia* followed, and, about 1616, Webster wrote the famous *Duchess of Malfi*. As a master of tragedy, Swinburne ranks Webster second only to Shakespeare.

Webster, Noah (1758-1843), American lexicographer, was born at Hartford, Conn. He was graduated from Yale; was admitted to the bar in 1781; but devoted himself chiefly to literary work. While teaching at Goshen, N. Y., he prepared his *Grammatical Institute of the English Language*, the first part of which became known as *Webster's Spelling Book*. In 1889, it was estimated that more than 60 million copies of this spelling book had been printed.

In 1785, Webster published *Sketches of American Policy*, advocating the formation of a new constitution. In 1807, he produced *A Philosophical and Practical Grammar of the English Language* and commenced his *American Dictionary of the English Language*; but, upon finding difficulties in etymology, he devoted ten years to its study. He then began his dictionary anew and, in 1828, published this great work, which contained 12,000 more words and 40,000 more definitions than any earlier English dictionary. Webster was also a judge, a member of the state legislature, and one of the founders of Amherst College.

Wedekind (*vā'dĕ-kĭnt*), **Frank (1864-1918),** German play writer, was born in Hanover. He first studied law, but soon devoted himself to writing. He traveled extensively; became a vaudeville performer, acting his own plays; and, in 1906, settled at Munich.

Wedekind can be classed in no school of writers. He was an audacious iconoclast, defying morality, accepted beliefs, and established forms, yet possessing to a high degree the art of presenting life and character, of creating illusion, and of producing works of power and beauty. Among his plays are *Pandora's Box*, *The Dance of Death*, *The Love Potion*, *The Philosopher's Stone*, *Such Is Life*, *The Awakening of Spring*, and *The Earth Spirit*.

Wedgwood, Josiah (1730-1795), English potter, was born in Staffordshire. On account of the death of his father, also a potter, his schooling ended with his ninth year. After being apprenticed to his brother and later associated with a prominent potter of Fenton, he opened works of his own in Burslem in 1759 and soon began the manufacture of an improved cream-colored domestic earthenware, named queen's ware in honor of Queen Charlotte. After establishing the most successful business in domestic pottery known up to that time, he directed his attention to artistic pottery, using for his patterns and inspiration the classic examples newly recovered from Pompeii and Campania. The result was the famous Wedgwood ware.

Wedgwood was the most successful and original workman known in the history of pottery, and its whole subsequent manufacture has been influenced by his skill. One of his daughters was the mother of the naturalist Charles Darwin.

Weeks, Sinclair (1893-), American business executive, was born at West Newton, Mass. Upon graduation from Harvard University, he entered the employ of the First National Bank of Boston. He served with the U.S. Army in France, 1917–19. On returning from the War he resumed his position with the bank but soon changed his occupation to that of manufacturer. In more than twenty years with the Reed & Barton corporation he progressed through vice-president to president, and then chairman of the Board. In 1944 he was named by Governor Saltonstall to fill a vacancy in the U.S. Senate created by the entrance of Senator Henry Cabot Lodge into overseas military service. He has served in the cabinet throughout the Eisenhower administration, having been appointed Secretary of Commerce in 1953.

Weir, Julian Alden (1852-1919), American painter, was born at West Point, N. Y. He received his first instruction from his father and, after studying at the National Academy of Design, New York, spent three years in Paris, 1873-76, under Gérome. He was one of the founders of the Society of American Artists, 1877, but, in 1898, seceded as one of the "ten American artists." Weir's work consists of portraits, genre and landscape pictures, and etchings. It includes "Portrait of a Young Girl," in the Luxembourg Museum, Paris; "Idle Hours," in the Metropolitan Museum, New York; and "Autumn," in the Corcoran Gallery, Washington, D. C. He was elected to the American Academy of Arts and Letters in 1915.

Weizmann, Chaim (1874-1952), chemist and Zionist leader, was born in Motol, Russia, and was educated at Pinsk, Berlin, and Freiburg. He was a lecturer in chemistry at the University of Geneva and later was appointed as reader in biochemistry at Manchester University. In 1916-19, he was director of the British Admiralty Laboratories, in which capacity he was associated with many inventions of naval and military value. He was president of the World Zionist Organization and Jewish Agency for Palestine, 1921-31, resigning in protest against British restriction of immigration, but returning to that office in 1935. In 1932 he became president of the Hebrew University of Jerusalem. In 1948 he was chosen president of the provisional council of government of the new Jewish state of Israel.

Welk, Lawrence (1903-), American band leader, was born on a farm in Strasburg, North Dakota, where his father had settled as a homesteader in 1878, shortly after coming to this country from Alsace-Lorraine. Next to the youngest of eight children, Lawrence learned from his father how to play the accordian, and his services were soon demanded for local weddings. He wanted an instrument of his own, and his father promised to give him one if he would stay on the farm until he was twenty-one. When given an expensive accordian on his twenty-first birthday, Lawrence began his professional musical career, playing with various bands, though without marked success. Then he began leading his own bands.

For a while after his marriage in 1931, he gave up professional music, because his wife wanted him at home, but everything he tried failed. So he resumed his musical career. After several years as a "Spanish" accordionist with a touring show, he went into the band business again. This time he was highly successful. His "champagne music" was a hit. He began in 1951 appearing five nights a week at a Los Angeles ballroom, and in 1955 became the TV sensation of America.

Welles, (George) Orson (1915-), stage, screen and radio actor, director, producer, and writer, was born at Kenosha, Wisconsin. Among his stage productions were *Macbeth* with a Negro cast, and *Julius Cæsar* in modern dress. His films include *Citizen Kane*, *The Magnificent Ambersons*, and *Othello*. His amazingly realistic radio version of H. G. Wells's *War of the Worlds* in 1938 caused a panic among some of his listeners.

Wellington, Arthur Wellesley, Duke of (1769-1852), British general, was born in Ireland. He completed his military education in the Military College of Angiers, France; entered the army as ensign in 1787; and became lieutenant colonel in 1793. While he fought with ability in the Netherlands in 1794, he won his first fame in the Mahratta War in India, 1803.

In 1808, he commanded the first division of the British army sent out from Cork to assist in the expulsion of the French from Spain and Portugal. Throughout the peninsular campaigns, 1809-14, success crowned his efforts and the French were everywhere repulsed or vanquished. Napoleon's ablest marshals, Soult, Victor, Masséna, and Marmont, each suffering defeat. In 1814, he was created Marquis of Douro and Duke of Wellington.

When Napoleon escaped from Elba and again headed an army in France, the defense of Belgium was assigned to an army under Wellington and a Prussian army under Blücher. The battles of Ligny and Quatre Bras were followed on June 18, 1815, by the great battle of Waterloo, in which the power of Napoleon was finally crushed. In 1827, he succeeded the Duke of York as commander in chief of the British army and, from 1828 to 1830, was prime minister of Great Britain. He was buried under the dome of Saint Paul's cathedral.

Wells, Herbert George (1866-1946), English novelist, was born at Bromley, Kent. He studied under Huxley, was graduated from London University with high honors, and taught biology several years. His scientific training prepared him for writing a long series of books remarkable for weird adventure, scientific knowledge, and bold imagination. Beginning with fantastic romances, somewhat in the manner of Jules Verne, he rose to foremost rank among living British novelists. Most of his works bespeak sociological interests and indicate a hope of reforming human affairs in accord with present or future scientific knowledge.

Among his many works are *The Time Machine*, *The First Men in the Moon*, *The Invisible Man*, *Mankind in the Making*, *The Food of the Gods*, *A Modern Utopia*, *The War of the Worlds*, *Ann Veronica*, *The New Machiavelli*, *When the Sleeper Wakes*, *Mr. Britling Sees It Through*, *Joan and Peter*, and *Mind at the End of Its Tether*. His *Outline of History*, an attempt to replace national histories by an account of the human race, was one of the most successful books of recent times. He collaborated in producing *The Science of Life*.

Wells, Horace (1815-1848), American dentist, was born in Hartford, Vt. He studied dentistry in Boston and began practice there, but, in 1836, removed to Hartford, Conn. Here, in 1840, he began experimenting with nitrous oxide, or laughing gas as a means of preventing pain in dentistry. After using nitrous oxide successfully in several cases in 1844, he proved its efficiency, at the Harvard Medical School in 1845, being the first to demonstrate publicly the use of an anesthetic in surgical operations. After his return from Paris, where he communicated his discovery to French medical societies, he published in 1847 *A History of the Application of Nitrous Oxide Gas, Ether and Other Vapors to Surgical Operations*. Controversies regarding his discovery as well as experiments upon himself with chloroform affected his mind and he committed suicide.

Wendell, Barrett (1855-1921), American educator and critic, was born at Boston. He was graduated from Harvard and was appointed to the faculty in 1880. In 1898, he became professor of English there. His writings include *The Duchess Emilia*, *Cotton Mather*, *William Shakespeare*, *A Literary History of America*, *Raleigh in Guiana*, *The Privileged Classes*, and *The Mystery of Education*. He was elected to the American Academy of Arts and Letters in 1916.

Werner (*vĕr'nĕr*), **Alfred (1866-1919)**, Swiss chemist, was born at Mülhausen, Alsace. He was educated at the Zurich Polytechnic School and later studied under Berthelot in Paris. In 1895, he became professor in the University of Zurich. Werner's most important work was in connection with the theory of molecules. He developed the conception of a molecule in three dimensions and demonstrated that two compounds identical in composition might differ in structure and in properties. This theory led him to perform experiments resulting in the formation of many new synthetic compounds of a complex nature. He was awarded the Nobel prize for chemistry in 1913.

Werrenrath, Reinald (1883-1953), American baritone operatic singer, was born in Brooklyn, N. Y. He was educated at New York University and studied music under various eminent instructors in America. He made his debut in *Pagliacci* at the Metropolitan Opera House, New York, in 1919, later appearing with marked success in recitals and oratorios in leading American cities. He collected and edited *One Hundred Modern Scandinavian Songs*.

Wesley, Charles (1707-1788), English clergyman and hymn writer, was born at Epworth, England and was associated with his brother John in the Methodist movement. He studied at Christ Church, Oxford, visited Georgia with his brother, and took an active part in the subsequent work in England. He was a clear and simple preacher and a man of fervent piety. He wrote many hymns, which were published in two volumes. Some of them are among the most admired in the English language.

Wesley, John (1703-1791), English preacher and founder of Methodism, was born at Epworth, Lincolnshire, England. When ten years of age, he was sent to school at the Charterhouse in London; at 17, he entered Christ Church College, Oxford; in 1725, he was ordained a deacon in the Church of England; and, in the following year, he was appointed Greek lecturer and moderator of the classics. In 1727, he obtained his M.A. degree and left Oxford to assist his father at Wroote. While serving there, he was advanced to priest's orders in 1728. He then returned to Oxford as a tutor and fellow of Lincoln College.

In 1735, Wesley accompanied General Oglethorpe to Georgia in order to preach as a missionary to the Indians and the colonists. On his return to England in 1738, already impressed with his own unworthiness and failure as a missionary, he became thoroughly convinced that he, who would have converted others, had not yet converted himself. Through the instruction of Bohler, a Moravian pietist, Wesley entered upon a session of prayer, and, on the evening of May 24, 1738, be became aware of a great change of religious feeling within him.

His first act after his conversion was to set out on a journey to the Moravian Brotherhood at Herrnhut in Saxony. He returned, burning with enthusiasm, and began field preaching at Kingswood near Bristol. His purpose was to awaken the spirit of religion slumbering within the Church, and it was rather an order than a sect that he designed to found.

Wesley discovered that he differed widely from the Moravians on the doctrine of Christian perfection and the means of grace, and the ensuing controversy between them terminated in a complete breach. His dispute with Whitefield, occasioned by the latter's doctrine of predestination, soon followed. The first of the societies that later grew into the Methodist Church was formed in 1740. Two years later, the members were divided into groups of 12, each group having a leader who reported to Wesley on the conduct of the members and on the receipt of money. Thus originated the class meetings, which formed a characteristic feature of the new denomination.

In 1744, Wesley summoned the first conference of the Methodist preachers. The Annual Conference became thereafter the governing body of the Methodist societies. Wesley's evangelization extended from England into Ireland in 1749 and to Scotland in 1751. In the latter year, he married a widow named Vazeille, from whom he was ultimately separated in 1771.

Wesley opened a school at Kingswood chiefly for the education of the sons of preachers; he founded an Orphans' Home at Newcastle, Charity Schools in London, and a dispensary at Bristol. During his unparalleled apostolate he traveled 250,000 miles and delivered 40,000 sermons, yet he managed to do a prodigious amount of literary work also. Probably no man ever exerted a greater influence on the religious condition of the people of England, and the organization which he founded spread to the remotest parts of the world. He died at London.

West, Benjamin (1738-1820), American historical painter, was born at Springfield, Pa. He began to paint at an early age, worked in Philadelphia and New York, studied in Italy, 1760-63, and then settled in England. In 1792, he succeeded Sir Joshua Reynolds as president of the Royal Academy. He exercised great influence as a teacher upon early American painters.

West, Rebecca (1892-), is the pen name of an English novelist and journalist, the daughter of a British army officer. Her maiden name was Fairfield, and she married Henry Maxwell Andrews, a banker. Such novels as *The Return of the Soldier*, *Harriet Hume*, and *The Thinking Reed* won her high rank as a writer of fiction. Her travel diary, *Black Lamb and Grey Falcon* (1941), based on a visit to Yugoslavia, is recognized as an unusually accurate piece of observation and description done on a massive scale. Articles which she wrote in reporting the postwar trial of "Lord Haw-Haw" were collected in a volume entitled *The Meaning of Treason*, and essays giving her views on the problems of guilt and punishment in our time are contained in the collection, *A Train of Powder*.

Westermarck (*vĕs'tĕr-märk*), **Edward Alexander, (1862-1939),** Finnish anthropologist, was born at Helsinki. Educated at the University of Finland, he was professor of moral philosophy there until 1890, when he went to England and taught sociology at the University of London from 1907 to 1930. For the next five years he was professor of philosophy at Turku University. His investigations into the history of marriage formed the point of departure for much of the anthropological studies in the succeeding half century. His conclusions were embodied in *The History of Human Marriage*. He wrote also *The Origin and Development of Moral Ideas* and *Marriage Customs in Morocco*.

Westinghouse, George (1846-1914), American inventor and manufacturer, was born at Central Bridge, N. Y. He served in the Union army, 1863-64; was assistant engineer in the United States navy, 1864-65; and then attended Union College to the end of his sophomore year. In 1868, he invented and successfully introduced the Westinghouse air brake, now in universal use. He made inventions in railway signals, steam and gas engines, steam turbines, and electrical machinery. He was the pioneer in introducing into America alternating-current machinery, which rendered possible the development of water power for long-distance electrical transmission. He was elected to the American Hall of Fame in 1955. See *Air Brake*.

Wharton, Edith Newbold (1862-1937), nee Jones, American novelist, was born in New York. She was educated privately and, in 1885, was married to Edward Wharton of Boston. Her first work of fiction, *The Greater Inclination*, 1899, was followed by a series of novels distinguished for subtle character analysis and for careful, finished style. Her works include *The Hermit and the Wild Woman*, *Glimpses of the Moon*, *The Mother's Recompense*, and *The Writing of Fiction*. She was elected to the American Academy of Arts and Letters in 1930.

Whipple, George Hoyt (1878-), American physiologist, was born at Ashland, N. H. After he was graduated from Yale and Johns Hopkins universities, he was attached as pathologist to a hospital in the Panama Canal Zone, 1905-07. After serving in a similar capacity at Johns Hopkins University until 1914, he went to the University of California and thence, in 1921, to the University of Rochester, where he became dean of the School of Medicine and Dentistry. For his studies in pathology and for contributions leading to the discovery in 1926 that a diet of liver has curative value in treating pernicious anemia, he received one-third the Nobel prize in medicine for 1934.

Whistler, James Abbott McNeill (1834-1903), painter and etcher, was born in Lowell, Mass. He studied drawing and painting in Leningrad and Paris, and, in 1863, he settled in London. In 1878, Whistler sued Ruskin for libel as a result of criticisms contained in the latter's *Fors Clavigera*. He obtained as damages one farthing and thereafter always wore the coin as a watch charm.

Whistler occupies a unique position in the development of art, embodying something of all the modern tendencies but remaining independent of them. He was a fine draftsman and a master of color value, resembled the Japanese in decorative quality, and imbued his work with subtle, dreamy, unreal effects. He won great distinction also as an etcher. He possessed a gift for keen satire, which he used unsparingly in debates with art critics. His most celebrated painting, "Portrait of My Mother," is in the Luxembourg, Paris. Of almost equal merit is his portrait of Carlyle, now in Glasgow. He was elected to the American Hall of Fame in 1930. See *Painting*.

White, Andrew Dickson (1832-1918), American educator and diplomat, was born in Homer, N. Y. He was graduated from Yale in 1853 and studied later at the University of Berlin. He was professor of history and of English literature at the University of Michigan from 1857 to 1863. In 1867, he became the first president of Cornell University, to which he gave $300,000 and a historical library of 30,000 volumes. He resigned the presidency in 1885. At different periods, he served as minister to Leningrad and as minister, and later ambassador to Berlin. His published works include *Warfare of Science with Theology*, *Seven Great Statesmen in the Warfare of Humanity with Unreason*, and *The Work of Benjamin Hale*. He was made a member of the American Academy of Arts and Letters in 1908.

White, Elwyn Brooks (1899-), American writer and editor, was born at Mt. Vernon, N. Y. After being graduated from Cornell University, he became a reporter but soon engaged in free lance writing, contributing articles regularly to *The New Yorker*, *Harper's Magazine*, and other periodicals. His miscellaneous articles, many of them written for *The New Yorker*, are distinguished for their urbane manner and genuine, unforced cleverness. He is the author of *One Man's Meat* and other books and is co-editor of *A Subtreasury of American Humor*.

White, Gilbert (1720-1793), English naturalist, was born at Selborne, Hampshire. In 1743 he was graduated from Oriel College, Oxford. Ordained in 1747, he became curate at Swarraton and later at Selborne and at Faringdon, a nearby parish. He spent his life in pastoral duties and in the study of nature. His charming *Natural History and Antiquities of Selborne* is an English classic, admired alike by masters of science and of literature.

White, Lawrence Grant (1887-1956), American architect, was born in New York City, the son of architect Stanford White. After study at Harvard University and the Ecole des Beaux Arts in Paris, he entered the firm of McKim, Meade and White, in which he became senior partner. He was president of the American Academy of Design and was a member of the Board of Trustees of the Metropolitan Museum of Art. Among his principal works are the Pennsylvania Railway Station in Newark, N. J., the Regimental Barracks on Governors Island, N. Y., and the Hotel National in Havana, Cuba. He is the author of *Sketches and Designs of Stanford White*, and of a translation of Dante's *Divine Comedy*.

White, Paul Dudley (1886-), American physician, was born at Boston, Mass. and received his education at Harvard College and the Harvard Medical School. The death of a sister from rheumatic fever turned his attention to the study of heart disease. After completing his internship at the Massachusetts General Hospital in Boston, he spent a year at the University College Hospital Medical School in London, working with leading specialists in cardiovascular disease. He was appointed resident in medicine at the Massachusetts General Hospital and became head of the Cardiac Clinic and Laboratory there. As a teacher at the Harvard Medical School and as one of the founders of the American Heart Association, he was already widely known in medical circles during the 1920's for his writings and lectures and for his pioneer work in the use of the electrocardiograph. He has become known to the general public chiefly through his service as consultant in the case of coronary thrombosis suffered by President Eisenhower in September, 1955.

In addition to numerous articles published in medical journals, he is the author of *Heart Disease* (first edition 1931, fourth revised edition 1951) and of *Heart Disease in General Practice* (1937). He is also co-author with Ashton Graybiel of *Electrocardiography in Practice*, which has appeared in three editions—1942, 1946, and 1952.

White, Stanford (1853-1906), American architect, was born in New York City. He was educated privately, studied architecture under C. D. Gambrill, and later worked under H. H. Richardson, being the latter's chief assistant in erecting Trinity Church, Boston. In 1879, he became a member of the firm of McKim, Mead, and White. White designed Madison Square Presbyterian Church, Washington Arch, and buildings of New York University, New York; buildings of the University of Virginia; pedestals and settings for numerous statues; and many private residences. He was killed by H. K. Thaw.

White, William Allen (1868-1944), American journalist and author, was born at Emporia, Kans., and was educated at Emporia College and at the University of Kansas. Devoting himself to journalism, he became, in 1895, editor and proprietor of the Emporia *Gazette*, which he made notable among the small papers of the United States. His "What's the Matter with Kansas?," published in 1896, was widely reprinted and, with other virile, picturesque editorials, gave him a national reputation. His writings include *The Real Issue*, *The Court of Boyville*, *In Our Town*, *A Certain Rich Man*, *Masks in a Pageant*, and biographies of Woodrow Wilson and Calvin Coolidge.

Whitehead, Alfred North (1861-1947), mathematician and philosopher, was born at Ramsgate, Eng. He was graduated from Cambridge University in 1887 and taught

mathematics there until 1911. He was called to the University of London, where he was professor of mathematics from 1914 until 1924, and then served as professor of philosophy at Harvard University, 1924-36.

Like Bertrand Russell, with whom he collaborated in writing *Principia Mathematica*, Whitehead proceeded from the fundamentals of mathematical reasoning to an interest in the principles underlying other fields of thought, as is indicated by the titles of his more important books. These include *A Treatise on Universal Algebra, The Organization of Thought, The Concept of Nature, Science and the Modern World, Religion in the Making, The Aim of Education*, and *Modes of Thought*.

Whiteman, Paul (1890-), American jazz conductor, was born at Denver, Colo. He first played the viola with the San Francisco Symphony and later in Victor Herbert's orchestra. In World War I he was a navy bandsman, and afterward in 1919 organized his own jazz band in Los Angeles. Ferde Grofe made special arrangements for him. Very popular among Whiteman's first recordings were "Whispering" and "Japanese Sandman." His greatest triumph came when he asked George Gershwin to write a symphonic jazz piece for him and Gershwin responded with his concerto for piano and orchestra, "A Rhapsody in Blue," which Whiteman conducted at the Aeolian Hall in New York in 1924, with the composer as soloist. Whiteman is one of America's top-ranking radio and television conductors.

Whitlock, Brand (1869-1934), American municipal reformer, diplomat, publicist, and novelist, was born at Urbana, Ohio. He was educated in the public schools and at an early age entered journalism. Later he studied law and, in 1894, was admitted to the bar, establishing a successful practice in Toledo. He became widely known for his vigorous writings exposing corrupt political and unfair economic conditions. He was four times elected mayor of Toledo. In 1913 he was appointed minister to Belgium.

Following the outbreak of World War I, Whitlock achieved international reputation for tact, vigor, and efficiency in handling problems of great difficulty, and notably facilitated the work of Belgian relief. He wrote his experiences in *Belgium, a Personal Narrative*. His other writings include *Her Infinite Variety, On the Enforcement of Law in Cities*, and *La Fayette*. He was elected to the American Academy of Arts and Letters in 1918.

Whitman, Walt (1819-1892), American poet, was born at West Hills, L. I. He learned the printing trade, taught school, and wrote for newspapers and magazines. Later he was a newspaper publisher and editor, practiced carpentry, built and sold houses, and traveled extensively on foot.

In 1855 appeared his first collection of *Leaves of Grass*, to the elaboration of which chiefly he devoted the remainder of his life. This work attracted attention first as a result of Emerson's recognition of its merit. It is largely unmetrical, but, for richness of poetic imagination, some of it is unexcelled in American literature. His *Drum Taps*, 1865, recalls the poet's experiences while an army nurse at Washington in the Civil War period.

Although a glorification of democracy and of the average man, Whitman's poetry has not been popular, mainly on account of its express defiance of literary and other conventions. He has long been recognized, however, by European and other critics as one of the outstanding figures in American literature. He was elected to the American Hall of Fame, 1930.

Whitney, Eli (1765-1825), American inventor, was born in Westboro, Mass. He was graduated from Yale, 1792; went to Georgia; and, for a time, read law, while living on the plantation of the widow of Nathanael Greene. Here he invented the cotton gin, from which, however, he realized but little financial profit on account of expensive litigation growing out of the claims of imitators and general disregard of his patents in the Southern states. The Carolinas voted him a moderate compensation. Between 1791 and 1803, the cotton exports were multiplied by 200, largely as a result of the use of Whitney's gin.

In 1798 he became successfully engaged in the manufacture of firearms at factories which he established at Whitneyville, near New Haven, Conn. He was elected to the American Hall of Fame in 1900.

Whittier, John Greenleaf (1807-1892), American poet, was born of Quaker parents at Haverhill, Mass. He learned the shoemaking trade, but early began to write for the press. In 1831, he published his first work, *Legends of New England*, in prose and verse. After editing several papers, he went to Philadelphia to edit the *Pennsylvania Freeman*, an Antislavery paper, the office of which was burned by a mob, 1838. In 1840, he settled at Amesbury, Mass.

Distinguished by simplicity and sincerity, Whittier ranks with the foremost American poets. Among his best-known poems are "Barbara Frietchie," "The Barefoot Boy," "Maud Muller," "The Eternal Goodness," "The Pipes at Lucknow," and some that have been set to music as hymns. He was elected to the American Hall of Fame in 1905.

Wiclif (*wik'lif*), **John (c. 1320-1384)**, English religious reformer, was born probably near Richmond, in Yorkshire. Studying first at Oxford, he attained a high reputation in theology and logic. He was made master of Balliol and warden of Canterbury Hall. Taking orders, he became rector of neighboring parishes and later was made king's chaplain.

Wiclif insisted boldly on the right of the individual to form his own opinions on the basis of Scripture and reason. Attacking abuses of the Church, he was condemned as a heretic. He suffered no harm, however, since he had made himself a champion of the nation in providing a logical ground for refusing dues claimed by the pope, then residing in France.

He devoted himself to translating the Scriptures, and the Wiclif Bible was the first complete translation of the book into English. Copies of the translation were expounded by followers of Wiclif, who were known as Lollards. Their doctrines were later carried to Bohemia and bore fruit in the teaching of Huss and Jerome. Wiclif is often called the morning star of the Reformation.

Wieland (*vē'länt*), **Christopf Martin (1733-1813)**, German poet, was born near Biberach, Württemberg. He studied at Tübingen and at Zurich, returning to Biberach in 1760. In 1767, he published the partly autobiographical novel *Agathon*, which did much to establish his literary reputation. After attaining a professorship at Erfurt, 1769, he wrote *Der goldene Spiegel*, a philosophical novel, which so pleased the Duchess of Weimar that she made him tutor to her sons, 1772. With Goethe, Herder, and Schiller, Wieland was a member of the group which for decades made Weimar the Athens of Germany. His numerous works include also *Geron der Adelige*; *Oberon*, his best-known epic; and *Die Abderiten*.

Wiener, Norbert (1894-1964), American mathematician, was born at Columbia, Mo. A child prodigy, he was graduated from Tuft's College at the age of 15, and while still in his teens earned his Ph.D. degree at Harvard. After studying abroad, he began in 1919 to teach mathematics at the Massachusetts Institute of Technology, where he was full professor from 1932 to 1960. A brilliant contributor to formulation of the principles of cybernetics (from a Greek word meaning steersman), which Wiener coined to describe the comparative study of the control and communication system in the human mind and nervous system with that of such mechanical devices as computing machines and other electronic mechanisms. He is the author of *The Fourier Integral and Certain of Its Applications* (1933); *Fourier Transforms in the Complex Domain* (1934); *Cybernetics* (1948); *The Human Use of Human Beings* (1950); and *Ex-Prodigy* (1953), besides many mathematical papers.

Wiggin, Kate Douglas (1856-1923), American author and educator, was born in Philadelphia, Pa. She was graduated from Abbott Academy, Andover, Mass., 1878, and went to California, where she became a successful teacher and organized the first free kindergarten on the Pacific Coast. In 1880, she was married to S. B. Wiggin, a California lawyer, who died in 1889. Following her marriage to G. C. Riggs, 1895, she resided in New York and Maine.

Her first literary success was *The Birds' Christmas Carol*, 1888. Other widely popular stories followed, including *A Cathedral Courtship, Penelope's English Experiences, The Diary of a Goose Girl, Rebecca of Sunnybrook Farm, Mother Carey's Chickens, Penelope's Postscripts*, and *Homespun Tales*. She wrote her autobiography, *My Garden of Memory*, shortly before her death.

Wilberforce, William (1759-1833), English statesman and philanthropist, was born at Hull. He was educated at Saint John's College, Cambridge, and, at 21, entered Parliament as the representative of his native town. His Parliamentary career lasted until 1825. In 1789, he first proposed in the House of Commons the abolition of the slave trade, and, with the aid of Charles James Fox, this measure was carried in 1807. He afterward devoted himself to a movement for the extinction of slavery, the bill being finally passed a few days before his death. He was buried in Westminster Abbey.

Wilde, Oscar O'Flahertie Wills (1856-1900), British dramatist, essayist, and poet, was born in Dublin. After distinguishing himself in the classics at Trinity College, Dublin, he went to Oxford in 1874 and made a brilliant intellectual record. While at Oxford he was the leader of the so-called æsthetic movement, which emphasized the "art for art's sake" dictum of Whistler. He was satirized for this activity in the character Bunthorne in Gilbert and Sullivan's *Patience*.

Beginning in 1884, he devoted his attention to writing poetry, essays, stories, and plays. In 1888, he produced a

volume of charming fairy tales entitled *The Happy Prince*, which was followed by *The House of Pomegranates* and by *The Picture of Dorian Gray*, a novel of sparkling literary cleverness. He wrote the poetic plays *The Duchess of Padua*, *A Florentine Tragedy*, and *Salomé*, but his chief contribution to literature consists of the prose comedies *Lady Windermere's Fan*, *A Woman of No Importance*, and *The Importance of Being Earnest*. For ingenuity, cleverness, and wit these plays are unsurpassed in modern times. His *Ballad of Reading Gaol* and *De Profundis* are the literary result of two years spent in prison after conviction on a charge of immorality.

Wilder, Thornton Niven (1897-), American novelist, was born at Madison, Wisc. Educated at Yale University, the American Academy in Rome, and Princeton University, he taught school at Lawrenceville, N. J., from 1921 to 1928. Meanwhile he began writing novels in which were combined ingenious plots and a style of languid charm. His *Bridge of San Luis Rey* and *Skin of Our Teeth* received Pulitzer prize awards. Among his other works are *The Woman of Andros*, *Heaven's My Destination*, and *The Merchant of Yonkers*. He was made a member of the American Academy of Arts and Letters in 1952.

Wiley, Harvey Washington (1844-1930), American chemist and food analyst, was born near Kent, Ind. He was primarily responsible for the enactment of the Federal Pure Food and Drug Act of 1906 and thereafter largely responsible for its administration. He was state chemist of Indiana from 1874 to 1883, and the Department of Agriculture's chief chemist from 1883 to 1912. Beginning in 1899, he was for many years professor of agricultural chemistry at George Washington University, Washington, D. C. Dr. Wiley wrote extensively on agricultural chemistry and the adulteration of foods. In 1956 the United States government issued a three-cent stamp bearing a portrait of Dr. Wiley, to commemorate the 50th anniversary of the passage of the Pure Food and Drug laws.

Wilhelmina (*vĭl'hĕl-mē'nä*), **Helena Pauline Maria, (1880-1962)**, queen of the Netherlands, was born at The Hague. She succeeded to the throne of the Netherlands on the death of her father in 1890, although she did not become of legal age until 1898, when she was crowned queen. In 1901, she married Duke Henry (died, 1934), youngest son of the Grand Duke of Mecklenburg Schwerin. When Germany overran the Netherlands in 1940, Wilhelmina escaped with her children to England, returning in May 1945. In September, 1948, Queen Wilhelmina abdicated in favor of her daughter Juliana (born 1909), who had previously acted as regent during her mother's illness.

Wilkes, Charles (1798-1877), American naval officer and explorer, was born in New York City. Entering the navy as a midshipman, 1818, he rose until, in 1830, he became head of the Department of Charts and Instruments. From 1838 to 1842, he commanded, and later wrote an account of, an important exploring expedition, during which he visited the antarctic regions, many groups of islands in the Pacific, and the coasts of California and Oregon.

During the Civil War, he commanded the sloop *San Jacinto*. On Nov. 8, 1861, he stopped the British mail steamer *Trent* and removed the two Confederate envoys, Mason and Slidell, thereby precipitating the Trent affair. Wilkes was made commodore in 1862 and retired, 1866, as rear admiral. His publications include *Western America* and *The Theory of the Winds*. See *Trent Affair*.

Wilkins, Sir George Hubert (1888-1958), Australian explorer, was born at Mt. Bryan East, S. Australia. Studying engineering at the Adelaide School of Mines, he took up aerial photography. He participated in Stefansson's Canadian arctic expedition, 1913-17, was airplane photographer in World War I, and, in 1923-25, led an expedition into unexplored parts of Australia. He then commanded expeditions both to the arctic and antarctic regions sent by American newspapers and other interests, in the course of which he made numerous corrections in the accepted views of the land and sea configurations in the polar regions.

Wilkins, Mary E. See *Freeman, Mary Eleanor Wilkins*.

Willard, Emma Hart (1787-1870), American educator, was born at Berlin, Conn. She was educated at Hartford Academy and, in 1809, married Dr. John Willard. She established a girls' boarding school at Middlebury, with improved methods of teaching. Partly with state support, she established at Waterford, N. Y., a girls' seminary, which was removed in 1821 to Troy and became well known as the Troy Female Seminary and later as the Emma Willard School. In 1830, she traveled in Europe, and, by her efforts, a school for the training of women teachers was founded in Greece. Among her books are *History of the United States*, *Universal History in Perspective*, *Last Leaves of American History*, and a book of poems, of which the best known is "Rocked in the Cradle of the Deep." She was elected to the American Hall of Fame in 1905.

Willard, Frances Elizabeth (1839-1898), American educator and reformer, was born in Churchville, N. Y. After some years spent in teaching, she became professor of æsthetics in Northwestern University and was made dean of the Woman's College in 1871. She began active temperance work in 1874 as secretary of the National Woman's Christian Temperance Union; in 1879, she was made president of that organization and held the office for nearly 20 years. She founded the World's Woman's Christian Temperance Union in 1883 and, in 1888, became its president.

She was an orator of great eloquence, humor, and power, possessing marked executive ability and a genius for organization. Besides many magazine articles and pamphlets, her writings include *Woman and Temperance and Glimpses of Fifty Years*. She was elected to the American Hall of Fame in 1910. See *Woman's Christian Temperance Union*.

William I (1027-1087), commonly called "the Conqueror," king of England, was born in Normandy. He was the illegitimate son of Robert the Devil, Duke of Normandy, and succeeded to the dukedom in 1035. He laid claim to the sovereignty of England on the death of Edward the Confessor, claiming title to it under the will of that monarch. Harold having assumed the crown, William invaded England in 1066, defeated and slew Harold at the battle of Hastings.

During his reign the feudal system was developed in England, the forest and game laws were introduced, and a survey was made the results of which are embodied in the *Domesday Book*. Possessed of remarkable ability, he ruled strictly, kept excellent order, and won success by his own exertions. He died while waging war with Philip I of France.

William I (1533-1584), called "the Silent," Prince of Orange and Count of Nassau, founder of the Dutch Republic, was born in Dillenburg. At the age of 15, he became page to the Emperor Charles V, who, in 1555, promoted him to the command of the Imperial army on the French frontier.

William opposed Philip's persecution of the Protestants in the principality of Orange, the government of which he had inherited, and in several provinces, of which he had become stadholder. He was compelled to flee to Germany on the approach of Philip's representative, the Duke of Alva, who seized William's property and took his son to Spain as a hostage.

William joined the Huguenots in France, and, in 1572, several Dutch cities chose him as their prince to defend them against the Catholic monarch Philip. The massacre of Saint Bartholomew and numerous Spanish victories drove William to desperate straits, and he was able to save Leiden for the Protestant cause only by cutting the dikes, thus permitting a relieving fleet to approach the besieged city. In 1576, five provinces that had been loyal to Spain joined William, but, in 1578, their forces were defeated at Gembloux by Alva's successor, John of Austria. The Walloon provinces were detached from the Protestant cause, but, in 1579, a league was formed that successfully defended itself against Spain. It comprised the provinces of Holland, Zealand, Utrecht, Friesland, Gelderland, Groningen, and Overyssel. These provinces declared their independence in 1581 and were later organized as the Dutch Republic.

William is known as one of the earliest champions of religious toleration. His sagacity and persevering courage made him a leader in one of the most desperate enterprises that ever led to the foundation of a nation. A price of 25,000 crowns was placed on his head by Philip of Spain, and he was assassinated.

William I (1797-1888), king of Prussia and emperor o Germany. He joined the army at an early age and was engaged in the campaigns of 1813-14 against France. On the coronation of his brother Frederick William IV in 1840, he became governor of Pomerania, and afterward sat in the Prussian diet, where he vigorously supported the Absolutist party. In consequence, he was so disliked by the people that, on the outbreak of the revolution of 1848, he fled to England, though he returned some months later and was elected to the National Assembly.

In 1857, William was commissioned regent, and, in 1861, he ascended the throne. He found in Bismarck an able minister who could rule without a Parliamentary majority. In the Franco-Prussian War, 1870-71, William commanded at the decisive battles of Gravelotte and Sedan and, in 1871, was proclaimed emperor of Germany in the palace at Versailles.

William II, Friedrich Wilhelm Viktor Albert (1859-1941), emperor of Germany, eldest son of Frederick III and Victoria, princess royal of England. Upon succeeding his father in 1888, he took much interest in social questions, and his strong initiative in political affairs brought about the dismissal of Prince Bismarck in 1890. His ability and aggressiveness did much to place Germany in the foremost rank of the world powers. His grandiose and militant speeches, on the other hand, did much to foster sentiments which made it easy to precipitate World

War I. His support of Austrian aggression against Serbia in 1914 and his flagrant violation of Belgian neutrality were among the most effective causes of that stupendous conflict. On the defeat of Germany and the resulting revolution in 1918, William abdicated and fled to the Netherlands, where he remained as a refugee until the German conquest of that country in 1940.

William III (1650-1702), former king of England, was born at The Hague. He was the posthumous son of William II of Orange and, through his mother, was a grandson of Charles I of England. In 1678, being then stadholder of the Netherlands, he went to England, and married Mary, a daughter of the Duke of York, afterward James II. In 1688, he landed with a Dutch army at Torbay, in Devonshire, and was soon after invited by the English Parliament to accept the throne which James had vacated. In April 1689, he was crowned, together with his wife, Mary. In 1690, he defeated James at the battle of the Boyne. He afterward engaged in a war with France, which was ended by the Treaty of Ryswick, 1697.

Williams, Sir George (1821-1905), founder of the Young Men's Christian Association, was born in Somersetshire, England. In 1841, he began work for a London dry goods firm. Two years later, he induced some of the employees to hold prayer meetings at regular intervals. In June 1844, he, with eleven others, formed a society under the name of Young Men's Christian Association, and to Williams belongs the chief credit for its organization. After serving as treasurer of the society from 1863 to 1885, he was made president. In 1894, he was knighted.

Williams, Roger (c. 1604-1683), English colonist and founder of Rhode Island, was born probably in London. He was educated at Cambridge and was ordained a clergyman of the Church of England; but, having embraced Puritan views, he emigrated to New England in 1631 and was assistant pastor at Plymouth from 1631 to 1663, when he became pastor at Salem.

For his insistence on religious liberty, he incurred the opposition of the government; was banished from the colony in 1635; and, in 1636, founded Providence, R. I., with a government based on complete toleration. Here, with eleven others, he founded the first Baptist Congregation in America, 1639. His chief written work is *The Bloudy Tenent of Persecution for Cause of Conscience Discussed.* Elected to the American Hall of Fame in 1920.

Williams, Tennessee (1914-), American playwright originally named Thomas Lanier Williams, was born at Columbus, Mississippi. He was educated at the University of Missouri, Washington University (St. Louis), and the University of Iowa. Among his successes are *The Glass Menagerie; A Streetcar Named Desire,* which won the Pulitzer prize and the Drama Critics' Circle award; *Summer and Smoke*; *The Rose Tattoo*; and *Cat on a Hot Tin Roof.*

Williams, William Carlos (1883-1963), writer and physician, was born at Rutherford, N.J. Before receiving his M.D. degree at the University of Pennsylvania in 1906, he studied at Geneva, Switzerland, and at Leipzig. Along with medical practice at Rutherford from 1910, he devoted some time to writing. His works included novels, essays, and short stories, but he is best known for his poems. His writings include *Selected Poems* and *Paterson.*

Willingdon, Freeman Freeman-Thomas, Viscount (1866-1941), British administrator. He was educated at Eton and Cambridge with a political career in view. Elected to Parliament in 1900, he became junior lord of the treasury in 1905, serving until 1912, when he was made governor of Bombay. He occupied the governorship of Madras from 1919 to 1924; in 1926, was made governor-general of Canada in succession to Lord Byng of Vimy; and, from 1931 to 1936, was viceroy of India. He was buried in Westminster Abbey.

Willkie, Wendell Lewis (1892-1944), American industrialist and politician, was born at Elwood, Ind. Educated at Indiana University, he practiced law at Elwood, Ind., and later at Akron, Ohio. Showing ability in the organization of electric power companies and in advising them as to public relations, he was chosen as president of Commonwealth and Southern Corporation in 1933. He directed litigation and a publicity campaign against the Tennessee Valley Authority. The campaign proved unsuccessful but recommended him as a leader against the New Deal.

In 1940, without obtaining delegates pledged to him, he was nominated as Republican candidate for the presidency of the United States. He conducted an extremely vigorous campaign but was defeated. In the summer of 1942 he made a world tour, recording his impressions in *One World.*

Willson, Meredith (1902-), director and composer, was born at Mason City, Iowa. When only nineteen he was flutist with Sousa's band. He played with the N. Y. Philharmonic Orchestra and the N. Y. Chamber Music Society, 1923-29, then became active as director of musical radio programs for the American Broadcasting Company. He is remembered for such programs as the Ford Showroom, Maxwell House Coffee Time, and many others. He has been visiting conductor for concerts with several symphony orchestras, particularly on the Pacific Coast. He has composed a number of popular songs and such band pieces as *America Calling* and *Mail Call March,* but he has become best known recently for his play, *The Music Man,* with its stirring theme melody, "Seventy-six Trombones." He is author of *What Every Young Musician Should Know.*

Wilson, Alexander (1766-1813), American ornithologist, was born at Paisley, Scotland. Coming to the United States in 1794, he taught school until 1802. Settling near Philadelphia, he became acquainted with the naturalist William Bartram and determined to illustrate the ornithology of the United States. In 1804, he traveled through the wilderness to Niagara, making collections, and described the journey in a poem entitled *The Foresters.* From 1808 until his death, Wilson published seven volumes of *American Ornithology.* He ranks with Audubon among the founders of American ornithology.

Wilson, Allen Benjamin (1824-1888), American inventor, was born in New York. His trade was that of cabinetmaker; but he turned his attention to the problem of mechanical sewing. In 1849, he constructed a sewing machine which contained a device by means of which the material was carried forward by a feeding plate, so that an endless seam could be made at any curve. In 1850, he improved this feature by the principle of the now universally used four-motion feed. At this time he added also the rotary hook and the stationary bobbin. During the same year, he began the manufacture of sewing machines at Bridgeport, Conn. See *Sewing Machines.*

Wilson, Edmund (1895-), American editor and critic, was born at Red Bank, N. J. Following his graduation from Princeton University, he was a reporter for *The New York Evening Sun,* became Managing Editor of *Vanity Fair,* then Associate Editor of *The New Republic* and later book reviewer for *The New Yorker.* His literary and social criticism is noted for directness and sometimes disturbing frankness. His travel sketches in the volume *Europe without Baedeker* were praised or condemned according to differing points of view, but they were read with interest in either case. Another controversial book was the group of satiric stories contained in his *Memoirs of Hecate County.* Provocative criticism is found in his book *Axel's Castle.*

Wilson, Harold (1916-), political leader, was born in Yorkshire, England. He won a scholarship at Oxford and, after graduation, became at age 21 a lecturer in economics at New College. Although his views differed somewhat from those of Bevan and Gaitskell, his associates in the Labor party, he was the logical successor to Gaitskell and became leader of the party following the latter's death in 1963. Elected Prime Minister in 1964.

Wilson, James (1835-1920), American agriculturist, was born in Ayrshire, Scotland. He came to the United States in 1851 and, in 1855, went to Tama County, Iowa, and engaged in farming. He rose to prominence as a member of the Iowa legislature and of Congress and lectured six years at Iowa Agricultural College. In 1897, he was appointed secretary of agriculture, and served continuously for 16 years. During his administration a national forest policy and a system of soil survey were inaugurated, and the work and influence of the department expanded.

Wilson, (Thomas) Woodrow (1856-1924), American educator, publicist, historian, statesman, and 28th president of the United States, was born at Staunton, Va. He was graduated from Princeton University in 1879, and later studied at the University of Virginia and at Johns Hopkins University. He practiced law in Atlanta, Ga., in 1882-83; became associate professor of history and political economy at Bryn Mawr College in 1885; held a similar chair at Wesleyan University from 1888 to 1890; and, in the latter year, was appointed professor of jurisprudence and political economy at Princeton. He was made president of the university in 1902 and continued to act until 1910, when he entered politics and was elected governor of New Jersey for the term 1911-13. In 1912, he was elected Democratic president of the United States, and was re-elected in 1916.

Presidential Administration. In his administration, Wilson frequently appeared in person to address joint sessions of Congress on matters of importance, this reviving a custom long in disuse. He enjoyed at first a marked personal ascendancy in Congress. Three amendments to the Constitution were made in his terms of office—the 17th, providing for the direct popular election of senators; the 18th, or Prohibition Amendment; and the 19th, extending the right of suffrage to women. He opposed the two latter ones. Other events of his administration were the Underwood Tariff Act, the Clayton Anti-trust Law, the establishment of the Federal Reserve banks, the repeal of the Panama Canal tolls, the Workman's Compensation Act, the Eight-hour Railway Wage Law, the purchase of the

Virgin Islands, a punitive expedition into Mexico, and participation of the U. S. in World War I.

PART IN WORLD WAR. Although Wilson made world peace his ideal and was awarded the Nobel peace prize for 1919, yet, by the force of events, he became one of the great war presidents. On the outbreak of the war in 1914, he adopted a policy of strict neutrality. Continued provocation on the part of Germany, especially the sinking of the *Lusitania* in 1915 and the prosecution of unrestricted submarine warfare in direct violation of promises made to the United States government, roused public indignation and led to America's declaration of war against Germany. Wilson at once took steps to unify and centralize all services looking to the efficient prosecution of hostilities. At the same time, by his vigorous idealistic leadership, he rallied the national spirit to a point of effective enthusiasm seldom paralleled in the history of a great nation. He stated in his fourteen points the general terms on which America would be willing to cease hostilities, and, when the Germans were defeated in 1918, their government appealed to Wilson regarding terms for an armistice. The Allies agreed, with reservations, to an armistice on the basis of the fourteen points.

EFFORTS FOR ENDURING PEACE. Wilson went to Paris in 1919 to help negotiate the Treaty of Versailles, to which, mainly through his influence, was attached the covenant of the League of Nations. Wilson is thus to be regarded as the chief founder of the League of Nations, although, on his return to Washington, he found Congress unwilling to join the League or to ratify the treaty. He appealed for popular support, setting out on a speaking tour through the country; but his strength had been overtaxed by his efforts of the preceding years, and, in September 1920, he suffered a collapse, from which he never completely recovered. Among the published works of Woodrow Wilson are *A History of the American People*, *The New Freedom*, and *International Ideals*. He was elected to the American Academy of Arts and Letters in 1908. In his honor was organized, in 1922, the Woodrow Wilson foundation, which awards annually a peace prize of $25,000.

Winchell, Walter (**1897-**), American newspaperman, was born in New York City. He went on the stage at the age of 13, playing the vaudeville circuits. His journalistic career began in 1922 when he started writing a column for *Vaudeville News*. Two years later he joined the staff of the *Daily Graphic*, a New York tabloid newspaper, which he served as columnist, dramatic critic, and amusement editor. In 1929 he became columnist of the New York *Mirror*, a position he still holds. His daily column of lively telegraphic gossip and pungent comments on the news is a widely syndicated American newspaper feature. Winchell is also famous for his Sunday night radio broadcasts. In 1956 he launched his own TV program.

Windaus (*vĭn'dous*), **Adolf** (**1876-1959**), German chemist. Becoming interested in the investigation of vitamins, he succeeded, while director of the chemical laboratory at the University of Göttingen, in explaining the nature of the chemical substance from which the antirachitic vitamin D is derived. This achievement was signalized by the award of the Nobel prize in chemistry for 1928. He crystallized vitamin D in 1931.

Winthrop, John (**1588-1649**), first governor of Massachusetts Colony, was born at Edwardston, Suffolk, England. He became a lawyer; and, in 1626, was appointed attorney in the court of wards and liveries.

When, in 1629, the London proprietors of the Massachusetts Company decided to transfer the seat of government to the New World, they chose Winthrop governor.

In 1630, he arrived at Salem, Mass., with eleven ships and 900 colonists, removing soon afterward to Charlestown and thence to Boston, which they founded in the same year. He was governor for a total of about 12 years and exercised a powerful influence. His *Journal* is one of the most important sources of early American history.

Wirt, William Albert (**1874-1938**), American educator, was born at Markle, Ind. He was graduated from DePauw University and studied also at the University of Chicago. While superintendent of schools at Bluffton, Ind., 1899-1907, and later at Gary, Ind., he developed methods known as the Gary system, among the chief features of which is the economical use of the school plant.

Wirtz, W. Willard (**1912-**), educator and political leader, was born at DeKalb, Ill. He was educated at Northern Illinois State Teachers College, Beloit College, University of California, and Harvard Law School. After a period of teaching in the law schools of the University of Iowa and Northwestern University, he entered public service as counsel to the War Labor Board. He was assistant secretary on the staff of Secretary of Labor Goldberg, whom he succeeded as secretary in 1962.

Wise, Stephen Samuel (**1872-1949**), Jewish rabbi, was born at Budapest, Hungary. Coming to America at an early age, he studied in the College of the City of New York and, in 1901, was graduated from Columbia University. He was a pastor of synagogues in New York and Portland, Oreg., until 1907, when he founded, and became rabbi of, the Free Synagogue in New York. He founded the Oregon State Conference of Charities and Correction and was founder of the first section of the Federation of American Zionists. He became a leader of American liberal thought and an outstanding figure in charitable causes.

Wister, Owen (**1860-1938**), American author, was born in Philadelphia, Pa. He was graduated from Harvard, studied law, and was admitted to the bar in 1889. Beginning in 1891, he devoted himself chiefly to literature and won wide popularity by his stories, particularly those descriptive of Western life. Besides short stories and verse, his writings include *Red Men and White*, *The Virginian*, and *When West Was West*. He was elected a member of the American Academy of Arts and Letters in 1912.

Witte (*vĭt'ĕ*), **Sergei Yulievitch, Count** (**1849-1915**), Russian statesman, was born at Tiflis. He was educated at Odessa, entered the railway administration, and first gained distinction by his clever organization of the transport of troops in the war of 1877-78. In 1903, he was made president of the committee of ministers; was one of the Russian plenipotentiaries in the negotiations for peace with Japan in 1905; and was the first prime minister of Russia. He resigned in 1906. His writings include *The Principles of Railway Rates* and *Friedrich List, Economist*.

Wodehouse (*wo͝od'hous*), **Pelham Grenville** (**1881-**), British humorist, whose amusing novels and short stories are as much appreciated in America as in England, was born at Guildford and educated at Dulwich College. Outstanding in the gallery of Wodehouse characters are Psmith, Bertie Wooster and his inimitable valet, Jeeves, and Mr. Mulliner, all of them ludicrously exaggerated British types.

Wöhler (*vû'lĕr*), **Friedrich** (**1800-1882**), German chemist, was born near Frankfort on the Main. He studied at the universities of Marburg and Heidelberg; worked under Berzelius at Stockholm; and, in 1836, became professor of chemistry at Göttingen. Wöhler was one of the founders of organic chemistry. In 1828, by laboratory methods, he produced urea, the first organic compound made artificially without the agency of life. He discovered isomerism, and the nickel industry was founded through his invention of a process for producing the pure metal on a large scale. He was the first to produce calcium carbide (1862), from which acetylene is made.

Wolfe, James (**1727-1759**), English general, was born in Westerham, Kent. His first service was in Flanders, where he took part in the battle of Dettingen; in Scotland, he was in the battles of Falkirk and Culloden. His skill and bravery at the attack of Louisburg, 1758, won him the title of "hero of Louisburg." In the final effort to drive the French out of Canada, Pitt gave the command of the invading army to Wolfe. His successful attack on Quebec, September 13, 1759, was one of the most famous exploits in Canadian colonial history. Though defeated in his first attempt, he scaled the cliffs with his army by night, and died in the moment of victory, while his brave antagonist, Montcalm, dying too, said, "It is a great consolation to have been vanquished by so brave an enemy."

Wolfe, Thomas Clayton (**1900-1938**), American novelist, was born at Asheville, N. C. After he was graduated from the University of North Carolina in 1919, he studied drama at Harvard and traveled and studied in Europe. Back in the U. S., he was instructor in English at New York University until 1930, when the success of his *Look Homeward, Angel* enabled him to devote himself solely to writing. In that book, as in *October Fair*, he produced fiction of great power. *The Web and the Rock* and *You Can't Go Home Again* were published after his death.

Wollaston (*wo͝ol'ă-stŭn*), **William Hyde** (**1766-1828**), English chemist and natural philosopher, was born at East Dereham, Norfolk, and was educated at Cambridge. He discovered how to work platinum on a practical scale and first detected the metals palladium and rhodium. He was the first to observe the dark lines in the solar spectrum, 1802. In 1809, he invented the reflecting goniometer and, in 1812, the camera lucida. He furnished the "Wollaston Doublet" to microscopists and adapted concavo-convex lenses for oculists' use.

Wolsey (*wo͝ol'zĭ*), **Thomas** (**c. 1475-1530**), English statesman and cardinal, was born at Ipswich. He was the son of a butcher, and was educated at Magdalen College, Oxford, where he was graduated at 15. Ordained priest in 1498, he rose rapidly and was introduced at the English court, where he gained the esteem of Henry VII and, in 1509, was made dean of Lincoln. After the accession of Henry VIII, he was appointed archbishop of York in 1514 and became cardinal in 1515. The king elevated him to the position of lord chancellor and prime minister.

For about 15 years, he was one of the foremost men in Europe, enjoying great wealth and honor. Among his

other acts, he founded and endowed Christ College, Oxford. In 1529, he was commissioned by Henry to procure from the pope the annulment of the royal marriage with Catherine of Aragon. Failing in the attempt, Wolsey was driven from the court and, in 1530, was arrested on a charge of high treason and died on his way to London.

Wood, Grant (1892-1942), painter, was born on a farm at Anamosa, Iowa, of Quaker ancestry. His early inclination toward art was encouraged by studies in the Handicraft Guild of Minneapolis and the Chicago Art Institute. He worked with the army's camouflage division in World War I, then studied at the Academy Julian in Paris. He returned to Iowa and began to paint people and scenes. Such portrayals of the Midwestern scene as "Woman with Plants," "Young Corn," "Dinner for Threshers," and the famous "American Gothic" are typical. In his classes at the University of Iowa and in his pamphlet, *Revolt Against the City*, he advocated the founding of regional art centers to encourage the development of a native art in America.

Wood, Leonard (1860-1927), American soldier and administrator, was born at Winchester, N. H., and was graduated from Harvard Medical School. He was President McKinley's personal surgeon and became the close friend of Theodore Roosevelt. On the outbreak of the Spanish-American War in 1898, Wood was associated with Roosevelt in raising and leading the famous regiment of "Rough Riders." For his conduct in this war, he became major general. He acted as military governor of Cuba, 1899-1902. He served later as a governor in the Philippines and, returning to America in 1908, was chief of staff until 1914.

His advocacy of preparedness brought him into disfavor with the administration, and he held inferior commands during World War I. He was governor-general of the Philippines from 1921 to 1927. His writings include *The Military Obligation of Citizenship*, *Our Military History*, and *Universal Military Training*.

Woolf, Virginia (1882-1941), English novelist, was the daughter of Sir Leslie Stephen. In 1912, she married Leonard Sidney Woolf, editor and author, and with him established the Hogarth Press. She was an exponent of the "stream of consciousness" novel, in which her psychological subtlety and artistry in language made her an outstanding figure. Her *Flush* is the autobiography of Elizabeth Barrett Browning's spaniel. Besides *The Common Reader* and other works of literary criticism, her books include *Night and Day*, *A Room of One's Own*, and *Roger Fry: a Biography*. She drowned herself after two of her houses had been destroyed by German bombs.

Woollcott, Alexander (1887-1943), American journalist, was born at Phalanx, N. J. Educated at Hamilton College and Columbia University, he acted as dramatic critic for the New York *Times* from 1914 to 1922 and later for other New York papers up to 1929, when he began broadcasting on American and British networks. He attracted an enormous following both as writer and broadcaster. His publications include *Enchanted Aisles*, *While Rome Burns*, *The Woollcott Reader*, and *Long, Long Ago*.

Woolley, Mary Emma (1863-1947), American educator, was born at South Norwalk, Conn. She taught history at Wheaton Seminary, 1886-91. She was graduated from Brown University, 1894; and, from 1895 to 1900, taught biblical history at Wellesley, becoming professor in 1898. From 1900 to 1937 she was president of Mount Holyoke College, and, for many years, was prominently identified with the development of educational opportunities for women in America and in other countries. President Hoover named her a delegate to the disarmament conference at Geneva in 1932.

Woolworth, Frank Winfield (1852-1919), American merchant, was born at Rodman, N. Y. He received a public school and business college education. In 1879, he opened a 5-cent store in Utica, N. Y., removing in the same year to Lancaster, Pa., where he continued in the same business. This he eventually developed to vast proportions, embracing about 800 "5- and 10-cent" stores in the United States and Canada and more than 50 in Great Britain. In 1911-12, at a cost of $14,000,000, he erected in New York City the Woolworth Building, 792 feet high. This vast structure, designed in modified Gothic style by Cass Gilbert was, at the time of its completion, the tallest inhabited building in the world.

Wordsworth, William (1770-1850), English poet, was born at Cockermouth, in Cumberland, England. He was sent to school first at Penrith; subsequently he was transferred to Hawkshead, Lancashire; in 1787, he was sent to Saint John's College, Cambridge. The future poet of nature was imbued with a lifelong passion for travel. His first tour was made in the autumn of 1790, in France, Switzerland, and Italy. The next year, he took his bachelor's degree at Cambridge; but, except in poetical literature, his knowledge of books was slight.

After a twelve months' sojourn in France, Wordsworth returned to London, where he published two volumes of verse,—*Descriptive Sketches* and *An Evening Walk*,—both written in college. He considered the ministry, but the political beliefs of his early manhood would not have been reconcilable with the position of clergymen in the Church of England. After wandering about for some years, he felt justified in regarding poetry as his true vocation.

He received in 1795 a legacy from his friend Raisley Calvert, which enabled him to live with entire singleness of aim until the settlement of his father's affairs. That autumn, Wordsworth took a house with his sister in Racedown, Dorsetshire, whence he removed two years later to Alfoxden, Somersetshire, in order that he might be near Coleridge. Here the two poets wrote in conjunction the famous *Lyrical Ballads*.

After spending the winter of 1798-99 in Germany with Coleridge, Wordsworth and his sister Dorothy, his most intimate friend and confidant, returned to their native Cumberland and settled at Grasmere. In 1803, he married Mary Hutchinson, to whose amiability his poems pay warm tribute. This same year, he made a trip to Scotland.

With his wife, his sister, and his three children, Wordsworth removed to Allan Bank, 1808, and, in 1813, he established permanent residence at Rydal Mount. A second tour of Scotland, in 1814, resulted in a few poems; in the summer of that year, he published *The Excursion*, one of his longest pieces. Various sonnets belong to this period. In 1820, Wordsworth made a tour of four months on the continent, the fruit of which appeared some time afterward in *Memorials*.

For his remaining 30 years, he lived among his beloved mountains and traveled much, but wrote very little. He made two visits to Scotland; in 1837, he again toured Italy. In 1842, he received a pension from the government, and, in 1843, he accepted nominal appointment as poet laureate of England.

Wordsworth, by his insistence on truth and simplicity of natural feeling, did much toward the revival of English poetry at the opening of the 19th century. He possessed an exceptional and passionate susceptibility to effects of beauty in the material world. From this arose a mystical communion with nature, which pervades the whole body of his poetry.

Wren, Sir Christopher (1632-1723), English architect, was born at East Knoyle, Wiltshire. He was graduated from Oxford, and became professor of astronomy in 1660. As a mathematician and scientist, he was engaged in 1663 by the dean of Saint Paul's to make a survey of the cathedral with a view to certain projected repairs. While thus employed, he became greatly interested in architecture, which he began to study with enthusiasm. In 1666, Saint Paul's was totally destroyed in the great fire, and Wren became the architect of the new cathedral, his masterpiece. His genius here displayed led to his being chosen to plan the most important buildings erected in London in the following 40 years.

Wright, Sir Almroth Edward (1861-1947), English physician and pathologist. After he was graduated from Dublin University, he continued his studies at Leipzig, Strasbourg, and Marburg. He was made demonstrator of pathology at Cambridge University, 1887, and of physiology at Sydney University, Australia, 1889. From 1892 to 1902, he was professor of pathology in the Army Medical School at Netley and was then appointed professor of experimental pathology in the University of London.

Wright was the author of the system of therapeutic inoculations for bacterial infections and introduced the successful method of immunization against typhoid fever by means of inoculation. His writings include *System of Anti-Typhoid Inoculation*, *Studies in Immunisation*, and *The Unexpurgated Case against Woman Suffrage*.

Wright, Frank Lloyd (1869-1959), American architect, was born at Richland Center, Wisc. Having studied engineering at the University of Wisconsin, he entered an architect's office in Chicago. In 1893, he began practicing independently and developed a style which became one of the strongest formative influences of 20th century architecture. Breaking sharply with tradition, he laid out buildings with an eye more exclusively to their use and the possibilities of new structural materials. His Imperial Hotel, in Tokyo, was one of the few buildings which withstood the great earthquake of 1923. The Midway Gardens, Chicago, and his own house, Taliesen, at Spring Green, Wisc., were among influential examples of his work, although the sharpness of his break with tradition circumscribed the extent to which his models were followed in America. His ideas were embraced more rapidly in the Netherlands and other European countries than in the United States. He was a member of the American Academy of Arts and Letters.

Wright, Orville (1871-1948), American inventor, was born at Dayton, Ohio, 1871. He was educated in the public schools. With his brother, Wilbur, he constructed the first airplane to fly successfully. After 1903, he devoted his attention mainly to the improvement of the invention, which was manufactured by the Wright Aeroplane Com-

pany. In 1915, he sold his interest in the company and was appointed member of the United States Naval Consulting board. Later he was made director of the Wright Aeronautical Laboratory. He received numerous honors both in America and abroad for his pioneer work in the development of the airplane. A monument to him and his brother was constructed by order of Congress and dedicated in 1932 on Kill Devil Hill near Kitty Hawk, N. C., where the first successful flight took place in 1903.

Wright, Wilbur (**1867-1912**), American inventor, was born near Millville, Ind. He was educated in the high schools of Richmond, Ind., and Dayton, Ohio. With his brother Orville, he became interested in the problem of mechanical flight, making at Dayton, Ohio, many experiments with kites and gliders. In a series of tests at Kitty Hawk, N. C., one of their machines, powered by an engine of their own design and make, on December 17, 1903, rose of its own power, remained in the air 12 seconds, and carried the operator 120 feet, the first instance of actual mechanical flight. In the fourth flight that day, their plane covered 852 feet in 59 seconds. In 1905, their airplane made a flight of 24¼ miles. Patents were secured and numerous exhibitions were made in the United States and abroad, demonstrating the success of the invention. He was elected to the American Hall of Fame in 1955. See *Airplane*.

Wundt (*vŏŏnt*), **Wilhelm Max** (**1832-1920**), German physiologist and psychologist, was born at Neckarau in Baden. He studied at Tübingen, Heidelberg, and Berlin. In 1875, he became professor of philosophy at Leipzig. Wundt was not only the most distinguished investigator in experimental psychology, but was the creator of the modern science of psychology. He united the work of Herbart, Weber, Fechner, and Lotze, bringing into correlation the mathematical, the experimental, the psychophysical, and the physiological movements in psychology. Among his many works are *Human and Animal Psychology* and *Outlines of Psychology*.

Wyant, Alexander Helwig (**1836-1892**), American landscape painter, was born at Port Washington, Ohio. He began portrait painting in Cincinnati; went to Paris in 1860, where he was much influenced by the work of Corot and Dupré; and later spent three years under Hans Gude at Düsseldorf and Karlsruhe. After 1864, he settled in New York. Losing the use of his right hand, he trained himself to paint equally well with the left, and rose to a distinguished place in American art. Wyant ranks second only to the more versatile Inness among the great painters of the Hudson River School.

Wyeth, Andrew (**1917-**), painter, was born at Chadd's Ford, Pa. Inherited talent, together with training by his father, Newell Convers Wyeth, gave him an early start toward his career. His first important pictures were landscapes and seascapes recalling sojourns in Maine. His later work, seen in many exhibits and museum collections, is praised for realism and depth of feeling. Examples are "The Blackberry Pickers," "The Spool Bed," and "The Skaters."

Wylie, Philip Gordon (**1902-**), American writer, was born at Beverly, Mass. After attending Princeton University, he joined the staff of the *New Yorker* magazine, later becoming a writer for Paramount Pictures and Metro-Goldwyn-Mayer. A prolific writer of stories and articles for leading American magazines, he has had many books published. His vigorously expressed social criticism in *A Generation of Vipers* aroused violent controversy.

Wyss (*vĭs*), **Johann Rudolf** (**1781-1830**), Swiss educator and author, was born at Bern. He is known chiefly as the author of *Swiss Family Robinson* and of the Swiss national anthem. Most of his life was spent as professor of philosophy at the University of Bern.

Xavier (*zăv'ĭ-ĕr*), **Saint Francis** (**1506-1552**), Jesuit missionary, styled the "apostle of the Indies," was born of a noble family in the north of Spain. At Paris, where he studied and then lectured, he was associated with Loyola in founding the Society of Jesus. He was ordained priest in 1537, lived at Rome in the service of the Society, and was sent as missionary to Portuguese colonies in the East.

Xavier arrived at Goa in 1542, and labored with equal zeal and success among the Europeans and the native population. After a year he visited Travancore, where in a month he baptized 10,000 natives. He then visited Malacca, the Banda Islands, Amboyna, the Moluccas, and Ceylon, where he converted the king of Kandy with many of his people. The mission which he founded in Japan flourished for a hundred years. He returned to Goa in 1552 to organize a mission to China. His strength had been worn out, however, by his labors and privations, and he died in the same year. He was canonized in 1622.

Xenophanes (*zē-nŏf'ā-nēz*), (**c.570 B. C.-?**), Greek philosopher, founder of the Eleatic School, was born at Colophon in Asia Minor. Xenophanes is the first man who is known to have observed the so-called anthropomorphic character of popular religions, which he attacked on the ground that, in them, men conceived of gods in their own image. He taught that there was one god and that he was changeless and eternal. His chief work, *On Nature*, has not survived, but a celebrated sentence has been preserved to the effect that, if oxen had gods, their gods would have the form of oxen. The date of his death is unknown.

Xenophon (*zĕn'ō-fŏn*), (**c.434 B. C.-c.355 B. C.**), Greek historian and military commander, was born at Athens. He was a pupil and friend of Socrates. He joined the expedition of Cyrus against his brother Artaxerxes, and, on its failure and the subsequent treacherous murder of the leaders of the Greek division, he was chosen to lead this force back from a point near Babylon to Trebizond on the Black Sea. After other military service, he retired to Elis.

His principal works are the *Anabasis*, an account of the expedition of Cyrus and of the retreat; the *Memorabilia*, an account of the life and teachings of Socrates; the *Hellenica*, a history of Greece beginning at the point where Thucydides discontinued his *Peloponnesian War*; and the *Cyropædia*, an account of the education of Cyrus the Elder.

Xerxes I (*zûrk'sēz*), (**c.519 B. C.-465 B. C.**), king of Iran, son of Darius I, whom he succeeded on the throne in 485 B. C. In 481, he attempted to subdue Greece by both sea and land. With his army he crossed the Hellespont by means of a bridge of boats; was checked for a time at Thermopylæ by Leonidas and his three hundred; advanced to Athens to see his fleet destroyed at Salamis by Themistocles; and left 300,000 men under Mardonius, who suffered defeat at Platæa in 479. He returned to Asia Minor, and, after an expedition against Babylon, in which he razed its temples to the ground, he was assassinated.

Yale, Elihu (**1648-1721**), English colonial official, was born at or near Boston, Mass. When four years old, he was taken to England by his father, and he never returned to America. From 1687 to 1692, he was governor of Fort Saint George, Madras, and, in 1699, became governor of the East India Company. Yale College received his name in the charter of 1745. Previously the building and, before that, the school at Saybrook, Conn., had been called by his name.

Yeats (*yāts*; *yēts*), **William Butler** (**1865-1939**), Irish poet and dramatist, was born in Dublin. His education was received in his native city and in London. He studied art for a time, but soon turned to literature. He devoted much effort to gathering folklore, which he utilized in poems, plays, tales, essays, and sketches. His new versions of the *Countess Kathleen* and the *Wanderings of Oisin*, with the *Poems* of 1895, marked the rise of a new Irish school and definitely established his fame. An Irish Literary Theater was founded with the assistance of Lady Gregory, Edward Martyn, and George Moore, and Yeats brought to the theater great poetic gifts. He served as senator when the Irish Free State was established in 1922. His writings include *The Celtic Twilight*, *A Book of Irish Verse*, *The Wind Among the Reeds*, *Cathleen ni Houlihan*, *The Hourglass*, *Deirdre*, *The Green Helmet*, *Plays for an Irish Theater*, and *The Tower*. He received the Nobel prize for literature in 1923. See *Hourglass, The*.

Yerkes (*yĕr'kēz*), **Charles Tyson** (**1837-1905**), American capitalist and philanthropist, was born in Philadelphia. After receiving a high school education, he became a clerk in a grain commission house. Rising rapidly, he obtained important holdings in the street railway system of Philadelphia and, by 1886, controlled the Chicago street railway system. He later took part in constructing the underground railway system of London, Eng. In 1892, he endowed the famous Yerkes observatory, at Williams Bay, Wisconsin.

Yerkes, Robert Mearns (**1876-1956**), American psychologist, was born at Breadysville, Pa. A graduate of Harvard University, he began teaching psychology there in 1901. After 1917, he was engaged in psychological tests for the army, work for the National Research Association, and, beginning in 1924, teaching as professor at Yale University. He specialized in animal behavior and investigated particularly the intelligence of anthropoid apes, assembling a considerable number of animals in the Yale Laboratory of Primate Biology and applying numerous tests to their mentality. His publications include *Almost Human*, *The Mind of the Gorilla*, and, with his wife Ada Watterson, *The Great Apes*.

Young, Brigham (**1801-1877**), American religious leader, was born at Whitingham, Vt. In 1832, having become a convert to the teachings of Joseph Smith, he was made an elder of the Church and began to preach at the Mormon settlement at Kirtland, Ohio. Three years later he was sent as a missionary to New England, where he secured numerous converts. After the death of Joseph Smith, at Nauvoo, Ill., 1844, Young assumed leadership and, in 1847, was chosen president of the Church of Jesus Christ of Latter-Day Saints, commonly called Mormons.

In 1845, he led the first party westward from Nauvoo and reached the Salt Lake Valley in 1847, where he located the site of a new temple and founded Salt Lake City. In 1851, he established a system of public schools. In 1852, he published the "revelation" of Joseph Smith favoring polygamy, which was finally officially prohibited in 1890. In 1868, he established a system of stores called Zion's Cooperative Mercantile Institution, which still controls a large amount of business in Utah.

Young was a leader of great force and remarkable foresight. The substantial growth and material prosperity of the Mormon settlements in Utah under his rule are proof of his administrative ability. When he died, he left about two million dollars, to be divided among numerous wives and more than 50 children. See *Salt Lake City.*

Young, Thomas (1773-1829), English scientist and archeologist, was born at Milverton, of Quaker parents. He was educated in London, Edinburgh, and Göttingen and began a medical practice in London. In 1801, he was made professor of natural history in the newly founded royal institution, but resigned in 1803. He was chosen on the staff of Saint George's hospital in 1811. He retired from practice in 1814 to become an insurance actuary.

In 1818, he was made superintendent of the *Nautical Almanac* and, in 1828, became sole conductor. He was the first to describe and measure astigmatism and is considered the founder of physiological optics. His most celebrated work was his demonstration of the wave theory, based on his discovery of the interference of light; also made notable researches in Egyptian hieroglyphics.

Young, Whitney M., Jr. (1921-), social reformer, was born at Lincoln Ridge, Ky. As a writer on problems of the Negro, he is known for a syndicated newspaper column and for his book, *To Be Equal* (1964). He is director of the National Urban League, an organization of Negro citizens with white participation, whose purpose is to improve local living conditions and employment opportunities.

Younghusband, Sir Francis Edward (1863-1942), English soldier, explorer, and writer, was born at Murree, India. He was educated at Clifton and Sandhurst; entered the British army; and became lieutenant colonel, 1908, for service in India. He undertook numerous difficult travels in unknown parts of Asia, covering parts of Manchukuo, Chinese Turkestan, the Pamir, Tibet, and northern India. In 1904, as the British commissioner to Tibet, he forced his way into the sacred city of Lassa. His writings include *Heart of a Continent, Kashmir, The Heart of Nature, The Epic of Everest, Dawn in India,* and *The Living Universe.*

Ypsilanti (*ĭp'sê-lăn'tê*), **Alexander (1792-1828)**, Greek soldier and revolutionary leader, was born at Istanbul. He accompanied his father, Constantine, to Leningrad; joined the Russian army in 1809; and fought with distinction in the campaign of 1812 and 1813, losing an arm at the battle of Dresden. He was made major general in the Russian army in 1817. He became president of the Greek league in 1820 and, in the following year, led an insurrection against the Turks in the Danube provinces. After a series of defeats, he fled to Austria, where he was kept in prison for seven years. Shortly before his death, his release was effected by Czar Nicholas I. His brother Demetrius (1793-1832) succeeded to the command of the Greek revolutionists and, in 1828, forced the capitulation of Aslan Bey at the pass of Petra, virtually ending the war for Greek independence.

Zaharias, Mildred Didrikson (1914-1956), American woman athlete, popularly known as "Babe" Didrikson, was the daughter of a Norwegian ship carpenter who settled in the United States. She was born and reared in Port Arthur, Texas. Even as a youngster, she excelled at many sports, including running, diving, swimming, high-jumping, hurdling, javelin-throwing, basketball, and baseball. She attracted world notice at the 1932 Olympic Games at Los Angeles by winning the javelin throw and the 80-meter hurdles. In 1935 she began to play golf and by 1950 had won all the available championships. She became U. S. Amateur champion in 1946, and the following year was the first American to win the British Amateur title.

Zamenhof (*zä'mĕn-hôf*), **Lazarus Ludwig (1859-1917)**, Russian oculist and linguist, was born at Bielostok, Grodno. He was educated at the universities of Moscow and Warsaw. He settled in Warsaw, where he practiced his profession and became noted for his advocacy of an international language. In 1887, he published his first book on Esperanto, an artificial language which attracted the attention of linguists throughout the world.

Zane, Ebenezer (1747-1811), American pioneer of the Revolutionary period, was born in Berkeley County, W. Va. He held several civil and military offices and attained the rank of colonel. In 1769, he established on the site of the present city of Wheeling the first permanent settlement on the Ohio River. For the protection of the settlers, he built a blockhouse, called Fort Henry, which was several times attacked by the Indians during the Revolutionary War. Zane owned the land where the city of Zanesville, Ohio, now stands and, in 1799, assisted in laying out the original town, at first called Westbourn but in 1802 renamed Zanesville.

Zeiss (*tsīs*). **Carl (1816-1888)**, German optician, was born at Weimar. He was educated for medicine. In 1846, he established at Jena the now world-famous optical factory, which still bears his name, being incorporated in 1889 as the Carl-Zeiss-Stiftung.

Zenker (*tsĕng'kĕr*), **Friedrich Albert von (1825-1898)**, German physician, was born in Dresden. He was educated in Leipzig and Heidelberg. In 1851, he became attached to the city hospital of Dresden, where, in 1855, he became professor of pathology in the Surgico-Medical Academy. While there he discovered that the disease trichinosis is caused by the trichina worm introduced into the body by eating insufficiently cooked pork from infected pigs. In 1862, he was made professor at Erlangen. See *Trichina.*

Zeno (c. 490 B. C.-?), Greek philosopher of Elea, in Italy, was a favorite disciple of Parmenides. He accompanied him to Athens and there taught the illustrious Pericles. He devoted his great powers of argumentation to enforce the doctrines first broached by Xenophanes and more systematically developed by Parmenides, attempting to demonstrate by ingenious examples the impossibility of motion. His paradoxes of Achilles and the hare and of the flying arrow have, in modern times, been used by Bergson in an attempt to show that motion alone exists. Zeno is said to have been arrested for conspiring to drive the tyrant Nearchus from Elea and to have been put to death by torture.

Zeno (?-c. 264 B. C.), Greek philosopher, was born at Citium, in Cyprus, and flourished in the early part of the 3d century B. C. He was at first a trader. Coming to Athens, he was attracted by the Cynic philosophy, the asperities of which he somewhat modified in doctrines that later became known under the term Stoicism. This name was derived from the *Stoa Poikile,* "painted porch," which he selected for the delivery of his lectures throughout his 58 years of teaching in Athens.

Stoic doctrine honored virtue above all things, esteeming as indifferent all other common objects of desire. Socrates was held up as the examplar of the virtuous man. The Athenians honored Zeno's memory by a public tomb and monument.

Zenobia (*zê-nō'bĭ-ä*), queen of Palmyra, succeeded her husband Odenathus in 267 and showed an independence of her Roman suzerains that resulted in several clashes with the Roman troops. When Aurelian became emperor, he marched with a large army against Zenobia and, after defeating her in several battles, besieged her in Palmyra. She attempted to escape, but was captured and brought to Rome in 272 to adorn the triumph of her conqueror. She was later presented by Aurelian with large possessions near Tivoli, where the remainder of her life was passed. She was a woman of great courage, high spirit, and remarkable beauty. With austerity of morals in private life she combined prudence, justice, and liberality in her administration of public affairs.

Zeppelin (*tsĕp'ê-lēn'*), **Ferdinand, Count von (1838-1917)**, German inventor, was born at Constance, Baden. He received his education in the Polytechnic School at Stuttgart, in the Military School at Ludwigsburg, and in the University of Tübingen. He entered the army and became a cavalry officer in 1858. In 1863, he came to the United States, where he fought with the Union army in the Civil War. He later returned to Germany.

Zeppelin spent much of his life in experimenting with dirigible balloons. The first large one was built in 1892 and, in 1909, he was able to make a flight from Friedrichshafen to Berlin. In the former place, he established a factory for manufacturing dirigible airships, a large number of which were used by Germany in World War I.

Zeuxis (*zūk'sĭs*), Greek painter, lived about the end of the 4th century B. C. He improved the methods of Apollodorus of Athens and excelled in coloring and expression. He executed small works for private patrons rather than decorations of a public or monumental character. Among his famous works were "Helen," which he presented to the people of Crotona; "Alcmena," given to Agrigentum; "Pan," presented to Archelaus; a youthful "Hercules"; and "Zeus Surrounded by the Gods."

Zhukov (*zhū'kŏf*), **Georgi Konstantinovich (1895-**), Russian general. Enlisting as a private soldier in 1915, he won promotion after the Revolution. He served against the Japanese on the Amur River in 1938-39. In 1941, he directed the armies which saved Moscow from the Germans and, in 1942, turned the tide of war in the northern sector of the front. He organized the Russian offensive

in 1943 and, in 1944-45, commanded the forces which reconquered Poland and captured Berlin. A popular hero, and seemingly well established as Soviet Defense Minister, he was suddenly removed by Khrushchev in 1957.

Ziegfeld, Florenz, Jr. (**1869-1932**), American theatrical producer, was born at Chicago, where he entered the theatrical business in 1892. He brought military bands from Europe for the world's fair, Chicago, in 1893. Besides producing *Ziegfeld's Follies* annually from 1907, he produced *Papa's Wife, The Parisian Model, Miss Innocence, The Pink Lady*, and many other spectacular shows. He married Billie Burke in 1914.

Zimbalist, Efrem (**1889-**), American violinist, was born at Rostov, Russia, and studied with Leopold Auer at the Leningrad Conservatory. He made his debut at Berlin, Germany, in 1907, after which he toured through Europe. His first appearance in the United States was at Boston in 1911. In 1914 he married Alma Gluck, the singer, and after her death (1938) married (1943) Mary Curtis Bok. Zimbalist has been director of the Curtis Institute of Music, Philadelphia, since 1941.

Zinzendorf (*tsĭn'tsĕn-dôrf*), **Nikolaus Ludwig, Count von** (**1710-1760**), was born at Dresden. A chance encounter with a wandering carpenter named Christian David aroused his interest in the Moravian brethren, and he invited the persecuted sect to settle on his estates in upper Lusatia; the colony thus formed was named Herrnhut. In 1737 Zinzendorf was ordained bishop of the Moravians. He afterwards traveled in England and in America, where, in 1741, he founded the Moravian colony at Bethlehem, Pa. He died at Herrnhut.

Zittel (*tsĭt'ĕl*), **Karl Alfred von** (**1839-1904**), German geologist and paleontologist, was born at Bahlingen, Baden. He was educated at Heidelberg and Paris. In 1866, he was made professor of paleontology at Munich, where he won an international reputation by his researches and publications in paleontology. He accompanied Rohlfs's exploring expedition to Egypt and the Libyan Desert in 1873-74. Among his publications are *The Sahara* and *History of Geology and Paleontology to the End of the Nineteenth Century*. With Schimper and Schenk, he published *Handbook of Paleontology*, a notably important work.

Zola (*zō'lä*; F., *zô'lä'*), **Emile** (**1840-1902**), French novelist, was born at Paris. He was educated at the Lycée Saint-Louis and settled in Paris. His first important venture in fiction was *Les mystères de Marseille*. In this and in *Thérèse Raquin*, he at once displayed his remarkable power in the critical analysis of human character. With Flaubert and the Goncourts, he founded the naturalistic school of fiction. His famous series known as *The Rougon-Macquart Family* was modeled somewhat after Balzac's *La comédie humaine*.

Among his more notable subsequent stories are *La joie de vivre, Au bonheur des dames, La bête humaine, La débâcle, Le rêve*, and *Lourdes*. The last forms one of a trilogy, which he called *Les trois villes*—Lourdes, Rome, and Paris—all in the extreme realistic vein. His last work, written in the exile occasioned by his courageous advocacy of justice in the notorious Dreyfus case, is entitled *Fécondité*. Zola was one of the most brilliant, impassioned, and sincere of modern French writers. See *La débâcle*.

Zorn (*tsôrn*), **Anders Leonhard** (**1860-1920**), Swedish painter, was born at Mora, Dalarne. He studied at Stockholm Academy and in London. In 1888, his first oil painting, "Fisherman from Saint Yves," was placed in the Luxembourg Museum. Although traveling extensively, he resided chiefly at Mora, where he devoted himself largely to painting Swedish subjects, excelling in the female figure.

Zorn ranks among the foremost modern portrait painters, combining strong naturalism with fine powers of characterization. Among his well-known figure paintings are "Summer in Sweden," "Dagmar," and "Watering the Horse."

Zoroaster (*zō'rō-ăs'tĕr*), often referred to under the Avestan form of his name, Zarathustra, was the founder of the Persian-Iranian religion, usually designated as Zoroastrianism. Forms of this religion are now held by the Ghebers in Persia and the Parsis in India. There is doubt as to the period in which he lived, some modern scholars placing it in the 7th and 6th centuries B. C.; others, in the 11th and 10th. He seems to have been born in Bactria, in the northwestern part of Iran. His doctrine then spread to Media and Persia.

Tradition leaves space for a period of religious preparation from his 15th to his 30th year, when he received a revelation of the faith and came forward as a reformer of the beliefs of the old Brahmanic creed. He was the leader of a group of chieftains who, after a period of political, military, and religious struggles, established a holy agricultural state. The laws of this state encouraged pastoral labor and thrift.

That Zoroaster was legislator, prophet, pontiff, and philosopher, as tradition asserts, may well be true. The propagation of his religious system occupied him until the time of his death. His end seems to have been violent and to have taken place during the invasion of Iran by the Turanians, who waged a religious war against Vishtaspa.

The present *Avesta*, or *Zend-Avesta*, the bible of Zoroastrianism, is the remnant of a greater religious literature. It includes (1) various hymns, or *gathas*, (2) a collection of liturgical forms, (3) sundry religious laws, (4) mythical fragments devoted to several divinities, and (5) several prayers. The *gathas*, verses from the sermons of Zoroaster, form the oldest and most sacred part of the *Avesta*.

Zoroastrianism teaches that the world is the scene of a conflict between two principles: the good, called Ormuzd; the evil, called Ahriman,—the god of life and the god of death. Every good action helps the one; every evil action, the other. Those who touch what is impure give Ahriman the more power over them. Zoroaster's belief in immortality and in the final triumph of good over evil resembles both the later Jewish and the Christian dogmas. Zoroaster died at the age of 77.

Zuloaga (*sōō'lô-ä'gä*), **Ignacio** (**1870-1945**), Spanish painter, was born at Eibar, Spain. He studied in Paris, devoting himself to the old Spanish masters, notably Velásquez. He first achieved distinction with his portrait group "Daniel Zuloaga and His Daughters," now in the Luxembourg Museum, Paris. He later settled in Spain, where he traveled extensively in remote districts, portraying with notable individuality, gypsies, bull fighters, beggars, fruit sellers, water carriers, and dancers.

His work is animated, intense, and powerful. While a master of rich and varied color harmonies, he excels in somber effects. In the Metropolitan Museum, New York, he is represented by the "Gypsy Bull Fighter's Family" and by "Mlle. Lucienne Breval as Carmen."

Zurbarán (*thōōr'bä-rän'*), **Francisco de** (**1598-1662**), Spanish painter, was born at Fuente de Cantos, Estremadura, 1598. He studied painting at Seville and developed a strong, realistic style of an intentionally Spanish character. His "Scenes from the Life of Saint Peter," executed for the cathedral of Seville in 1625, brought him wide fame. Among his important paintings are scenes from "The Life of Saint Buenaventura," in the Louvre, Berlin, and Dresden museums; "Apotheosis of Saint Thomas Aquinas"; "Saint Francis of Assisi"; "Immaculate Conception"; and "The Crucifixion." Through the influence of Velásquez he was made painter to the king in 1633. Zurbarán's religious pictures and fine portraits of monks did for the cloister what the work of Velásquez did for the court.

Zweig (*tsvīk*), **Arnold** (**1887-**), German novelist, was born at Gross-Glogau, Prussia, in 1887. After studying languages, history, and psychology in the leading German universities, he served as a private during World War I. His experiences there inspired several novels, including *The Case of Sergeant Grischa, Young Woman of 1914*, and *Education before Verdun*, characterized by a sharply-etched realism. When the Hitler party rose to power, he left Germany, being of Jewish blood, and, in 1934, took up his residence in Palestine. His later works include *Crowning of a King* and *Insulted and Exiled*.

Zweig, Stefan (**1881-1942**), Austrian critic and biographer, was born in Vienna. He died by his own hand in Brazil, a refugee from war-torn Europe who had failed to find tranquillity either in England or in the United States. He is noted especially for his combined biographical and critical studies of several groups, for example: Balzac, Dickens, and Dostoievsky; Casanova, Stendhal, and Tolstoi; and Hölderlin, Kleist, and Nietzsche. In *The World of Yesterday* (1942) and other autobiographical writings, he shows keen sensitiveness to cross-currents of prejudice and to psychological problems arising from the disturbed conditions of his time.

Zwicky, Fritz (**1898-**), American astrophysicist, was born at Varna, Bulgaria, and was educated at Zurich, Switzerland. He came to the United States in 1925 as a research fellow at the California Institute of Technology, Pasadena. In 1927 he was made assistant professor of theoretical physics, associate professor (1929-41), and then professor of astrophysics (1942). An authority on novae and supernovae, he has been astronomer at Mount Wilson and Palomar observatories since 1948. His work in connection with cosmic rays, jet propulsion, and the activity of ions in gases has been notable.

Zwingli (*tsvĭng'lē*), **Ulrich** (**1484-1531**), Swiss religious reformer, was born at Wildhaus. He served in Italy as a soldier; visited Erasmus at Basel in 1514; and, two years later, at the monastery of Einsiedeln, began to preach freely, opposing the sale of indulgences and favoring changes in doctrine and practice similar to those advocated by Luther. He met Luther in 1529 but failed to agree with certain of his more radical innovations in doctrine. Zwingli was one of the leaders of the Protestant cantons of Switzerland, and was slain in a battle against the Catholic cantons.

STUDY AND REFERENCE GROUPS

IN studying a person's biography we are concerned, not only with the facts of his life, but also with his place in history. We see him, not as an isolated individual, but as one who played his part with others in some important branch of human activity. It is natural to ask, "Who were his predecessors, his co-workers, his rivals, his successors?" Thus, Hannibal is linked with Scipio, Francis I with Henry VIII, and Wellington with Ney and Grouchy as well as Napoleon. A man like Faraday is considered in relation to earlier scientists whose ideas he inherited, and to later ones who profited by his special contribution. The names of Burke, Pitt, and Fox are associated together in the great period of British oratory, as are those of their American contemporaries, Samuel Adams, James Otis, and Patrick Henry. In thinking of the individual, we think naturally of the group to which he belongs.

Plan and Arrangement. To aid the student in fixing the historical position of persons described in the foregoing biographical sketches, the individuals are grouped below in 100 main classifications. These major fields of activity are listed in alphabetical sequence, beginning with "Actors" and ending with "Zoologists." Some of the groups—for example, "Air Line Executives" and "City Planners"— may contain only a few names as yet, but they represent new and growing fields of specialization, in which a person may make an important contribution to society. As a matter of convenience, some of the larger groups are subdivided; for example, "Dramatists" are given three headings: American, English, and World. Both "Rulers" and "Military Leaders" are listed according to the conventional periods of history: Ancient, Medieval, and Modern. Within each group or subdivision the names appear in chronological order, based on the individual's date of birth.

This feature gives the Department of Biography the valuable advantages of the *historical* as well as the *encyclopedic* arrangement. The reader may refer to each biographical sketch alphabetically, as in an encyclopedia; he may study each noted character in the order of his appearance, as in a history; and he may further consider each person's achievements as compared with those of other important figures in the same group or in related groups.

In addition to the 100 principal divisions, there are two special groups found on page 2024, namely: **Hall of Fame** and **American Academy of Arts and Letters.** Because these honors have come in recognition of achievement in many different fields, the names in these lists, with some exceptions, are duplicated in one or another of the 100 divisions. A further classification, **Nobel Prize Winners,** is given in tabulated form on pages 2024–2028.

Explanation for the User. In making reference to a name in any of the groups, the following points should be observed.

1. The name of a man or woman whose sketch is given in the Department of Biography appears usually in but *one* group, representing the field in which the person did his most distinguished work.

2. A number in parentheses following a name indicates another group in which the person in question achieved a noteworthy degree of distinction. Two or more numbers placed after a name indicate that such a person was distinguished in two or more fields of achievement. The names of these additional fields of effort may be quickly found by turning to the study groups designated by these numbers.

3. A geographical name or abbreviation in Italics indicates the country to which the person belongs.

Illustrative Examples. A few concrete instances will make clear the value of these groups when used for systematic study or reference.

By turning to group (9), the reader will find a list of nearly fifty noted astronomers arranged in chronological order. It begins with Thales, one of the seven wise men of ancient Greece, and ends with Jones, a present-day scientist whose observations aided in reconstructing our ideas of the universe. The group therefore comprises the leaders of astronomical progress covering a period of 2500 years. By studying the lives of these men in historical order, the reader will be able greatly to enlarge his knowledge of astronomical science.

The newer science of anthropology may be studied in terms of the men listed in group (6), beginning with its founder, Johann Friedrich Blumenbach (1752–1840), and coming down to the present, as represented by Louis S. Leakey, whose research resulted in the discovery of the earliest known specimen of the human species, and Loren C. Eiseley, a leading interpreter of the theories of Darwin.

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(1) Actors and Actresses:

AMERICAN

Forrest, Edwin
Cushman, Charlotte (98)
Booth, Edwin Thomas
Barrett, Lawrence
Drew, John
Mantell, Robert B.
Skinner, Otis
Sothern, E. H. (94)
Miller, Henry J.
Fiske, Minnie M. (30)
Allen, Viola
Hackett, J. K.
Adams, Maude
Houdini, Harry
Duncan, Isadora
Barrymore, L.
Barrymore, Ethel
Hampden, Walter
Barrymore, J.
Fairbanks, Douglas
Tucker, Sophie
Chaplin, Charles S.
Lunt, Alfred
Pickford, Mary
Cornell, Katharine
Laughton, Charles (94)
Hayes, Helen
Waters, Ethel
Bankhead, T. B.
Dietrich, Marlene
Crosby, Bing
Davis, Bette
Garbo, Greta
Hepburn, Katharine
Martin, Mary
Welles, Orson
Poitier, Sidney

WORLD

Cibber, Colley (13) (30) (94)
Clive, Kitty
Garrick, David (30) (94)
Siddons, Sarah
Kemble, John Philip
Kemble, Charles
Kean, Edmund
Kemble, Frances A.
Kean, Charles John
Irving, Sir Henry
Coquelin, Benoît (25)
Modjeska, Helena
Bernhardt, Sarah (30) (88)
Terry, Ellen Alice
Forbes-Robertson, J.
Duse, Eleonora
Campbell, Mrs. P.
Arliss, George (13) (94)
Anglin, Margaret
Chevalier, Maurice
Hardwicke, Cedric (94)
Fields, Gracie
Lillie, Beatrice
Evans, Maurice
Fokine, Michel
Pavlowa, Anna
Olivier, Laurence
Guinness, Alec

(2) Advertising Executives and Writers:

Calkins, Ernest Elmo
Osborn, Alex. F.
Arden, Elizabeth

(3) Agriculturists:

Columella, Lucius J.
Judd, Orange (32)
Hellriegel, Hermann
Wilson, James (78)
Wallace, Henry (78)
Benson, Ezra T.

(4) Aircraft Designers and Manufacturers:

Montgolfier, Jacques E. (11)
Montgolfier, Joseph M. (11)
Langley, S. P.
Zeppelin, Count von (11)
Wright, Wilbur (11)
Wright, Orville
Santos-Dumont, A. (11)
Curtiss, Glenn (11)
Martin, Glenn L. (11)
Sikorsky, Igor (11)
Seversky, Alexander(11)
Messerschmitt, Willy
Beech, Olive

(5) Air Line Executives:

Rickenbacker, Edward V. (11)
Lindbergh, Chas. A. (11)

(6) Anthropologists:

Blumenbach, J. F. (74)
Galton, Sir Francis (39)
Lubbock, Sir J. (100)
Powell, J. W. (37)
Bertillon, Alphonse
Fraser, Sir J. G.
Cushing, Frank H.
Westermarck, Edw. Alexander
Hrdlicka, Ales
Lowie, Robert Heinrich
Mead, Margaret
Hooten, Earnest A. (33)
Dart, Raymond (33) (72)
Leakey, Louis S.
Eiseley, Loren C.

(7) Archeologists:

Ixtlilxochitl, F. de (41)
Young, Thomas (73)

Champollion, J. F.
Curtius, Ernst (41) (69)
Layard, Sir Austen Henry (78)
Cesnola, Count di
Petrie, W. M. F.
Breasted, James Henry (20)
Albright, William F.
Glueck, Nelson

(8) Architects:

AMERICAN

Bulfinch, Charles
Latrobe, Benj. (34)
Walter, Thomas U.
Renwick, James
Olmsted, Frederick L.
Hunt, Richard Morris
Post, George B.
Richardson, Henry H.
Burnham, Daniel H.
Mead, William R.
McKim, Charles F.
White, Stanford
Kendall, W. M.
Flagg, Ernest
Carrère, John Merven
Coolidge, Charles A.
Cobb, Henry Ives
Gilbert, Cass
Hastings, Thos.
Heins, George Lewis
La Farge, C. G.
Bacon, Henry
Goodhue, B. G.
Wright, Frank L.
Corbett, Harvey W.
Pope, John R.
Delano, W. A.
White, Lawrence Grant
Harrison, Wallace
Stone, Edward D.
Saarinen, Eero

WORLD

Callicrates
Callimachus (88) (67)
Apollodorus
Brunelleschi, Filippo
Alberti, Leon B.
Bramante
Palladio, Andrea
Fontana, D. (34)
Jones, Inigo (27)
Wren, Sir C. (9) (54)
Garnier, Jean Louis
Lutyens, Sir E. L.
Saarinen, Eliel (19)
Gropius, Walter (33)

(9) Astronomers:

Thales (phil.) (70)
Aristarchus
Fratosthenes (39)
Hipparchus
Ptolemy (39)
Copernicus, Nicolas (54)
Brahe, Tycho (54)
Kepler, Giovanni Domenico (54)
Cassini, G. D. (54)
Flamsteed, John
Halley, Edmund (54)
Bradley, James (54)
Celsius, Anders (46)
Lalande, Joseph Jérôme Le-F. de
Herschel, Sir W. (73)
Bode, Johann E. (54)
Delambre, Jean Baptiste J. (54)
Laplace, P. S. (54) (73)
Herschel, Caroline L.
Bowditch, N. (54)
Bessel, F. W. (54)
Encke, Johann Franz
Herschel, Sir John F. W.
Airy, G. B. (54) (73) (34)
Leverrier, U. J. J.
Galle, Johann G.
Mitchell, Maria

Adams, John C. (54)
Gould, Benjamin A.
Huggins, Sir William
Clark, Alvan
Newcomb, S. (54) (33)
Lockyer, Sir J. N. (73)
Flammarion, C. (63)
Pickering, E. C. (73) (33)
Lowell, Percival
Barnard, Edw. E. (33)
Campbell, W. W.
Cannon, Annie J.
Hale, George Ellery
Moulton, F. R.
Morehouse, D. W. (33)
Eddington, Sir Arthur Stanley (73)
Shapley, Harlow (33)
Hubble, Edwin Powell
Jones, Sir Harold

(10) Automobile Manufacturers:

Ford, Henry
Chrysler, Walter P.
Knudsen, William S. (78)
Kaiser, Henry J.
Ford, Henry II

(11) Aviators:

Eckener, Hugo
Piccard, Auguste and Jean
Byrd, Richard (37)
Doolittle, James H. (58)
Putnam, Amelia Earhart
Lindbergh, Chas. A. (5)
Lindbergh, Anne (36)

(12) Biblical Characters and Saints:

Moses
Paul, St.
Justin (95)
Anthony, St. (95)
George, St.
Athanasius, St. (95) (64)
Basil, St. (95)
Ambrose, St. (49) (95)
Jerome, St. (20) (41) (95)
Chrysostom, St. (64)
Augustine, St. (95)
Geneviève, St.
Benedict, St. (33) (95)
Isodore, St. (20) (95)
Boniface, St. (86)
Dunstan, St. (73) (95)
Olaf, St. (ruler) (73)
Gregory VII (pope) (95)
Bruno, St.
Anselm, St. (33)
Bernard, St. (95)
Becket, Thomas à
Dominic, St. (95)
Francis of Assisi, St. (95)
Anthony of Padua, St. (95)
Louis IX, St. (ruler) (58)
Alexander Nevsky (97)
Aquinas, St. Thomas (33) (70) (95)
Bonaventura, St. (95)
Catherine, St.
Francis of Paola, St.
Loyola, St. Ignatius de (95)
Xavier, St. Francis (86)
Philip Neri, St. (33) (68)
Francis de Sales, St. (64) (95)
Vincent de Paul, St. (68)
Cabrini, St. F. X.

(13) Biographers:

Plutarch
Vasari, Giorgio (67)
Boswell, James
Forster, John
Smiles, Samuel
Strachey, G. Lytton
Ludwig, Emil (41)
Hackett, Francis
Guedalla, Philip (41)
James, Marquis
Marshall, Catherine

(14) Botanists:

Theophrastus (70)
Bartram, John
Linnaeus, Carolus (60)
Bonnet, Charles (70)
Jussieu, Antoine Laurent de
Brown, Robert
De Candolle, Augustin Pyrame (18)
Torrey, John (72)
Brongniart, A. T.
Gray, Asa (72)
Hooker, Sir J. D.
Mendel, Gregor (14) (95)
Sachs, Julius von
Sargent, Chas. S. (38)
Warming, Johannes
Pfeffer, Wilhelm
De Vries, Hugo
Coulter, John M. (33)
Saunders, Charles E. (18)
Fairchild, David
Sinnott, Edmund W. (33)

(15) Business Leaders

Gresham, Sir T. (68)
Halifax, C. M. (78)
Necker, Jacques (78)
Rothschild, Mayer A. (78)
Rothschild, Mayer A.
Rothschild, Solomon
Rothschild, Nathan
Rothschild, Karl
Rothschild, Jacob
Cornell, Ezra (68)
Rothschild, Lionel
Sage, Russell
Higginson, H. L. (68)
Green, Hetty H. R.
Clews, Henry
Gould, Jay (85)
Morgan, J. Pierpont (68)
Yerkes, C. T. (85)
Rockefeller, J. D.
Rothschild, N., Baron
Baker, George F.
Vail, Theodore N.
Gary, E. H. (49) (53)
Astor, William W.
Candler, Asa G. (68)
Mellon, A. W. (53) (78)
Folger, Henry Clay (68)
Astor, John J. (46)
Kahn, Otto H. (68)
Morgan, J. Pierpont
Loeb, James (68)
Rothschild, L., Baron
Strauss, Lewis L.
Black, Eugene R.
Dillon, Douglas
Funston, Keith
Culligan, Matthew J.

(16) Cartoonists:

Davenport, Homer C.
McCutcheon, John T.
Bairnsfather, Bruce
Low, David
Darrow, Whitney, Jr.

(17) Characters of Note:

Aspasia
Cornelia
Apollonius of Tyana
Ayeshah
Catherine of Aragon
Nostradamus, Michel de
Boleyn, Anne
Grey, Lady Jane
Fawkes, Guy
Stradivari, A.
Casanova
Brummel, Beau
Sacagawa
Barnum, Phineas T.
Pinkerton, Allan
Kellar, Harry
Oakley, Annie
Rasputin

(18) Chemists:

Helmont, Jan B. van
Glauber, J. R. (72)
Cronstedt, Axel Frederic, Baron (37)
Cavendish, Henry (73)
Priestley, Joseph (21)
Scheele, Carl W.
Klaproth, Martin H.
Lavoisier, Antoine Laurent (73)
Berthollet, C. L.
Gregor, William (39)
Tennant, Smithson
Dalton, John (73)
Wollaston, Wm. Hyde (73)
Avogadro, A. (7)
Courtois, Bernard
Davy, Sir Humphry
Gay-Lussac, Joseph Louis (73)
Berzelius, Jöns J.
Guthrie, Samuel (72)
Chevreul, Michel Eugène
Dumas, Jean B.
Wöhler, Friedrich
Liebig, J., Baron von
Bunsen, Robert W.
Draper, John W. (74)
Gerhardt, Charles F.
Fresenius, Karl R.
Hofmann, A. W. von
Kolbe, Adolph W. H.
Cannizzaro, Stanislao
Berthelot, Pierre Eugène M.
Cailletet, Louis Paul
Crookes, Sir Wm. (73)
Mendeléev, Dmitri I.
Baeyer, A. von (100)
Perkin, Sir William Henry
Babcock, Stephen Moulton
Wiley, Harvey W.
Remsen, Ira (33)
Moissan, Henri
Ramsay, Sir William
Van't Hoff, J.
Sabatier, Paul
Arrhenius, Svante August
Curie, Pierre (73)
Buchner, Eduard
Carver, G. W. (33)
Werner, Alfred
Curie, Madame (73)
Haber, Fritz
Grignard, Victor
Weizmann, Chaim (78)
Windaus, Adolf
Soddy, Frederick
McCollum, Elmer V.
Langmuir, Irving
Bergius, Friedrich
Urey, Harold C. (33)
Joliot, Irene Curie
Joliot, Frederic
Pauling, Linus
Greenewalt, C. H.
Todd, Sir Alexander
Libby, Willard
Seaborg, Glenn T.

(19) City Planners:

Saarinen, Eliel (8)
Abercrombie, Sir Patrick (8)
Le Corbusier (8)
Moses, Robert (78)

(20) Classical and Oriental Scholars:

Einhard (41)
Erasmus, D. (95)
Budaeus
Lily, William (33)
Scaliger, Joseph J.
Galland, A. (33)
Heyne, Christian G.
Jones, Sir William
Rawlinson, Sir Henry C. (78) (96)

Hepburn, James Curtis (72)
Jowett, B. (33)(96)
Harkness, A. (33)
Gildersleeve, B. L. (33)
Goodwin, William W. (33)
Jebb, Sir R. C.
Murray, G. G. A. (33) (96)
Goodspeed, Edgar J. (33) (96)

(21) Clergymen:

Mather, Increase (33) (41)
Edwards, Jonathan (70)
Asbury, Francis
Beecher, Lyman
Beecher, Henry Ward (64)
Spurgeon, Charles H.
Brooks, Phillips (64)
Ireland, John
Conwell, R. H. (33)
McDowell, W. F.
Matthews, Shailer (33)
Cadman, S. Parkes
Ryan, John A.
Duffy, Francis S.
Wise, Stephen
Coffin, Henry S.
McNicholas, John T.(86)
Fosdick, Harry E. (95)
Holmes, John H.
Sockman, Ralph
Peale, Norman V. (86)
Keller, James G.
Blake, Eugene Carson
Hesburgh, Theodore M. (33)
Graham, Billy
King, Martin Luther

(22) Colonists and Colonial Leaders:

Carver. John
Baltimore, Lord (78)
Smith, John (78)
Standish, Miles
Hooker, Thomas (95)
Endicott, John
Winthrop, John
Bradford, William
Stuyvesant, Peter
Alden, John
Williams, R. (86)
Berkeley, Sir W.
Frontenac, Comte de
Andros, Sir Edmund
Bacon, Nathaniel
Penn, William (68)
Braddock, Edw (58)
Pepperrell, Sir W.
Franklin, Benjamin (28) (36) (46) (47) (78) (83)
Hutchinson, T. (41)
Montcalm, Louis Joseph
Amherst, J., Lord (58)
Gage, Thomas (58)
Adams, S. (64) (78)
Otis, James (64) (78)
Wolfe James (58)
Howe, Sir Wm. (58)
Lee, Richard H. (58) (64)
Washington, George (34) (58) (78)
Henry, Patrick (64) (78)
Hancock, John (78)
Clark, George Rogers (37)

(23) Composers:

AMERICAN

Foster, Stephen C.
Gottschalk, L. (59)
Buck, Dudley (24)
Paine, John Knowles
Foote, Arthur (24)
Chadwick, G. (24)
Sousa, John Philip (24)
Kelley, Edgar S.
Herbert, Victor (24)
Mahler, Gustav (24)
De Koven, R. (25)
MacDowell, E. (24) (59)
Loeffler, C. M.
Bond, Carrie J. (77)
Damrosch, W. (24)
Nevin, Ethelbert
Parker, H. W. (24)
Cole, R. G. (24)
Hadley, Henry K. (24)
Handy, William C.
Carpenter, John A.
Lieurance, Thurlow
Cadman, Charles W.
Friml, Carl R.
Kern, Jerome
Taylor, Deems (25)
Romberg, Sigmund
Spalding, Albert (59)
Porter, Cole
Hanson, Howard
Gershwin, Geo.
Copland, Aaron
Rodgers, Richard
Willson, Meredith
Barber, Samuel
Schuman, William H.
Menotti, Gian C.
Diamond, David
Bernstein, Leonard

WORLD

Hucbald
Guido d'Arezzo
Dunstable, John
Dufay, Guillaume
Palestrina, G. da (24)
Lasso, Orlando di
Cavalieri, Emilio del
Peri, Jacopo
Monteverde, Claudio
Cavalli, Francesco
Carissimi, Giacomo
Lully, Jean B. (24)
Bach, Johann Sebastian
Handel, George F. (24)
Arne, Thomas A.
Bach, Karl Philipp
Gluck, Christoph W.
Haydn, Joseph (24)
Mozart, J. W. A. (24)
Beethoven, Ludwig van (24)
Auber, Daniel F.
Bishop, Sir H. R. (24)
Weber, Karl M. von
Czerny, Karl (24) (32)
Meyerbeer, G. (24)
Rossini, G. A.
Donizetti, Gaetano
Schubert, Franz P.
Bellini, Vincenzo
Bériot, Charles de (24)
Berlioz, Hector (24)
Glinka, Mikhail I.
Balfe, Michael W.
Mendelssohn-Bartholdy (24)
Chopin, Frédéric (24) (59) (75)
David, Félicien César
Schumann, R. (32)
Liszt, Franz (59)
Thomas, Ambroise
Flotow, Friedrich von
Verdi, Giuseppe
Wagner, R. (30) (77)
Heller, Stephen (24)
Gade, Niels Wilhelm
Gounod, Charles F.
Offenbach, Jacques
Franck, César (24)
Bruckner, Anton (24)
Strauss, Johann (24)
Brahms, Johannes
Borodin, Alexander P. (18)
Cui, César A. (34)
Saint-Saëns, Charles C. (24)
Balakirev, Mili A.
Bizet, Georges
Bruch, Max
Mussorgsky, M. P.
Tchaikovsky, P. I.
Dvorák, Antonin
Boito, A. (30) (63)
Massenet, Jules E.
Sullivan, Sir A. S. (24)
Grieg, Edvard H.
Rimski-Korsakov, N.
Parry, Sir C. H. (32)
Godard, Benjamin
Indy, Paul M. d' (24)
Huber, Hans
Humperdinck, E.
Sinding, Christian
Elgar, Sir E. (24)
Leoncavallo, Ruggiero
Puccini, Giacomo
Charpentier, Gustave
Chaminade, Cécile
Debussy, Claude A.
German, Edward
Mascagni, Pietro
Strauss, Richard
Sibelius, J. J. C.
Glazunov, Alexander
Bantock, G. (24)
Rachmaninov, S. V.
Coleridge-Taylor, S.
Casals, Pablo (24)
Stravinsky, Igor
Milhaud, Darius
Hindemith, P.
Korngold. Erich W.
Chavez, Carlos
Shostakovich, Dmitri
Britten, Edward B.

(24) Conductors:

Damrosch, Leopold (23)
Thomas, Theodore
Mahler, Gustav (23)
Toscanini, Arturo
Koussevitsky, Serge
Beecham, Sir Thomas
Stokowski, Leopold
Furtwängler, Wilhelm
Whiteman, Paul
Munch, Charles
Barlow, Howard
Fiedler, Arthur
Mitropoulous, Dimitri
Szell, George
Ormondy, Eugene
Kostelanetz, Andre
Bing, Rudolf
Welk, Lawrence

(25) Critics:

Hazlitt, William (36)
Carlyle, Thomas (36) (41)
Sainte-Beuve, Charles
Gervinus, Georg G.
Allibone, Samuel A.
Ruskin, John (90)
Higginson, T. W. (36)
Curtis, G. W. (41)
Norton, C. E. (33)
Rolfe, W. J.
Taine, Hippolyte A.
Furness, H.
Lounsbury, T. R. (33)
Pater, Walter H. (36)
Brandes, Georg
Gosse, E.
Moulton, R. G.
Matthews, B. (33)
Lemaitre, Francois
More, Paul Elmer
Shaw, George Bernard (30)
Phelps, W. L. (33)
Cortissoz, Royal
Belloc, Hilaire (36)
Canby, H. S. (13) (33)
Zweig, Stefan
Nathan, George Jean
Van Doren, Carl (13) (41)
Brooks, Van Wyck (13)
Morley, Christopher (36) (63)
Atkinson, Brooks
Devoto, Bernard (32)
Cowley, Malcolm (96)
Brown, John Mason
Bazin, Germain
Rorimer, James
North, Sterling
Prescott, Orville
Barzun, Jacques (33)
Edel, Leon (33)

(26) Dancers and Choreographers:

Duncan, Isadora
Fokine, Michel
St. Denis, Ruth
Nijinsky, Vaslav
Shawn, Ted
Astaire, Fred
Markova, Alicia
Fonteyn, Margot
Graham, Martha
Tallchief, Maria

(27) Designers:

Chippendale, Thomas
Sheraton, Thomas
Heppelwhite, George
Hitchcock, Lambert
Steinway, Henry (55)
Goudy, Frederick
Bakst, Leon
Reinhardt, Max
Geddes, Norman Bel
Loewy, Raymond
Schiaparelli, Elsa
Disney, Walter E. (16)
McCobb, Paul

(28) Diplomats:

Jay, John
Talleyrand-Perigord
Gallatin, Albert (78)
Castlereagh, Viscount
Metternich, Prince
Ashburton, Lord
Gadsden, James
Seward, W. H. (78)
Adams, C. F. (78)
Cavour, Count (78)
Bismarck, Prince (78)
Bryce, James (36) (41)
Hay, John (78)
Clemenceau, G.
Root, Elihu (49) (78)
Balfour, A. J. (78)
Witte, Count
Asquith, Herbert H. (78)
Jusserand, J. A. (41)
Bethmann-Hollweg
House, E. M.
Orlando, Vittorio
Briand, Aristide
Grey, Edw. Viscount (78)
Lansing, Robert
Venizelos, E. (78)
Gerard, James R. (78)
Stimson, H. L. (78)
Horthy, de N. Nicholas
Whitlock, Brand (47)
Smuts, Jan (58) (78)
Hull, Cordell (78)
Metaxas, John (78)
Blum, Leon (78)
Sforza, Carlo (78)
Morrow, Dwight W. (15) (78)
Tweedsmuir, Baron (63) (78)
Adenauer, Konrad (51)
Litvinov, Maxim
Osmeña, Sergeo (78)
Reynaud, Paul
Byrnes, James F. (49) (78)
Halifax, Viscount
Vargas, Getulio
Lothian, P. H. K.
Bryan, Ruth O.
Koo, V. K. W.
Dulles, John Foster (78)
Madariaga. Don Salvador
Winant, John G. (78)
Molotov V. M. (78)
Acheson, Dean (51)
Ribbentrop, J. von
Murphy, Robert D.
Herter, Christian (78)
Lie, Trygve
Eden, Anthony (78)
Jessup, Philip (13) (33)

Pearson, Lester (78)
Chou En-lai
Bidault, Georges
Romulo, Carlos P. (47) (58)
Ciano, Count
Hoover, Herbert, Jr.(34)
Bohlen, Charles E.
Bunche, Ralph (33)
Shepilov, Dmitri
Malik, Charles
Gromyko, Andrei
Rusk, Dean

(29) Discoverers:

Cabot, John (37)
Columbus, Christopher (62)
Ponce de Leon (37)
Cabot, Sebastian (37)
Balboa, Vasco de (58)
Alvarado, Pedro
Cartier, Jacques
Soto, Hernando de
Drake, Sir Francis
Gosnold, Bartholomew
Raleigh, Sir W.
Champlain, S. de (61)
Hudson, Henry (62)
Marquette, Jacques
Hennepin, Louis (86)
La Salle, Sieur de (62)
Joliet, Louis
Clark, William
Lewis, Meriwether
Pike, Zebulon (58)
Fremont, J. C. (58) (78)

(30) Dramatists:

AMERICAN

Payne, John H.
Herne, James A. (1)
Howard, B.
Gillette, Wm. (1)
Thomas, A.
Fitch, W. Clyde
Moody, W. V. (33) (77)
Kennedy, C. R.
Peabody, Josephine (77)
Mackaye, Percy (77)
Cohan, George M.
Sheldon, E. B.
Anderson, Maxwell
O'Neill, Eugene G.
Kaufman, George
Connelly, Marc
Crouse, Russell
Hammerstein, Oscar
Sherwood, Robt. E. (13)
Williams, Tennessee

WORLD

Thespis
Aeschylus
Sophocles
Euripides
Aristophanes (43)
Menander (43)
Plautus (43)
Terence (43)
Vega Carpio, Lope
Marlowe, Christopher (77)
Shakespeare, William (77)
Jonson, Ben (77)
Fletcher, John
Webster, John
Beaumont, F.
Ford, John
Calderon de la Barca, Pedro
Corneille, Pierre
Molière (43)
Racine, Jean B.
Congreve, William (43)
Goldoni, Carlo
Lessing, Gotthold E. (25)
Beaumarchais, Pierre de
Alfieri, Count
Sheridan, Richard B. (64) (78)
Schiller, Johann F. (77)
Kleist, Bernd von
Knowles, James S.
Grillparzer, F. (77)
Scribe, Augustin E.
Hertz, Henrik
Hugo, Victor (63) (77)
Augier, G. Victor
Dumas the Younger
Ibsen, Henrik
Sardou, Victorien
Echegaray, Jose
Gilbert, Wm. S. (43)
Perez-Galdos, B.
Strindberg, August
Parker, Louis N.
Pinero, Sir Arthur W.
Shaw, George Bernard (25)
Wilde, Oscar (63)
Sudermann, H. (63)
Brieux, Eugene
Donnay, Maurice C.
Gregory, Lady
Lavedan, Henri
Hyde, Douglas
Hauptmann, G. (63)
Maeterlinck, M. (63)
Schnitzler, Arthur
Annunzio, Gabrielle d'
Wedekind, Frank
Benavente, Jacinto
Galsworthy, John (63)
Bergström, Hjalmar
Phillips, Stephen (77)
Rostand, Edmond (77)
Synge, John M.
Bernstein, Henry L.
Dunsany, Lord
Colum, Padraic
Drinkwater, John
Ervine, St. John
O'Casey, Sean
Coward, Noel (1) (23)
Van Druten, John
Fry, Christopher

(31) Economists:

Bodin, Jean (79)
Quesnay, F. (72)
Hume, David (41) (70)
Smith, Adam
Turgot, A. R. J.
Malthus, Thomas R.
Ricardo, David
Mill, James (41) (70)
Cobden, Richard (78)
Mill, John S. (70) (91)
Passy, F. (78)
Bagehot, Walter (25)
Jevons, William S.
George, Henry (90)
Sumner, William G.
Patten, Simon N.
Hadley, A. T. (33)
Veblen, T. B. (33) (90)
Johnson, E. R. (33)
Fisher, Irving (33)
Moody, John
Babson, Roger
Keynes, J. M.
Laski, Harold J.
James, Frank C. (33)
Burns, Arthur F.
Weaver, Robert C.
Galbraith, J. Kenneth
Ward, Barbara (32)

(32) Editors:

AMERICAN

Hale, Sara Josepha
Bennett, J. G.
Greeley, Horace (78)
Bigelow, John
Dana, Charles A.
Bowles, Samuel
Warner, C. D. (63)
Reid, Whitelaw
Watterson, Henry
Pulitzer, Joseph (78)
Stone, Melville E.
Grady, H. W. (64)
Johnson, R. U.
Bigelow, P.
Page, Walter H. (25)
Lummis, C. F.
Perry, Bliss (25) (33)
Bok, Edward (83)
Brisbane, Arthur
Harvey, George B. (28)
Hapgood, N.
Lorimer, George H.
White, W. Allen (13) (63)
Du Bois, W. E. B. (33)
Baker, Ray S. (13) (36)
Grosvenor, G. H.
Hard William
McCormick, J. Medill
Patterson, J. M.
Wallace, DeWitt
Sulzberger, Arthur H.
Phillips, Hubert
Jones, H. Mumford
Merz, Charles
Wilson, Edmund
White, E. B.
Grosvenor, Melville Bell
Kronenberger, Louis
Canham, Erwin
Mich, Daniel D.
Fenner, Mildred
Piel, Gerard
Field, Adelaide
Ashmore, Harry S.

WORLD

La Bouchere, H. du Pre
Harden, Maximilian
Northcliffe, Baron
O'Connor, Thomas P.
MacDonald, James A.

(33) Educators:

AMERICAN

Harvard, John (95)
Yale, Elihu
Dwight, Timothy (95)
Morse, Jedidiah
Gallaudet, Thomas Hopkins
Willard, Emma
Pierce, Cyrus
Mann, Horace (78)
Lyon, Mary
Hopkins, Mark (95)
Peabody, Elizabeth
Barnard, Frederick Augustus (54) (73)
Barnard, Henry (32)
Hill, T. (61) (6) (28)
Angell, J. B. (78)
Gilman, D. C. (32)
White, Andrew D. (28)
Eliot, Chas. W. (18) (78)
Adams, Charles K. (41)
Harris, W. T. (70)
Gallaudet, E. M.
De Garmo, Charles
Barnes, Mary S.
Palmer, Alice Freeman
Farmer, Fanny
Washington, Booker Taliaferro
McMurry, Frank M.
Cross, Wilbur Lucius
Finley, John Huston (79)
Woolley, Mary Emma
Gulick, Luther H.
Baker, George Pierce
Flexner, Abraham
Hamilton, Edith (41)
Kilpatrick, Wm. H.
Wirt, William A.
Bethune, Mary McLeod
Jessup, Walter A.
Flint, Charles W.
Day, Edmund E. (31)
Dobie, J. Frank (41)
O'Hara, Rev. J. F. (95)
Haas, Francis Jos. (78)
Sproul, Robt. G.
Gannon, Robt. I. (95)
Conant, James B. (18)
Adams, Arthur Stanton
Hatcher, Harlan (41)
Goheen, Robert
Hutchins, Robert M.
Dodds, Harold W. (79)
Johnson, George (21)
Barr, Stringfellow (32)
Eisenhower, Milton (47) (78)
Thurman, Howard
Hannah, John A. (78)
Hunt, Herold C.
Griswold, Alfred W. (41)
Mumford, Lawrence Q.
Adams, Raymond W.
Kirk, Grayson L.
Killian, James R., Jr.
Flemming, A. S. (78)
Pusey, Nathan M.
Horwich, Frances R.
Hochwalt, F.
Allen, James E., Jr.
Wirtz, W. Willard (78)
Hesburgh, Theo. M. (21)
Franklin, John H. (41)
Asimov, Isaac (47)

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Protagoras (70)
Socrates (70)
Isocrates (25) (64)
Plato (70)
Aristotle (70)
Cicero (36) (64) (78)
Apollonius of Tyana (70)
Quintilian
Clement of Alexandria (95)
Origen (95)
Benedict, St. (95)
Alcuin (95)
Alfred the Great (87)
Anselm, St. (70)
John of Salisbury
Albertus Magnus (95)
Aquinas, St. Thomas (phil.) (70) (95)
Pletho, Georgius Gemistus (70)
Colet, John (95)
Ascham, Roger (28)
Comenius, J. A.
Epée, Abbé de l' (68)
Rousseau, Jean Jacques (91)
Basedow, Johann B.
Pestalozzi, Johann Heinrich
Bell, Andrew (91)
Girard, Jean B.
Herbart, Johann Friedrich (70) (82)
Jahn, Friedrich L.
Lancaster, Joseph
Froebel, F. W.
Arnold, Thomas (41)
Braille, Louis
Pitman, Sir Isaac
Fryer, John (28)
Tory, Henry M.
Falconer, R. A. (95)
Cody, Henry J.
Montessori, Maria (72)

(34) Engineers and Builders:

McAdam, John L.
Stephenson, George (46)
Fairbairn, Sir W.
Brassey, Thomas
Lesseps, Viscount de
Cooke, Sir W. F. (46)
Roebling, John A.
Eads, J. B. (46)
Fleming, Sir S.
Eiffel, A. G. (11)
Lindenthal, Gustav
Hammond, John H.
Goethals, G. W.
Gaillard, D. Du Bose
Parsons, W. Barclay
Modjeski, Ralph
O'Shaughnessy, M. M.
Steinmetz, C. P.
Cooper, Hugh L.
Strauss, J. B.
Kettering, C. F. (46)
Ammann, Othmar H.
Von Karman, Theodore
Nervi, Pier Luigi (8)
Oettershagen, Martin
Fuller, R. Buckminster

Burchard, John E.
Kelly, Mervin J.
Murphy, A. Gordon
Kappel, Fred'k. R. (15)
Glennan, T. Keith
Barnes, Henry A.
Braun, Wernher von
Eckert, John P., Jr.
Froehlich, Jack

(35) Engravers and Etchers:

Mantegna, Andrea (67)
Durer, Albrecht (67)
Holbein, Hans (67)
Van Dyck, Sir A. (67)
Claude Lorraine (67)
Rembrandt (67)
Potter, Paul (67)
Ruysdael, Jacob (67)
Hogarth, Wm. (67)
Bewick, Thomas (60)
Turner, J. M. W. (67)
Durand, Asher B.
Currier, Nathaniel
Jacque, Charles (67)
Millet, Jean F. (67)
Daubigny, C. F. (67)
Whistler, James A. McN. (67)
Dielman, F. (67)
Cole, Timothy
Low, Will H. (67)
Pennell, Joseph
Remington, F.
Gibson, C. D. (44)
Christy, H. C. (44)
Fisher, H.
Flagg, James M. (44)
Kauffer, E. McK.

(36) Essayists:

Cicero (64)
Montaigne
Walton, Izaak (13)
Addison, Joseph (77)
Steele, Sir Richard (30)
Chesterfield, Earl of
Johnson, Samuel (25) (69) (77)
Walpole, Horace
Staël, Madame de
Lamb, Charles (25)
Irving, Washington (13) (41)
Hunt, Leigh (47)
De Quincy, Thomas (25)
Repplier, Agnes
Huneker, James
Le Gallienne, R. (77)
Malraux, Andre
Packard, Vance

(37) Explorers:

Cabot, John
Columbus, Christopher (62)
Ponce de Leon
Cabot, Sebastian (62)
Balboa, Vasco de (58)
Alvarado, Pedro
Cartier, Jacques
Soto, Hernando de
Gosnold, Bartholomew
Raleigh, Sir Walter
Champlain, S. de (61)
Hudson, Henry (62)
Marquette, Jacques
Hennepin, Louis (86)
La Salle, Sieur de (62)
Joliet, Louis
Bruce, James
Vancouver, G.
Clark, William
Park, Mungo
Lewis, Meriwether
Pike, Zebulon M. (58)
Franklin, Sir John (61)
Fremont, John C. (58)
Livingstone, David (86)
Barth, Heinrich (40)
Speke, John H.
Markham, Sir C. (40)
Nordenskjöld, Nils (40)
Muir, John
Przhevalski, N. (100) (39)
Emin Pasha (72)
Stanley, Sir H. M. (47)
Greely, A. W. (58)
Peary, R. E. (6) (61)
Nansen, Fridtjof
Kingsley, Mary (18)
Younghusband, Sir F. E. (58)
Borchgrevink, C. E.
Cook, Frederick A. (72)
Hedin, S. A. (39)
Scott, Robert Falcon
Amundsen, Roald
Abruzzi, Duke of the
MacMillan, Donald B.
Shackleton, Sir E. H.
Stefansson, V. (6)
Mawson, Sir Douglas
Andrews, R. C. (60)
Hubbard, B. R. (39)
Wilkins, Sir Geo. H.
Byrd, Richard E. (11)
Hillary, Sir Edmund
Heyerdahl, Thor

(38) Foresters:

Sargent, Charles S. (14)
Davey, John
Pinchot, Gifford (78)

(39) Geographers and Oceanographers:

Strabo
Mercator, Gerardus
Humboldt, F. H. (18) (73)
Espy, James Pollaed
Reclus, Jean J. E.
Marsh, Othniel (100)
Cope, Edward D. (100)
Gannett, Henry
Merriam, John C.

(40) Geologists and Paleontologists:

Hitchcock, E. (33) (95)
Lyell, Sir Charles
Miller, Hugh
Dana, James D. (33)
Dawson, Sir. J. W. (33)
Le Conte, Joseph (73)
Hayden, Ferdinand V.
Geikie, Sir Archibald
Zittel, Karl A. von
King, Clarence (46)
Chamberlin, T. (33)
Osborn, H. F. (33) (100)
Wallace, R. C.

(41) Historians:

Herodotus
Thucydides (64)
Xenophon (33)
Polybius
Nepos, Cornelius
Sallust
Livy
Josephus, Flavius
Tacitus, Publius (64)
Eusebius of Caesarea
Cassiodorus
Bede, the Venerable
Einhard
Anna Comnena
Froissart, Jean
Vega, Garcilaso de la
Hakluyt, Richard
Holinshed, Raphael
Pepys, Samuel (13)
Gibbon, Edward
Hallam, Henry
Guizot, Francois
Sparks, Jared (33)
Grote, George (78)
Lockhart, John G. (13)
Ranke, Leopold von
Prescott, Wm. Hickling
Bancroft, George
Macaulay, T. B. (36) (78)
Fergusson, James
Creasy, Sir E. S.
Lossing, Benson J.
Motley, John L.
Graetz, Heinrich
Mommsen, Theodore
Froude, James A.
Gregorovius, F. (77)
Freeman, Edw. A.
Parkman, Francis
Smith, Goldwin (33) (79)
Lea, H. C.
Stubbs, William (95)
Gardiner, Samuel R.
McCarthy, Justin
Bancroft, H. H.
Stephen, Leslie (13)
Acton, Baron (33)
Bourinot, Sir J. G.
Morley of Blackburn, Viscount (13) (36)
Green, John R.
Lecky, W. E.
Adams, Henry (13)
Trevelyan, Sir G. O. (78)
Symonds, J. A. (25)
Fiske, John
Doughty, C. M.
Rhodes, J. F. (36)
McMaster, J. B. (33)
Hart, Albert B. (33)
Tarbell, Ida M. (13)
Sedgwick, H. D. (36)
Robinson, J. H. (33)
Andrews, Charles M.
Howe, De Wolfe (13)
Wells, Herbert G. (63)
Hazen, Charles D.
Hendrick, Burton J. (47)
Ferrero, Guglielmo
Beard, Charles A. (33)
Trevelyan, G. M.
Adams, J. T. (36)
Ludwig, Emil (13)
Van Loon, Hendrik W.
Morison, Samuel E.
Schlesinger, Arthur M.
Toynbee, Arnold J.
Guedalla, Philip (13)
Nevins, Allan
Carmer, Carl (63)
Catton, Bruce
Angle, Paul
Mason, T. Van Wyck
Commager, Henry Steele
Parkinson, Cyril N.

(42) Horticulturists:

Burbank, Luther
Bailey, L. H. (14) (33)

(43) Humorists and Satirists:

Aristophanes (30)
Menander (30)
Plautus (30)
Terence (30)
Juvenal (77)
Apuleius (63)
Rabelais (36)
Cervantes (63)
Butler, Samuel (77)
Moliere (30)
Swift, Jonathan (36)
Smith, Sydney (36)
Barham, Richard H. (77)
Halliburton, Thomas C.
Jerrold, Douglas
Shaw, Henry Wheeler
Browne, Charles T.
Clemens, Samuel (63)
Bierce, Ambrose (63)
Nye, Edgar Wilson
Bunner, Henry C. (63)
Jerome, Jerome K. (63)
Mason, Walt
Ade, George (30)
Burgess, F. G.
Dunne, Finley Peter
Leacock, Stephen B. (31)
Beerbohm, Max (36)
Irwin, Wallace (63)
Chesterton, Gilbert K. (36) (63) (77)
Rogers, Will
Mencken, Henry L. (32)
Guest, E. A.
Adams, F. P. (77)
Wodehouse, P. G.
Thurber, James G.

(44) Illustrators:

Rowlandson, Thomas
Cruikshank, George
Doré, Paul G. (67)
Du Maurier, George (63)
Vedder, Elihu (67)
Crane, Walter
Frost, Arthur B. (48)
Abbey, E. A. (67)
Pyle, Howard (48) (67)
Beardsley, Aubrey
Fisher, Harrison
Flagg, James M.
Kent, Rockwell (67)
Kauffer, Edward M.
Rockwell, Norman

(45) Industrialists:

Slater, Samuel
Krupp, Alfred
Carnegie, A.
Phipps, Henry
Frick, H. C.
Rhondda, Lord
Schwab, C. M.
Ford, Henry
Chrysler, Walter P.
Kaiser, Henry J.
Gifford, W. S.
Curtice, Harlow
Reed, Philip D.
Ford, Henry II
McCone, John A.

(46) Inventors:

AMERICAN

Fitch, John
Stevens, John (34)
Evans, Oliver
Fulton, R. (34)
Whitney, E. (53)
Hoe, Robert (53)
Cooper, Peter (53) (68)
Morse, S. F. B. (67) (73)
Allen, Zachariah (53)
Bogardus, James
Goodyear, Charles
Borden, Gail (53)
McCormick, C. H. (53)
Otis, Elisha Graves
Hoe, Richard M. (53)
Colt, Samuel (53)
Corliss, G. H. (53)
Gatling, Richard J.
Howe, Elias (53)
Sholes, C. L.
McKay, Gordon (53)
Wilson, A. B. (53)
Gordon, C. G.
Gray, Elisha
Dolbear, A. E. (33)
Hyatt, John Wesley
Hammond, J. B.
Hoe, Robert (53)
Maxim, Sir H. S. (34) (53)
Holland, John Philip
Selden, G. B.
Westinghouse, Geo. (53)
Bell, Alexander Graham (33) (73)
Edison, Thomas Alva
Tripler, Charles E. (73)
Berliner, Emile
Frasch, Herman
Thomson, Elihu
Eastman, George (53)
Fiske, B. A. (61)
Mergenthaler, Ottmar
Browning, John M.
Acheson, E. G.
Ives, Frederic Eugene
Tesla, Nikola (34)
Lewis, Isaac N.
Diesel, Rudolf
Sperry, E. A.
Hewitt, Peter C. (34)
Bakeland, Leo Hendrik
Hall, C. M. (18) (53)
De Forest, Lee
Ives, Herbert E. (73)
Birdseye, Clarence
Maxim, Hiram P. (34)
Kettering, Charles F. (34)

Alexanderson, E. F. W.

WORLD

Gutenberg, Johannes
Palissy, Bernard de (18) (73)
Böttger, J. F. (18)
Papin, Dennis (73)
Newcomen, Thomas
Ged, William
Harrison, John
Dollond, John
Arkwright, Sir Richard (53)
Hargreaves, James
Jacquard, Joseph M.
Crompton, Samuel
Senefelder, Aloys
Daguerre, Louis Jacques (67)
Ericsson, John (34)
Armstrong, Sir W. G. (34) (53)
Bessemer, Sir Henry (34) (53)
Geissler, Heinrich (53)
Albert, Joseph
Nobel, A. B. (18) (53)
Benz, Karl
Parsons, Sir C. A. (34)
Claude, Georges
Marconi, Guglielmo (34)

(47) Journalists:

Bowles, Samuel
Reid, Whitelaw (78)
Graham, Hugh
Pulitzer, Joseph (83)
Stone, Melville E.
Ochs, Adolph S. (83)
Northcliffe, Baron (78) (83)
Irwin, W. H. (63)
Cobb, Irvin S. (43)
Kaltenborn, H. V.
Beaverbrook, William (78) (83)
Hansen, Harry
Costain, Thomas B.
Woolcott, Alex (36)
Hall, James Norman
Lawrence, David
Duranty, Walter
Wallace, Henry A. (3) (78)
Lippmann, Walter (36) (79)
Davis, Elmer
De Kruif, Paul (74)
Thompson, Dorothy
Seltzer, Louis B.
Winchell, Walter
McGill, Ralph
Sheean, James Vincent
Alexander, Eben R.
Pyle, Ernest T. (32)
Ingersoll, Ralph
Gunther, John (41)
Wylie, Philip
Murrow, Edw. R.
Reston, James B.
Seaton, Frederick A.
Huntley, Chester R.
Cousins, Norman
Sevareid, Eric
Alsop, Stewart
Daly, John Charles
Riesel, Victor
Cronkite, Walter
Agronsky, Martin
Amory, Cleveland
Brinkley, David
Rowan, Carl T.

(48) Juvenile Writers:

Aesop
La Fontaine, Jean de (63)
Perrault, Chas. (36) (77)
Grimm, J. L. (69)
Andersen, Hans C.
Optic, Oliver
Hughes, Thomas
Trowbridge, J. T. (63) (77)
Alcott, Louisa May (63)
Carroll, Lewis (54)
Eggleston, Edw. (32) (63)
Dodge, Mary E. M
Cox, Palmer (44)
Harris, J. C. (63)
Pyle, Howard (44) (67)
Lagerlöf, Selma (63)
Wiggin, Kate Douglas (33) (63)

(49) Jurists:

Jeffreys, Baron
Erskine, Lord (64)
Marshall, John (78)
Taney, Roger B.
Brougham, H. (70) (78)
Story, Joseph
Chase, S. P. (78)
Field, Stephen J.
Fuller, Melville W.
Harlan, J. M.
Holmes, Oliver W.
Brandeis, L. D. (79)
Hughes, C. E. (28) (78)
McReynolds, J.
Landis, Kenesaw M.
Cardozo, B. M. (52)
Hand. Learned
Frankfurter, Felix (33)
Allen, Florence E.
Black, Hugo L. (78)
Burton, H. H. (78)
Rutledge, W. B.
Vinson, F. M. (78)
Warren, Earl
Harlan, John M.
Hastie, William Henry
Brennan, Wm. Jos.

(50) Labor Leaders:

Gompers, Samuel
Mitchell, John
Green, William
Lewis, John L.
Hillman, Sidney
Meany, George
Reuther, Walter P.

(51) Lawyers:

Choate, Rufus
Field, David D.
Lockwood, Belva
Choate, Joseph H.
Ingersoll, Robert G. (64)
Kellogg, Frank B. (28) (78)
Darrow, Clarence
Clarke, John H.
Landis, James M. (78)
Stevenson, Wm E.
Dewey, T. E. (78)
Goldberg, Arthur J.
Marshall, Thurgood
Clement, Frank Good
Kennedy, Robert F.

(52) Legal Writers:

Gaius (49)
Justinian (87)
Bracton, H. de (95)
Littleton, Sir T. (49) (51)
Coke, Sir E. (49) (51)
Hale, Sir M. (51)
Blackstone, W. (49)
Bentham, Jeremy (31) (70)
Kent, James (49) (51)
Livingston, E. (70)
Story, Jos. (49) (51)
Dana, R. H. (49)
Dwight, T. W. (33) (49)
Hutchins, H. B.
Pepper, G. W. (78)
Pound, Roscoe (33)

(53) Manufacturers:

Alströmer, Jonas
Wedgewood, Josiah
Whitney, E.
Slater, Samuel
Hoe, Robert (46)
Cooper, Peter (46) (68)
Allen, Zachariah
Borden, Gail
McCormick, C. H. (46)
Hoe, Richard M. (46)
Krupp, Alfred
Colt, Samuel (46)
Faber, Johann
Corliss, G. H. (46)
McKay, Gordon (46)
Wilson, A. B. (46)
Pullman, G. M. (46)
Armour, Philip D.
Carnegie, A. (15) (68)
Solvay, Ernest (18) (46)
Phipps, Henry (68)
Hoe, Robert (46)
Maxim, Sir H. D. (34) (46)
Westinghouse, G. (46)
Frick, H. C. (15)
Eastman, George (46)
Beck, Sir Adam
Schwab, C. M. (15) (45)
Ford, Henry (45)
Du Pont, T. Coleman (15)
Hall, C. M. (18) (46)
Chrysler, W. P. (10) (45)
Kaiser, Henry J. (45)
Wilson, Charles E. (45)
Weeks, Sinclair (78)
Blough, Roger M.
Ford, Henry II (68) (10)

(54) Mathematicians:

Anaximander (9) (70)
Euclid
Archimedes (46)
Apollonius
Cardan, J. (33) (70) (72)
Napier, John
Briggs, Henry
Gunter, Edmund (9)
Bernoulli, James
Bernoulli, John
Euler, Leonhard
Clairant, Alexis Claude (9) (73)
Alembert, J. d' (36) (70)
Lagrange, Joseph Louis, Count
Fourier, Jean Baptiste Joseph, Baron (73)
Gauss, Karl F.
Cauchy, A. L., Baron
Abel, Niels Henrik
Hamilton, Sir W. R.
Pierce, Benjamin (9)
Russell, Bertrand A. (70)
Jeans, James H. (9)
Wiener, Norbert

(55) Merchants:

Faneuil, Peter (68)
McGill, James (68)
Girard, Stephen (68)
Astor, John Jacob
Lawrence, Abbott (68)
Tiffany, C. L.
Eaton, Timothy
Field, Marshall (68)
Wanamaker, John (78)
Altman, Benjamin
Ward, Montgomery
Straus, Nathan (68)
Lipton, Sir T. (92)
Woolworth, Frank W.
Rosenwald, Julius (68)
Penney, James C.

(56) Metallurgists:

Babbitt, Isaac
Bessemer, Sir Henry
Hall, C. M. (18) (46)

(57) Meteorologists:

Boyle, Robert (18) (73)
Lavoisier, Antoine Laurent (18)
Dalton, John (18) (73)
Gay-Lussac, Joseph Louis (73)
Espy, James P.
Helmholtz, Hermann L. F. von (73) (74)

(58) Military Leaders:

ANCIENT

Miltiades
Themistocles (78)
Cimon
Pelopidas
Alcibiades (78)
Camillus, Marcus
Epaminondas (78)
Alexander the Great (78)
Pyrrhus
Hamilcar Barca
Fabius, Maximus
Hannibal
Scipio Major
Scipio Minor
Marius, Gaius
Sulla, Lucius (87)
Spartacus
Crassus, Marcus (78)
Lucullus, Lucius
Pompey (78)
Cassius
Cæsar, Julius (78) (87)
Antony, Mark (78) (64)
Ariovistus
Drusus, Nero C.
Arminius
Aurelianus (87)

MEDIEVAL

(476 A.D. to 1492 A.D.)

Belisarius
Charles Martel (78)
William I, *Eng.* (78)
Godfrey of Bouillon
Saladin (87)
Richard I, *Eng.* (87)
Genghis Khan (87)
Wallace, Sir W.
Bruce, Robert (87)
DuGuesclin, Bertrand
Edward, the Black Prince (87)
Timur (87)
Bajazet I (87)
Glendower, O. (87)
Hunyadi János
Joan of Arc
Warwick, Earl of (87)

MODERN

Boabdil
Pizarro, Francisco
Bayard, Chevalier
Berlichingen, G. von
Cortes, Hernando (37)
Alvarado, Pedro de
Foix, Gaston de
Bourbon, Charles
Gustavus I Vasa (78)
Alva, Duke of (78)
Conde, Louis I, Prince de
William the Silent (78)
John of Austria
Guise, Henri de Lorraine (78)
Henry IV of France (78)
Sidney, Sir Philip (77)
Tilly, Johann T.
Maurice, Prince of Orange (78)
Wallenstein, A. von
Gustavus II Adolphus (78)
Turenne, Vicomte de
John III Sobieski (78)
Marlborough, Duke (78)
Eugene, Prince
Frederick the Great (78)
Herkimer, Nicholas
Putnam, Israel
Kalb, Baron de
Burgoyne, John (30)
Clive, Baron (78)
Rochambeau, C. de
Gates, Horatio
Stark, John
Steuben, Baron
Marion, Francis
Washington, George (22) (34) (78)
Clinton, Sir Henry

Cornwallis, Marquis (78)
Allen, Ethan (78)
Dumouriez, Charles F.
Warren, Joseph (72)
Blücher, Gebhard von
Greene, Nathanael
Toussaint L'Overture, Francois
Kutuzov, Mikhail
Wayne, Anthony
Kosciusko, Tadeusz
Pulaski, Casimir
Knox, Henry
Lee, Henry (78)
Lafayette, Marquis de (78)
Barclay de Tolly, M.
Moore, Sir John
Grouchy, Marquis de
Hofer, Andreas
Jackson, Andrew (78)
Murat, Joachim
Napoleon Bonaparte (78)
Brock, Sir Isaac
Wellington, Duke of (78)
Ney, Michel
Soult, Nicolas
Davout, Louis N.
Harrison, William H. (78)
Jomini, Henri, Baron
Napier, Sir Charles J.
Bolivar, S. (78)
Taylor, Zachary (78)
Scott, Winfield
Ibrahim Pasha
Campbell, Sir Colin
Ypsilanti, Alexander
Havelock, Sir Henry
Santa Anna A. de
Moltke, Count von
Johnston, Albert S.
Anderson, Robert
Johnston, Joseph E.
Lee, Robert E. (33)
Garibaldi, G.
Hooker, Joseph
Kearny, Philip
Meade, George G.
Early, Jubal A. (49)
Thomas, George H.
Bragg, Braxton
Beauregard, P. G. T.
Hampton, Wade (78)
Sherman, W. T.
Longstreet, James
Grant, U. S. (78)
Burnside, A. E. (78)
Hancock, Winfield S.
Jackson, T. J.
Hill, Ambrose P.
Pickett, George E.
McClellan, George B. (78)
Howard, Oliver Otis (33)
Hood, John Bell
Sheridan, Philip H.
Roberts, Sir F. S.
Gordon, Charles G.
Stuart, James E.
Custer, George A.
Miles, Nelson A.
Oyama, Iwao, Prince
Kuroki, Count
Hindenburg, Paul von (78)
Kuropatkin, Alexei
Gallieni, Joseph S.
Nogi, Count
Cadorna, Count Luigi
Kitchener of Khartum
Connaught, Duke of
Foch, Ferdinand
Joffre, Joseph J.
French, Lord John D.
Bliss, T. H.
DeWet, C. R.
Petain, Henri P.
Baden-Powell, R. S.
Allenby, Sir Edmund
Diaz, Armando
Haig, Douglas
Botha, Louis (78)
Byng, Sir Julian
Funston, Fred
Ludendorff, E.
Badoglio, Pietro
Currie, Sir Arthur
MacArthur, Douglas
Marshall, George C. (28)
Brauchitsch, W. von
Keitel, Wilhelm
Mitchell, William (General "Billy")
Donovan Wm. J. (49)
Stillwell, Joseph
Wavell, Sir A. P.
Patton, George S.
Arnold, H. H.
Newall, Sir C. L.
Gort, John S.
Montgomery, B. L.
Eisenhower, D. D. (33)
De Gaulle, Charles
Alexander of Tunis, Vct.
Franco, Francisco (78)
Bradley, Omar
Mao Tse-Tung (78)
Timoshenko, S.
Zhukov, Gregory
Clark, Mark
Doolittle, James H. (11)
Clay, Lucius D. (78)
Rommel, Erwin
Ridgway, Matthew B.
Malinowsky, Rodion Y.
Gruenther, Alfred
Lemnitzer, Lyman L.
Taylor, Maxwell
Medaris, Gen. John B.
Norstad, Lauris
Ayub Khan

(59) Musicians:

AMERICAN

Nordica, Lillian
Schumann-Heink, E.
Fremstad, Olive
Homer, Louise
Garden, Mary
Hofmann, Josef (75)
Martin, Riccardo
Farrar, Geraldine
Stokowski, Leopold A.
Werrenrath, R.
Gluck, Alma
Hayes, Roland
Tibbett, Lawrence M.
Ponselle, Rosa
Rodgers, Richard
Swarthout, Gladys
Anderson, Marian
Traubel, Helen
Pons, Lily
MacDonald, Jeanette
Stevens, Rise
Munsel, Patrice

WORLD

Garcia, Manuel del P.
Paganini, Niccolo (98)
Garcia, Manuel
Bull, Ole Bornemann (98)
Chopin, Frederic F. (23) (75)
Liszt, Franz (23) (75)
Lind, Jenny
Rubenstein, A. (23)
Faure, Jean B. (23)
Von Bulow, Hans G.
Joachim, Joseph
Clauss-Szavardy, W.
Guilmant, Felix
Paderewski, I. (23) (75) (78)
Melba, Nellie
Albert, E. F. d' (23)
Calve, Emma
Lauder, Sir Harry
Caruso, Enrico
Chaliapin, Theodore
Tetrazzini, Luisa
Kreisler, Fritz (23) (98)
Schweitzer, Albert (65) (70) (72) (95)
Kubelik, Jan (98)
Grainger, Percy (23) (75)
McCormack, John
Martinelli, G.
Bori, Lucrezia
Zimbalist, E. (98)
Galli-Curci, Amelita
Elman, Mischa (98)
Flagstad, Kirsten
Heifetz, Jascha (98)

(60) Naturalists:

White, Gilbert (14)
Audubon, J. J. (67)
Baer, Karl Ernst von
Fabre, Jean Henri
Comstock, Anna B. (33) (44)
Hornaday, W. H.
Hudson, W. H. (63)
Seton, E. T. (67)
Beebe, William (47)
Teale, Edwin Way

(61) Naval Commanders:

Coligny, G. de
Hawkins, Sir John
Drake, Sir F. (37) (62)
Raleigh, Sir W. (37)
Tromp, Martin H.
Blake, Robert
Morgan, Sir Henry
Iberville, Sieur de
Boscawen, Richard
Hopkins, Esek
Rodney, Lord
Howe, Richard, Earl
Barry, John
Jones, John Paul
Nelson, H., Viscount
Bainbridge, William
Decatur, Stephen
Lawrence, James
Perry, Oliver Hazard
Farragut, D. G.
Foote, Andrew Hull
Porter, David D.
Dewey, George
Schley, Winfield S.
Mahan, A. T. (36)
Sampson, W. T.
Sigsbee, Charles D.
Evans, Robley D.
Tirpitz, Alfred von
Sims, W. S.
Beatty, Sir David
Leahy, William D. (78)
King, Ernest J.
Stark, Harold R.
Halsey, W. F.
Cunningham, Sir A.
Nimitz, C. W.
Radford, Arthur W.
Mountbatten, Louis
Burke, Arleigh A.

(62) Navigators:

Diaz, Bartholomew (37)
Vespucci, A. (37)
Gama, Vasco da (37)
Magellan, F. (37)
Verranzo, G. da
Frobisher, Sir M. (61)
Davis, John (37)
Baffin, William
Bering, Vitus (37)
Cook, Captain J. (37)
Bougainville, L. A. de (37) (39)
Laperouse, Count (37)
Flinders, M. (39)
Wilkes, C. (37) (61)

(63) Novelists and Story Tellers:

AMERICAN

Brown, Charles Brockden
Cooper, James Fenimore
Hawthorne, Nathaniel (48)
Stowe, Harriet B. (47) (91)
Melville, Herman
Wallace, Lewis (58) (78)
Davis, Rebecca Harding
Jackson, Helen Hunt (77)
Alger, Horatio
Howells, W. D. (25) (36)
Smith, F. Hopkinson (34) (67)
Harte, Bret (77)
James, H. (36)
Cable, George W.
Hardy, Arthur S. (78)
Boyesen, Hjalmar (36)
Allen, James Lane
Burnett, Frances H. (30) (48)
Jewett, Sarah Orne
Page, Thos. Nelson (78)
Crawford, F. M.
Atherton, Gertrude
Deland, Margaretta Wade (36)
Garland, Hamlin (77)
Wister, Owen
Long, J. L. (49)
Freeman, Mary E.
Porter, W. S. ("O. Henry") (47)
Wharton, Edith
Fox, J. W., Jr.
Davis, R. H. (47)
Dixon, Thomas (30)
Ford, P. L. (41)
McCutcheon, G. B.
Nicholson, Meredith
Herrick, Robert (33)
Porter, Gene Stratton (100)
Tarkington, B. (30)
Norris, Frank
Rice, Alice C. H.
Adams, Samuel Hopkins
Churchill, Winston
Dreiser, Theodore (47)
Stein, Gertrude
Glasgow, Ellen A.
Cather, Willa (36)
Anderson, Sherwood (47)
London, Jack (91)
Rinehart, Mary R. (30)
Beach, Rex (30)
Glass, Montague
Fisher, Dorothy C. (36)
Cabell, James B.
Erskine, John
Post, Emily (47)
Hergesheimer, J.
Kyne, P. B.
Norris, Kathleen
Heyward, Du Bose
Roberts, Kenneth L.
Lewis, Sinclair
Gardner, Erle Stanley
Ferber, Edna
Buck, Pearl
Marquand, John P.
Bromfield, Louis
Fitzgerald, F. Scott
Faulkner, William
Wilder, Thornton
Hemingway, E.
Adamic, Louis
Mitchell, Margaret
Wolfe, Thos. C.
Caldwell, Erskine
Preston Steinbeck, John
Cozzens, James Gould
Farrell, Jas. T.
Kantor, MacKinlay
O'Hara, John Henry
Warren, Robt. P.
Michener, James
Stuart, Jessie H.
Saroyan, William
Hersey, John
Baldwin, James

ENGLISH

Malory, Sir Thomas
Bunyan, John (95)
Defoe, Daniel (47)
Richardson, Samuel
Fielding, Henry
Sterne, Laurence

Smollett, Tobias George
Goldsmith, Oliver (30) (77)
Scott, Sir Walter (79)
Austen, Jane
Porter, Jane
Marryat, Frederick
Shelley, Mary G.
Lytton, Bulwer-Lytton, Lord
Gaskell, Elizabeth
Thackeray, Wm. M. (36) (43)
Dickens, Charles
Reade, Charles
Trollope, Anthony
Brontë, Charlotte
Eliot, George (77)
Kingsley, Charles (48)
Collins, Wilkie
Blackmore, Richard Doddridge
Meredith, George (77)
Butler, Samuel
De Morgan, W. F. (46)
Ramée, Louise de la
Hardy, Thomas
Stevenson, Robert Louis (36) (48)
Watson, John (95)
Ward, Mrs. Humphry
Caine, Hall (30)
Conrad, Joseph
Harris, Frank (13)
Haggard, Sir H. R. (49)
Doyle, Sir A. C. (72)
Barrie, Sir James M. (30) (48)
Gordon, C. W. (95)
Roberts, C. G.
Parker, Sir H. G.
Phillpotts, Eden
Hawkins, Anthony H.
Locke, William J.
Corelli, Marie
Hichens, Robert S.
Grand, Sarah
Hannay, J. O. (95)
Kipling, Rudyard (48) (77)
Oppenheim, E. P.
Wells, Herbert G. (41)
Bennett, A. (30) (36) (47)
Hobbes, John Oliver
Maugham, W. S.
Hutchinson, A. S.
Woolf, Virginia (25)
Joyce, James (77)
Walpole, Hugh
Lawrence, D. H.
Aldington, Richard (77)
Christie, Agatha
West, Rebecca
Sayers, Dorothy
Priestley, John B.
Graves, Robert
Jameson, Storm
Forester, Cecil S.
Waugh, Evelyn
Greene, Graham
Snow, C. P.
DuMaurier, Daphne

WORLD

Æsop
Apuleius
Boccaccio, Giovanni
Rabelais, François
Cervantes
Bergerac, Cyrano de (30)
La Fontaine, Jean de (77)
Perrault, Charles (poet) (48)
Lesage, Alain R. (77)
Saint-Pierre, J. de (36)
Chateaubriand, Vicomte de (78)
Fouqué, F. H. (78)
Manzoni, Alessandro (77)
Almqvist, Karl Jonas (30) (36) (77)
Balzac, Honoré de
Bremer, Fredrika
Dumas the Elder (30)
Mérimée, Prosper (7) (41)
Sand, George
Sue, Eugène
Andersen, Hans C. (48) (77)
Gógol, Nikolai V.
Gautier, Théophile (36) (77)
Freytag, Gustav (30) (36)
Turgéniev, Ivan
Dostoiévsky, Fiódor
Flaubert, Gustave
Baudelaire, C. P. (77)
Erckmann-Chatrian (30)
Jókai, Maurus
Tolstóy, Liov (30) (91)
Verne, Jules
Ebner-Eschenbach, Marie (77)
Heyse, Paul (30) (77)
Björnson, B. (30) (77)
Halévy, L. (30)
Daudet, Alphonse
Zola, Emile
Suttner, Baroness von (91)
Sienkiewicz, Henryk
Huysmans, J. Karl
Franzos, Karl E. (36)
Maupassant, Guy de
Viaud, Louis Marie
Bourget, Paul (36) (77)
Pontoppidan, H.
Lagerlöf, S. (41)
Heidenstam, Verner von (78)
Chékov, Anton (30)
Hamsun, Knut
Rolland, R. (36)
Blasco Ibañez, V.
Gorky, Maxim
Reymont, W. S.
Bunin, Ivan
Proust, Marcel
Andréiev, L. K. (30)
Baroja, Pio
Mann, Thomas (25) (36)
Deledda, G.
Martin du Gard, R.
Undset, Sigrid
Kafka, Franz
Feuchtwanger, L.
Romains, Jules
Zweig, Arnold
Morand, Paul (36) (41)
Fallada, Hans
Remarque, Erich

(64) Orators:

AMERICAN

Adams, Samuel
Otis, James (22)
Henry P. (22) (49)
Adams, John Quincy
Randolph, John
Clay, Henry (78)
Calhoun, J. C. (78)
Webster, Dan. (78)
Hayne, Robert Y. (78)
Everett, Edward (78)
Choate, R. (87) (78)
Simpson, Matthew (95)
Phillips, Wendell (91)
Sumner, Charles (78)
Beecher, H. W. (95)
Davis, H. W. (49) (78)
Douglass, Frederick
Blaine, J. G. (78)
Choate, J. H. (49) (78)
Ingersoll, Robert G. (49)
Brooks, Phillips (95)
Watterson, Henry (47)
Grady, H. W. (47)
Graves, John T. (47)
Bryan, William Jennings (78)

WORLD

Isocrates
Æschines (33) (47)
Demosthenes (78)
Cicero (36) (78)
Antony, Mark (58) (87)
Athanasius, St. (12)
Chrysostom (12) (95)
Peter the Hermit (95)
Boussuet, J. B. (95)
Pitt, William (78)
Burke, Edmund (36) (78) (79)
Grattan, Henry (78)
Fox, C. J. (78)
Mirabeau, Count de (78)
Curran, J. P. (49) (78)
Erskine, Thomas (49)
Pitt, William (78)
Canning, George (78)
O'Connell, Daniel (78)
Kossuth, Louis (78)
Disraeli, B. (63) (78)
Favre, Jules C. (78)
Gladstone, W. (36) (47) (78)
Bright, John (78)
Castelar, E. (41) (78)
Gambetta, Léon (78)
Laurier, Sir Wilfrid (78)
Lloyd George, D. (78)

(65) Organists:

Bach, Johann Sebastian (23)
Gounoud, Charles Francois (23)
Franck, César A. (23)
Bruckner, Anton (23)
Saint-Saëns, Charles C. (23)
Foote, Arthur (23)
Parker, H. W. (23)
Schweitzer, Albert (70) (72) (95)

(66) Ornithologists:

Wilson, Alex. (47) (67)
Audubon, J. J. (60) (67)
Baird, Spencer F.
Hudson, W. H. (36) (60) (63)
Thomson, J. Arthur

(67) Painters:

AMERICAN

Copley, John S.
West, Benjamin
Peale, Charles W.
Stuart, Gilbert
Trumbull, John
Sully, Thomas
Cole, Thomas
Inman, Henry
Cranch, C. (36)
Leutze, Emanuel
Kensett, John F.
Read, Thos. B. (77)
Gifford, Sandford R.
Hunt, William M.
Johnson, Eastman
Inness, George
Church, Frederick E.
Whistler, J. M. (35)
La Farge, John
Homer, Winslow
Martin, Homer D.
Vedder, E (35)
Wyant, Alexander H.
Moran, Thomas
Hovenden, Thomas
Millet, F. D.
Blakelock, R. A.
Blashfield, E. (53)
Harnett, William M.
Duveneck, Frank (56)
Tiffany, Louis C.
Chase, W. M.
Abbey, E. A. (53)
Weir, Julian (53)
Harrison, Thomas A.
Inness, George, Jr.
Brush, G. de F.
Alexander, J. W.
Cox, Kenyon (53)
Sargent, John S.
Daingerfield, E. (53)
Hassam, Childe (53)
Moses, "Grandma"
Nourse, Elizabeth
Platt, Charles A.
Benson, F. W. (53)
Beaux, Cecilia
Cox, Louise (35)
Henri, Robert
Fuertes, Louis Agassiz
Kent, Rockwell (44)
O'Keeffe, Georgia
Sheeler, Charles
Burchfield, Charles E.
Wyeth, Andrew

WORLD

Parrhasius
Apelles
Zeuxis
Giotto (8)
Orcagna, A. (8) (77) (88)
Eyck, Hubert van
Eyck, John van
Angelico, Fra
Lippi, Fra Filippo
Bellini, Giovanni
Bellini, Gentile
Mantegna, A. (35)
Botticelli, Alessandro
Ghirlandajo, D.
Vinci, Leonardo da (8) (34) (88)
Carpaccio, Vittore
Dürer, Albrecht (35)
Cranach the Elder
Bartolommeo, Fra
Giorgione
Titian
Ghirlandajo, Ridolfo
Raphael
Sarto, Andrea del
Giulio Romano (8)
Correggio
Holbein, Hans (35)
Tintoretto
Brueghel, Pieter
Cagliari, P. V.
Carracci, Lodovico
Carracci, Agostino
Carracci, Annibale
Brueghel, Jan
Reni, Guido
Rubens (35)
Hals, Frans
Domenichino
Jordaens, Jakob
Zurbarán, F. de
Van Dyck, Sir A. (35)
Velásquez
Claude Lorraine
Rembrandt
Dou, Gerard
Murillo
Lebrun, Charles
Potter, Paul (35)
Ruysdael, Jacob (35)
Hobbema, Meindert
Huysmans, Cornelis
Watteau, Antoine
Hogarth, William (35)
Reynolds, Sir Joshua
Greuze, Jean Baptiste
Gainsborough, Thos.
Fragonard, Jean H.
Romney, George
Goya, Francisco de
David, Jacques L.
Vigée-Lebrun, Marie
Raeburn, Sir Henry
Hokusai
Crome, John
Lawrence, Sir Thos.
Gérard, Baron
Turner, J. M. (35)
Constable, John
Ingres, Jean Auguste
Cornelius, Peter von
Eastlake, Sir Charles
Corot, Jean Baptiste
Delaroche, Paul
Hiroshige, Ando
Delacroix, Ferdinand
Landseer, Sir E. H.

Decamps, Alexandre
Diaz de la Peña
Gallait, Louis
Dupré, Jules
Rousseau, Théodore
Millet, Jean F. (35)
Meissonier, Jean L.
Daubigny, C. F. (35)
Watts, G. F. (35) (88)
Courbet, Gustave
Frère, Pierre E.
Fromentin, Eugène
Bonheur, Rosa
Gérôme, Jean Léon
Hofmann, H.
Israëls, Josef
Bouguereau, W. A.
Breton, Jules A.
Hunt, W. Holman
Millais, Sir John E.
Leighton, Lord
Manet, Edouard
Burne-Jones, Sir E.
Boughton, George H.
Degas, Hilaire
Alma-Tadema, Sir L.
Lenbach, Franz von
Fortuny, Mariano
Mauve, Anton
Cézanne, Paul
Monet, Claude
Cazin, Jean Charles
Renoir, Pierre Auguste
Munkácsy, Michael
Crofts, Ernest
Gauguin, Paul
Detaille, Jean B.
Harris, Robert
Van Gogh. Vincent
Dicksee, Margaret I.
Walker, Horatio
Zorn, Anders L.
Sorolla y Bastida
Toulouse-Lautrec, Monfa
Kandinsky, Vasily
Bakst, Leon
Brangwyn, F.
Matisse, Henri de
Zuloaga, Ignacio
Bone, Sir M.
Picasso, Pablo
Braque, Georges
Modigliani, Amadeo
Rivera, Diego
Chagall, Marc
Chirico, Giorgio di
Dali, Salvador

(68) Philanthropists:

Atticus Herodes
Faneuil, Peter (53)
Epee, Abbe de l' (21)
Howard, John (91)
Oberlin, Jean F. (95)
McGill, James (55)
Wilberforce, Wm. (78)
Girard, Stephen (15)
Fry, Elizabeth (91)
Jeejeebhoy, Sir J. (53)
Lawrence, Abbott (53)
Vassar, Matthew (53)
Peabody, G. (55)
Howe, S. G. (91)
Shaftesbury, Earl of (78)
Nightingale, Florence
Barton, Clara (33)
Dunant, Jean H.
Carnegie, A. (45)
Field, Marshall (55)
Hearst, Phebe
Straus, Nathan (15)
Candler, Asa G. (15)
Rosenwald, Julius (55)
Berry, Martha M. (33)
Shepard, H. M. Gould
Harkness, Edward S.
Ford, Henry II (53)

(69) Philologists:

Webster, Noah (33)
Grimm, Jacob (48)
Littre, Maximilian Paul Emile (70)
Freund, Wilhelm (33)
Blackie, J. S. (33)
Müller, F. Max (20)
Furnivall, F. J.
Murray, Sir James A. H.
Harper, Wm. R. (20) (33)
Smith, Benjamin Eli (47)
Zamenhof, Louis (72)
Putnam, Herbert
Vizetelly, F. H. (32)

(70) Philosophers and Ethical Writers:

Thales (9) (54)
Pythagoras (54)
Xenophanes
Empedocles
Parmenides
Anaxagoras
Zeno of Elea
Socrates (33)
Democritus
Plato (31) (33) (79)
Aristippus
Diogenes
Aristotle (14) (31) (33) (36) (74)
Mencius
Theophrastus (14)
Epicurus (33)
Zeno (33)
Seneca (30)
Epictetus
Aurelius, Marcus (87)
Plotinus
Hypatia
Erigena (33) (95)
Anselm, Saint (33)
Abelard, P. (95)
Bacon, Roger (18) (73) (95)
Aquinas, Saint Thomas (33) (95)
Occam, W. of (33) (95)
Pletho, G. (33)
Bruno, Giordano
Bacon, Francis (36) (41)
Campanella, T. (77)
Hobbes, T. (31)
Gassendi, P. (54) (73)
Descartes, Rene (54)
Browne, Sir T. (72)
La Rochefoucald
Locke, John
Spinoza, Baruch
Leibnitz, G. von (54)
Bayle, Pierce (36)
Berkeley, George (95)
Voltaire (30) (36) (41) (63)
Hume, David
Diderot, Dennis
Condillac, Etienne de
Kant, Immanuel (33)
Paine, Thomas (47)
Bentham, Jeremy (49) (52)
Fichte, Johann
Schleiermacher, F. (95)
Hegel, Georg W.
Schelling, F. von
Hamilton, Sir W. (33)
Schopenhauer, Arthur
Cousin, Victor
Comte, Auguste
Martineau, James
Mill, J. S. (31) (91)
Kierkegaard, S. A.
Lotze, Rudolph H.
Lewes, G. H. (13) (25) (74)
Spencer, Herbert (33)
Fischer, E. K.
Harris, W. T. (33)
Green, T. H.
Hartmann, Karl von
James, Wm. (82)
Nietzsche, F.
Eucken, R.
Nordau, Max Simon
Adler, Felix (33)
Haldane, Viscount (78)
Royce, Josiah (33) (36)
Bergson, Henri
Dewey, John (33) (82)
Hibben, J. G. (33) (36)
Whitehead, Alfred (36) (54)
Santayana, George (33) (36)
Schiller, F. C. S.
Croce, Benedetto (41)
Russell, B. A. (54) (91)
Schweitzer, Albert (65) (72) (95)
Keyserling, H. A.
Spengler, Oswald
Maritain, Jacques (36) (95)
Sartre, Jean P. (30) (36)
Bronowski, Jacob

(71) Photographers:

Brady, M. B.
Pathé, Charles
Steichen, Edward (27)
Bourke-White, M. (47)
Karsh, Yousuf

(72) Physicians and Surgeons:

AMERICAN

Bache, F. (18) (73)
Jackson, Charles T.
Flint, Austin (33) (74)
Long, Crawford W.
Wells, Horace
Morton, William T. G.
Blackwell, Elizabeth
Still, Andrew T.
Mitchell, Silas Weir (63) (74) (77)
Jacobi, Abraham (33)
McBurney, Charles
Palmer, D. D.
Reed, Walter
Gorgas, William C.
Murphy John B.
Kelly, Howard A.
Mayo, William J.
Crile, Geo. W.
Mayo, Charles Horace
Jelliffe, Smith Ely
Cushing, Harvey W.
Carrel, A. (74)
Baker, S. Josephine
Hinkle, Beatrice
Greene, Jas. S.
Dick, George F. (33)
White, Paul Dudley
Menninger, William C.
Sabin, Albert B.
Salk, Jonas E.

WORLD

Hippocrates
Erasistratus (74)
Dioscorides
Galen
Avicenna (70)
Linacre, T. (20) (33)
Paracelsus
Graf, Regnier de
Boerhaave, H. (18)
Auenbrugger von A., Leopold
Hunter, John (74)
Jenner, Edward
Hahnemann, S. C.
Gall, F. C. (74)
Cooper, Sir A. P.
Bright, Richard (74)
Simpson, Sir J. Y. (74)
Zenker, F. A. von (74)
Lister, Joseph, Baron
Kocher, E. T.
Osler, Sir William (33)
Behring, E. A. von (74)
Ehrlich, Paul (18) (74)
Ross, Sir R. (74)
Finsen, Niels (46) (74)
Wright, Sir A. E. (74)
Schweitzer, Albert (65) (70) (95)

(73) Physicists:

Gilbert, William (72)
Galileo (9) (46)
Mariotte, Edmé
Guericke, Otto von
Torricelli, E. (54)
Boyle, Robert (18)
Huygens, C. (9) (46)
Newton, Sir Isaac (54)
Fahrenheit, Gabriel Daniel (46)
Coulomb, Charles A.
Galvani, Luigi (72)
Volta, Alessandro
Rumford, Benjamin Thompson, Count (78)
Biot, Jean B. (9)
Ampère, André Marie (46) (54)
Oersted, Hans C.
Brewster, Sir David
Arago, Dominique
Fraunhofer, J. von
Ohm, Georg Simon
Becquerel, Antoine C.
Fresnel, Augustin J.
Faraday, Michael (18)
Haidinger, W. von (39)
Carnot, N. L. S.
Henry, Joseph (33)
De la Rive, Auguste A.
Weber, Wilhelm E.
Jolly, Philipp von
Mayer, Julius R. von
Zeiss, Carl
Joule, James P.
Foucault, Jean B. L.
Becquerel, A. E.
Tyndall, John
Helmholtz, H. von
Clausius, Rudolf J. E.
Hittorf, Johann W.
Kelvin, Lord (54)
Maxwell, James C.
Gibbs, Josiah Willard
Kundt, August
Dewar, Sir James (46)
Rayleigh, Baron
Lippmann, G.
Roentgen, Wilhelm K.
Rowland, Henry A.
Braun, Ferdinand
Lodge, Sir O. J. (33)
Becquerel, A. H.
Michelson, A. A.
Lorentz, H. A.
Onnes, Heike K.
Thomson, Sir J. J.
Hertz, Heinrich
Planck, Max
Pupin, M. I. (46)
Guillaume, C. E.
Gullstrand, A.
Millikan, R. A. (33)
Rutherford, E. (18)
Coolidge, William D.
Broglie, Duc de
Broglie, L. V. de
Aston, F. W.
Einstein, Albert (54)
Richardson, O. W.
Davisson, C. J.
Franck, J.
Goddard, Robert H.
Bohr, N. H. D.
Compton, Karl (33) (78)
Stern, Otto
Bragg, W. L.
Bush, Vannevar (33)
Compton, A. H. (33)
Cockcroft, Sir John
Rabi, I. I.
Smyth, H. De Wolfe (33)
Dryden, Hugh L.
Zwicky, Fritz
Fermi, Enrico
Lawrence, E. O.
Kaplan, Joseph
Oppenheimer, J. R. (33)
Anderson, Carl D. (33)
McMillan, Edwin M.
Mauchly, John W.
Teller, Edward
Hagen, John P. (9)
Van Allen, James A.
Abelson, Philip

(74) Physiologists:

Erisistratus
Eustachio, B.

Vesalius, A. (72)
Fallopius, G. (72)
Fabricius, H. (72)
Harvey, William (72)
Malpighi, Marcello
Haller, A. von (14) (77)
Hunter, John
Brillat-Savarin, Anthelme
Gall, F. C.
Bright, Richard (72)
Weber, Ernst H.
Owen, Sir Richard
Simpson, Sir J. Y. (72)
Pasteur, Louis (18)
Zenker, F. A. von
Gegenbauer, Karl
Mitchell, S. W. (63) (72)
Flint, Austin (72)
Szent-Györgyi, Albert
Koch, R. (72)
Golgi, Camillo
Laveran, C. L. (72)
Pavlov, Ivan P.
Behring, E. A. von (72)
Ehrlich, Paul (72)
Ross, Sir R. (72)
Finsen, Niels R. (72)
Loeffler, Friedrich
Wright, Sir A. E.
Nicolle, C. J. H.
Landsteiner, Karl
Sabin, Florence
Carrel, A. (72)
MacLeod, J. J. R.
Whipple, George H.
Fleming, Alex (72)
Dam, Henrik
Harvey, E. N.
Gasser, H. S.
Bunting, Fred G.
Murphy, W. P.
Doisy, Edward A.

(75) Pianists:

Czerny, Karl (23)
Chopin, Frederic (23)
Liszt, Franz (23)
Gottschalk, L. (23) (24)
Saint-Saëns, Charles C. (23) (65)
Sinding, Christian (23)
Paderewski, Ignace Jan (23) (78)
Chaminade, Cecile (23)
Mac Dowell, E. (23) (24)
Debussy, Claude A. (23)
Godowski, Leopold (33)
Rachmaninov, S. V. (23)
Hofmann, Josef
Grainger, Percy (23)
Gershwin, George (23)
Cliburn, Van

(76) Pioneers and Plainsmen:

Boone, Daniel
Zane, Ebenezer (34)
Chapman, John
Pike, Zebulon (58)
Crockett, David
Houston, Sam (58)
Carson, Christopher (58)
Fremont, John C. (58) (78)
Cody, Wm. F. (58)

(77) Poets:

AMERICAN

Hopkinson, Francis (78)
Freneau, Philip
Barlow, Joel (78)
Key, Francis Scott
Halleck, Fitz-Greene
Payne, John Howard (30)
Bryant, William C. (47)
Emerson, Ralph W. (36) (70)
Simms, W. G. (63)
Longfellow, Henry Wadsworth (33)
Whittier, John (91)
Holmes, Oliver W. (36) (74)
Poe, Edgar Allan (36) (73)
Lowell, James R. (36)(28)
Whitman, Walt
Cary, Alice
Crosby, Fanny
Read, Thomas B. (67)
Cary, Phœbe
Taylor, Bayard (47)
Timrod, Henry
Dickinson, Emily
Hayne, Paul Hamilton
Aldrich, Thomas Bailey (30) (32) (63)
Thaxter, Celia (48)
Ryan, Abram Joseph
Miller, Joaquin (47)
Lanier, Sidney (33)
Field, Eugene (47) (48)
Markham, Edwin
Riley, James Whitcomb
Stanton, Frank L.
Bates, Katharine Lee (33) (36)
Masters, Edgar Lee
Robinson, Edwin Arlington
Dunbar, Paul L.
Lowell, Amy (13) (36)
Frost, Robert
Sandburg, Carl (13)
Lindsay, Nicholas Vachel
Stevens, Wallace
Neihardt, John G.
Williams, Wm. Carlos
Untermeyer, Louis
Fletcher, John G.
Kilmer, Joyce
Jeffers, Robinson
Moore, Marianne Craig
Eliot, Thomas S. (30)
Seeger, Alan
Aiken, Conrad Potter
Cummings, E. E.
MacLeish, Archibald
Millay, Edna St. Vincent
Benét, Stephen V.
Hughes, Langston
Nash, Ogden

ENGLISH

Cædmon
Barbour, John (41)
Langland, William
Chaucer, Geoffrey (78)
Spenser, Edmund
Chapman, George (96)
Shakespeare, Wm. (30)
Herrick, Robert
Milton, John (36)
Cowley, Abraham
Dryden, John (30) (36) (43)
Cibber, Colley (1) (30) (94)
Watts, Isaac (95)
Gay, John
Pope, Alexander (43)
Wesley, Charles
Gray, Thomas
Akenside, Mark
Cowper, William
Darwin, Erasmus (72)
Crabbe, George
Blake, W. (35) (67)
Burns, Robert
Baillie, Joanna (30)
Wordsworth, William
Cary, H. F. (95)
Coleridge, Samuel T. (25) (36)
Southey, Robert (13) (41)
Landor, W. S. (36)
Campbell, Thomas
Moore, Thomas
Heber, R. (95)
Byron, Lord
Keble, John (95)
Shelley, Percy B.
Hemans, Felicia D.
Keats, John
Hood, Thomas (43)
Browning, Elizabeth Barrett
Fitzgerald, Edward
Tennyson, Alfred
Browning, Robert
Faber, F. W.
Ingelow, Jean (63)
Arnold, Matthew (36)
Rossetti, Dante G. (67)
Rossetti, Christina G.
Lytton, Bulwer-Lytton, Earl of (78)
Morris, William (67)
Austin, Alfred (36)
Swinburne, Algernon (30)
Bridges, Robert
Hopkins, Gerard Manley
Henley, William E. (30)
Drummond, W. H.
Housman, A. E. (20)
Carman, Bliss (36)
Tagore, R.
Scott, Duncan C.
Yeats, William Butler (30)
McCrae, John D. (72)
Service, Robert (63)
Masefield, John (30)
Pratt, Edwin J.
Noyes, Alfred
Brooke, Rupert
Sitwell, Sir Osbert
Auden, Wystan
Spender, Stephen
Thomas, Dylan

WORLD

Homer
Hesiod
Alcæus
Sappho
Anacreon
Pindar
Menander (30) (43)
Apollonius Rhodius
Theocritus
Ennius, Quintus
Lucretius
Catullus
Virgil
Horace
Ovid
Juvenal
Ausonius, Decimus
Boethius (70)
Firdousi
Omar Khayyam (9)
Bernard of Cluny (95)
Dante
Hafiz
Petrarch
Villon, Francois
Ariosto, Ludovico
Colonna, Vittoria
Vega, G. de la (58)
Camoëns, Luiz Vaz de
Ferreira, Antonio
Tasso, Torquato
Alarcón y Mendoza
Perrault, Chas. (36) (48)
Holberg, Baron (30) (41)
Klopstock, Friedrich
Wieland, C. (36)
Bellman, Karl Mikael
Derzhavin, Gavril (78)
Herder, J. von (36)
Goethe, Johann von (13) (30) (36) (63) (94)
Rouget de Lisle
Franzén, F. M. (95)
Oehlenschläger, Adam Gottlob (30)
Béranger, Pierre de
Chamisso, A.
Körner, Karl Theodor
Heine, Heinrich
Púshkin, Alexander
Vigny, Comte de (63)
Shevchenko, Taras
Cremazie, Octave
Mistral, Frédéric
Carducci, G. (78)
Sully-Prudhomme, René
Rimbaud, Arthur
Verhaeren, Emile
Rouault, Georges
Rillke, Rainer Maria
Cammaerts, Emile
Cocteau, Jean
Jiménez, Juan Ramón
Leger St. Leger, A.
Nerudo, Pablo

(78) Political Leaders:

AMERICAN

Franklin, Benjamin (13) (22) (28) (36) (46) (47) (73) (78)
Washington, George (22) (34) (58) **(78)**
Morris, Robert (15)
Adams, John (15)
Carroll, Charles
Clinton, George (58)
Jefferson, Thomas
Gerry, Elbridge
Pinckney, C. C.
Muhlenberg, F. (95)
Madison, James
Morris, Gouverneur
King, Rufus
Burr, Aaron
Hamilton, A.
Monroe, James
Gallatin, A. (15) (28)
Adams, J. Q.
Jackson, A. (58) (64)
Clinton, DeWitt
Quincy, Josiah
Harrison, W. H. (58)
Clay, Henry (64)
Johnson, R. M.
Benton, Thomas H.
Calhoun, John C. (64)
Cass, Lewis
VanBuren, Martin
Webster, Dan. (64)
Taylor, Zachary (58)
Marcy, Wm. Learned
Tyler, John
Buchanan, James
Hayne, R. Y. (64)
Stevens, Thaddeus
Everett, Edward (64)
Polk, James Knox
Clayton, John M.
Johnson, Reverdy (49)
Fillmore, Millard
Seward, William H.
Pierce, Franklin
Dorr, Thomas Wilson
Fessenden, Wm. Pitt
Adams, C. F. (31)
Davis, Jefferson (58)
Fish, Hamilton
Johnson, Andrew
Hamlin, Hannibal
Lincoln, Abraham (64)
Morrill, Justin S.
Sumner, Chas. (3) (64)
Stephens, A. H.
Douglas, Stephen (64)
Stanton, Edwin McM.
Tilden, Samuel J.
Davis, H. W. (51) (64)
Butler, B. F. (58)
Breckinridge, J. C.
Hayes, R. B. (58)
Sherman, John
Morgan, John T. (58)
Edmunds, G. F. (49)
Conkling, Roscoe
Schurz, C. (58) (64)
Arthur, Chester Alan
Blaine, James G. (64)
Frye, William Pierce
Garfield, J. A. (58)
Harrison, Benj. (51)
Olney, Richard (51)
Cannon, J. G. (51)
Cleveland, Grover (49)
Hanna, M. A. (18) (55) (85)
Reed, T. B. (49)
Croker, Richard
McKinley, William
Nelson, Knute (48)
Root, Elihu (49) (51) (79)

Jones, Samuel Milton
Clark, Champ (49)
Lodge, H. C. (79)
Knox, P. C. (49)
LaFollette, R. M. (51)
Morgenthau, H.
Wilson, Woodrow (33) (41)
Taft, W. H. (49) (51)
Glass, Carter
House, E. M.
Roosevelt, Theodore (37) (41) (58)
Curtis, Charles
Bryan, W. J. (64)
Volstead, A. J.
Kahn, Julius
Norris, George W.
Beveridge, A. J (13) (32)
Daniels, Josephus (32)
Smoot, Reed
Jones, Wesley L. (51)
McAdoo, Wm. G. (51) (85)
Lane, Franklin K.
Borah, W. E. (51)
Dawes, C. G. (15)
Harding, W. G.
Johnson, H. W. (51)
Gerard, J. W. (51)
Stimson, H. L.
Garner, John N.
Cox, James M.
Baker, N. D. (51)
Hull, Cordell (28)
Coolidge, Calvin
Smith, Alfred E.
Knox, Frank (83)
Hoover, Herbert C.
McCormick, J. M.
Wagner, Robert F.
Barkley, Alben W.
Byrnes, J. F. (49) (51)
Roosevelt, Franklin D.
Perkins, Frances (91)
La Guardia, Fiorello
Eastman, J. B.
Rayburn, Samuel
Vandenberg, Arthur H.
Truman, Harry S.
Collier, John
Roosevelt, Theo., Jr.
Farley, James A.
Taft, Robert A.
Madden, J. W. (51)
McCormick, John W.
Morgenthau, Henry, Jr.
McNutt, Paul V.
Jackson, Robt. H. (51)
Forrestal, James
Willkie, Wendell L.
Dirksen, Everett
Bricker, John W.
Folsom, Marion
Brucker, Wilber
La Follette, R. M., Jr.
Lausche, Frank J.
Hoover, J. Edgar (51)
Henderson, Leon (31)
Herter, Christian (28)
Clay, Lucius D. (58)
Summerfield, Arthur
Lilienthal, D. E. (51)
Halleck, Charles A.
Stevenson, Adlai E.
Mansfield, Michael
Dewey, Thomas E. (51)
Lodge, Henry C. Jr.
Mitchell, James P.
Kefauver, Estes
McElroy, Neil H. (53)
Javits, Jacob
Fulbright, J. W.
Stassen, Harold E. (33)
Fong, Hiram
Knowland, William
Johnson, Lyndon B.
Rockefeller, Nelson
Goldwater, Barry M.
Collins, Leroy
Ribicoff, Abraham
Celebrezze, Anthony J.
Daniel, Price
Wagner, Robt. F., Jr.
Humphrey, Hubert
Nixon, Richard M.
Jackson, Henry M.
Day, J. Edward
Miller, William E.
McNamara, Robert
Udall, Stewart L.
Gronouski, John A. (33)

ENGLISH

Wolsey, Thomas (80)
More, Sir T. (20) (79)
Cromwell, Thomas
Cecil, William, Lord Burleigh
Bodley, Sir T. (20)
Hampden, J. (58)
Cromwell, Oliver (58)
Oxford, R. Harley, Earl of
Walpole, Sir Robert
Bolingbroke, Viscount
Pitt, William (51) (64)
Burke, E. (64) (79)
Hastings, Warren
North, Frederick, Lord
Francis, Sir Philip
Grattan, Henry (64)
Fox, Charles J. (64)
Curran, J. P. (64)
Pitt, William (64)
Wilberforce, Wm. (91)
Grey, Charles, Earl
Castlereagh, Viscount
Canning, George (64)
Ashburton, Lord (28)
O'Connell, Daniel (64)
Elphinstone, M. (41)
Palmerston, Viscount
Peel, Sir Robert
Derby, Earl of
Bulwer, Sir W. H. (41)
Disraeli, Benj. (63)
Howe, Joseph
Gladstone, W. (32) (64)
Bright, John (64)
Elgin, Earl of
Macdonald, Sir J. A.
Tupper, Sir Charles
Mackenzie, Alexander
Salisbury, Marquis of
Fawcett, Henry
Chamberlain, Joseph
Bryce, Viscount (28) (41)
Cremer, W. (79)
Cromer, Earl (28)
Laurier, Sir Wilfrid
Alverstone, Viscount
Davitt, Michael (36)
Parnell, Charles S.
Balfour, A. J. (70)
O'Connor, T. P. (36) (47)
Dillon, John
Grey, A. H. G., Earl
Asquith, Herbert H.
Hughes, Sir Samuel
Jameson, Sir L. (58) (72)
Rhodes, Cecil J. (15)
Borden, R. L. (51)
Deakin, Alfred
Haldane, Viscount (70)
Hardie, James Keir
Law, A. Bonar
Curzon, Earl
Grey, Edw., Viscount
Lloyd George (64) (93)
Henderson, Arthur
Chamberlain, J. Austen
Cecil, Lord E.
Hughes, W. M.
Willingdon, Viscount
MacDonald, J. R. (50)
Baldwin, Stanley
Devonshire, Duke of
Chamberlain, Neville
Gandhi, M. K.
Smuts, Jan C. (58)
Bennett, R. B.
Bondfield, M. G.
Athlone, Earl of
Churchill, W. L. S. (41) (64)
King, W. L. M.
Meighen, Arthur
Tweedsmuir, Baron (63)
Geddes, Sir Auckland
Cosgrave, W. T.
Bessborough, Earl of
Halifax, Viscount
DeValera, Eamonn
Bevin, Ernest (50)
Bruce, Stanley M.
Attlee, Clement R. (50)
Curtin, John (50)
Morrison, Herbert (50)
Cripps, Sir Stafford
Collins, Michael (58)
Menzies, Robt. G. (28)
Diefenbaker, John G.
Eden, Anthony
Hepburn, Mitchell
Home, Douglas
Martin, Paul
Gaitskell, Hugh
Wilson, Harold

WORLD

Aristides
Pericles (87)
Cato, Marcus
Catiline
Cato the Younger
Antony, Mark
Brutus, Marcus Junius
Agrippa, Marcus
Agricola
Machiavelli, N. (41) (79)
Borgia, Cesare
Barneveldt, John
Grotius, H. (51) (79)
Richelieu (80)
Mazarin, Jules (80)
Colbert, Jean B. (15)
DeWitt, Jan
Mirabeau, G. (64)
Hardenberg, Prince
Cambacérès, J. J. (51)
Carnot, Lazare N. (54)
Robespierre, M.
Danton, Georges (64)
Desmoulins, Camille
Fouché, Joseph
Esterházy, Prince (58)
Metternich, Prince
Emmett, Robert
Thiers, L. A. (41)
Kossuth, Louis (64)
Deák, Ferencz
Mazzini, Giuseppe
Tocqueville, A. de (79)
Juárez, Benito
Grévy, F. P. J.
Favre, J. C. G. (64)
Cavour, Count
Bismarck, Prince
Crispi, Francesco
Kruger, S. J. P.
Gómez y Báez, M. (58)
Castelar, Emilio (41) (64)
Palma, Tomás E.
Asser, T. (52)
Gambetta, Léon
Clemenceau, G. (36)
Fallières, Clément A.
Ito, Prince
Katsura, Prince
Witte, Count
Masaryk, T. G.
Fukushima, Baron
Jusserand, J. A. (28) (36) (41)
Bethmann-Hollweg
Millerand, A.
Orlando, Vittorio
Poincaré, Raymond
Briand, Aristide
Doumergue, Gaston
Venizelos, Eleutherios
Sun Yat Sen
Pilsudski, J.
Mannerheim, Carl (58)
Horthy de N., Nicholas
Alessandri, A.
Metaxas, John
Lebrun, Albert
Lenin, Nicolai
Herriot, Edouard
Blum, Léon
Sforza, Carlo
Adenauer, Konrad (51)
Litvinov, Maxim
Calles, P. E.
Quezon, Manuel Luis
Osmeña, Sergeo
Reynaud, Paul
Trotzky, Leon
Stalin, Joseph
Saud, Abdul Ibn
Saavedra, Lamas C.
Matsuoka, Y.
DeGasperi, Alcide
Vargas, Getulio
Laval, Pierre
Vishinsky, Andrei (51) (52) (64)
Mussolini, Benito
Benes, Edward
Inonu, Ismet (58)
Chiang Kai-shek (58)
Koo, V. K. W.
Hitler, Adolf
Nehru, Jawaharial Pandit (93)
Salazar, Antonio de Oliveira
Molotov, V. M. (28)
Segni, Antonio
Ley, Robert
Tito, Marshal
Göring, Hermann W.
Mao Tse-Tung (58)
Khrushchev, Nikita
Bulganin, Nikolai
Grandi, D., Count
Peron, Juan (58)
Eshkol, Levi
Garcia, Carlos P.
Cardenas, Lazaro
Erhard, Ludwig
Goebbels, Josef (47)
Bidault, Georges
Himmler, Heinrich
Bourgiba, Habib
Shastri, Lal Badadur
Brezhnev, Leonid
Hammarskjöld, Dag
Brandt, Willy
Nasser, Gamal
Tshombe, Moise
Castro, Fidel
Adoula, Cyrille
Nyerere, Julius K.

(79) Political Scientists:

Machiavelli, N. (41) (78)
Bodin, Jean (31)
Grotius, Hugo (49) (78)
Hobbes, T. (70)
Locke, John (70)
Montesquieu, M. de (70)
Tocqueville, A. de (78)
Smith, Goldwin (41)
Foster, J. W. (78)
Bryce, J. (28) (41)
Hill, David Jayne
Low, Seth (33)
Jordan, D. S. (33) (100)
Bourgeois, L. V. (78)
La Fontaine, H.
Hart, A. B. (33) (41)
Jenks, J. W. (33)
Lowell, A. W. (33)
Moore, John B. (28) (33)
Butler, N. M. (33)
Lange, Christian
Barrows, D. P. (33)
Fosdick, R. B. (6) (33)

(80) Popes and Cardinals:

Gregory I (78) (86) (95)
Gregory VII (12) (95)
Adrian IV
Innocent III (49) (95)
Julius II (58)
Bembo, P. (20) (41)
Wolsey, Thomas (78)
Sixtus V
Richelieu, Duc de (78)
Mazarin, Jules (78)
Pius IX
Newman, J. H. (36) (95)
Manning, H. E. (95)
Leo XIII
McClosky, John
Gibbons, James
Pius X

Farley, John Murphy
Mercier, D. J.
Benedict XV
Pius XI
O'Connell, Wm. H.
Glennon, Joseph
Dougherty, Dennis
Merry del Val (28) (78)
Hayes, Patrick J.
Pius XII
Mooney, Edward
Stritch, S. A.
McIntyre, J. F.
Spellman, F. J.
John XXIII
Muench, Aloisius
Ritter, Joseph E.
Cushing, Richard
Paul VI
Meyer, Albert

(81) Printers:

Fust, Johann
Caxton, William
Manutius, Aldus (83)
Ged, William (46)
Devinne, Theodore L.
Morris, Robert (77)

(82) Psychologists:

Fechner, G. T. (73)
Wundt, W Max (74)
James, William (70)
Hall, G. Stanley (33)
Binet, Alfred (33)
Cattell, J. McK. (32) (33)
Baldwin, James
Jastrow, Joseph (33)
Münsterberg, H. (33)
Meyer, Adolf (74)
Titchener, E. (33)
Angell, J. R. (33)
Adler, Alfred
Judd, Charles H. (33)
Thorndike, E. L. (33)
Jung, Carl G.
Yerkes, Robert M. (33)
Watson, John B.
Gesell, Arnold (33) (72)

(83) Publishers:

Manutius, Aldus (81)
Brockhaus, F. A.
Knight, C. (32) (41)
Chambers, W. (32)
Baedeker, Karl
Childs, G. W. (91)
Ginn, Edwin (91)
Funk, I. K. (32) (91) (95)
Curtis, Cyrus H. K.
Munsey, F. A. (32)
Ochs, Adolph S.
Hearst, W. R. (15) (47)
Capper, A. (32) (47) (78)
Northcliffe, Baron (32) (78)
Beaverbrook, Wm. (78)
McCormick, R. R. (47)
Howard, Roy
Knopf, Alfred
Luce, Henry
Cerf, Bennett
Ingersoll, Ralph (32)
Cowles, Gardner
Johnson, John H.

(84) Radio Executives:

Sarnoff, David

(85) Railway Managers and Ship Owners:

Cunard, Sir S. (34) (53)
Vanderbilt, C. (15)
Fargo, William
Field, C. W. (15)
Strathcona, Baron (91)
Stanford, L. (15) (91)
Depew, C. (51) (64) (78)
Hill, James J. (15)
Harriman, E. H. (15)
Mackenzie, Sir W.
Huntington, H. E. (15)
Shaughnessy, Baron
McAdoo, Wm. G. (78)
Thornton, Sir H.
Harriman, A. (15) (78)

(86) Religious Leaders:

Zoroaster
Lao-Tzu
Confucius
Buddha
Ulfilas
Mohammed
Wiclif, John (95)
Jerome of Prague
Huss, John (21)
Savonarola (95)
Luther, Martin (95)
Zwingli, Ulrich
Melanchthon, Philip (20) (33)
Ridley, Nicholas
Knox, John (95)
Calvin, John (95)
Hutchinson, Anne
Eliot, John
Williams, Roger (22)
Fox, George
Hennepin, Louis (29)
Swedenborg, E. (74)
Zinzendorf, Ct. von (95)
Wesley, John (95)
Serra, Junipero
Hicks, Elias (95)
Judson, Adoniram
Young, Brigham
Smith, Joseph
Noyes, John H.
Huc, Evariste R. (37)
Livingstone, D. (37)
Holyoake, George J.
Eddy, Mary B. G.
Williams, Sir George
Booth, William (91)
Jackson, Sheldon (33)
Moody, Dwight L.
Damien, Joseph
Dowie, John A.
Clark, Francis E. (95)
Sunday, William A. (21)
Grenfell, Wilfrid T. (72)
Booth, Evangeline C.
McNicholas, J. T. (95)
Buchman, Frank
Peale, Norman V. (21)
Merton, Thomas
Graham, Billy

(87) Rulers:

ANCIENT

Cheops
Hammurabi
Rameses
Arbaces
Draco (49) (52)
Nebuchadnezzar
Necho
Crœsus
Pisistratus
Cyrus the Great
Cambyses
Leonidas I
Darius I
Gelon
Xerxes I
Agesilaus
Dionysius the Elder (30) (58) (77)
Cyrus the Younger
Philip II
Artemisia
Darius III
Alexander the Great (58)
Ptolemy I
Ptolemy II
Asoka
Antiochus III
Cleopatra
Augustus
Claudius I
Vespasian
Caligula
Nero
Trajan
Hadrian
Antoninus Pius
Aurelius, Marcus (70)
Caracalla
Alexander Severus
Diocletian
Zenobia
Constantine the Great
Julian
Alaric I
Theodosius (58)
Attila
Genseric

MEDIEVAL

Theodoric (58)
Clovis I
Justinian the Great
Brunhilde
Ethelbert *England*
Heraclius
Omar, Abu-Hafsa
Al-Mansur
Pepin the Short
Charlemagne (58)
Irene
Haroun-al-Raschid
Alfred the Great
Otho I
Brian Boroihme
Hugh Capet
Vladimir the Great
Edmund *England*
Canute *England*
Olaf, St. *Norway* (12)
Ferdinand I, the Great
Edward the Confessor
Alexius I Comnenus
Henry IV *Germany*
Henry I *England*
Frederick I, Barbarossa
Henry II *England*
Philip II *France*
John *England*
Henry III *England*
Louis IX (saint) (12)
Rudolf I *Germany*
Alfonso X (9) (70)
Edward I *England*
Edward II *England*
Edward III *England*
Henry IV *England*
Henry V *England*
Constantine XIII
Henry the Navigator
Charles VII *France*
Charles the Bold
Ivan III *Russia*
Edward IV *England*
Medici, Lorenzo de'

MODERN

Isabella, *Sp.*
Ferdinand V, *Sp.*
Henry VII, *Eng.*
Louis XII, *Fr.*
Emanuel I, *Port.*
Atahualpa, *Peru*
James IV, *Scot.*
Henry VIII, *Eng.*
Margaret of Angoulême
Francis I, *Fr.*
Gustavus I Vasa, *Sw.* (58)
Solyman II, *Turk.*
Charles V, *Ger.*
Ferdinand I, *Ger.*
Mary, *Eng.*
Catherine de Medici, *It.*
Philip II, *Sp.*
Ivan IV, *Russ.*
Elizabeth, *Eng.*
William the Silent, *Hol.* (58)
Akbar, *Ind.*
Mary Queen of Scots
Charles IX, *Fr.*
Henry III, *Fr.*
Henry IV, *Fr.*
James I, *Eng.*
Christian IV, *Denmark*
Ferdinand II, *Ger.*
Shah Jehan, *Ind.*
Gustavus II Adolphus, *Sw.*
Cromwell, Oliver, *Eng.* (58) (61)
Louis XIII, *Fr.*
Charles I, *Eng.*
Frederick William, *Pruss.* (58)
Charles X Gustavus, *Sw.*
Christina, *Sw.*
Charles II, *Eng.*
James II, *Eng.*
Louis XIV, *Fr.*
William III, *Eng.*
George I, *Eng.*
Anne, *Eng.*
Peter the Great, *Russ.*
Charles XII, *Sw.*
George II, *Eng.*
Frederick William I. *Pruss.* (58)
Louis XV, *Fr.*
Maria Theresa, *Aust.*
Catherine II, *Russ.*
George III, *Eng.*
Joseph II, *Ger.*
Gustavus III, *Sw.*
Louis XVI, *Fr.*
Barras, Count Paul, *Fr.*
Louis XVIII, *Fr.*
George IV, *Eng.*
Charles XIV, John, *Sw.*
William IV, *Eng.*
Christophe, Henri, *Haiti*
Bonaparte, Joseph, *Sp.*
Francis II, *Aust.*
Frederick VI, *Denmark*
Napoleon Bonaparte, *Fr.*
Louis Philipe, *Fr.*
Louise, *Pruss.*
Alexander I, *Russ.*
Bonaparte, Louis, *Holland*
Bonaparte, Jerome (58)
William I, *Ger.*
Pedro I, *Brazil*
Napoleon III, *Fr.*
Alexander II, *Russ.*
Victoria, *Eng.*
Victor Emmanuel II, *It.*
Pedro II, *Brazil*
Oscar II, *Sw.*
Diaz, Porfirio, *Mex.* (58)
Francis Joseph, *Aust.*
Ismail Pasha, *Egypt*
Maximilian Ferdinand, *Mex.*
Kalakaua, David, *Hawaii*
Edward VII, *Eng.*
Mutsuhito, *Japan*
Gustavus V, *Sw.*
Carranza, V., *Mex.*
William II, *Ger.* (58)
George V, *Eng.*
Constantine I, *Ger.*
Nicholas II, *Russ.*
Victor Emmanuel III, *It.* (58)
Christian X, *Denmark*
Ebert, Friedrich, *Ger.*
Haakon VII, *Nor.*
Albert I, *Belg.*
Mustapha Kemal, *Turk.*
Obregon, Alvaro, *Mex.* (58)
Wilhelmina, *Neth.*
Alfonso XIII, *Sp.*
Hitler, Adolf, *Ger.*
Haile Selassie, *Ethiopia*
Edward VIII, *Eng.*
George VI, *Eng.*
Hirohito, *Japan*
Leopold III, *Belg.*
Elizabeth II, *Eng.*

(88) Sculptors:

AMERICAN

Greenough, Horatio
Powers, Hiram
Brown, Henry K. (67)
Crawford, Thomas
Rinehart, William H.
Hosmer, Harriet
Ward, J. Q. A.
Hoxie, Vinnie Ream
Saint-Gaudens, Augustus
French, Daniel C.
Kelly, James Edward
Niehaus, Charles H.
Adams, Herbert
Taft, Lorado
Dallin, Cyrus Edwin
Partridge, William O.
Grafly, Charles
Barnard, George G.

MacMonnies, F.
Akeley, Carl E. (60)
Bartlett, Paul W.
Flanagan, John
MacNeil, H. A.
Bitter, Karl
Borglum, G. (35) (67)
Borglum, Solon H.
Scudder, Janet
Walker, Nellie Verne
Fraser, James E.
Hyatt, Anna Vaughn
Aitken, Robert I.
Epstein, Jacob
Manship, Paul
Jones, Thomas
Hoffman, Malvina (36)
Calder, Alexander
Moore, Henry

WORLD

Phidias
Praxiteles
Ghiberti, Lorenzo
Donatello
Robbia, Lucca della
Michelangelo (8) (67)
Bandinelli, Baccio
Cellini, Benvenuto (13)
Goujon, Jean (8)
Bernini, G. (8) (67)
Algardi, Alessandro
Gibbons, Grinling
Houdon, Jean A.
Flaxman, John
Canova, Antonio
Dannecker, J. von
Thorvaldsen, Bertel
David, Pierre Jean
Barye, Antoine Louis
Foley, John Henry
Frémiet, Emmanuel
Meunier, C. (67)
Bartholdi, Frédéric
Dalou, Jules
Rodin, Auguste
Hébert, Louis P.
Glicenstein, Henri
Allward, Walter S.
Milles, Carl
Mestrovic, Ivan

(89) Singers:

AMERICAN

Nordica, Lillian
Schumann-Heink, E.
Fremstad, Olive
Homer, Louise
Garden, Mary
Martin, Riccardo
Farrar, Geraldine
Werrenrath, R.
Gluck, Alma
Hayes, Roland
Tibbett, Lawrence M.
Ponselle, Rosa
Swarthout, Gladys
Anderson, Marian
Traubel, Helen
Pons, Lily
MacDonald, Jeanette
Jackson, Mahalia
Stevens, Rise
Munsel, Patrice
Price, Leontyne

WORLD

Garcia, Manuel del P.
Lind, Jenny
Melba, Nellie
Calve, Emma
Lauder, Sir Harry
Caruso, Enrico
Chaliapin, Theodore
Tetrazzini, Luisa
Martinelli, G.
Bori, Lucrezia
Galli-Curci, Amelita
Flagstad, Kirsten
Callas, Maria

(90) Social Reformers:

Saint-Simon
Owen, Robert (78)
Fourier, Francois
Cabet, Etienne
Hill, Sir Rowland
Brown, John
Garrison, W. L. (32)
Burritt, E. (32) (69)
Phillips, Wendell (64)
Douglass, F. (64)
Marx, Karl (31)
Howe, Julia (95)
Lassalle, Ferdinand
Bradlaugh, Chas.
Lombroso, Cesare (82)
Willard, Frances (33)
Hyndman, H.
Kropotkin, Prince
Bellamy, Edw. (47) (63)
Debs, Eugene V.
Lathrop, Julia C
Webb, Sidney
Jaures, A. M. J. J. (78)
Addams, Jane
Berger, V. L. (32) (78)
Branting, H.
Snowden, P. (78)
Wald, Lilian D.
Lindsey, B. B. (49)
Hillquit, Morris
Beers, Clifford W.
Stopes, Marie (14)
Thomas, Norman (21)
Young, Whitney M., Jr.

(91) Sociologists:

Bakunin, M. (78)
Ely, Richard T. (90)
Veblen, T. (90)
Ellis, Henry H.

(92) Sportsmen and Sports Authorities:

Lipton, Sir T. J. (53)
Camp, Walter (47)
Rice, Grantland
Moody, Helen Wills
Zaharias, Mildred D.
Owens, Jesse
Musial, Stanley
Spahn, Warren
Rudolph, Wilma

(93) Statesmen:

Lycurgus
Draco
Solon
Grotius (49) (79)
Richelieu (78) (80)
Pitt, William (64) (78)
Burke, Edmund (36) (64) (91)
Washington, George (34) (58) (78)
Jefferson, Thomas (78)
Hamilton, Alex. (78)
Metternich, Prince (28)
Clay, Henry (64) (78)
Webster, Daniel (64) (78)
Peel, Sir Robert (78)
Disraeli, Benj. (63) (64) (78)
Lincoln, Abraham (51) (64) (78)
Cavour, Count (78)
Bright, John (64) (78)
Bismarck, Prince (78)
Laurier, Sir Wilfrid (78)
Balfour, A. J. (28) (70)
Masaryk, T. G. (78)
Wilson, Woodrow (33) (41) (78)
Lloyd-George, D. (64) (78)
Smuts, Jan C. (58) (78)
Baruch, Bernard (15)
Churchill, W. L. S. (41) (64) (78)
Rhee, Syngman
George, Walter F.
Roosevelt, F. D. (64) (78)
St. Laurent, Louis S.
Benes, Edward (78)
Byrd, Harry Flood
Ben-Gurion, David
Vanier, George
Nehru, J. (78)
Costello, John Aloysius
Macmillan, Harold
Menzies, Robert G.
Ikeda, Hayato
Lloyd, Selwyn
Gomulka, Wladyslaw
Magsaysay, Ramon
Mendes-France, Pierre
Eisenhower, D. D. (58)
Kennedy, John F. (78)
Edinburgh, Duke of

(94) Theatrical Producers:

Cibber, Colley (1) (13) (30)
Garrick, David (1)
Goethe, J. W. von (13) (25) (30) (63) (77)
Sheridan, R. B. (30) (64) (78)
Kemble, John Philip (1)
Barrett, Lawrence (1) (13)
Irving, Sir H. (1)
Herne, James A. (1) (30)
Belasco, David (30)
Mansfield, Richard (1)
Thomas, A. (1) (30)
Hyde, Douglas (1)
Arliss, George (1)
Cochran, Charles Blake
De Mille, Cecil B.
Goldwyn, Samuel
Hurok, Solomon
Rank, J. Arthur
Hardwicke, Sir C. (1)
Laughton, Charles (1)
Massey, Raymond (1)
Hitchcock, Alfred
Selznick, David O.
Sullivan, Edward V.
Balanchine, George
Schary, Dore
Logan, Joshua

(95) Theologians, Religious Writers, and Church Historians:

Hillel
Tertullian
Arius
Eusebius
Athanasius, St. (12)
Chrysostom (12)
Augustine, St. (12)
Nestorius
Justin (12)
Bede
Lanfranc
Aquinas, St. Thomas (12) (33)
Duns, Scotus (33) (70)
Kempis, Thomas a
Luther, Martin (86)
Cranmer, Thomas
Calvin, John (86)
Arminius, Jacob
Ussher, James
Jansen, Cornelis
Taylor, Jeremy
Biddle, John
Pascal, Blaise (54)
Bossuet, Jacques (64)
Bourdaloue, Louis
Fleury, Claude
Collier, Jeremy (41)
Fenelon, Francois
Butler, Joseph
Paley, William
Lacordaire, Jean B.
Alzog, Johann B.
Tischendorf, L. von
Blavatsky, Helena
Farrar, F. W. (77)
Baring-Gould, S. (77)
Besant, Annie
Drummond, Henry (21)
Harnack, Adolf (33)
Inge, William R. (36)
Jacks, L. P. (36)
Jowett, John Henry (21)
Maritain, Jacques (36) (70)
Sheen, Fulton J.

(96) Translators:

Tyndale, William (20)
Coverdale, Miles
Chapman, Geo. (30) (77)
Dryden, John (25) (30) (36) (43)
Pope, Alex. (43) (77)
Fitzgerald, Edward (77)
Rawlinson, Sir H. (20)
Jowett, Benjamin (20)
Taylor, Bayard (77) (97)
Norton, C. E. (33)
Rossetti, D. G. (67) (77)
Morris, Wm. (67) (77)
Murray, G. G. A. (20)
Goodspeed, Edgar J. (20)
Knox, Ronald

(97) Travelers:

Polo, Marco (37)
Park, Mungo (37)
Taylor, Bayard (77) (96)
Muir, John (60)
Andrews, R. C. (37)
Thomas, L. (13) (41) (47)
Forbes, J. Rosita (47)
Halliburton, R. (47)

(98) Violinists:

Lully, Jean Baptiste
Arne, Thomas (23)
Paganini, Niccolo (23)
Bull, Ole
Godard, Benj.
Loeffler, C. M. (23)
Kreisler, Fritz (23)
Kubelik, Jan
Zimbalist, Efrem
Elman, Mischa
Heifetz, Jascha

(99) Woman Suffragists:

Stanton, Elizabeth (91)
Anthony, Susan B. (91)
Key, Ellen (91)
Catt, Carrie Chapman
Decker, Sarah P. (91)
Gilman, Charlotte (47)
Astor, Lady Nancy (78)
Rankin, Jeannette (78)

(100) Zoologists:

Pliny the Elder (14)
Leeuwenhoek, A. van (73)
Reaumur, R. A. de (73)
Buffon, Count de
White, Gilbert (14) (60)
Banks, Sir J. (37)
Lamarck, J. B. de (14)
Huber, Francois
Wilson, A. (47) (67)
Cuvier, G. C. (74)
Brogniart, A. (39)
Geoffroy Saint-Hilaire, E. (74)
Audubon, J. J. (60) (67)
Baer, Karl Ernst von
Agassiz, Louis (60)
Darwin, Charles (14)
Gosse, Philip Henry (60)
Baird, Spencer F. (60)
Fabre, Jean Henri (36)
Wallace, Alfred R.
Bates, Henry W.
Huxley, T. H. (74)
Haeckel, Ernst H.
Coues, Elliott
Lankester, Sir E. R. (74)
Comstock, Anna B. (33) (44) (60)
Geddes, P. (14) (33)
Hornaday, W. T.
Hudson, W. H. (36) (60) (63)
Loeb, Jacques (74)
Seton, E. T. (60) (67)
Chapman, Frank M.
Morgan, T. H.
Ditmars, R. L. (36)
Beebe, William (36) (47)
Huxley, Julian S. (47)
Hogben, Lancelot
Needham, Joseph
Beadle, George W.
Perkins, R. Marlin
Carson, Rachel

HALL OF FAME:

Adams, John
Adams, J. Quincy
Agassiz, Louis
Anthony, Susan B.
Audubon, J. James
Bancroft, George
Beecher, Henry W
Bell, Alexander Graham
Boone, Daniel
Booth, Edwin T.
Brooks, Phillips
Bryant, William C.
Channing, William E.
Choate, Rufus
Clay, Henry
Clemens, S. L.
Cleveland, G.
Cooper, James F.
Cooper, Peter
Cushman, Charlotte
Eads, James B.
Edison, Thomas A.
Edwards, Jonathan
Emerson, Ralph W.
Farragut, D. G.
Foster, Stephen C.
Franklin, Benjamin
Fulton, Robert
Gibbs, Josiah W.
Gorgas, William C.
Grant, Ulysses S.
Gray, Asa
Hamilton, Alexander
Hawthorne, Nathaniel
Henry, Joseph
Henry, Patrick
Holmes, Oliver W.
Hopkins, Mark
Howe, Elias
Irving, Washington
Jackson, Andrew
Jackson, "Stonewall"
Jefferson, Thomas
Jones, John Paul
Kent, James
Lanier, Sidney
Lee, Robert Edward
Lincoln, Abraham
Longfellow, H. W.
Lowell, James R.
Lyon, Mary
MacDowell, Edward A.
Madison, James
Mann, Horace
Marshall, John
Maury, Matthew F.
Mitchell, Maria
Monroe, James
Morse, S. F. B.
Morton, W. T. G.
Motley, John L.
Newcomb, Simon
Paine, Thomas
Palmer, Alice F.
Parkman, Francis
Peabody, George
Penn, William
Poe, Edgar Allan
Reed, Walter
Roosevelt, Theodore
Saint-Gaudens, A.
Sherman, Wm. T.
Story, Joseph
Stowe, Harriet B.
Stuart, Gilbert
Thoreau, Henry D.
Washington, Booker
Washington, George
Webster, Daniel
Westinghouse, George
Whistler, James McN.
Whitman, Walt
Whitney, Eli
Whittier, John G.
Willard, Emma
Willard, Frances E.
Williams, Roger
Wilson, Woodrow
Wright, Wilbur

AMERICAN ACADEMY OF ARTS AND LETTERS, 1961

Aiken, Conrad
Auden, W. H.
Barber, Samuel
Benton, Thomas Hart
Blume, Peter
Buck, Pearl S.
Burchfield, Charles E.
Catton, Bruce
Clarke, Gilmore D.
Colum, Padraic
Copland, Aaron
Dickinson, Edwin
Dos Passos, John
Faulkner, Barry
Hellman, Lillian
Hersey, John
Hocking, Wm. Ernest
Hopper, Edward
Huntington, Anna Hyatt
Kennan, George F.
Kroll, Leon
Krutch, Joseph Wood
Lipchitz, Jacques
Lippmann, Walter
Lowell, Robert
MacLeish, Archibald
Manship, Paul
Moore, Douglas
Moore, Marianne Craig
Morison, Samuel E.
Mumford, Lewis
Nevins, Allan
Niebuhr, Reinhold
O'Keeffe, Georgia
Piston, Walter
Redfield, Edward W.
Sandburg, Carl
Sessions, Roger
Steinbeck, John E.
Stravinsky, Igor
Taylor, Deems
Thomson, Virgil
Van Doren, Mark
Warren, Robert Penn
Wilder, Thornton
Wyeth, Andrew

NOBEL PRIZE WINNERS

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Chemistry				
1901	Van't Hoff, J. H.	1852-1911	Dutch	Founded science of stereochemistry; osmotic pressure.
1902	Fischer, Emil	1852-1919	Ger.	Synthetic production of sugar.
1903	Arrhenius, Svante A.	1859-1927	Swed.	Theory of ionization in electrolysis of liquids.
1904	Ramsay, William	1852-1916	Eng.	Discovery of neon and argon.
1905	Baeyer, J. Adolf von	1835-1917	Ger.	Analysis of indigo; preparation of synthetic dyes.
1906	Moissan, Henri	1852-1907	Fr.	Electric furnace; artificial diamond; isolation of fluorine.
1907	Buchner, Eduard	1860-1917	Ger.	Discovery of cell-less fermentation.
1908	Rutherford, Ernest	1871-1937	Eng.	Proof that atom consists of proton and electrons.
1909	Ostwald, Wilhelm	1853-1932	Ger.	Production of nitrogen explosives from ammonia.
1910	Wallach, Otto	1847-1931	Ger.	Synthesis of essential oils, perfumes, gums.
1911	Curie, Marie S.	1867-1934	Fr.	Discovery of polonium and radium.
1912	Grignard, Victor	1871-1935	Fr.	Synthesis of hydrocarbons, alcohols, aldehydes.
	Sabatier, Paul	1854-1941	Fr.	Hydrogenation by catalytic agents.
1913	Werner, Alfred	1866-1919	Swiss	Co-ordination theory of valency.
1914	Richards, Theodore	1868-1928	Amer.	Precise determination of atomic weights.
1915	Willstätter, R.	1872-1942	Ger.	Investigations on coloring substances of plants.
1918	Haber, Fritz	1868-1934	Ger.	Synthetic production of ammonia using nitrogen of air.
1920	Nernst, Walter	1864-1941	Ger.	Invention of electric lamp and reversible galvanic cells.
1921	Soddy, Frederick	1877-1956	Eng.	Formulated theory of isotopes.
1922	Aston, Francis W.	1877-1945	Eng.	Investigation of isotopes by mass spectrograph.
1923	Pregl, Fritz	1869-1930	Austr.	Micro-chemical analysis; antiseptic iodine solution.
1925	Zsigmondy, Richard	1865-1929	Ger.	Ultra-microscope; discovery thereby of nature of colloids.
1926	Svedberg, The	1884-	Swed.	Investigation of colloids.
1927	Wieland, Heinrich	1877-1957	Ger.	Study of fermentation in digestive processes.
1928	Windaus, Adolf	1876-1959	Ger.	Discovery of vitamin D; isolation of same.
1929	Harden, Arthur	1865-1940	Eng.	Investigation of enzyme action in sugar fermentation.
	Euler-Chelpin, H. von	1873-1964	Swed.	Investigation of enzyme action in sugar fermentation.
1930	Fischer, Hans	1881-1945	Ger.	Synthesis of hemin, blood constituent.
1931	Bergius, Friedrich	1884-1949	Ger.	Liquefaction of coal to produce gasoline.
	Bosch, Karl	1874-1940	Ger.	Commercial production of ammonia from nitrogen of air.
1932	Langmuir, Irving	1881-1957	Amer.	Gas-filled tungsten lamp; atomic hydrogen produced.
1934	Urey, Harold C.	1893-	Amer.	Discovery of heavy water.
1935	Joliot, Frédéric	1900-1958	Fr.	} Method of transmuting elements by displacement or
	Joliot, Irène Curie	1897-1956	Fr.	} addition of component parts of atoms.
1936	Debye, Peter J. W.	1884-	Dutch	Studies in atomic architecture of molecules.
1937	Haworth, Walter Norman	1883-1950	Eng.	Researches on vitamin C.
	Karrer, Paul	1889-	Swiss	Studies of vitamins A and G, and vegetable coloring.
1938	Kuhn, Richard*	1900-	Ger.	Isolation of vitamin G (lactoflavin).
1939	Butenandt, A.*	1903-	Ger.	Isolation of male sex hormone (androsterone).
	Ruzicka, L.	1887-	Swiss	Synthesis of androsterone from sheep-wool fat.
1943	Hevesy, Georg von	1885-	Hung.	Isotopes used as indicators in studying chemical processes.
1944	Hahn, Otto	1879-	Ger.	Work on splitting uranium atom.
1945	Virtanen, A. I.	1895-	Finn.	Agricultural biochemistry.
1946	Sumner, James B.	1887-1955	Amer.	Enzyme research.
	Northrop, John H.	1891-	Amer.	Virus research.
	Stanley, Wendell M.	1904-	Amer.	Virus research.

*Prize declined because of disapproval by German government.

NOBEL PRIZE WINNERS—Con.

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Chemistry—Con.				
1947	Robinson, Sir Robert	1886-	Eng.	Investigation of biologically important plant products.
1948	Tiselius, Arne	1902-	Swed.	Development of two methods for biochemical study of proteins, enzymes, and other substances.
1949	Giauque, William	1895-	Can.	Research in thermodynamics, especially on substances at low temperatures.
1950	Diels, Otto	1876-1954	Ger.	Discovery of dian synthesis, by which odors and complex chemical compounds can be reproduced artificially
	Alder, Kurt	1901-1958	Ger.	
1951	Seaborg, Glenn T.	1912-	Amer.	Discovery of plutonium.
	McMillan, Edwin M.	1907-	Amer.	
1952	Martin, Archer	1910-	Eng.	Developing method of identifying and separating chemical elements by chromotographic analysis.
	Synge, Richard	1914-	Eng.	
1953	Staudinger, Herman	1881-	Ger.	Research in giant molecules.
1954	Pauling, Linus C.	1901-	Amer.	Discoveries of forces which hold molecules together.
1955	Vigneaud, Vincent du	1901-	Amer.	Work on biochemically important compounds, especially for the first synthesis of a polypeptide hormone.
1956	Hinshelwood, Cyril N.	1897-	Eng.	Work on chemical reaction kinetics to improve the internal combustion engine and plastics.
	Semenov, Nikolai N.	1898-	Russ.	
1957	Todd, Sir Alexander	1907-	Brit.	Work in proteins, technically described as nucleotides and nucleotic enzymes.
1958	Sanger, Frederick	1918-	Eng.	Work on structure of proteins, especially insulin.
1959	Heyrovsky, Jaroslav	1890-	Czech.	Discovery and development polarographic analysis.
1960	Libby, Willard F.	1908-	Amer.	For carbon 14 dating in archaeology, geology, etc.
1961	Calvin, Melvin	1911-	Amer.	For discovering the sequence of chemical reactions in photosynthesis.
1962	Perutz, Max F.	1914-	Eng.	For mapping protein molecules with the use of X-rays.
	Kendrew, John C.	1917-	Eng.	
1963	Ziegler, Carl	1897-	Ger.	For their work in uniting simple hydrocarbons into large molecule substances with important commercial uses.
	Natta, Giulio	1903-	Ital.	
1964	Hodgkin, Dorothy C.	1910-	Eng.	Determined the structure of biochemical compounds essential in combating pernicious anemia.
Literature	*Italics* indicate titles of books.			
1901	Sully-Prudhomme, R.	1839-1907	Fr.	Poet; *La justice, Le bonheur.*
1902	Mommsen, Theodor	1817-1903	Ger.	Historian; *History of Rome.*
1903	Björnson, B.	1832-1910	Nor.	Novels, dramas, poems: *The Newly Married.*
1904	Mistral, Frédéric	1830-1914	Fr.	Poet of Provence; *Mirèio.*
	Echegaray, José	1832-1916	Span.	Dramatist; *The Great Galeota.*
1905	Sienkiewicz, H.	1846-1916	Pol.	Novelist; *Quo Vadis?*
1906	Carducci, Giosuè	1836-1907	Ital.	Poet; *Decennali, Odi barbare.*
1907	Kipling, Rudyard	1865-1936	Eng.	Poems, novels; *Puck of Pook's Hill.*
1908	Euchen, Rudolf	1846-1926	Ger.	Philosophical writer; *Religion and Life.*
1909	Lagerlöf, Selma	1858-1940	Swed.	Poems, novels; *Gösta Berling's Saga.*
1910	Heyse, Paul	1830-1914	Ger.	Short stories; *Book of Friendship.*
1911	Maeterlinck, M.	1862-1949	Belg.	Dramas, essays; *The Bluebird, The Life of the Bee.*
1912	Hauptmann, G.	1862-1946	Ger.	Dramatist; *The Sunken Bell.*
1913	Tagore, Rabindranath	1861-1941	Ind.	Poet: *Lover's Gift, The Fugitive.*
1915	Rolland, Romain	1866-1944	Fr.	Novelist; *Jean-Christophe.*
1916	Heidenstam, V. von	1859-1940	Swed.	Poet, novelist; *Charles XII and his Wars.*
1917	Gjellerup, Karl	1857-1919	Dan.	Novelist; *The Pilgrim Carmenita.*
	Pontoppidan, Henrik	1857-1943	Dan.	Novelist: *The Promised Land.*
1919	Spitteler, Karl	1845-1924	Swiss	Poet, essayist; *Olympic Spring, Truths Spoken in Jest*
1920	Hamsun, Knut	1859-1952	Nor.	Novelist; *Growth of the Soil.*
1921	France, Anatole	1844-1924	Fr.	Novelist; *The Human Tragedy.*
1922	Benavente, Jacinto	1866-1954	Span.	Dramatist; *La Malquerida.*
1923	Yeats, William B.	1865-1939	Irish	Poet, dramatist; *The Hourglass.*
1924	Reymont, Wladislaw	1868-1925	Pol.	Novelist; *The Peasants.*
1925	Shaw, G. Bernard	1856-1950	Eng.	Dramatist; *Man and Superman.*
1926	Deledda, Grazia	1875-1936	Ital.	Novels of Sardinian life; *The Mother, Ashes.*
1927	Bergson, Henri	1859-1941	Fr.	Philosophical works; *Creative Evolution.*
1928	Undset, Sigrid	1882-1949	Nor.	Novelist; *Kristin Lavransdätter.*
1929	Mann, Thomas	1875-1955	Ger.	Novelist; *Die Buddenbrooks.*
1930	Lewis, Sinclair	1885-1951	Amer.	Novelist; *Main Street, Babbitt, Arrowsmith.*
1931	Karlfeldt, Erik A.	1864-1931	Swed.	Poet; *Songs of the Wilderness and of Love.*
1932	Galsworthy, John	1867-1933	Eng.	Novelist, dramatist; *The Forsyte Saga, Strife.*
1933	Bunin Ivan	1870-1953	Russ.	Novelist, short story writer; *The Village.*
1934	Pirandello, Luigi	1867-1936	Ital.	Novelist, dramatist; *As You Desire Me.*
1936	O'Neill, Eugene Gladstone	1888-1953	Amer.	Dramatist; *Strange Interlude, Anna Christie.*
1937	Martin du Gard, Roger	1881-1958	Fr.	Novelist; *Les Thibaults.*
1938	Buck, Pearl S.	1892-	Amer.	Novelist; *The Good Earth.*
1939	Sillanpaa, Emil	1888-1964	Finn.	Novelist; *The Maid Silja.*
1944	Jensen, Johannes V.	1873-1950	Dane	Poet, novelist; *The Long Journey.*
1945	Mistral, Gabriela (Lucila Godoy de Alcayaga)	1889-1957	Chilean	Poet; *Sonetos de La Muerte, Desolacion.*
1946	Hesse, Hermann	1877-1962	Swiss	Poet and novelist; *Unterm Rad.*
1947	Gide, André	1869-1951	Fr.	Critic and essayist; his whole literary work.
1948	Eliot, Thomas S.	1888-	Eng.	Poet; pioneer work in modern poetry.
1949	Faulkner, William	1897-1962	Amer.	Novelist, short story writer. *Sanctuary.*
1950	Russell, Bertrand	1872-	Eng.	Philosopher, writer. *Principia Mathematica.*
1951	Lagerkvist, Pär	1891-	Swed.	Poet, essayist, novelist, philosopher; *Barabbas.*
1952	Mauriac, François	1885-	Fr.	Novelist, poet, playwright, essayist.

NOBEL PRIZE WINNERS—Con.

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Literature—Con.				
1953	Churchill, Winston	1874-	Eng.	Statesman, orator, historian, biographer.
1954	Hemingway, Ernest	1898-1961	Amer.	Novelist; *A Farewell to Arms, For Whom the Bell Tolls, The Old Man and the Sea.*
1955	Laxness, Halldor Kiljan	1902-	Iceland	For his vivid epic power which has renewed the great narrative art of Iceland.
1956	Jiménez, Juan Ramón	1881-1958	Span.	For his lyrical poetry.
1957	Camus, Albert	1913-1960	Fr.	For his novel, *The Fall*, and plays.
1958	Pasternak, Boris	1890-1960	USSR	Lyrics, works in the Russian epic tradition. Declined.
1959	Quasimodo, Salvatore	1901-	Ital.	Lyrics with classical fire, expressing the tragic experienc of life in our own times.
1960	St. John Perse (Leger, Alexis)	1887-	Fr.	Award made under his pen name St. John Perse for poems, lyrical and philosophical in modern spirit.
1961	Andric, Ivo	1892-	Yugoslav	For his principal work, *Bridge on the Drina.*
1962	Steinbeck, John E.	1902-	Amer.	Principally for *The Winter of Our Discontent.*
1963	Seferiades, Giorgos (Seferis, Giorgos)	1900-	Greek	For becoming a symbol of all that is indestructible in the Hellenic acceptance of life.
1964	Sartre, Jean-Paul	1905-	Fr.	Exponent of existentialism.
Medicine and Physiology				
1901	Behring, Emil A. von	1854-1917	Ger.	Discovered diphtheria antitoxin.
1902	Ross, Ronald	1857-1932	Eng.	Discovered life history of malaria parasite.
1903	Finsen, Niels R.	1860 - 904	Dan.	Discovered curative effect of ultra-violet rays.
1904	Pavlov, Ivan P.	1849-1936	Russ.	Study of animal behavior—conditioned reflex.
1905	Koch, Robert	1843-1910	Ger.	Discovered bacilli of tuberculosis and cholera.
1906	Golgi, Camillo	1844-1926	Ital.	Discovered that nerves form interlacement, not network.
	Ramón y Cajal, S.	1852-1934	Span.	Investigations into structure of brain and nerves.
1907	Laveran, Charles L. A.	1845-1922	Fr.	Discovered blood parasite causing malaria.
1908	Ehrlich, Paul	1854-1915	Ger.	Discovered salvarsan, specific for syphilis.
	Mechnikov, Elie	1845-1916	Russ.	Study of immunity in infectious diseases.
1909	Kocher, E. Theodor	1841-1917	Swiss	Surgery of the thyroid gland.
1910	Kossel, Albrecht	1853-1927	Ger.	Elucidation of chemical composition of body cells.
1911	Gullstrand, Allvar	1862-1930	Swed.	Investigations into the mechanism of vision.
1912	Carrel, Alexis	1873-1944	Amer.	Transplanting of living tissue.
1913	Richet, Charles	1850-1935	Fr.	Studies in anaphylaxis and serum therapy.
1914	Bárány, Robert	1876-1936	Austr.	Methods of diagnosis for disorders of inner ear.
1919	Bordet, Jules	1870-1961	Belg.	Elucidation of antitoxic action; serum for whooping cough.
1920	Krogh, August	1874-1949	Dan.	Discovered element regulating action of blood capillaries.
1922	Hill, Archibald V.	1886-	Eng.	Study of heat produced by muscular activity.
	Meyerhof, Otto	1884-1951	Ger.	Study of chemical changes accompanying muscular contraction.
1923	Banting, Frederick G.	1891-1941	Can	Insulin method for treatment of diabetes.
	MacLeod, J. J. R.	1876-1935	Can.	Insulin method for treatment of diabetes.
1924	Einthoven, Willem	1860-1927	Dutch	Invented cardiometer for measuring action of heart.
1926	Fibiger, Johannes	1867-1928	Dan.	Experimental production of cancer.
1927	Wagner-Jauregg, J.	1857-1940	Austr.	Malarial cure for general paralysis.
1928	Nicolle, Charles	1866-1936	Fr.	Discovered typhus vaccine.
1929	Eijkman, Christiaan	1858-1930	Dutch	Discovered vitamin B.
	Hopkins, Frederick G.	1861-1947	Eng.	Discovered vitamin A.
1930	Landsteiner, Karl	1868-1943	Amer.	Classification of individuals by blood groups.
1931	Warburg, Otto H.	1883-	Ger.	Cancer research.
1932	Sherrington, Charles S.	1857-1952	Eng.	Elucidation of process by which nervous system integrates bodily functions.
	Adrian, Edgar D.	1889-	Eng.	Explanation of physiological basis of sensation.
1933	Morgan, Thomas H.	1866-1945	Amer.	Discovered gene, physiological unit of inheritance.
1934	Minot, George R.	1885-1950	Amer.	Discovery of the liver treatment for the cure of pernicious anemia.
	Murphy, William P.	1892-	Amer.	
	Whipple, George H.	1878-	Amer.	
1935	Spemann, Hans	1869-1941	Ger.	Discoveries in connection with embryonic evolution.
1936	Dale, Henry H.	1875-	Eng.	Discovery and proof of chemical origin of nervous impulses.
	Loewi, Otto	1873-1961	Austr.	
1937	Szent-Györgyi, Albert von	1893-	Hung.	Study of metabolism and effects of vitamins A and C.
1938	Heymans, Corneille	1892-	Belg.	Showed neutral link between blood changes and breathing.
1939	Domagk, Gerhard*	1895-1964	Ger.	Discovery of prontosil, forerunner of sulphanilimide.
1943	Dam, Henrik	1895-	Amer.	Discovery of vitamin K.
	Doisy, Edward A.	1893-	Amer.	Discovery of the chemical nature of vitamin K.
1944	Erlanger, Joseph	1874-	Amer.	Discoveries concerning the highly differentiated functions of single nerve fibers.
	Gasser, Herbert S.	1888-1963	Amer.	
1945	Fleming, Sir Alexander	1881-1955	Eng.	Discovery of penicillin.
	Florey, Sir Howard W.	1898-	Eng.	
	Chain, Ernest B.	1906-	Eng.	
1946	Muller, Hermann J.	1890-	Amer.	Genetics: influence of X-rays.
1947	Cori, Carl F.	1896-	Amer.	Disclosing the mechanism of enzymatic synthesis of glycogen or animal starch.
	Cori, Gerty T.	1896-1957	Amer.	
	Houssay, Bernardo Alberto	1887-	Arg.	Discovery of the significance of the hormone produced by the frontal lobe of the hypophasis (pituitary gland).
1948	Müeller, Paul	1899-	Swiss	Development of insect-killing DDT.
1949	Hess, Walter Rudolph.	1881-	Swiss	Discoveries in brain function.
	Moniz, Egas	1874-1955	Port.	Brain operations—prefrontal lobotomy.

*Prize declined because of disapproval by German government.

NOBEL PRIZE WINNERS—Con.

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Medicine and Physiology—Con.				
1950	Kendall, Edward C.	1886-	Amer.	Research in hormones, including discovery of cortisone.
	Hench, Phillip S.	1896-	Amer.	
	Reichstein, Tadeus	1897-	Swiss	
1951	Theiler, Max	1899-	Amer.	Discovery of yellow fever vaccine.
1952	Waksman, Selman A.	1888-	Amer.	Work in discovery of streptomycin.
1953	Lipmann, Fritz A.	1899-	Amer.	Discoveries concerning living human cells.
	Krebs, Hans A.	1900-	Eng.	
1954	Enders, John F.	1897-	Amer.	Discovery that poliomyelitis virus is capable of growing in cultures of different tissues.
	Weller, Thomas H.	1915-	Amer.	
	Robbins, Frederick C.	1916-	Amer.	
1955	Theorell, Hugo	1903-	Swed.	Discoveries concerning the nature and mode of action of oxidation enzymes.
1956	Richards,Jr.,DickinsonW.	1895-	Amer.	In 1929 Forssmann worked a catheter into right ventricle of his heart through a vein in his right arm.
	Cournand, Andre F.	1895-	Amer.	Richards and Cournand applied the technique to test pressure in the circulatory system and abnormalities in heart functioning.
	Forssmann, Werner	1904-	Ger.	
1957	Bovet, Dr. Daniel	1907-	It.	For drugs that relieve allergies.
1958	Beadle, George Wells	1903-	Amer.	One-half awarded jointly for discovery that genes regulate definite chemical events.
	Tatum, Edward Lawrie	1909-	Amer.	
	Lederberg, Joshua	1925-	Amer.	Genetic recombinations, genetic material of bacteria.
1959	Ochoa, Severo	1905-	Amer.	Discovery of mechanisms in biological synthesis of ribonucleic and deoxyribonucleic acids.
	Kornberg, Arthur	1918-	Amer.	
1960	Medawar, Peter Brian	1915-	Eng.	Joint discovery of acquired immunological tolerance.
	Burnet, Sir Macfarlane	1899-	Australian	
1961	Bekesey, Georg von	1899-	Hung.	For pioneering discoveries in mechanism of the inner ear.
1962	Watson, James Dewey	1928-	Amer.	"Discoveries concerning molecular structure of nucleic acids" which dictates growth and development of cells of the body.
	Crick, Francis H. C.	1916-	Eng.	
	Wilkins, Maurice H. F.	1916-	Eng.	
1963	Hodgkin, Alan L.	1914-	Eng.	For their research on nerve cells.
	Huxley, Andrew F.	1917-	Eng.	
	Eccles, Sir John C.	1903-	Australian	
1964	Bloch, Konrad E.	1912-	Amer.	Discoveries concerning mechanism and regulation of cholesterol and fatty acid metabolism.
	Lynen, Theodor	1911-	Ger.	
Peace	*Italics* indicate titles of books.			
1901	Dunant, J. Henri	1828-1910	Swiss	Founded Red Cross society.
	Passy, Frédéric	1822-1912	Fr.	Founded first French peace society.
1902	Ducommun, Elie	1833-1906	Swiss	An organizer of International Bureau of Peace.
	Gobat, Charles A.	1843-1914	Swiss	Activities in International Bureau of Peace.
1903	Cremer, William R.	1838-1908	Eng.	Founded International Arbitration League.
1904	Inst. International Law	1873-	Belg.	Organized at Ghent, Belgium, 1873.
1905	Suttner, Bertha von	1843-1914	Austr.	Pacifist; *Lay Down Your Arms.*
1906	Roosevelt, Theodore	1858-1919	Amer.	Secured peace by mediation in Russo-Japanese war.
1907	Moneta, Ernesto	1833-1918	Ital.	Activities in Lombard League of Peace.
	Renault. Louis	1843-1918	Fr.	Judge on Hague Tribunal.
1908	Arnoldson, K. P.	1844-1916	Swed.	Pacifist lecturer and author.
	Bajer, Fredrik	1837-1922	Dan.	An organizer of International Bureau of Peace.
1909	Beernaert, A. M. F.	1829-1912	Belg.	Activities in international peace conferences.
	d'Estournelles de Constant	1852-1924	Fr.	Member of Hague Permanent Court of Arbitration.
1910	Intern'l Bur. of Peace	1891-	Swiss	Founded at Bern, Switzerland, in 1891.
1911	Asser, Tobias M.	1838-1913	Dutch	Studies in international law.
	Fried, Alfred H.	1864-1921	Ger.	Founded German Peace Society.
1912	Root, Elihu	1845-1937	Amer.	Promoted Pan-American unity: plan for World Court.
1913	La Fontaine, Henri	1854-1943	Belg.	Activities in International Bureau of Peace.
1917	Int. Com. of the Red Cross	1863-	Swiss	Founded at Geneva, Switzerland, in 1863.
1919	Wilson, Woodrow	1856-1924	Amer.	Founder of League of Nations.
1920	Burgeois, Leon	1851-1925	Fr.	Activities in League of Nations.
1921	Branting, Hjalmar	1860-1925	Swed.	Peaceful separation of Norway and Sweden.
	Lange, Christian	1869-1938	Nor.	Activity in Inter-Parliamentary Union.
1922	Nansen, Fridtjof	1861-1930	Nor.	Pacifist; repatriation of World War prisoners.
1925	Chamberlain, Austen	1863-1937	Eng.	Negotiation of Locarno treaties.
	Dawes, Charles G.	1865-1951	Amer.	Dawes Plan for payment of German reparations.
1926	Briand, Aristide	1862-1932	Fr.	Negotiation of Locarno treaties.
	Stresemann, G.	1878-1929	Ger.	Negotiation of Locarno treaties.
1927	Buisson, Ferdinand	1841-1932	Fr.	Early advocate of a league of nations.
	Quidde, Ludwig	1858-1941	Ger.	Pacifist; attacked German imperialism; *Caligula.*
1929	Kellogg, Frank B.	1856-1937	Amer.	Negotiation of Paris Pact for outlawry of war.
1930	Soederblom, Lars Olaf J.	1866-1931	Swed.	Religious historian and peace advocate.
1931	Addams, Jane	1860-1935	Amer.	Pacifist lecturer; *Peace and Bread in Time of War.*
	Butler, N. M.	1862-1947	Amer.	Publicist; advocate of international understanding.
1933	Angell, Sir Norman	1874-	Eng.	Author, lecturer; *The Great Illusion.*
1934	Henderson, Arthur	1863-1935	Eng.	President of World Disarmament Conference.
1935	Ossietski, Carl von	1889-1938	Ger.	Journalist; fearless attacks on militarism.
1936	Saavedra Lamas, Carlos	1880-1959	Arg.	Exponent of Pan-American peace pacts.
1937	Cecil, Viscount of Chelwood	1864-1958	Eng.	Active in behalf of League of Nations.
1938	Nansen International Office for Refugees	1931-1938	Swiss	Organ of League of Nations; succeeded 1939 by High Commissioner for Refugees.
1944	Int. Com. of the Red Cross	1863-	Swiss	Founded at Geneva, Switzerland, in 1863.
1945	Hull, Cordell	1871-1955	Amer.	Services in promoting United Nations.

NOBEL PRIZE WINNERS—Con.

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Peace—Con.		1865-1955		
1946	Mott, John R.	1867-1961	Amer.	Missionary activities.
	Balch, Emily G.		Amer.	Activities in peace societies.
1947	American Service Comm.	1917-	Amer.	Non-combatant services to soldiers and relief for civilians during and after the World Wars.
	Friends Service Council	1915-	Eng.	
1949	Boyd-Orr, Baron	1880-	Eng.	President World Federalist Congress; crusader against world food shortage.
1950	Bunche, Ralph J.	1904-	Amer.	Work as mediator in Palestine war.
1951	Jouhaux, Léon	1879-1954	Fr.	Anti-Communist labor leader.
1952	Schweitzer, Albert	1875-	Fr.	Philosopher, theologian, and medical missionary in Africa.
1953	Marshall, George C.	1880-1959	Amer.	Soldier and statesman.
1954	Office U.N. Commissioner	for Refugees		
1955	Not awarded			
1956	Not awarded			
1957	Pearson, Lester B.	1897-	Can.	For aid in settling Suez dispute.
1958	Pire, Dominique Georges	1910-	Belg.	Dominican Father, organized relief for refugees.
1959	Noel-Baker, Philip	1889-	Eng.	Promoter of general disarmament. Member of Parliament.
1960	Luthuli, Albert J.	1900-	S. Afr.	For amelioration of race relations in South Africa.
1961	Hammarskjold, Dag	1905-1961	Swed.	For his diplomatic work for peace in the Congo and elsewhere.
1962	Pauling, Linus C.	1901-	Amer.	For his campaign against nuclear testing.
1963	Int. Com. of the Red Cross	1863-	Swiss	Founded at Geneva, Switzerland, in 1863.
	League of Red Cross Societies	1863-	Swiss	
1964	King, Martin Luther	1929-	Amer.	For his leadership of the American Negro cause.
Physics				
1901	Roentgen, W. K.	1845-1923	Ger	Discovery of X-rays.
1902	Lorentz, H. A.	1853-1928	Dutch	Investigated effects of magnetism on radiation.
	Zeeman, Pieter	1865-1943	Dutch	Displacement of spectrum lines by magnetic field.
1903	Becquerel, Antoine Henri	1852-1908	Fr.	Discovery of radioactivity.
	Curie, Marie S.	1867-1934	Fr.	Research in radioactivity.
	Curie, Pierre	1859-1906	Fr.	Research in radioactivity.
1904	Rayleigh, Lord	1842-1919	Eng.	Discovery of argon.
1905	Lenard, Philipp	1862-1947	Hung.	Discovered penetrating power of cathode rays.
1906	Thomson, Joseph J.	1856-1940	Eng.	Investigation of electrical properties of gases.
1907	Michelson, Albert A.	1852-1931	Amer.	Determination of the velocity of light.
1908	Lippman, Gabriel	1845-1921	Fr.	Method for color photography; capillary electrometer.
1909	Marconi, Guglielmo	1874-1937	Ital.	Invention of radiotelegraphy.
	Braun, Ferdinand	1850-1918	Ger.	Improvements in radio transmission.
1910	Waals, J. van der	1837-1923	Dutch	Law of continuity of liquid and gaseous states.
1911	Wien, Wilhelm	1864-1928	Ger.	Study of black body radiation.
1912	Dalen, N. Gustav	1869-1937	Swed.	Invention of automatic regulator for gas lamps.
1913	Onnes, Heike K.	1853-1926	Dutch	Liquefaction of helium at temp. near absolute zero.
1914	Laue, Max von	1879-1960	Ger.	Proof of regular arrangement of atoms in crystals.
1915	Bragg, William H.	1862-1942	Eng.	Elucidation of atomic structure of crystals.
	Bragg, William L.	1890-	Eng.	Elucidation of atomic structure of crystals.
1917	Barkla, Charles G.	1877-1944	Eng.	Discovery of characteristic radiations of elements.
1918	Planck, Max	1858-1947	Ger.	Formulation of quantum theory.
1919	Stark, Johannes	1874-1957	Ger.	Decomposition of spectrum lines by electric field.
1920	Guillaume, C. E.	1861-1938	Swiss	Production of invar, showing minimum expansion by heat.
1921	Einstein, Albert	1879-1955	Ger.	Theory of relativity; discovered law of photoelectric effect.
1922	Bohr, Niels H. D.	1885-1962	Dane	Theory of atomic structure—electrons moving in orbits.
1923	Millikan, Robert A.	1868-1953	Amer.	Proof of electrical nature of electrons.
1924	Siegbahn, K. M. G.	1886-	Swed.	Established unit for measuring short-wave radiations.
1925	Franck, James	1882-1964	Ger.	Laws governing impact of electron upon atom.
	Hertz, Gustav	1887-	Ger.	Laws governing impact of electron upon atom.
1926	Perrin, Jean	1870-1942	Fr.	Explained Brownian movement in liquids.
1927	Compton, Arthur H.	1892-1962	Amer.	Proof of wave-length alteration in X-rays striking object.
	Wilson, Charles T. R.	1869-1959	Eng.	"Cloud chamber," for showing path of ionized atoms.
1928	Richardson, O. W.	1879-1959	Eng.	Study of emission of electricity from hot bodies.
1929	Broglie, Louis Victor de	1892-	Fr.	Proof that matter consists of waves as well as corpuscles.
1930	Raman, C. V.	1888-	Ind.	Study of infra-red absorption bands of transparent substances.
1932	Heisenberg, Werner	1901-	Ger.	Set forth principle of uncertainty for electrons.
1933	Schroedinger, Erwin	1887-1961	Ger.	Established belief that the atom is a positive nucleus surrounded by a field of negative electricity.
	Dirac, P. A. M.	1902-	Eng.	Theory that there is only one kind of fundamental particle in nature.
1935	Chadwick, James	1891-	Eng.	Discovery of neutron, sub-atomic particle without electric charge.
1936	Anderson, Carl D.	1905-	Amer.	Discovery of positive electron, or positron.
	Hess, Victor F.	1883-	Austr.	Study on origin of cosmic radiation.
1937	Davisson, Clinton J.	1881-1958	Amer.	Interference in electronic bombardment of crystals.
	Thomson, George P.	1892-	Eng.	Studies in nature of thin metallic surfaces.
1938	Fermi, Enrico	1901-1954	Ital.	Transmutation of atoms by adding neutrons to nucleus.
1939	Lawrence, Ernest O.	1901-1958	Amer.	Discovery of cyclotron.
1943	Stern, Otto	1888-	Amer.	Contributions to atomic ray method and discovery of magnetic moment of the proton.
1944	Rabi, Isidor I.	1898-	Amer.	For resonance method of recording the magnetic properties of atomic nuclei.
1945	Pauli, Wolfgang	1900-1958	Amer.	Atomic research: "Pauli's exclusion principle."

NOBEL PRIZE WINNERS—Con.

Year	Name	Birth-Death Dates	Nationality	Representative Achievements
Physics—Con.				
1946	Bridgman, Percy W.	1882-1962	Amer.	Research in atmospheric pressure.
1947	Appleton, Sir Edward V.	1892-	Eng.	Researches in the physics of the atmosphere—discovery of the Appleton layer, reflecting radio short waves.
1948	Blackett, Patrick M. S.	1897-	Eng.	Development of Wilson method of studying courses of radioactive particles, and discoveries in cosmic radiation.
1949	Yukawa, Hideki	1907-	Jap.	Mathematical prediction of the meson 14 years ago.
1950	Powell, Cecil F.	1905-	Eng.	Work on cosmic rays.
1951	Cockcroft, John D.	1897-	Eng.	Pioneer work on transmutation of atomic nuclei by artificially accelerated atomic particles.
	Walton, E. T. S.	1903-	Irish	
1952	Block, Felix	1905-	Amer.	Development of new method of measuring magnetic fields in atomic nuclei.
	Purcell, Edward Mills	1912-	Amer.	
1953	Zernike, Frits	1888-	Dutch	Development of special microscope, especially vauable in cancer research.
1954	Born, Max	1882-	Ger.	Studies in connection with foundation of modern nuclear physics.
	Bothe, Walter	1891-1957	Ger.	
1955	Lamb, Willis E.	1913-	Amer.	Discoveries concerning the fine structure of the hydrogen spectrum.
	Kusch, Polykarp	1911-	Amer.	Precision determination of the magnetic monent of the electron.
1956	Bardeen, John	1908-	Amer.	Work on an electric transistor.
	Brattain, Walter H.	1902-	Amer.	
	Shockley, William B.	1910-	Amer.	
1957	Lee, Tsung Dao	1927-	Chinese	For contribution to nuclear physics, proving that principle of conservation of parity does not apply in the case of smashed atoms.
	Yang, Chen Ning	1922-	in U. S.	
1958	Cerenkov, Pavel Alekseevic	1904-	USSR	Joint discovery and interpretation of Cerenkov effect.
	Frank, Ilja Michajlovic	1908-	USSR	
	Tamm, Igor Evgenevic	1895-	USSR	
1959	Segre, Emilio	1905-	Amer.	Awarded jointly for discovery of antiproton.
	Chamberlain, Owen	1920-	Amer.	
1960	Glaser, Donald A.	1926-	Amer.	Inv. "bubble chamber" to photograph atom smashing.
1961	Hofstader, Robert	1915-	Amer.	For work on the atomic nucleus, including proton and neutron.
	Moessbauer, Rudolf L	1929-	Ger.	
1962	Landau, Lev D.	1908-	Russ.	Pioneering theories for condensed matter, especially liquid helium.
1963	Wigner, Eugene P.	1902-	Amer.	For his work in atomic theory.
	Mayer, Maria Goeppert	1906-	Amer.	For discoveries concerning nuclear shell structure.
	Jensen, J. Hans D.	1907-	Ger.	
1964	Townes, Charles Hard	1915-	Amer.	Fundamental work in field of quantum electronics which led to construction of oscillators and amplifiers based on maser-laser principle.
	Prokhorov, Aleksandr M.	1916-	Russ.	
	Basov, Nikolai G.	1922-	Russ.	

TEST QUESTIONS

In the following section, where the names of the persons are given in any question, the precise passage containing the answer is easily found because of the alphabetic arrangement of the names on each page of text. Where no name is mentioned in the question, however, the reader is referred to the exact quarter page. The upper and lower halves of the first column are designated by **a** and **b** and the corresponding halves of the second column are indicated by **c** and **d.**

Most of the questions found on page 2030 involve the use of the Study and Reference Groups. Although they usually lead to an investigation of individual biographies, they also call attention to the period and activities of a number of persons who are associated together because they all won distinction in a particular field. To answer these questions necessitates a rapid survey of each classification and invites a review of many biographical sketches that are presented alphabetically in the text.

Name a scholastic philosopher whose romance has become one of the great love stories of the world . . . . . 1701 a-b

What architect has prepared a "master plan" for rebuilding London? . . . . . 1701 b

Who was the second president of the United States? the founder of Hull House, Chicago? 1702a,d

Who is known as "the father of tragedy"? Why? . . . . . 1703 b-c

For what is the Duke of Alva notorious? . . 1708

What is Amundsen's chief title to fame? What Greek philosopher is known for teaching that mind rules the universe? . . . . 1708 c, d

Name an American college president and former editor who has used the "Great Books" approach to education . . . . 1722 a

Who produced the famous statue of Liberty in New York harbor? . . . . . 1722 d

Name the only opera Beethoven composed . 1726

Where was Edward Bok buried? 1734

How did each of the following enter into the life of Julius Cæsar: Cornelia, Pompey, Gaul, Cleopatra, the calendar, the Ides of March? 1749

Why are the names Calvin and Geneva associated? 1751

What did Charlemagne do for the pope? How did Cicero save Rome? 1759, 1763

What were the acknowledged motives of Columbus in undertaking his voyages of discovery? 1768

In what way did Copernicus revolutionize the world's knowledge of the earth and the sun? 1771

Name the earliest work and the most celebrated work of Dante 1780

What books did Defoe write besides *Robinson Crusoe*? 1784

In what respect was Demosthenes a self-made orator? What was Descartes' chief contribution to mathematics? 1785, 1786

Who directed the "office of strategic services" in World War II? . . . . . 1789 d

Name the leading Negro poet of America . 1793 a

What important scientific discovery was made by Benjamin Franklin? 1811

What theory brought Galileo into conflict with the authorities of the Church? 1817

Who designed the Woolworth building, New York? . . . . . 1824 d

Who invented the first air pump? the staff used in musical notation? . . . . . 1835 a-b

Who killed Alexander Hamilton? . . . . 1840 a

Who first called Herodotus "the father of history"? 1851

Give a cogent reason for believing that Homer existed 1857
Who invented the sewing machine? . . . . 1861 a
What fate overtook the discoverer of Hudson Bay? John Huss, the Bohemian reformer? Anne Hutchinson? Hypatia? . . . 1862 b–1866
Why did Henrik Ibsen forsake his native land? 1866
What battle "made" Andrew Jackson? . . . 1869
Who originated vaccination? . . . . . 1872 d
What term of reproach did John Knox apply to Mary Queen of Scots? 1884
How long did Abraham Lincoln attend school? 1896
Who founded the Society of Jesus? In what century did he live? . . . . . 1903 b
What Roman poet is said to have died a victim of his wife's love? . . . . . 1903 c
How did Malthus propose that the over-population of the earth should be forestalled? . 1909
Name an Austrian priest who made a discovery that remained unnoticed throughout his life but made him famous in the 20th century . . . . . 1917 a
Name three poems by John Milton 1920
Quote the sentence which sums up the Mohammedan confession of faith? . . . 1922 a
How did Friedrich Nietzsche classify Christian morality? 1933
In what manner did the donor of the Nobel prizes obtain his money? . . . . . 1933 b
What famous school was founded by Plato? . 1948
Name a work of sculpture by Augustus Saint-Gaudens. Who was the most gifted poetess of Greece? . . . . . 1965–1967 b
Who conquered Hannibal? . . . . . 1968 c-d
Who commanded Seneca to commit suicide? By what evidence are the dates of Shakespeare's plays inferred? 1970–1971
Where is the "Book of Mormon" said to have originated? . . . . . 1975 a
Name a man who commanded an army fighting against Great Britain and later commanded a British army. What is meant by the term Socratic irony? . . . . . 1975 b, d
Of the two English writers, Edmund Spenser and Herbert Spencer, which was philosopher and which was poet? 1977
To what speed did George Stephenson's locomotive, "Rocket," attain? 1979
Who predicted the eclipse of the sun that occurred on May 28, 585 B.C.? . . . . 1986 a
Name the estate which George Washington owned and in which he was buried . . . 1998
Who was the chief founder of the League of Nations? . . . . . 2006 a
Name some American and some foreign actors who have been theatrical producers . . . 2011
Which pioneers in aircraft design are associated with lighter-than-air machines? bombers? helicopters? pursuit planes? 2011
Cite some American and some European architects who have contributed to the development of modern style in the design and placing of buildings 2012
Who were the predecessors of Copernicus? How did his astronomical theories differ from theirs? 2012
Who was the first biographer, and what did he write? 2012
What family of business leaders was honored by a patent of nobility from the Austrian government? 2012
Name a famous chemist who has also been a political leader in the newly formed state of Palestine 2012
What classical and oriental scholars have also been noted as translators? 2013
Which American colonial leaders were distinguished orators? 2013
Name three composers whose music is classified as "modern" in style and spirit . . . 2013
What American and foreign diplomats have been prominently connected with international affairs since the close of World War II? 2013
Of the dramatists born later than George Bernard Shaw, name three belonging to each of the following groups: American, British, French, Irish, German 2014
To what period does Thomas Arnold belong? Johann Pestalozzi? What did each contribute to education? 2014
What engineers were active in the following fields: bridge building; canal construction; efficiency, or scientific management? . . . 2014
Name four recent or contemporary explorers. For what is each noted? 2015
What historians have been noted for their work as biographers? 2015
List six American illustrators. With what works are they associated? Who is best known as the illustrator of Dickens? Of Dante's *Divine Comedy*? 2015
Name one or more inventors who are associated with each of the following: the steamboat, the reaper, the printing press, small arms, radio 2015
What jurist served the longest term as chief justice of the United States supreme court? 2016
Where does Samuel Gompers belong in the American labor movement? 2016
Name some manufacturers who were also inventors. Some mathematicians who were also astronomers 2016
Cite two French military leaders who were contemporaries of Napoleon 2016
In World War II, who were the principal generals each of these countries: United States, Great Britain, Germany, Russia? 2017
Name three prominent naval commanders of World War I. Of World War II 2017
What American novelist was an engineer and a painter? 2018
To what period of American history does Gilbert Stuart belong? What is his most famous portrait? 2018
What is the period, the country, and the principal work of each of the following artists: Raphael, Rembrandt, Gainsborough, Corot, Menzel, Picasso, Rivera? 2018
Name six recent or contemporary philosophers and state the chief contribution made by each 2019
When did each of these physicians live, and for what is each noted: Hippocrates, Galen, Bright, Gorgas, Lister, Schick? 2019
What physicists are remembered in connection with the following: the law of gravitation, the thermometer; X-rays, the theory of relativity? 2019
Cite some electrical terms that are derived from the names of physicists 2019
What physiologists are recent Nobel prize winners? 2020
Name some contemporaries of the poet Edwin Markham. What is his most famous poem? 2020
What English poets of the middle nineteenth century were also painters? 2020
What labor leaders have been prominent recently in British politics? 2021
What religious leaders were also explorers? 2022
Who was the last emperor of Russia? The last king of Spain? 2022
Name some American women who have been sculptors 2022
What social reformer was also a novelist? What work of fiction did he write? 2023
Who were the outstanding statesmen of ancient Greece? For what was each noted? . . 2023
What zoologists were also painters? Botanists? 2023

BIBLIOGRAPHY

The following list of carefully selected biographical works, while by no means exhaustive, contains a substantial number of the great biographical works which are easily available in English. Some of them have recently come from the press; others have stood the test of enduring popularity.

In addition to biographies will be found the best standard biographical reference works. By consulting these the reader may find information regarding thousands of persons who are known only for certain special reasons and may also obtain additional details concerning the smaller number who have become more universally famous. A selection from the more celebrated autobiographies is given in a separate group. The biographies proper may be either the greatest works of their class or the best available works on the greatest men. The list contains also a liberal proportion of works on famous women and on members of the American hall of fame.

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Thayer, W. R.—The Art of Biography. . *Scribner*

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Cyclopedia of Names . . . . . *Appleton*
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Who's Who in America . . . . . *Marquis*
Webster's Biographical Dictionary . . . *Merriam*
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Bispham, David—A Quaker Singer's Recollections. *Macmillan*
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Adams, Samuel	Hosmer, James K.	*Houghton Mifflin*
Alcott, Louisa M.	Meigs, Cornelia	*Little Brown*
Aldrich, Thomas B.	Greenslet, Ferris	*Riverside Press*
Alexander the Great	Cummings, L. V.	*Houghton Mifflin*
Alfred, King	Besant, Sir Walter	*Appleton*
Audubon, J. J.	Rourke, Constance N.	*Harcourt Brace*
Austen, Jane	Firkins, O. W.	*Holt*
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Barnum, P. T.	Werner, M. R.	*Harcourt Brace*
Barton, Clara	Epler, P. H.	*Macmillan*
Beecher, Henry Ward	Abbott, Lyman	*Am. Pub. Co.*
Beethoven	Ludwig, Emil	*Putnam*
Bernhardt, Sarah	Verneuil, Louis.	*Harper*
Boone, Daniel	Bakeless, John E.	*Morrow*
Bronte, Charlotte	Benson, E. F.	*Longmans Green*
Bronte, Charlotte	Gaskell, Mrs. E. S.	*Harper*
Brooks, Phillips	Allen, A. G. V.	*Dutton*
Brown, John	Villard, Oswald G.	*Houghton Mifflin*
Browning, Elizabeth Barrett	Clarke, Isabel	*Hutchinson, Ltd.*
Browning, Robert	Dowden, Edward	*Dutton*
Bryant, William Cullen	Bigelow, John	*Houghton Mifflin*
Burke, Edmund	Morley, John	*Harper*
Burns, Robert	Lockhart, J. G.	*Dutton*
Caesar, Julius	Buchan, John	*Nelson*
Calhoun, John C.	Hunt, Gaillard	*Jacobs*
Calvin, John	Harkness, Georgia	*Holt*
Carlyle, Thomas	Froude, James A.	*Scribner*
Carver, George W.	Holt, Rackham	*Doubleday*

Subject	Author	Publisher
Cavour, Count	Thayer, W. R.	*Houghton Mifflin*
Cervantes	Ybarra, T. R.	*Boni*
Charlemagne	Bulfinch, Thomas	*Dutton*
Churchill, Winston	Kraus, R.	*Lippincott*
Clay, Henry	Schurz, Carl	*Houghton Mifflin*
Clemens, Samuel (See Twain, Mark)		
Cleveland, Grover	Nevins, Allan	*Dodd Mead*
Cook, Captain	Besant, Sir Walter	*Macmillan*
Cooper, J. Fenimore	Boynton, H. C.	*Century*
Cromwell, Oliver	Roosevelt, Theodore	*Scribner*
Dante Alighieri	Fletcher, J. B.	*Holt*
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Decatur, Stephen	Anthony, Irvin	*Scribner*
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Disraeli, Benjamin	Meynell, W.	*Appleton*
Douglas, Stephen A.	Brown, W. G.	*Houghton Mifflin*
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Edison, Thomas	Miller, F. T.	*Winston*
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Eisenhower, Dwight	Davis, Kenneth S.	*Doubleday*
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Farragut, Admiral David G.	Mahan, A. T.	*Appleton*
Fawcett, Henry	Holt, Winifred	*Houghton Mifflin*
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Francis of Assisi, Saint	Egan, M. F.	*Dutton*
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Fremont, John C.	Nevins, Allan	*Harper*
Gibbons, Cardinal	Will, A. S.	*Dutton*
Gladstone, W. E.	Morley, John	*Macmillan*
Grant, Ulysses S.	Green, Horace	*Scribner*
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Ibsen, Henrik	Koht, Halvan	*Norton*
Inness, George	Inness, George, Jr.	*Century*
Jackson, Andrew	Bassett, J. S.	*Doubleday*
Jackson, Stonewall	Tate, Allen	*Minton, Balch & Co.*
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Jones, John Paul	Thomson, V.	*Liveright*
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Machiavelli, N.	Villari, Pasquale	*Unwin*
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Marquette, Pere	Repplier, Agnes	*Doubleday*
Marx, Karl	Spargo, John	*Huebsch*
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Michelangelo	Symonds, J. A.	*Nimmo*
Milton, John	Pattison, Mark	*Macmillan*
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Raleigh, Sir Walter	Ober, F. A.	*Harper*
Raphael	Ady, Mrs. J. C.	*Duckworth*
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Stalin, Joseph	Deutscher, Isaac	*Oxford*
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Miscellany

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Medal of Honor
Navy

Medal of Honor
Army

Distinguished
Service Cross

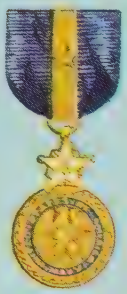
Navy Cross

Distinguished
Service Medal
Army

Brevet Medal
Marine Corps

Legion of Merit

Distinguished
Flying Cross



Distinguished
Service Medal
Navy

Purple Heart

Soldier's Medal

Principal
DECORATIONS
of the U. S. Armed Forces
World War II

Navy - Marine Corps
Medal

Bronze Star
Medal

Air Medal

Distinguished
Service Medal
Merchant Marine

Silver Star

Mariner's Medal

MISCELLANY

INTRODUCTORY

THIS department bears the title Miscellany primarily because it comprises groups of information that are more or less unrelated to each other. Moreover, each group contains material which, in its entirety, cannot properly be classified under any particular one of the preceding departments.

In no sense, however, is this department a mere medley of odds and ends. On the contrary, each group contains some of the most carefully arranged, informing, and useful material in the work. This material has been placed here, not because it could not be readily distributed elsewhere in the volume, but because its arrangement in these specially constituted groups greatly enhances its reference value.

The advantages of this plan may be seen in the section on Heroic Deeds, in which the various stories inspire far greater human interest than would the same material scattered through the departments of History, Geography, Useful Arts, and Biography. Again, the combined historic, romantic, artistic, and spiritual suggestiveness of the section on California Missions would be all but lost should this material be separated into its component parts and the fragments placed under History, Geography, Biography, and Fine Arts.

A second important advantage gained by bringing things of the same kind together in the manner adopted for these miscellaneous groups is the ease of reference thereby secured. Instead of finding it necessary to turn to two or more widely separated departments and then to combine the information obtained, the user will discover that this task has been performed for him in advance. The marked saving of time and effort effected by this arrangement is clearly shown in the numerous groupings, which include Sobriquets and Nicknames, Popular Names of States and Peoples, State Mottoes, State Emblems, State Flowers, and various other somewhat similar assemblages of interesting information.

Parliamentary Law. To an ever increasing extent this is an age of organization, of association, and of co-operation. We act more and more in groups and less and less solely as individuals. Every progressive community, as a rule, contains several active organizations. In the country there are farmers' clubs and co-operative associations in great variety. In villages and in towns there are men's clubs, women's clubs, and numerous other organizations. In the larger cities there are organizations in connection with practically every activity in which the citizens engage—commercial, social, civic, political, musical, literary, educational, or religious. Moreover, in many schools, formal organization has become part of the regular procedure of the institution.

From time to time it is necessary for such bodies to transact business and to act upon various matters presented for consideration. It is highly desirable that such transactions should be made in accordance with correct parliamentary procedure. This is extremely important whenever financial considerations are involved. In such cases parliamentary proceedings have a legal significance and may affect the title to valuable property or the disposition of large sums of money.

In the section devoted to this subject, the essentials of a complete manual have been brought together within the compass of 12 pages. Great care in preparation has been exercised in order to secure a simple and effective arrangement combined with absolute clearness of presentation. By studying this material, the user of this volume will be enabled to acquaint himself very quickly with the parliamentary rules in conformity with which organizations of all types should conduct their deliberations.

Societies and Organizations. It has been stated above that the present age is pre-eminently one of organization and co-operation. The total number of organizations, in fact, has become so enormous that a mere catalogue of their names would fill volumes.

With a view to furnishing the reader with helpful information concerning some of the larger and more distinguished of these, concise articles treating some 70 orders, societies, and various other organizations are presented in an ensuing section. Here will be found authoritative facts regarding the history, scope, and purpose of the most notable organizations in the United States and in other countries.

California Missions. Among the recollections which remain most sharply etched in the minds of travelers upon the Pacific coast are the impressions produced by visits to the old California missions. Most persons dwelling in other parts of the continent have a very imperfect knowledge of these historic institutions or of the influence which they exerted in many ways upon the later development of California.

In the section devoted to this subject will be found an array of facts of unusual interest concerning the long chain of missions founded among the Indians of the Pacific coast more than 150 years ago by heroic Franciscan padres from Mexico. Authentic information is presented in regard to the origin, history, former prosperity, and later decline of these celebrated missions. Of especial value are the descriptions of their modern remains and the exact information given in regard to their location and their accessibility to the traveler.

Heroic Deeds. Courage is a virtue of the most universal appeal. The American Indians used to take steps which they believed would secure for themselves the heroism of their most daring enemies. No less marked is the homage which the children of a civilized age pay to those who show themselves intrepid in the face of danger. A thrill of admiration and pride passed through millions of hearts when they read of the numerous acts of quiet heroism performed when the *Titanic* or the *Lusitania* was sinking in mid-ocean.

The division reserved for the description of notable deeds of heroism recounts those of many different types. Heroes of science will be found treated, as well as heroes of the sea. There are exploits of women, of children, of priests and warriors, of explorers, workmen, and kings. The human interest of these stories is increased by the fact that, except for one or two which depend on tradition, they are authentic accounts of actual occurrences.

Sobriquets and Nicknames. Often a person or a place bears a distinctive name that has long been applied by general consent. It may not for the time seem appropriate. It may appear as meaningless as a word of an unknown tongue. Yet those names frequently carry interesting stories for the one who can interpret them.

The origin and the meaning of a large number of such names are explained in the section under the above caption. There one may find answers to such questions as Who was called the mill boy of the slashes? How did Uncle Sam come to symbolize the United States? Who was the weeping philosopher? By finding the answers to these and many similar questions, the reader will travel far over the field of human history and will bring back with him many interesting items of information which it will long be a pleasure to remember.

National Symbols and Flags. In every land the sentiments of millions of human beings are centered about certain objects usually insignificant in themselves—a piece of colored cloth or an arbitrarily chosen flower or animal. An insult to these enshrined symbols is instantly resented as an indignity to the people who have chosen them. Fealty to its symbols is interpreted as a sign of friendship to the people.

The reader may see in the following pages an account of the flowers and the animals which have been made emblematic of various countries of the world as well as of each state of the Union. In the past two decades of wars and revolutions, the flags of many countries have been altered, in some cases several times. For this reason, the older sources of information regarding national flags are sure to be misleading. In this department the present flags of the chief countries of the world will be found clearly described.

Festivals and Holidays. This section brings together for reference and comparison a fund of instructive information, a large part of which is not readily accessible to the average reader. While fairly clear ideas prevail as to the origin and meaning of patriotic holidays, such as July Fourth, Memorial Day, and Flag Day, and also concerning religious holidays, such as Christmas and Easter, most persons find themselves at a loss to explain the significance of various other festivals and holidays observed in their own country, not to mention those celebrated in other lands.

The section devoted to this subject gives the history and meaning of Saint Valentine's Day, April Fool's Day, May Day, and Halloween. It likewise enlightens the reader concerning some of the more important local festivals which have become established in the United States, including the Mardi Gras, the Rose Festival, the Tournament of Roses, Labor Day, Arbor Day, and Mother's Day.

Popular Superstitions. It will be a matter of astonishment to many people to read in a following section that many of the common superstitions playfully discussed nowadays were once elements of magic accepted in dead earnest by people hundreds of years ago. Familiar as they are, they often bear an age-long antiquity. Such are those connected with charms, like the lucky horseshoe, and with customs, like shoe throwing at weddings.

The reader will find also the scientific explanation of many of the common errors which have passed current for many generations. These include the belief that toads or frogs fall in rain and that horsehairs turn to snakes if left for a certain length of time in water.

Great Disasters. The customary security in which we live tends to make us forget that we have no guarantee against catastrophe. Nature pursues her regular course regardless of human life. Cataclysmic earthquakes occur alike in unpeopled tracts and in the most populous lands. Volcanoes may break forth not merely in Alaska but also above great cities, such as Naples. It makes no difference to the seething waters of a flood whether they carry away broken trees or human habitations.

Particularly at the time of such unhappy occurrences, people's minds revert to earlier catastrophes. They desire to learn how many perished in this or that former disaster. A clear and concise presentation of such information is given in this department, which records the most notable modern disasters.

Discoveries and First Uses. From the earliest times people have shown a lively curiosity in regard to the origin of the various objects with which they meet. It is such curiosity regarding the origin of the world that accounts for the myths of creation invented by nearly all early peoples. Their customs, their arts, and even the geographical features of their countries are frequently explained by stories which make their surroundings seem more understandable to primitive people.

In the present age, which is distinguished from all others by the multitude of newly invented arts and sciences which it possesses, a knowledge of the origins of these various innovations is especially interesting. For the first time in history, careful records make it possible to give the true answers to such queries as When did the first locomotive run? Who made the first dynamo? What was the first newspaper published in America?

The interesting list of discoveries and first uses given in the following section will be found to include dates for the discovery of bacteria, the establishment of the first free public bath in America, the first manufacture of artificial ice, the determination of the velocity of light, the construction of the first suspension bridge, and numerous other events which were the first of their kind.

Drawing and Design. Within the past decade or two has occurred a widespread popular awakening of interest in applied art. Not only have advertisements in magazines become veritable picture galleries, but large numbers of people are becoming aware of the fact that, by desirable combinations of color and lines, it is possible greatly to enhance the beauty of their houses, their gardens, and their costumes. It is a commonplace among psychologists that to have pleasing and restful surroundings conserves the nervous energy. It does more—it enriches life.

Up to the present the possibilities lying in the application of artistic principles in everyday life have scarcely begun to be realized. Without the expenditure of a single additional dollar, the charm of nearly every house might be vastly increased by the application of certain simple rules. The section on drawing and design, besides containing much else of great value, explains these principles and gives many useful hints for household decoration.

Furniture. This instructive section gives a brief outline of the history of furniture and an account of the chief types of period furniture. It characterizes the ornamentations found on the chairs and couches made in ancient times and enables one to recognize by their qualities the articles which copy the furniture of Louis XIV, Queen Anne, or the American Colonial days.

Games and Sports. It is a curious fact that many of our familiar games date from a remote antiquity. Cards and chess, for example, were known among the ancient Egyptians. Lacrosse is a game which originated among certain North American Indians. The phenomenal popularity of tennis and baseball, however, is of more recent date. Interesting articles on the character and the history of these and many other well-known games will be found in the section entitled Games and Sports.

General Miscellany. The material which will be found arranged alphabetically in General Miscellany includes some of the most useful and interesting information in this volume. The reader may there be made acquainted with the once important "science" of alchemy and the seven wonders of the world, famous since ancient times. He may learn much about patents, ways of reckoning time, the significance of various flowers as emblems, the Nobel prizes, the history of the America Cup races, ways of making fire, notable communistic societies, and a large number of other engrossing subjects.

PARLIAMENTARY LAW

THE term "parliamentary law" was applied originally to the customs and rules under which business was conducted in the English Parliament. As these usages of Parliament became fixed for that body, they gradually came to be recognized outside of Parliament, not only as authoritative in the governing of deliberative assemblies, but also as forming part of the unwritten law of the land. From England, the usages of Parliament spread to America as well as to other countries, and, with modifications to suit the needs of individual bodies, these usages have formed the basis for rules and regulations governing all of our deliberative assemblies, including legislative bodies and legal corporations. Parliamentary law in America has very generally conformed to the usages of Congress. These, of course, differ somewhat in the two houses of Congress, and are changed and revised from time to time.

Definition. Parliamentary law is, therefore, a set of customs and rules used by organized bodies in the conduct of their meetings, defining what may or may not be fairly or properly done at such meetings.

While no organized body need be bound by any set parliamentary rules, it is quite impossible, without such rules, to conduct a meeting with fairness and alacrity. Most organizations, therefore, not only follow general parliamentary rules, but adopt some particular work on parliamentary law as a guide for the conduct of their meetings.

A typical work on parliamentary law should describe methods of organizing societies and of conducting meetings, and should outline the duties of officers. It should give also the names of motions, with comment upon each motion. This comment should cover the following points: the object and effect of the motion; whether it can be amended or debated; if debatable, the extent to which it opens the main question to debate; the circumstances under which the motion may be made; and what other motions may be made while it is pending. The purpose of this section is to present to the reader, in a brief, concise form, as much of parliamentary law as one needs to know in order to be an alert, intelligent citizen, competent to participate in public discussions and organizations.

TEMPORARY ORGANIZATION

When a number of persons who previously have agreed to meet for the purpose of organization are assembled, anyone present may rise and say, "I move that Mr. A act as chairman." Anyone else present, either seated or standing, may say, "I second the motion." The maker of the motion, standing, should then say: "It has been moved and seconded that Mr. A act as chairman. All in favor say *aye*. All opposed say *no*." If the maker of the motion is satisfied that a majority have voted aye, he says: "The motion is carried. Will Mr. A please take the chair." If he is satisfied that a majority have voted no, he says: "The motion is lost. I will receive the nomination of some one else." If, at this time, more than one person is nominated, the maker of the first motion puts before the assembly the name that he first hears, and so on until a choice is made.

Alternative Method. Instead of some one's rising and himself nominating a chairman, any person may rise and say, "Will the meeting please come to order. I will receive nominations for chairman." Thereupon he becomes a kind of temporary chairman. and continues to receive and to put nominations for chairman until some one is elected in the manner explained above.

The Temporary Chairman. The person elected should immediately take the chair, when he may speak very briefly of the honor conferred upon him or on the purpose of the organization or on both subjects. He may call for the nomination of a secretary, tellers, and other officers, to be elected in the same manner as the chairman, by saying, for example, "Nominations for secretary are in order," or "I will receive nominations for secretary"; or he may simply say, "What is your further pleasure?" and await the action of some member. To expedite matters, the newly elected chairman may say, "If there are no objections, I will appoint a secretary and tellers." Hearing no objections, he immediately appoints a secretary and at least two tellers, and proceeds with the organization.

PERMANENT ORGANIZATION

First Meeting. If a permanent organization is contemplated, after the election of the chairman and the election or appointment of the secretary and tellers, either the chairman, or some one previously agreed upon, at the call of the chairman, sets forth, somewhat in detail, the purpose of the meeting. This person usually concludes his remarks by offering a resolution, previously prepared. This resolution is usually passed to and read by the secretary, although it may be read by the person offering it. A motion to adopt the resolution is then in order and, when made and seconded, may be freely debated by anyone present. Such a resolution might read, "Resolved, That it is the sense of this meeting that a society or club shall be formed in this city for the purpose of the improvement of the city."

If the resolution as read or as amended is adopted, some one makes a motion that the chairman appoint a committee (specifying the number to be on the committee) to draft a constitution and by-laws for such an organization as has been agreed upon by the passing of the resolution. Usually, if this motion is carried, the chairman appoints a committee or announces his intention of doing so later. A motion to adjourn to some definite time or place, or both, may now be made. Such a motion is debatable. Or a motion to adjourn, or to adjourn subject to the call of the chairman, may be made. Neither of these two motions is debatable. If any motion for adjournment is carried, the chairman states the effect of the action, using the words of the motion; as, for example, "We stand adjourned subject to the call of the chair."

Second Meeting. At the next meeting, the officers of the former meeting are in charge until superseded by permanent officers.

The chairman calls the meeting to order and asks the secretary to read the minutes of the preceding meeting. The chairman then says: "You have heard the minutes; are there any corrections or additions?" If no one replies, he then says: "If there are no corrections or additions to the minutes as read, they stand approved." (Pause) "Hearing none, I declare them approved." If corrections or additions are made by anyone and the assembly seems to agree, the chairman says, "The minutes as corrected (or enlarged) stand approved."

Adopting Constitution and By-Laws. The chairman then says, "The next order of business is the report of the committee on constitution and by-laws." The chairman of this committee rises, addresses the chair, and, when recognized, either reads the proposed constitution or passes it to the secretary to be read. When the reading has been concluded, the chairman of the meeting says: "You have heard the report of this committee. What is your pleasure concerning it?" Anyone present may rise and say, "I move the adoption of the constitution and by-laws as read." If the motion is seconded, the chairman puts it, and, if it is carried, the constitution and by-laws as read become the fundamental law of the society or club.

Instead of the assembly's voting on the constitution and by-laws as a whole, any person present may move that the constitution and by-laws be

considered (or acted upon) article by article. If this motion is adopted, the secretary of the meeting, or the chairman of the committee, reads the first article.

The chairman of the meeting then says, "Are there any amendments or additions to this article?" If there are amendments or additions, he must entertain motions to that effect until the first article is amended or enlarged to the satisfaction of a majority of those present, when he will proceed in like manner with the second and subsequent articles. If, after a short pause following the reading of the first article, no amendments or additions are suggested, the chairman says, "There being no amendments or additions to this article, we will pass to the reading of the second article." Each succeeding article should be taken up in like manner.

After each article has been so considered, separately, the chairman says, "You have passed upon the constitution and by-laws by sections (or articles); will you adopt them as a whole?" Any person present may offer further amendments or additions to the constitution and by-laws as a whole, or may move their adoption as read (or as amended or enlarged) and as a whole.

If no motion of any kind is offered concerning the whole, the chairman says, "There being no further amendments or additions, all who are in favor of adopting the constitution and by-laws as read (or as amended or enlarged) and as a whole, manifest it by saying *aye*." After considering the apparent number of favorable votes carefully, he says, "Those opposed manifest it by saying *no*." He then announces the result by saying, "The constitution and by-laws as read (or as amended or enlarged) have been adopted (or have not been adopted)." At this juncture it is customary to have an intermission, when those who wish to become members of the newly organized society or club sign the constitution and by-laws, if these have been adopted.

ELECTION OF OFFICERS

After the intermission, the chairman says, "The next order of business is the election of officers in accordance with our constitution." Officers are usually elected in one of two ways.

(1) COMMITTEE ON NOMINATIONS

A committee on nominations may be provided for and appointed. When the committee has made its report, the chair asks if there are any other nominations. At this time any member present is at liberty to nominate a candidate from the floor in the same way as he could if no nominating committee had been appointed. If no member nominates a candidate from the floor or if all nominations seem to have been made, the presiding officer proceeds to the election according to the by-laws of the organization, or according to any acceptable method of voting if the by-laws do not prescribe a method. See *Voting: Ballot*; also (2) below.

Accepting the Committee's Report. Instead of procedure according to the above plan, it frequently happens, when no nominations are made from the floor, that some member moves that the report of the nominating committee be accepted and that the candidates be declared elected. The acceptance of the report of the nominating committee is thus considered to be the election. Although this plan is commonly practiced and quite generally accepted, it has no authority either in parliamentary rules or in law. The acceptance of the report of the nominating committee means that the assembly regards the persons whose names are reported by the committee as candidates for the respective offices. It means nothing more; an election is still necessary. If one or more candidates are nominated from the floor, the presiding officer properly treats the nominee of the nominating committee in exactly the same way as those nominated from the floor, and proceeds with the election as indicated under (2) below.

(2) NOMINATIONS FROM THE FLOOR

According to the second plan, the chairman says, "Nominations for president (or whatever the presiding officer's title is) are in order." Any member present, upon being recognized by the chair, may nominate a candidate. A nomination does not require to be seconded. Sometimes, however, a nomination is seconded in a brief speech.

When the chairman is satisfied that sufficient time has been given for nominations for any office, he says, "Are there any further nominations?" Hearing no response, he says: "If there are no further nominations for (president), I declare the nominations closed. You may prepare your ballots for (president)." At this point, the chairman either reads the list of nominations or asks the secretary to do so. If tellers have not previously been appointed, the chairman, with the consent of the assembly, now appoints them, usually three or more.

The Election. The tellers should distribute and collect the ballots. Before they begin to count the ballots, the presiding officer says, "Have all voted who wish?" Hearing no response, he says, "If so, I declare the ballot closed." The tellers count the ballots, sometimes in the presence of the assembly and sometimes in a separate room. They should tabulate the vote in writing and announce the result to the chairman, who should announce it to the members, as follows: "Whole number of votes cast, 39. Necessary for a choice, 20. Mr. A received 21; Mr. B, 12; Mr. C, 5; and Mr. D, 1. Mr. A having received a majority, I declare him duly elected (president)." If no one receives a majority, the chairman, after announcing the count, says, "No one having received a majority, you may prepare your ballots for (president)." The same procedure is continued until some one receives a majority. After the first or any subsequent ballot, if no one has received a majority, a candidate may withdraw his name.

Only One Nomination. If only one nomination is made, it is, in some organizations, customary for the chairman to say, "There being but one nomination for (president), I declare Mr. A elected." Sometimes a member, having addressed the chair, says, "There being but one nomination for (president), I move that the secretary cast one ballot for Mr. A for (president)." If the motion is seconded and carried, the secretary writes the ballot and formally announces that the ballot has been cast, and the chairman announces the member duly elected. These two methods of electing officers are regarded as bad practices and are usually held to be illegal and unparliamentary. Neither is ever allowable when the constitution or a law or a rule of the organization specifies that the officers shall be elected by ballot. If but one member is nominated, exactly the same procedure is followed as if two or more were nominated. This gives any member a right to vote in secret for some one else if he chooses.

Nomination by Informal Ballot. Instead of having nominations made from the floor, it is sometimes decided beforehand, either by common consent or by formal vote, that nominations shall be made by "informal ballot." According to this method, each member present writes the name of his choice on a piece of paper. The papers are collected by the tellers, counted, and the result reported to the assembly in the same manner as are votes in a regular ballot. The names of those receiving one or more votes are then declared by the chairman to be nominees, and the election proceeds as though the members had been nominated from the floor. This is the most democratic way of making nominations.

Time of Taking Office. It is customary, in many organizations, for the chairman to vacate his seat when a new presiding officer has been chosen, and for the newly elected official to take his place and conduct the election of the other officers.

The new presiding officer begins by calling for nominations for the office next in importance. The same procedure is followed in the election of all officers, each taking his seat as soon as elected. The election of officers completes the permanent organization.

Installation of Officers. Instead of the officers immediately taking office as indicated above, it is customary in some organizations for the officers to be "installed" at a later meeting. Such "installation of officers" is accompanied by more or less ceremony and may be made very solemn and impressive. The time when officers shall assume their duties is usually specified in the constitution.

CONSTITUTION AND BY-LAWS

A constitution is the fundamental, organic law or principles of government of a nation, a society, or the like, whether embodied in writing or not. By-laws are detailed regulations for working out the objects of the organized body and the purposes of the constitution. The constitution may be so complete that few, if any, by-laws are necessary. On the contrary, the by-laws may so completely cover the field that a constitution is hardly needed.

Constitution. A constitution should be brief, and should contain only important essentials. In general, it should include the following topics: (1) The name of the organization. (2) The object of the organization. (3) Requirements for membership. (4) The officers: their terms of office; when they shall assume office; the manner of their election; and their duties, if these differ from those of similar officers in other organizations. (5) Committees. (6) Time and place of meeting. (7) How the constitution can be amended. The process of amendment should be made difficult. It should require a two-thirds vote and action in at least two meetings.

By-Laws. The by-laws should cover all details of procedure not included in the constitution. They may include the following: (1) How many shall constitute a quorum. (2) Rights and duties of members. (3) Punishment of members. (4) Fees or dues. (5) Authority for settling disputed points. (6) How by-laws may be amended. It should be possible to amend by-laws more easily than the constitution. The general rule is that amendments to the by-laws be proposed at one meeting and voted on at the next. Usually a majority vote is held to be sufficient for such action. (7) Order of business. A special provision should be made for setting aside the order of business in case of emergency.

TYPICAL CONSTITUTION AND BY-LAWS

CONSTITUTION

Article I—Name

The name of this organization shall be the Booster Club of the city of Oswego.

Article II—Object

The Booster Club shall have for its object the improvement and entertainment of its members; and the moral, social, and business improvement of the city of Oswego.

Article III—Members

Members of the Booster Club shall consist of two classes, active and honorary. Any adult resident of the city of Oswego may become an active member of this club by making written application to the secretary, paying a fee of one dollar, and signing the constitution. Any former adult resident of the city of Oswego may become an honorary member of this club by signing an application blank and paying a fee of five dollars.

Article IV—Officers

The officers of the Booster Club shall be a president, a vice president, a recording secretary, a corresponding secretary, and a treasurer, elected by ballot from the active members of the club at the first regular meeting in January of each year. The officers shall assume office at the first regular meeting following their election and shall serve for a period of one year or until their successors are elected. A vacancy in any office may be filled at any regular meeting, for the balance of the term.

Article V—Committees

There shall be the following standing committees, of five members each, and as many other committees as from time to time may seem necessary: membership, entertainment, municipal, and welfare. Members of these committees shall be appointed by the president, at the second regular meeting in January, and shall serve for one year or until their successors are elected.

It shall be the duty of the membership committee to attempt to secure desirable members for the club. The entertainment committee shall provide some entertainment for each regular meeting and for any special meeting, when so directed by the club. The municipal committee shall co-operate with the city officials in enforcing all laws; and with progressive citizens in an attempt to secure better local, state, and national laws relating to the city. The welfare committee shall co-operate, with any organized or unorganized group of citizens, in an effort to aid the weak or unfortunate in the city.

Special committees, with specified duties, may be appointed from time to time as necessity arises. Unless otherwise provided for in the resolutions creating them, all special committees shall be appointed by the president.

Article VI—Meetings

There shall be a regular meeting at 12:30 P. M., at some place designated by the entertainment committee, on each Thursday during the year, except during the months of July and August. Special meetings may be called by the president, with the consent of the entertainment committee, at such times and places as seem advisable to the members authorized to call such meetings.

Article VII—Amendments

Proposed amendments to this constitution must be presented in writing at a regular meeting, read by the secretary at such meeting, and left on the table until the next regular meeting, when a vote on such amendment or amendments shall be taken. If two-thirds of the members present at the regular meeting, following the meeting when the amendment or amendments were proposed, vote in favor of such amendment or amendments, this constitution shall be so amended.

BY-LAWS

Article I—Quorum

Three-fifths of all the active members constitute a quorum.

Article II—Rights and Duties of Members

Active members shall have all the rights and be subject to all the duties customary in parliamentary bodies. Honorary members shall have all the rights of active members except the right to vote. An honorary member cannot be required to serve on a committee.

Article III—Punishment of Members

Each active member shall pay a fine of twenty-five cents for nonattendance at any regular meeting. Any active member who refuses or neglects to act on any committee to which he or she has been appointed shall be fined one dollar. When the unpaid fines of any active member amount to two dollars, written notice shall be sent to him or her by the secretary. Refusal or neglect to pay such fines, within thirty days, shall constitute just cause for dismissal from the club.

Article IV—Fees and Dues

The dues of active members shall be five dollars annually, payable semiannually, in advance. The dues of honorary members shall be ten dollars annually, payable, in advance, in January of each year. Special fees or dues may be levied on active members by a two-thirds vote at a regular meeting.

Article V—Authority in Disputes

The final authority in the settlement of disputes shall be *Robert's Rules of Order Revised*.

Article VI—Amendments

Proposed amendments to these by-laws must be presented in writing at a regular meeting, read by the secretary at such meeting, and left on the table until the next regular meeting, when a vote on such amendments shall be taken. If a majority of the members present at the meeting following the meeting when the amendments were proposed vote in favor of such amendments, these by-laws shall be so amended.

Article VII—Order of Business

At every regular meeting, the following order of business shall be followed:

I. Roll Call.
II. Reading Minutes of Preceding Meeting.
III Receipt of Communications, Bills, etc.
IV. Report of Standing Committees.
V. Report of Special Committees.
VI. Unfinished Business.
VII. New Business.
VIII. Lunch or Dinner.
IX. Speeches, Stories, Songs, etc.
X. Adjournment.

By a two-thirds vote, at any regular meeting, the order of business may be set aside for that meeting.

GENERAL POWERS AND DUTIES OF THE PRESIDING OFFICER

Not only the success of an individual meeting, but the success of a year's work, frequently depends on the skill of the presiding officer. Consequently, great care should be exercised in selecting a person for this position. Not only is executive ability necessary, but the knack of getting along affably with people and of inducing people to work congenially with each other is equally important. Under no consideration should anyone be elected presiding officer of an organization for social or political reasons or because of long and faithful service. The ability to preside and to direct the affairs of the organization should be the determining factors, in the selection of a presiding officer.

Duties. The presiding officer calls the meeting to order, announces the business to be transacted according to regular or special order, preserves quiet, decides all questions of order unless an appeal is made to the members, states and puts all questions. In speaking, in stating and putting questions, and in announcing the results of votes, the presiding officer should always stand. Under no circumstances should he allow anyone to speak to the members without "addressing the chair." When a member rises and addresses the presiding officer, the latter should recognize him by saying, "Mr. A"; or, if two or more rise and address the chair at about the same time, he should first decide which is entitled to the floor and then say, "Mr. B has the floor."

Putting Motions. When a motion has been regularly made and seconded, the presiding officer should say, "The motion has been made and seconded," or "It has been moved and seconded that (here give the exact words as stated by the maker)." If he cannot remember the exact words, he may call on the secretary to read the motion or on the maker to state it again. If the motion is debatable, he should then say, "Are there any remarks?" When the discussion lags, he may say: "Are there any further remarks? If not, are you ready for the question?" If there is no response, or if one or more members call out "Question," he should say: "The motion has been made and seconded," or "It has been moved and seconded that (the exact words of the motion). All those in favor manifest it by saying *aye* (or whatever expression the customary manner of voting calls for). Those opposed, by saying *no*." Or, in calling for the negative vote, he may say, "Contrary, the same sign."

When both favorable and unfavorable votes have been taken, the chair announces, "The motion is carried," or "The motion is lost." If the vote was upon a motion that had been amended, he should say, "The motion, as amended, is carried." Sometimes, in political and other organizations, the presiding officer, instead of simply saying, "It has been moved and seconded," says, in putting a motion, "It has been moved by Mr. B and seconded by Mr. K that, etc."

Putting Resolutions. In presenting a resolution, the presiding officer says, "It has been moved and seconded that the resolution that you have just heard read (by the secretary) be adopted." If no one offers to discuss the resolution, the presiding officer may say, "Does anyone wish to discuss the resolution that is before us or to have some part of it reread or explained?" If there is no response or if the discussion lags, he may say, "Are you ready for the question?" Hearing no response, or upon call for the "question," he may say: "The question is on the adoption of the resolution you have heard read; as many as are in favor of its adoption say *aye*. As many as are opposed say *no*." He then announces the result by saying, "The resolution has been adopted," or "The resolution has been lost." As in the case of a motion, if the resolution has been amended, he says, "The resolution, as amended, has been adopted."

Approving Minutes. After the reading of the minutes of the preceding meeting or meetings, the presiding officer may expedite matters by not waiting for a formal motion to adopt the minutes. He may say: "If there are no corrections or additions to the minutes as read, they stand approved." (Pause) "Hearing none, I declare them approved." Any member may, upon being recognized, correct an error in the minutes or add something which the secretary overlooked. In such a case, the presiding officer proceeds as above, saying, instead of "minutes," "minutes as corrected," or "as enlarged," or "with additions."

General Conduct of the Meeting. The presiding officer should never interrupt a speaker when the latter is in order. If the speaker is not in order, the presiding officer should use the gavel in calling him to order, and, if requested, should explain why he rules that the speaker is not in order. Except on questions of order and in performing the necessary routine of his office, the presiding officer should never discuss any question nor address the members from the chair. If he wishes to discuss any question that is before the house or to bring some question before the house, he should ask the vice president or some other member to take the chair, whereupon he should take his seat with the members and speak only when recognized by the chair.

When speaking of himself, the presiding officer should always use his title, as, "the chair." In a firm but affable manner, he should insist on good order. He should be strictly nonpartisan on all questions while presiding. The dignity of the meeting depends almost entirely on the dignity and skill of the presiding officer. If the chairman will carefully plan the details of each meeting and will speak in a clear, deliberate tone, he will add greatly to the decorum of the meeting.

VICE PRESIDENT

While the office of vice president is usually regarded as unimportant, great care should be taken in selecting this officer, as he is likely to succeed to the office of president or to be called upon at any time to preside.

Responsibility. A person elected to the vice presidency of any organization should immediately acquaint himself with the powers and duties of a presiding officer, and should make himself familiar with the ordinary forms of parliamentary law. If he neglects to do this, he is likely to embarrass greatly both the organization and himself, if he be called upon unexpectedly to preside.

RECORDING SECRETARY

The recording secretary should be careful to take down every motion that is made, whether it be seconded or not, as only in this way can an accurate record of the motions passed be available for the permanent record. If the recording secretary be in doubt as to the wording of a motion, he should ask the maker to repeat it or to put it in writing. The rough notes taken down as the meeting progresses should show, in full, the exact wording of every motion, resolution, or petition (including the names of the maker and seconder) which was stated by the chair, and what disposition was made of each by the assembly. Motions lost, as well as motions passed, should be recorded.

Contents of Minutes. Either as the meeting proceeds or soon after adjournment, the recording secretary should transcribe his rough notes to a permanent book, in ink. Motions made but not seconded need not be transcribed to the permanent record. The minutes should give an accurate account of the entire proceedings of the meeting, showing in detail the things done rather than the things said. Especial care should be taken to record accurately motions authorizing the expenditure of

money. The record should show the amount to be paid, to whom, and for what.

Besides an accurate record of every motion stated by the chair, as indicated above, the minutes should show also the following: the kind of meeting,—whether regular or special, adjourned regular, or adjourned special; the name of the organization; date and place of meeting, if not always the same; the fact of the presence or the absence of the regular presiding officer and the secretary,—in case of their absence, the names of their substitutes; disposition of minutes of preceding meeting; the hours of meeting and adjournment. Brief extracts from speeches, if important, may be recorded, but no comment of any kind, either favorable or unfavorable, should be made. Every important communication received by the organization should be recorded in the minutes, either in its entirety or in substance, as well as what disposition was made of it by the organization. This rule applies to reports of committees as well as to communications from nonmembers. When an important matter is before the organization, and the yeas and nays are called for, the list of the names of those voting, with the side upon which each voted, should be recorded.

Reading of Minutes. When regular meetings are held weekly, monthly, or quarterly, it is customary to read the minutes of the preceding meeting at the opening of each meeting. Corrections are made, if necessary, and the minutes as read or as corrected and read are approved. If meetings are held several days in succession, with recesses during the day, the minutes are read at the opening of business each day. If the next meeting is not to be held for a period of many weeks or months or for a year, the minutes that have not been read previously should be read and approved before final adjournment. When minutes have been approved, they should be marked "Approved,"—with date of approval, if approved at an irregular time,—and signed by the secretary. If minutes are to be published, they should be marked "Approved" and signed by both the president and the secretary.

Custodial Duties. It is the duty of the recording secretary to keep a register, or roll, of the members and to call the roll when it is requested by the presiding officer. All bills rendered to the organization should be kept on file, where they may be consulted by any member. When bills are paid, the recording secretary should see to it that they are receipted and permanently filed. The recording secretary should carefully preserve the constitution and by-laws, together with amendments thereto. It is especially important that the constitution and by-laws and a permanent record of the proceedings of all previous meetings be available at every meeting. Consequently, the recording secretary, if unable to be present at any meeting, should see to it that these records are at the place of meeting, and especially that the report of the last meeting is properly transcribed, so that it may be read and acted upon.

When the Recording Secretary Presides. When both the president and the vice president are absent, the recording secretary should call the meeting to order and act as presiding officer until some one regularly succeeds him. At other times, a motion that refers especially to the presiding officer should be stated and put to a vote by the recording secretary.

Other Duties. Unless otherwise specified in the by-laws, it is the duty of the recording secretary to notify officers, committees, and delegates of their election or appointment, to furnish committees with all papers referred to them, and to supply delegates with credentials; also to sign with the president all orders on the treasurer which have been authorized by the organization. When the word "secretary" is used, it always refers to the "recording secretary," other secretaries being designated by specific titles.

CORRESPONDING SECRETARY

It is the duty of the corresponding secretary to send out proper notices of all called meetings, and of other meetings when necessary, and to conduct the correspondence of the organization, unless it is otherwise provided for.

SECRETARY'S TYPICAL REPORT OF A MEETING

A regular meeting of the Booster Club was held in the dining room of the Pontiac, on Thursday, June 21, 1923. The president was in the chair. In the absence of the secretary, E. J. Nearbin acted for him. Following the roll call, the minutes of the preceding meeting were read and approved. A communication was received from the Salvation Army requesting aid in providing suitable bathing facilities for the poor children of the city. On motion of Mr. A, seconded by Mr. B, the communication was referred to the welfare committee for immediate and favorable action. A bill was received from The Wells Clothing Co. for two suits of clothes ordered by the welfare committee, at $14 each.

On motion of Mr. D, seconded by Mr. F, it was ordered paid. The membership committee reported the names of Mr. M and Mr. N for active membership. The secretary was instructed, by the chair, to add their names to the list of active members. The special committee on an "Evening Meeting" reported in favor of such a meeting at the Country Club on Thursday, June 28, 1923 at 6:30 P. M.

On motion of Mr. G, seconded by Mr. K, it was voted to accept the recommendation of the special committee on "Evening Meeting" and to hold such meeting as recommended. On motion of Mr. H, seconded by Mr. K, it was resolved that the municipal committee be requested to confer with the commissioner of public works in regard to having the weeds and grass, along the water front, cut.

A delicious luncheon was then served by the Pontiac staff. This was followed by several original songs by the Booster quartet and stories by Messrs. P, Q, and R. Mr. William R. Benjamin, editor of the *Boston Star*, spoke at some length on "Co-operation between the Community and the Press." The meeting adjourned at 1 45 P. M.

E. J. Nearbin, Secretary, Pro. Tem.

TREASURER

The treasurer should keep in a permanent book, with ink, an accurate record of all moneys received and paid out. This record should show from whom or from what sources all moneys were received and to whom and for what they were paid out. A receipt should be given by the treasurer to every person from whom he receives money. The treasurer should insist on a receipt from every person or firm to whom he pays money.

Orders for Payment. Under no circumstances should the treasurer pay out money except upon written orders signed by the proper officers. The treasurer should preserve these orders as evidence of his authority to pay out such sums. The treasurer should refuse to pay out money on orders properly signed unless he knows the persons who signed them were authorized to do so in accordance with the rules of the organization. It is customary in most organizations to pay out no money except after the payment has been authorized by a majority vote at a legal meeting.

Care of Money, Forms. It is usually best to deposit all moneys belonging to the organization in some bank in the name of the organization and to pay all bills by checks. Before paying any bills, the treasurer should insist on some written forms of order and receipt, similar to the following:

FORM OF ORDER

$68.00 Oswego, N. Y., June 7, 1949.

To John Simmons, Treasurer of the Booster Club

Pay to the order of Frank Beal

Sixty-eight..... .....Dollars

For two suits of clothes.

Thomas Broad,
Secretary of the Booster Club.

FORM OF RECEIPT

$5.00 Oswego, N. Y., Jan. 11, 1949.

Received from Stephen A. Soule

Five and no/100.....Dollars.

For annual dues to the Booster Club from Jan. 1, 1949 to Jan. 1, 1950.

John Simmons,
Treasurer of the Booster Club.

Reports. The treasurer should be prepared at every meeting to tell definitely how much money there is in the treasury, and he should from time to time make detailed reports to the organization of all receipts and disbursements since the last report. Copies of these reports should be carefully made, with ink, and should be open to the members of the organization at all times.

COMMITTEES

To expedite the transaction of business, it is customary, in all organized bodies, to refer to committees nearly all matters that come before the assembly. The object of this procedure is to have the committee make a more detailed study of conditions than it is possible for the whole assembly to make. When the report of a committee on any question is favorable, it frequently happens that the assembly adopts their report with little or no discussion. An unfavorable report often results in "dropping the question," that is, in giving it no further consideration.

Committee of the Whole. When the main body of an organization has to consider a subject, the statement of which is not in proper form for definite action, or when it is deemed advisable to consider the subject without all the formalities and restrictions attending the conduct of the main body, and yet it is not desired to refer the matter to a small committee, the freedom of an ordinary committee can be secured by referring the question to the committee of the whole, that is to say, to a committee consisting of the entire membership. This committee may consider anything the organization may desire. The committee of the whole is useful where the subject to be considered contains many items and relates to divers subjects. One great advantage of this committee is that it tends to prevent the organization from rushing precipitately to a conclusion on a question before the subject has been thoroughly considered, discussed, and matured.

The committee of the whole is usually formed in pursuance of a motion similar to the following: "I make a motion (or I move) that the assembly do now resolve itself into a committee of the whole, to take under consideration (whatever the subject may be)." If this motion is carried, the presiding officer names a member to act as chairman of the committee; or the committee of the whole may demand that it elect its own chairman. The latter action is unusual and by some authorities is considered "contrary to sound parliamentary sense." The secretary of the organization is usually secretary of the committee of the whole.

Procedure in the committee of the whole differs from that in other committees in the following respects: The previous question cannot be moved; a motion to postpone to a certain day or to postpone indefinitely cannot be made; nor can a motion to lie on the table or to adjourn to some other time or place be made; the committee cannot order the yeas and nays; it cannot refer anything to a subcommittee; every member may speak as often as he pleases, provided he can obtain the floor. The only motions in order in the committee of the whole are to amend, to adopt, and that the committee rise and report.

When the committee has finished the consideration of the subject, or when it desires to adjourn or to have the main body limit debate, a motion is made that the committee rise, and that the chairman (or some other member) report its proceedings to the assembly. The motion having been carried, the chairman resumes his place on the floor, and the presiding officer takes his chair. Then the person designated to make the report rises and informs the presiding officer that he is ready to make the report. He then awaits the pleasure of the assembly.

Authority of Committees. The person who makes a motion that a committee be appointed should specify the purpose for which the committee is to be appointed, the number to serve upon the committee, and who should appoint them, unless the constitution provides how all committees are to be formed. A committee has no authority except that which is granted to it by the constitution and by-laws or by a vote of the organization. A committee authorized to investigate in regard to the expense and desirability of a certain thing has no right, even if it finds the thing very desirable, to incur any debt or to involve the organization in any way. Instead, it should report its findings and await further authority from the organization.

Committee Procedure. Unless the position is otherwise provided for, the person first named on a committee is its chairman and should preside at its meetings. The chairman should call the committee together; but, if he neglects to do so, a majority of the committee may agree on a time and place of meeting and may notify all members to that effect. The majority of a committee constitutes a quorum, whether the chairman be one of the number or not, provided the committee has been regularly called together.

When a committee has been regularly appointed or elected, it should be definitely understood that under no consideration should one or more members go ahead with the business of the committee without action by the committee as a whole. Before any action is taken by any member, the committee should be regularly called together as explained above. No action should ever be taken and no report should be made except that agreed upon at a meeting regularly called. If emergency makes it necessary, action may be taken in accordance with the wish of the majority, provided all members of the committee have been consulted in regard to, or notified of, the intended action.

Committee Reports. The chairman of a committee is expected to report for the whole committee. He may begin his report as follows: "The committee appointed to investigate the desirability of having a municipal garbage plant wishes to submit the following report." (Here the member may read the report or give it orally.) Written reports sometimes end with the following: "All of which is respectfully submitted." This form, however, is wholly unnecessary. If the members of a committee are unable to agree as to the report to be made, there may be a "majority" and a "minority" report.

In making such reports, the person reporting should say, "The majority of the committee appointed, . . . ," or "The minority of the committee appointed, ..." Both reports are entitled to a reading, but only the report of the majority may be considered, unless a motion is passed to substitute the minority report for the majority report. In the latter case, the minority, and not the majority, report is considered. If the organization votes to adopt or to accept the report of the committee, all the recommendations of the committee become binding on the organization.

Care should be taken not to confuse the word "receive" with the word "adopt" or "accept." If the assembly votes to "receive" the report of a committee, the vote means simply that the body will take the report under consideration. If it votes to "adopt" or to "accept" the report of the committee, all the recommendations of the committee become binding on the assembly.

When a committee has performed the duties for which it was appointed, it goes out of existence without any action on the part of the body authorizing it.

MOTIONS

A motion is the usual form of bringing before an organization a question for consideration or a proposal of action. Though most of the motions presented to organizations are oral, the presiding officer may refuse to receive or to put a motion unless it be in writing. When a motion is reduced to writing, it

may be read by the mover and then passed to the secretary, or it may be handed to the secretary, who should read it, when so requested by the presiding officer. The rule requiring that motions be in writing applies only to principal motions.

PRINCIPAL MOTIONS

A principal motion is a motion which brings a particular subject before an assembly for consideration. When a member of an organization wishes to bring any matter before the body for its consideration, he rises, addresses the chair, and, when recognized, states his motion; as, for example, "I move that a committee of three be appointed by the chair to inquire into the possibility of securing the Robinson Auditorium for a public meeting."

The mover should be very careful to word his motion so that it may not be misinterpreted. Custom requires that a motion be seconded, although it may be put and legally passed without a second. In seconding a motion, strict parliamentary rules require that the member wishing to second it shall rise address the chair, and, when recognized, say, "I second the motion," or "I second Mr. A's motion." However, if there is but one motion pending, in many organizations it is customary for any member, without rising or addressing the chair, to call out, "I second the motion." Thereupon the presiding officer assumes that the assembly wishes to vote on the motion, and regularly puts it before the body. In routine business the presiding officer sometimes seconds the motion himself.

Resolutions. When the motion is lengthy, it should always be in writing. In this case it is known as a resolution. Such motions usually begin with the word "Resolved." The member wishing to put a resolution before an organization should carefully write out the resolution in advance. When the proper time arrives for the consideration of such business, he should address the chair, and, when recognized, say, "I move the adoption of the following resolution." (Here he reads the resolution and passes it to the chairman.) The resolution may now be seconded and acted upon in the same way as any other motion. Any member who is in doubt as to the wording or the meaning of some part of the resolution may request that a part or all of it be read again. Upon request of the presiding officer, the secretary should then read part or all of the resolution.

Petitions. A petition to be presented to an organization should be carefully worded and should be signed by the person who wrote it. It is customary to have a petition presented by some member other than the one who wrote it. The member presenting the petition should be thoroughly familiar with it and know that the language of the paper contains nothing disrespectful to the assembly or to any of its members.

Upon addressing the chair and being recognized, the presenter, with petition in hand, should briefly inform the members as to the substance of the petition and move that it be received. If his motion is seconded and carried, he takes the petition to the desk of the secretary, who, when formally requested by the chair, reads the document. It is then regularly before the organization and may be disposed of by immediate consideration, or by a motion to assign some future time for its consideration, to refer it to a committee, or to lay it on the table, etc. If there be no objection, the presiding officer may receive a petition and order it read without the formality of a motion to receive it. However, the formal motion is preferable.

Withdrawal. A motion which has been made and seconded may be withdrawn by the maker at any time before it is stated by the chair, but not after.

Rescinding. At any time after a motion has been passed, it may be annulled by passing a motion or resolution to rescind or repeal it. If notice of such proposed action is not given at a previous meeting, a two-thirds majority of those present or a majority of all the membership is required to rescind. The motion to rescind is a main motion without any privilege, and can be introduced only when there is nothing else before the assembly. The effect of a motion to rescind is to revoke or set aside a previous act.

SUBSIDIARY MOTIONS

When a principal motion has been made and seconded and has been stated by the chair, the assembly is not at liberty to consider any other business. A motion bearing on any other subject would be out of order and could not be considered. However, certain motions are always in order and may have precedence over others. Such motions are known as subsidiary motions.

Amend. When it is desired to change a motion which is regularly before an assembly, by unanimous consent, the maker may change it, the seconder giving his consent. Instead, however, any member, on being recognized, may propose an amendment to the motion. The amendment, if seconded, is debatable and should be voted on in the same way as any other motion. If carried, it becomes part of the original motion. The original motion as amended should then be considered as a whole and disposed of. While the amendment is pending, any member, when recognized, may propose an amendment to the amendment, which, if seconded, should be voted on, and which, if carried, becomes a part of the amendment. The amendment, as amended, is then put to a vote, and, if carried, it becomes part of the original motion. The original motion, as amended, should then be put to a vote.

Adjourn. A motion to adjourn is always in order except when a speaker has the floor, when a vote is being taken, or when the assembly is in the midst of some business that cannot be abruptly stopped. If the motion is simply to adjourn, it is not debatable and, if voted down, may be renewed any number of times during a session, but not immediately after being voted down. If the motion is to adjourn to some definite time or place, or both, it is debatable, and, if voted down, may be reconsidered.

Commit or Refer to a Committee. If a motion becomes involved through amendments, or in any other way, or is unexpectedly introduced and not well understood by the members, a motion may be passed referring it to a committee for further consideration. The motion to commit is intended to take the subject from the main body and transfer it to the consideration of a smaller number, or to the whole number acting under broader privileges than those of the formal body. See *Committees*.

The form of the motion is as follows: "I move that the (matter, motion, or whatever the proposition may be) be referred to a committee" (indicating the character of the committee). The motion to commit may be made as soon as the matter is introduced or after there has been discussion or amendment, or when any other stage in the consideration has been reached. This motion may be made while an amendment is pending, and it is debatable. It is amendable only as to the membership of the committee, its place of meeting, or other similar details. If more than one kind of committee is suggested, then the vote will be, first, on the committee of the whole; second, on a standing committee; and, third, on a special (or select) committee. The effect of the adoption of the motion to commit is to end the consideration of the matter in the body, and to pass it over to the designated committee.

Recommit. The motion to recommit is the same as to commit, except that it refers to a matter which has already been reported by a committee.

Lie on the Table. If at any time an assembly does not wish to consider further a motion which is before it, or wishes to dispose of the question permanently without allowing it to come to a vote, a

motion may be introduced that the question lie on the table The motion is neither debatable nor amendable, and permanently disposes of the question until a majority see fit to take it up again.

Postpone to a Certain Time. A motion to postpone the question before the house to some definite future time is in order, except when a speaker has the floor. It is debatable as to the question of postponement only.

Reconsider. A member who voted with the majority on a motion may, on the same day or at the same session in which the motion was disposed of, make a motion to reconsider the previous motion. Such a motion can be made in the midst of debate and when another member has the floor, but cannot be considered while another motion is pending. However, when it is taken up, it has precedence over every other motion except a motion to adjourn. If the original question was debatable, the motion to reconsider is debatable, but not otherwise. If the motion is carried, the original question is before the assembly for consideration. If a motion to reconsider is entered on the minutes, it need not be acted upon at that session, but it must be acted upon at the session following or it is lost.

Take from the Table. A motion to take from the table a question which lies there may be made at any time under the head of unfinished business. If adopted, it cannot be reconsidered; if lost, it can be reconsidered. It cannot be amended, is not debatable, and does not open the main question to debate.

Withdraw. A motion can be made to withdraw a motion which is before the house. Such a motion is undebatable, cannot be amended, and does not open the main question to debate.

Previous Question. If debate on any question becomes tiresome or is long drawn out, any member may rise and, when recognized, say, "I move the previous question." If this motion is seconded, the presiding officer says, "Shall the main question be now put? All those in favor manifest it by (usual sign). Opposed, by the same sign." If the vote on the previous question is in the affirmative, a vote on the main question shall follow immediately. If the vote on the previous question is in the negative, the discussion continues as if the motion on the previous question had not been made. The previous question takes precedence of all subsidiary motions except the motion to lie on the table. It is neither debatable nor amendable, and requires a two-thirds vote for adoption.

To Limit Debate. A motion to limit debate to a certain number of minutes for each person on each side may be made, if there is a tendency to prolong debate unnecessarily.

STANDING RULES

Standing rules are resolutions of a more or less permanent nature, which are binding until they are modified or rescinded.

PARLIAMENTARY INQUIRIES

Parliamentary inquiries are questions addressed to the presiding officer in order to ascertain the status of the business, the effect of a proposition, or the proper procedure at a particular time. Both the inquiry and the response of the chair are usually informal and no appeal can be taken from the "response of the chair."

READING PAPERS

When papers are laid before a formal body for action, every member has a right to have them once read before he votes on them. When a call is made for the reading of a paper on a question before the assembly, the presiding officer directs it to be read. Papers not on a question before the house can only be read with the consent of the assembly. Motions for the reading of papers cannot be debated.

FILLING BLANKS

Propositions are often introduced with blanks purposely left to be filled in by the meeting. These can be filled by suggestions without the formality of a motion if the assembly consents. If there is objection, action on these may be taken as on any amendment.

UNANIMOUS CONSENT

The decisions of a parliamentary body are usually ascertained by voting, but the judgment of the body may be ascertained in two ways: first by vote; second, by "unanimous consent," the latter method being employed particularly in matters of routine or on questions of little moment. In matters of ordinary routine, the presiding officer may say, "If there is no objection, (a certain thing) will be considered the action of the meeting," or "If there is no objection, I will (do a certain thing or appoint a committee, etc.)." If any member objects, the matter must be decided by a vote.

POINT OF ORDER

While the presiding officer should insist on conducting the affairs of an organization according to parliamentary rules, it frequently happens that he fails to do so. If the violation of order is a flagrant one or if, when continued, it would result in a procedure different from that which would result if the affairs were conducted according to rule, some member should rise to a point of order.

Regardless of who has the floor, any member may rise and, without waiting to be recognized, say, "Mr. President (or Mr. Chairman), I rise to a point of order." Hereupon, whoever is speaking should stop, and the presiding officer should say, "Please state your point of order." The member, in a calm, deliberate manner, should explain as briefly as possible why he regards the speaker as out of order or the procedure as not parliamentary. If the presiding officer agrees with the member, he says, "The point of order (or the contention) is sustained. The speaker will please yield the floor," or he will say whatever is necessary to halt the unparliamentary procedure. If the chair disagrees with the member and thinks the procedure in order, he says, "The point of order (or the contention) is denied. The speaker may continue," or he will say whatever is necessary to continue the procedure.

At this point the member who arose to a point of order, or any other member, may rise, and, without waiting to be recognized, say, "Mr. President (or Mr. Chairman), I appeal from the decision of the chair." Whereupon the presiding officer says, "Shall the decision of the chair stand as the decision of the assembly?" The question is now open for debate and may be discussed freely by any members. The presiding officer is at liberty to discuss this question without leaving the chair. At the conclusion of the debate a vote is taken in the same manner as on other questions. If the presiding officer is sustained, his decision stands. Otherwise, he yields to the wish of the majority and proceeds accordingly.

PRIVILEGED QUESTIONS

A privileged question, or motion, is one which, by reason of its importance when raised, demands immediate attention and decision, excluding for the time being any other business that may be before the house.

Types. There are five privileged questions: 1. To adjourn. 2. To fix the time to which the body shall adjourn. 3. To take a recess. 4. To call for the orders of the day. 5. To raise a question of privilege,

General Conditions. Privileged questions do not modify nor bear upon the main question, though they may be presented while the principal motion or other motions are being considered. They may be introduced at any time, and must be considered before any other subject or proposition that may be before the house.

Orders of the Day. Orders of the day are matters the consideration of which has been fixed for some particular day or time. This is done by a motion that the subject be made "the order of the day" for such a time, and the matter so assigned becomes the subject for consideration on that day or at that time. If several subjects are assigned for the same day they are called "orders of the day."

Questions of Privilege. Questions of privilege should not be confused with privileged questions in general. A question of privilege is a privileged question, but not all privileged questions are questions of privilege. Questions of privilege relate to the rights and privileges of the body, or of any of its members, and are of many kinds. Such, for example, are questions arising when charges are made against the official character of a member, when the proceedings are disturbed by members or strangers, or when an open window endangers the health or comfort of a member. Questions of privilege supersede all other questions, excepting the motions to fix the time to which to adjourn and to adjourn. If the question requires immediate action, a member who has the floor can be interrupted. A member rises, addresses the chair, and says, "I rise to a question of privilege." The procedure which follows is virtually the same as that outlined above under *Point of Order*.

ADDRESSING THE CHAIR

The term "chair" is a parliamentary form used in speaking of the person who presides at a formal meeting, and refers to the one who occupies the presiding officer's chair.

If a man occupies the chair, it is customary to say, "Mr. President (or Mr. Chairman)." If the chair is occupied by a woman, either married or single, it is customary to say, "Madam President (or Madam Chairman)." Similarly, whatever title the presiding officer bears may be used.

Having the Floor. A member is said to "have the floor" when he has been granted by the presiding officer the privilege of speaking to the members.

A MEMBER SPEAKS BUT ONCE

Except to clear a matter of fact or to explain himself in some material part of his speech, a member can speak but once on any motion or question before an organization. When all have spoken who wish to do so, a member may speak a second time if permitted by a majority vote of the assembly.

MEMBERS MUST VOTE

It is customary for every member who is in the room at the time the question is stated to vote, and for those not in the room at that time not to vote. It sometimes happens that, for special reasons, a member, by a majority vote of the others present, is excused from voting.

REQUIRED ATTENDANCE

Most legislative bodies have rules requiring attendance at important meetings. When a vote on some important measure is to be taken in either house of Congress, the party "whip" puts forth every effort to secure the attendance of all members of his party. Failing in this, he may appeal to the speaker who may send sergeants-at-arms to "arrest" the members and bring them to the meeting. Many organizations secure attendance through fines for absence or by dismissal after a certain number of absences.

MENTION OF NAMES IN DEBATE

In speaking before an assembly, no one is expected to mention by name a member then present. Instead, a member is identified by the location of his seat, or as the member who last spoke or last but one, or as one's opponent, if the occasion be a formal debate.

PAYING OUT MONEYS

No member of an organization has a right to spend money belonging to the organization or to contract debts against it unless he has been authorized to do so by some by-law or by a majority vote of the members. Organizations frequently, by a majority vote, authorize a member or a committee to expend money not to exceed a certain amount for some specified thing (possibly flowers).

Under no circumstances should accounts against an organization be paid unless a written bill is presented. These bills when paid should be receipted and kept as part of the secretary's or treasurer's permanent record. In most organizations the treasurer pays accounts only when he receives written orders to do so, signed by the secretary or by the president and the secretary. Before such orders can be drawn by the secretary or signed by the president, a majority vote of the members is necessary. Such vote usually takes the following form: A member rises and, when recognized by the chair, says, "I move that the secretary draw an order on the treasurer for seven dollars and sixteen cents in favor of Fisher and Co. for badges furnished (or in payment of bill rendered) June 22, 1923." See *Treasurer, Recording Secretary*.

DECORUM

Probably the most serious defect in most organizations is the lack of reasonable decorum. If business is to be transacted or a program is to be carried out, it is necessary that good order be maintained. While whispering need not be prohibited, it should be absolutely avoided while anyone is speaking from the floor. Common courtesy demands observance of this rule. From the time the gavel drops to call the meeting to order until it falls again, dismissing the assembly, loud talking and indiscriminate laughing should not be indulged in by any member. Such conduct interferes greatly with the progress of the meeting and conveys the impression of ill-breeding on the part of the offending member.

Permission to Withdraw from Meeting. No member of an organization should leave during the progress of a meeting unless he is formally excused by the presiding officer. Courtesy demands that any member wishing to leave should rise, address the chair, and, when recognized, courteously ask to be excused; or he should rise and say, "I rise to a question of personal privilege." In the latter case, the presiding officer says, "The member (or gentleman) will state his question of privilege." The member then courteously asks to be excused and may give briefly his reason. If the request seems reasonable, the presiding officer says: "The question of privilege is sustained. The member is excused."

If the absence of the member would reduce the number in the assembly to less than a quorum or would interfere with the progress of the meeting, the presiding officer should say, "The question of privilege is denied." In case of sickness, the member should, of course, be excused, and the assembly may if necessary take a recess or even adjourn. Where circumstances seem to demand it, in cases other than sickness, the member should be excused, even if such action forces an adjournment. Any member may appeal from the decision of the chair to the assembly, in which case the method of procedure is the same as appealing from the decision of the chair upon a point of order.

Recess. When the business under discussion at a meeting seems to demand an informal treatment, it is often wise to take a recess for a short time to allow members to move about and talk informally.

Manner of Speaking. In speaking from the floor, members should be very careful to maintain a calm attitude and a deliberate tone of voice, even though inwardly they may feel neither calm nor deliberate. Nothing so mars the dignity of a meeting as a retort from some member in a harsh or loud, angry voice. The deliberate speech is much more effective, and lends dignity to the meeting and respect to the speaker.

MEETINGS

Regular. Regular meetings are those fixed by the constitution or the by-laws or by the rules of the body.

Special. Special meetings are called in the interim between regular meetings. Due notice of such meetings, including the times and places, and the specific purposes for which such meetings are called, must be given to every member. The business of any special meeting is limited to the specific matters mentioned in the call.

Adjourned. When circumstances demand it, a regular or a special meeting may adjourn to some later time. In such a case the second meeting is known as an "adjourned meeting." An adjourned meeting has all the powers of the original meeting which was adjourned, and is a continuation of it, as though there had been no adjournment.

Quorum. A quorum is such a number of members of an assembly as must be present in order that business can be legally transacted. See *Constitution and By-Laws*.

Counting a Quorum. When the roll is called to ascertain whether a quorum is present, it sometimes happens that members refuse or neglect to respond to their names, when called, and the presiding officer doubts the accuracy of the record, if it shows less than a quorum present. In such cases, he may direct the clerk or secretary to count the members present. This procedure is called "counting a quorum."

VOTING

Various forms of voting are in use. The simplest and most common is the voice vote, in which those in favor say *aye* and those opposed say *no*. The chairman determines the result from the sound or volume of the voice. Other forms of voting are *raising the hands*, *rising*, *standing in different parts of the room*, *recording the yeas and nays*, and *by tellers*. The vote by rising or by standing in different parts of the room is known as a *division*.

Division. While the voice vote and the raising of hands are commonly used, neither is satisfactory, if the question is important and the vote close. If the chair is in doubt as to which side has it, he may call for a division or any form of voting by which he can determine the exact result. If the chair announces the result of the approximate vote, and a member in his own mind questions the decision of the chair, or thinks it uncertain, he can compel a further test. This he can do by rising and saying, "Mr. President, I call for a division of the house." Thereupon the chair calls for a division by asking those in favor to rise or to stand in a certain part of the room, while they are counted, either by the chair, by the secretary, or by tellers from both sides, appointed by the chair. When these have been counted and recorded, he calls for those opposed to rise or assemble and be counted, in like manner.

Yeas and Nays. When an important question is before an assembly and there is a desire to record how each member votes, any member present may rise and say, "Mr. President, I move that the yeas and nays be recorded on the question now before the house." If this motion is seconded and carried, the clerk or secretary calls the roll and records the votes of the members.

Ballot. Voting by ballot is a form of secret voting in which each member writes his decision on a piece of paper and deposits it in a common receptacle. After these ballots have been shaken up, so that the writers cannot be identified from the order of the ballots, they are counted by the tellers (usually in the presence of the members, but sometimes, for convenience, in a separate room).

Informal Ballot. By this method an expression of opinion upon a subject is secured from individual members without the formality of a definite motion upon the matter. Each member writes on a piece of paper his decision. The ballots are collected in a receptacle, are counted, and are classified. The result is announced to the assembly. It shows the opinions of members, but is not binding as a decision without some further action by the assembly.

Deciding Vote. If the presiding officer is a member of the assembly, he may vote on all questions. In oral voting, it is customary for him not to vote unless his vote will render or change a decision. If the vote is a tie, he may break the tie. If the vote lacks one of being a tie, he may make it a tie and thus defeat the measure. In voting by ballot, if the presiding officer does not vote before the ballots are counted, he cannot then vote without permission of the meeting. The principle of making and breaking a tie does not apply to a ballot vote.

Proxy. One is said to vote by proxy, who, though absent from the meeting, votes through another member who is present and who casts the vote of the absent member by virtue of a written authority called a proxy, signed by such absent member. Voting by proxy is allowed only when that right has been specifically given, either by public law or by the constitution or the by-laws of the particular society.

Kind of Vote Required. Unless the constitution, the by-laws, or the rules of the assembly specify otherwise, at least a majority vote is required on all questions. In important questions, such as amending the constitution or expelling a member or passing a law over the veto of the chief executive of a state or nation, it is customary to call for a vote greater than a majority. In most of such cases, a two-thirds vote is necessary, and, in rare cases, a three-fourths vote is required.

A *majority* is more than half the total number of votes cast. A candidate having more votes than any other of several rivals is said to have a *plurality*. See *Political Terms and Institutions*.

Unanimous vote means that all members vote on the same side of a question.

Pairing. In order that they may be absent from a meeting or that they may avoid having their names recorded in a yea and nay vote, two members, who have agreed to vote on opposite sides of some question, agree not to attend the meeting or not to vote if present. This practice is known as "pairing."

PROGRESSIVE ACTION ON MEASURES

Some bodies take only one vote upon a proposition, but other parliamentary bodies, such as Congress, with more time at their disposal, take several actions upon a measure before it is finally adopted.

First Reading. At the request of the presiding officer, the clerk or secretary reads the proposed measure in full, and the presiding officer states it by title. It may then be acted upon by passing it to a second reading, but it cannot be amended upon a first reading.

Second Reading. Regularly, the second reading must occur on another day than that of the first reading. It is done by the clerk, who then hands the measure to the presiding officer. The presiding officer, rising, states to the assembly the title of the bill; that this is the second time of reading it; and that the question will be whether it shall be committed or engrossed and read a third time. Upon vote, the bill may be ordered engrossed and passed to a third reading, or it may be referred to a special committee or to a committee of the whole.

Third Reading. After the bill has been approved by a special committee or by the committee of the whole, either with or without amendments, it comes before the assembly for final disposition. The assembly now decides whether the bill shall be engrossed and passed to a third reading. If the vote is favorable to this action, the measure is engrossed and read in full by the clerk. It is then passed to the presiding officer, who states the title and asks what action shall be taken on the bill. It is then before the house for final passage. Sometimes slight amendments are made to the measure after the third reading.

In some legislative bodies, bills are first read by title only; the second and third times they are read in full.

TABLE SHOWING PRECEDENCE OF MOTIONS

Motions rank in order as follows, the highest in rank being at the top of the list and the lowest at the bottom. When any one of these motions is pending, the motions above it in the list are in order, and those below are out of order. All of these motions require a majority vote, except the "previous question" and "extend limits of debate," which require a two-thirds vote.

Numbers 1 to 8, inclusive, are undebatable; 9 to 13, inclusive, are debatable. Numbers 1 to 5, inclusive, are privileged. Numbers 7 to 12, inclusive, are subsidiary.

1. Fix the Time to Which to Adjourn
2. Adjourn (when not qualified)
3. Take a Recess (when other business is pending)
4. Raise a Question of Privilege
5. Call for the Orders of the Day
6. Lie on the Table
7. Previous Question
8. Extend Limits of Debate
9. Postpone to a Certain Time
10. Commit or Refer
11. Amend
12. Postpone Indefinitely
13. A Main Motion

Answering More than 300 Questions in Parliamentary Procedure

	1	2	3	4	5	6	7	8
Explanation of the Table. Eight general rules appear in headings at the right. If a rule applies to a motion listed on the left, the letter "Y" is found under the rule and to the right of the motion. If a rule does not apply to a motion listed on the left, the letter "N" is found under the rule and to the right of the motion. A figure instead of the letter "Y" or "N" refers to a note of explanation below.	Amendable	Debatable	Must Be Seconded	Can Be Reconsidered	Requires Only a Majority Vote	Subsidiary Motions Can Be Applied	Debate Confined to Pending Question	Out of Order when Another Has the Floor
Adjourn	N	N	Y	N	Y	N	Y	Y
Adjourn (to a definite time or place)	Y	Y	Y	1	Y	N	Y	Y
Adopt or Accept a Report	Y	Y	Y	Y	Y	Y	Y	Y
Adopt Rules of Order, Constitutions, or By-Laws	Y	Y	Y	2	Y	Y	Y	Y
Adopt Standing Rules	Y	Y	Y	Y	Y	Y	Y	Y
Amend	Y	3	Y	Y	Y	Y	Y	Y
Amend an Amendment	N	3	Y	Y	Y	Y	Y	Y
Amend Rules of Order, Constitutions, or By-Laws	Y	Y	Y	2	4	Y	Y	Y
Amend Standing Rules	Y	Y	Y	Y	12	Y	Y	Y
Appeal (except relating to indecorum)	N	Y	Y	Y	Y	Y	Y	N
Appeal (relating to indecorum, etc.)	N	N	Y	Y	Y	Y	Y	N
Blanks, Filling	N	Y	N	Y	Y	Y	Y	Y
Commit, Recommit, or Refer	Y	Y	Y	5	Y	Y	Y	Y
Debate, To Close, Limit, or Extend	Y	N	Y	Y	N	Y	Y	Y
Division of the Assembly	N	N	N	N	Y	N	Y	N
Division of the Question	Y	N	6	N	Y	Y	Y	6
Fix the Time to Which to Adjourn	Y	7	Y	Y	Y	Y	Y	Y
Informal Consideration of a Question	N	Y	Y	2	Y	Y	Y	Y
Leave to Continue Speaking after Indecorum	N	N	Y	Y	Y	N	Y	Y
Lie on the Table	N	N	Y	N	Y	N	Y	Y
Main Motion or Question	Y	Y	Y	Y	Y	Y	Y	Y

TABLE OF RULES RELATING TO MOTIONS—Con.

Answering More than 300 Questions in Parliamentary Procedure

	1	2	3	4	5	6	7	8
Explanation of the Table. Eight general rules appear in headings at the right. If a rule applies to a motion listed on the left, the letter "Y" is found under the rule and to the right of the motion. If a rule does not apply to a motion listed on the left, the letter "N" is found under the rule and to the right of the motion. A figure instead of the letter "Y" or "N" refers to a note of explanation below.	Amendable	Debatable	Must Be Seconded	Can Be Reconsidered	Requires Only a Majority Vote	Subsidiary Motions Can Be Applied	Debate Confined to Pending Question	Out of Order when Another Has the Floor
Nominations, To Make	N	Y	N	N	Y	Y	Y	Y
Nominations, To Close	Y	N	Y	N	N	Y	Y	Y
Nominations, To Reopen	Y	N	Y	2	Y	Y	Y	Y
Objection to Consideration of a Question	N	N	N	2	8	N	Y	N
Order, Questions of	N	N	N	N	Y	N	Y	N
Order, To Make a Special	Y	Y	Y	Y	N	Y	Y	Y
Orders of the Day, To Call for	N	N	N	N	Y	N	Y	N
Order of the Day (when pending)	Y	Y	Y	Y	Y	Y	Y	Y
Parliamentary Inquiry	N	N	N	N	Y	N	Y	N
Postpone Definitely	Y	Y	Y	Y	Y	Y	Y	Y
Postpone Indefinitely	N	Y	Y	9	Y	Y	N	Y
Previous Question	N	N	Y	10	N	N	Y	Y
Privilege, To Raise Question of	N	N	N	N	Y	N	Y	N
Privilege, Questions of (when pending)	Y	Y	Y	Y	Y	Y	Y	Y
Reading Papers	N	N	Y	Y	Y	N	Y	Y
Recess, To Take a (when privileged)	Y	7	Y	N	Y	Y	Y	Y
Reconsider	N	3	Y	N	Y	Y	11	N
Rescind or Repeal	Y	Y	Y	2	2 13	Y	N	Y
Substitute (same as Amend)	Y	Y	Y	Y	Y	Y	Y	Y
Suspend Rules	N	N	Y	N	N	N	Y	Y
Take from the Table	N	N	Y	N	Y	N	Y	Y
Take up a Question out of its Proper Order	N	N	Y	N	N	N	Y	Y
Voting, Motions Relating to	Y	N	Y	Y	Y	Y	Y	Y
Withdraw a Motion, Leave to	N	N	N	2	Y	N	Y	Y

1. Cannot be reconsidered until after some business has intervened.
2. An affirmative vote on this motion cannot be reconsidered.
3. Not debatable when the motion to be amended or reconsidered is not debatable.
4. Before adoption, a majority vote. After adoption the vote named in rules of order, constitution, or by-laws, usually a two-thirds vote.
5. Cannot be reconsidered after the committee has taken up the subject, but by two-thirds vote the committee, at any time, may be discharged from further consideration of the question.
6. If resolutions or propositions relate to different subjects which are independent of each other, they must be divided on request of any member, which can be made when another has the floor. If they relate to the same subject and yet each part can stand alone, they must be divided only on a regular motion and vote.
7. Not debatable if made when another question is before the assembly.
8. Objection can be made only before debate begins. A two-thirds vote must be opposed to the consideration in order to sustain the objection.
9. A negative vote on this motion cannot be reconsidered.
10. Cannot be reconsidered after a vote has been taken under it.
11. Opens main questions to debate when those questions are debatable.
12. Standing rules may be amended at any time by a majority vote if previous notice has been given, or by a two-thirds vote without notice.
13. Rescind is under the same rules as to amend something already adopted. See *Note 4*.

ORDERS, SOCIETIES, AND ORGANIZATIONS

THE following section contains brief accounts of a few of the numerous orders, societies, and organizations existing in America and elsewhere. The list includes organizations devoted to fraternal, scientific, charitable, religious, patriotic, or other purposes.

The number of such societies in existence is extraordinarily great; consequently it is impossible, within a limited scope, to deal with all of them. The ones selected for special treatment, however, are prominent among the societies regarding which detailed and authentic information will be found of value to the greatest number of people.

Academy of Arts and Letters, American. This distinguished body owes its foundation to the action of the American Social Science Association, which, at its annual meeting of 1898, nominated a small group of noted authors and artists to constitute the National Institute of Arts and Letters. Membership in this body was at first restricted to one hundred fifty, but later was increased to two hundred fifty. Eligibility for membership was conditioned on distinguished attainment in literature or in the fine arts. In the course of six years the membership of the institute had grown to embrace a large proportion of the most eminent writers and artists in the United States. Corresponding members from foreign countries were chosen for the first time in 1929.

In 1904 the institute proceeded to organize the American Academy of Arts and Letters. Seven members of the institute were elected founding members of the academy, and these were authorized to choose from the membership of the institute eight additional members of the academy. The fifteen members then proceeded to choose five more, and the twenty in turn selected an additional five. This method of selecting members of the academy from the larger membership of the institute was continued until the entire membership of the academy, limited by its constitution to fifty, had been chosen.

The original seven members of the academy were William Dean Howells, the novelist; Edmund Clarence Stedman, the poet; Samuel Langhorne Clemens, the humorist; John Hay, the author and statesman; Augustus Saint-Gaudens, the sculptor; John LaFarge, the painter; and Edward Alexander MacDowell, the composer.

In 1916 the organization received a national charter from Congress. Vacancies are filled by vote of the members, at the annual meetings of the academy. The academy occupies a permanent home at 633 West 155th street, New York City.

Academy, French. This famous honorary society of letters was founded by Cardinal Richelieu in 1635. The cardinal's purpose was to enlist the service of a group of literary men in developing and purifying the French language. The academy enjoyed great prestige down to the French Revolution, when it was suppressed. It was revived, however, in 1795, as the principal branch of the newly created Institute of France. The academy is restricted to 40 members, "the immortals." Vacancies are filled through election by the remaining members.

The most important work of the academy has been the publication, in several editions, of a dictionary of the French language. Out of the income of certain trust funds, the academy each year grants various prizes to persons notable for "virtuous and laborious lives," as well as prizes for literary works most serviceable to morality. The academy shares with the other branches the policy of appointing correspondents, some of whom are foreigners.

Alcoholics Anonymous. A movement dedicated to curing persons afflicted with alcoholism, in which ex-alcoholics help alcoholics to recover. The core of the procedure is spiritual, but no particular form of organized religion is advocated. The Alcoholic Foundation in New York, organized in 1938, is the general service headquarters of the movement. There are 3000 groups of Alcoholics Anonymous throughout the world.

Alliance Française, Federation de L'. An association of local groups, clubs, and societies in the United States and Canada, formed in 1902 for the purpose of encouraging the study of the language, literature, art, and history of France. A large portion of the federation's membership is composed of students and teachers in schools and colleges. The federation holds general annual meetings, and, under its auspices, lecturers, particularly French men of letters, visit the local groups.

Altrusa International. The first service club for executive and professional women. Its ideals are patriotism, efficiency, and service. Only one representative of each occupational classification of business or profession in a community can hold membership. The idea is that business and professional women shall put their united strength into local civic development. The first club was organized in Nashville, Tennessee, in 1917.

American Legion. A patriotic, nonmilitary, nonpartisan organization to which all those who served honorably in the armed forces of the United States during the World War are eligible for membership. The society originated at a meeting of about 1000 officers and enlisted men of the A. E. F., held at Paris, France, in March 1919. As a result, a committee of fifteen returned to the United States to promote the organization among the men at home. A preliminary convention was held at Saint Louis, Mo., May 1919; the society was incorporated by act of Congress, September 16, 1919; and the first regular convention was held in November 1919.

The objects of the association are: to preserve the memories of the members' association in the World War; to uphold and defend the Constitution of the United States; to maintain law and order; to foster and perpetuate a 100 per cent Americanism; to combat autocracy whether of the classes or the masses; to make right the master of might; to promote peace and good will on earth; to safeguard and transmit to posterity principles of justice, freedom, and democracy; to inculcate a sense of individual obligation to the community, state, and nation; and to sanctify the comradeship of the war by mutual helpfulness.

Local units of the order, known as "posts," are organized into departments, one for each state and territory, the District of Columbia, Alaska, the Canal Zone, the Philippine Islands, Canada, Mexico, and continental Europe. National headquarters is at Indianapolis, Ind. The American Legion Auxiliary, having similar aims, is open to the wives, sisters, mothers, and daughters of Legion members and of deceased World War veterans. As of 1947, membership of the Legion was 3,019,002, and of the Legion Auxiliary, 924,621.

Army and Navy Legion of Valor. A patriotic society organized in 1890, to which anyone is eligible who has received a medal of honor or the distinguished service cross of the United States.

Association for the Advancement of Science, American. The leading scientific society in America. It was organized under its present title in 1847, being an outgrowth of the original Association of American Geologists, which was founded at Philadelphia in 1840. It meets each summer in 11 sections devoted to the following departments of science: mathematics and astronomy; physics; chemistry; mechanical science and engineering; geology and geography; zoology; botany; anthropology and psychology; social and economic science; physiology and experimental medicine; and education. During the past half century, the names of practically all the leaders of science in America have been on the roll of this association.

Audubon Societies, National Association of. Named in honor of John Audubon, pioneer ornithologist and painter of birds, this endowed association has for its principal object the protection of wild birds. It was the outgrowth of a movement begun in 1886 by George B. Grinnell, then editor of *Field and Stream*. Activities of the organization have ranged from the forming of bird study classes for children to the promotion of legislation making it a misdemeanor to trap, snare, or kill non-game birds. It has also encouraged the establishing of government reservations in which breeding colonies of birds are protected from molestation. *The Audubon Magazine*, published by the national society, continues the tradition of the earlier periodical *Bird Lore*.

Baptist Youth Fellowship. A religious organization in which are united many of the young people's societies that are connected with Baptist churches in the United States and Canada. It was organized in 1941.

Benedictines. The general name of the monks living under the rule of Saint Benedict. The order spread from the monastery founded by Saint Benedict at Monte Cassino, Italy, about the year 529. The vows of the monks were originally three—to remain at the monastery, to labor till death in order to attain perfection, and to obey their superiors.

In the 10th century, the abbey of Cluny in southeastern France became the virtual head of the Benedictine monasteries, which so increased throughout Europe that, in the 15th century, they numbered about 37,000. The order was the chief agent in the preservation of art and literature during the middle ages, and Benedictine vows were taken by many of the greatest figures of the time, including Hildebrand, Bede, Alcuin, and Anselm.

The first congregation of the Benedictines in the United States came from Bavaria in 1846 and was established in 1855 as Saint Vincent's priory, Latrobe, Pa. There are now about 700 Benedictine monasteries in the world.

B'nai B'rith, Independent Order of, or **Sons of the Covenant.** A Jewish fraternal organization, founded in New York City in 1843 by a group of German Jews headed by Henry Jones. It has for its object the development of morality and of the principles of charity, benevolence, and brotherly love among its members. The subordinate bodies are called lodges; the governing bodies, grand lodges.

Boy Scouts of America. An organization having a membership of approximately 5 million, comprising three age groups: Cubs, 8–10; Scouts, 11 through 17; and Explorers, high school age. Its object is the mental, moral, and physical training of its members so that they may become good citizens and live up to their motto, "Be Prepared," and their slogan, "Do a Good Turn Daily."

Cub Scouts meet week after week in home-centered "dens" under the supervision of their Den Mother and Den Chief. The Cub Scout den is a small neighborhood group of boys who like to be together and who are learning to get along together through joint participation in planned activities. Because the Cub Scout's parents work with him on his achievements, home life is built more solidly and family teamwork is enriched.

A Scout troop is made up of several patrols of six to eight Scouts. A Scoutmaster selected by a troop committee of three or more men is in charge of the troop, which is operated by some institution, such as a school or a church. The organization is administered by the national council, working through an executive board. The president of the United States is honorary president.

Every boy who joins the Boy Scouts of America promises, 'On my honor I will do my best to do my duty to God and my country, and to obey the Scout law; to help other people at all times; to keep myself physically strong, mentally awake, and morally straight." The pledge of allegiance to the flag, in the revised form adopted June 14, 1954, is as follows:

"I pledge allegiance to the flag of the United States of America and to the republic for which it stands, one nation under God, indivisible, with liberty and justice for all."

The Scout law states that a Scout is trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, and reverent. There are three classes of Scouts: Tenderfoot, Second Class, and First Class. Succeeding ranks, of Star, Life, and Eagle Scout, are attained by the acquirement of a specified number of merit badges, each of which denotes recognized accomplishment in some special branch of activity. Awards are also made for life-saving by a national court of honor. A large proportion of Scouts spend a week or more in camp each summer.

The Boy Scout movement was originated in England by Sir Robert Baden-Powell. The Boy Scouts of America was incorporated February 8, 1910, and was chartered by an act of Congress on June 15, 1916. The organization is nonmilitary and nondenominational. The first international meeting, or jamboree, was held in 1920 at London. National jamborees are held in the United States every four years.

The national office, which serves the more than 132,000 Scout units in the United States, is located at New Brunswick, New Jersey.

Brotherhood of American Yeomen. A fraternal, beneficiary society organized in 1897, with headquarters at Des Moines, Iowa. Accident, sickness, and death benefits are paid to members or their beneficiaries. The governing body acts through a board of five directors.

Brotherhood of Saint Andrew. A religious society of laymen connected with the Protestant Episcopal Church, founded in Saint James parish, Chicago, in 1883. The unit of organization is the local chapter. The headquarters of the association is at Boston. A corresponding society of women is known as the Daughters of the King.

Camp Fire Girls. An organization which provides a leisure time program for girls based on the following seven interests, or "crafts": home, hand, health, nature lore, camping, business, and citizenship. By awarding "honors" for progress in these crafts, the organization encourages its members to develop their natural aptitudes, to enjoy and be at home in the out-of-doors, and to meet cheerfully the responsibilities of home and community life.

Any group of girls ten years of age or over may form a Camp Fire under the leadership of an older friend. Interest is fostered particularly in American Indian arts and crafts. Each girl chooses for herself an Indian name symbolic of her aspirations. Every year the national organization announces a "project," which is designed to emphasize some phase of the program. Examples of these projects are Indian lore, tree planting, international friendship, home decoration, and hobbies.

The organization was founded in 1910 by a group of men and women, headed by Dr. and Mrs. Luther Gulick, interested in recreation for girls.

Catholic Knights of America. The first Roman Catholic fraternal organization in America. It was founded at Nashville, Tenn., in 1877, with the primary object of providing male Roman Catholics between the ages of 18 and 45 with the intellectual, social, and business advantages of a fraternal, mutual life insurance association. Since 1901, Catholic women have been eligible to membership. The executive authority is held by the supreme council, with headquarters in Saint Louis, Mo.

Christian Endeavor. A religious society founded February 2, 1881, in Williston Congregational

church of Portland, Me., by the Rev. Francis E. Clark. Its purpose is distinctly religious, and the full privileges of membership are extended to any society that belongs to an evangelical church and adopts the name and pledge of the organization. The pledge includes an agreement to be a regular attendant at the weekly prayer meeting which is conducted by each local society. The organization extends to more than 60 countries and is sponsored by more than 80 religious denominations.

Cincinnati, Society of the. A patriotic, memorial society organized by the officers of the Continental army at their last encampment, May 13, 1783. The first meeting was held in the Verplanck house, the headquarters of Baron Steuben, on the Hudson river, near Fishkill. As the officers were leaving the army to return to their farms, they named their society after Lucius Quinctius Cincinnatus, who left the plow to become dictator of Rome and returned to his farm when the civil emergency had passed. Membership in the society was declared to be hereditary. Washington, the first president general of the society, held this position until his death. Hereditary members now number about 1000.

Colonial Dames of America, National Society of the. An ancestral and patriotic society of American women, founded May 19, 1892. Its objects are to preserve colonial history and relics and to encourage patriotism. To be eligible, a woman must be a descendant of an ancestor who settled in America before 1750 and who rendered important service to the colonies. The valuable collection of historical relics in the old Van Cortlandt manor house in New York City is under the control of the New York branch of the society.

Confederate Veterans, United Sons of. A patriotic society organized in 1896 at Richmond, Va., for the purpose of cultivating friendship among its members, collecting material for an accurate history of Confederate activities, perpetuating the memories of Confederate veterans, and giving aid to their widows and orphans. Membership is confined to the male descendants of veterans who served actively in the Confederate cause.

Daughters of the American Revolution. A patriotic society of women, organized at Washington, D. C., in 1890, and incorporated by act of Congress in 1896. The objects of the society are: to perpetuate the memory of the spirit of those who achieved American independence; to promote institutions for the diffusion of knowledge; to cherish, maintain, and extend the institutions of American freedom; to foster true patriotism; and to aid in securing for mankind the blessings of liberty. Membership is open to women, one or more of whose ancestors gave active aid in the establishment of American independence.

The society has its own headquarters building, the Memorial Continental Hall, in Washington, D. C. Delegates from local chapters meet in annual convention at Washington during the week in which April 19 occurs.

Daughters of the Confederacy, United. A woman's patriotic society, organized at Nashville, Tenn., in 1894. Membership is open to mothers, sisters, daughters, wives, widows, or direct female descendants of those who served in the Confederate army or navy or who personally aided the Confederate cause. Local branches are called chapters; the state organization is known as a division.

Daughters of the Revolution. A patriotic, hereditary society of women, founded at New York in 1891, largely by a group which withdrew from the Daughters of the American Revolution because they wished to have more stringent eligibility requirements. The objects are very similar to those of the older society. Membership is open to women one or more of whose direct ancestors actively assisted in the American Revolution and thus became liable to conviction for treason against Great Britain.

Deaconesses. The name applied, in the early Church, to groups of women to whom certain charitable and educational work was assigned. Usually, only women who were widows of one husband and had borne children could be appointed deaconesses. In the Roman Catholic Church, the sisterhoods gradually displaced the deaconesses, although the latter survived as orders in the Greek Church until the 12th century. In the 19th century, the deaconess function was revived among Protestants, especially in the Episcopal and the Methodist Episcopal churches. The deaconesses conduct orphanages, hospitals, and schools, and assist in parish work.

Dominicans. A Catholic religious order founded in 1216 by Saint Dominic for the purpose of reclaiming heretics and ministering to the spiritual needs of the poor and ignorant. The organization includes the order of the preachers, sometimes called black friars from the black outer mantle of their uniform; the Dominican sisters, an order of nuns; and the brothers of penitence, which is open to men and women married and following secular pursuits. The order of the preachers numbers about 5000 fathers, of whom approximately 350 are in the U.S.

De Molay, Order of. A fraternal organization open to young men of good character between their 14th and 21st birthdays. An initiatory degree is conferred, which is dramatic and historical in character memoralizing the martyrdom of Jacques De Molay (1244-1314), the last grand master of the Knights Templar. Headquarters are at Kansas City, Mo. The order was founded by Frank S. Land in 1919.

Eastern Star, Order of the. A charitable and benevolent association to which only master masons, their mothers, wives, widows, sisters, and daughters are eligible. It was originated by the poet Robert Morris about 1850, and, in 1868, it was revised to approximately its present form by Robert Macoy.

Elks, Benevolent and Protective Order of. A fraternal organization founded in New York City in 1868 from an older society composed chiefly of members of the theatrical profession and known as the Jolly Corks. White, male citizens, 21 years or more of age, are eligible for membership. Only one lodge is established in any city, and the city must have a population of at least 5000. Each year, on the first Sunday of December, a memorial service is held for the deceased members. The organization has been noted for its response in time of calamity.

Epworth League (Methodist Youth Fellowship). A society of young people founded May 15, 1889, for the purpose of promoting Christian living according to the standards of the Methodist Episcopal Church. Following the unification of Methodist churches in 1939, the scope of the organization's activities was broadened and the new name, "Methodist Youth Fellowship," was adopted.

Foreign Wars of the United States, Military Order of. A hereditary, patriotic, military organization instituted December 27, 1894. Membership is open to commissioned officers of the United States army who have served in wars against foreign powers, and to their direct lineal descendants. The order stands for defense against foreign aggression.

Foresters, Orders of. A group of benevolent and beneficent fraternal orders founded on the history and tradition of the English royal forests, especially in connection with the story of Robin Hood and his followers. The first authentic records of the society, known originally as the Royal Order of Foresters, were made at Leeds, England, in 1813. Division in the ranks of the Royal Foresters led, in 1834, to the formation of the *Ancient Order of Foresters*, which eventually superseded the Royal order. The society was introduced into America at Philadelphia, 1832.

All American "courts" held allegiance to the high court of the ancient English order until 1874, when several bodies seceded to form the *Independent Order of Foresters*. This was later reorganized in

Canada, largely under the direction of Dr. Oronhyetkha, a Mohawk Indian. Membership of women is provided for by the Miriam degree, and a uniformed grade or rank is known as the knights of Sherwood forest.

In 1889, another dissatisfied American group separated from the Ancient order and assumed the name of Ancient Order of Foresters of America, which, in 1895, was changed to *Foresters of America*. The uniformed grade of this society is called the Glenwood degree.

Four-H Clubs (head, heart, hands, and health), whose members are rural young folk from 10 to 21 years of age, are part of the educational extension program in agriculture and economics directed by the U. S. department of agriculture and state colleges of agriculture. Organized in 1914, the clubs, with a membership of 2,000,000 boys and girls, are under the supervision of county extension agents and voluntary workers.

Franciscans. The name applied to three religious orders instituted by Saint Francis of Assisi in the 13th century. These are the Friars Minor, the Poor Clares, and the Third Order, or Brothers and Sisters of Penance. The first-named is the original society and the order commonly known as the Franciscan. The Franciscans have devoted themselves particularly to missionary and educational work. Franciscan fathers who accompanied Columbus in 1493 established convents on the island of Haiti. Missions of the order which were founded by Father Junipero Serra in California in the 18th century are famous. The order now conducts numerous missions and several colleges in the United States.

The Poor Clares is the oldest of the several Franciscan orders for women, having been established in 1212, when Saint Clare adopted the religious life under the teaching of Saint Francis.

Future Farmers of America (FFA). An organization for the welfare of farm boys, 14 to about 21 years of age, who are studying vocational agriculture in public secondary schools. Organized in 1928, it has a membership of about 380,000.

Garter, Order of the. The highest order in Great Britain, and one of the oldest of European orders of knighthood. The date of its institution has been fixed approximately between the years 1346 and 1348, in the reign of Edward III, although the precise occasion of its inception is still obscure. Membership in the order is restricted to 25 knights companions, the original number, and the British sovereign, who is the permanent head of the order. However, royal princes are admitted as supernumerary members, and the distinction is frequently conferred upon foreign sovereigns. Until the reign of Edward VI, the order was known as the Order of Saint George, and the badge bears the figure of the saint on horseback fighting the dragon. The emblem is a garter of dark blue ribbon edged with gold, bearing the motto, *honi soit qui mal y pense*, "shame to him who thinks evil of it."

Girl Scouts. An organization of girls, very similar to, and based on, that of the Boy Scouts. It was founded in England by Sir Robert Baden-Powell, originator of the Boy Scouts, and is known in British countries as the Girl Guides. The name Girl Scouts was adopted in America in 1915 by an organization founded in 1912 at Savannah, Ga., by Mrs. Juliette Gordon Low (1860–1927), and previously known as Girl Guides.

Girls from 10 to 18 years of age may become Girl Scouts. There is also a younger group for girls between 7 and 10 called the Brownies. On reaching the age of 10, a Brownie becomes an intermediate Girl Scout, and at 14 or on entering high school a senior Girl Scout. The local unit is the troop which may be divided into patrols. Each patrol chooses its own leader. A troop is led by an adult.

The badge of a girl scout is the trefoil, the threefold division of which reminds her of her three promises: to do her duty to God and her country; to help other people at all times; and to obey the scout law. This law, as well as the motto, "Be Prepared," is the same as that of the Boy Scouts.

Good Templars, International Order of. A fraternal society having for its object the promotion of total abstinence from the use of alcoholic beverages, and of universal prohibition of the manufacture and sale of such products. Membership is unrestricted by age, sex, or color. A committee appointed by the governing body of the society inaugurated the Prohibition party in 1869. In 1874, Good Templar women founded the Woman's Christian Temperance Union.

Grand Army of the Republic. A patriotic society of former soldiers and sailors who served honorably in the Union forces during the Civil War, or who were members of state militia on active duty and subject to national call at that time. The first local group or post of the G. A. R. was established at Decatur, Ill., April 6, 1866. The society continued to grow until 1890, when the membership became 408,489. The final encampment was held in 1949, and the last survivor, Albert Woolson of Duluth, died in 1956 at the age of 109.

Hibernians, Ancient Order of. A fraternal, beneficiary society of men of Irish birth or descent who are of the Roman Catholic faith. The order originated in Ireland, and was introduced into America at New York City in 1836.

Holy Name Society, The. An important religious factor in the life of Catholic men in the United States. Its origin dates back to the Council of Lyon, 1274, which decreed that the faithful have a special devotion to the Name of Jesus and that reparation be offered for insults to that Name by unthinking men. Gregory X, the Roman pontiff of that period, selected the order of St. Dominic to preach the devotion. Under the direction of John of Vercelli, master-general of the Dominicans, the society was formed and spread to every nation in Europe before the close of the 16th century.

Owing to a lack of documents it is impossible to determine at what time this society was introduced into the United States. The apostle of the devotion to American Catholic manhood is generally accepted as the Very Rev. Charles H. McKenna, O. P., who was assigned to Holy Name work in 1871. In his missionary travels he established a large number of branches and rekindled the enthusiasm of members wherever it existed. To him goes a large share of the credit of propagating the Holy Name Society, which numbers more than three million Catholic men.

The purpose of the society may be summed up in one sentence used by Pope Gregory in writing to John of Vercelli, requesting him to spread devotion to the Name of Jesus among Catholic men: "We have judged it proper to persuade the faithful to demonstrate more reverence for that Name above all Names, the only Name in which we claim salvation—Jesus Christ who has redeemed us from the bondage of sin."

Honor, Legion of. A French order founded by Napoleon Bonaparte in 1802, for the purpose of recognizing and rewarding distinguished service in military and civil life. As constituted by Napoleon in 1804, after he had become emperor, the order comprised a grand master, which capacity the emperor assumed, 7 grand officers, 20 commanders, 30 officers, and 350 legionaries. The rank of grand eagle, now grand cross, taking precedence of grand officer, was added in 1805. The order was displaced at the Restoration (1815) but was reinstated in 1830 in its unique position as the only French order. The president of the republic is now the grand master. The grades are, (1) grand cross; (2) grand officer; (3) commander; (4) officer; (5) chevalier.

Admission to the legion of honor is, in peace time, based upon distinguished services continued through

20 or 25 years, although, in extraordinary circumstances, this condition may be waived. Promotion to one of the higher ranks is granted only upon completion of a certain period of years in a lower grade. *Légionnaires* who have served in the French army or navy receive small pensions, according to their rank in the legion. Loss of French citizenship involves forfeiture of membership. Women, notably Madame Curie, have been admitted. For unusual service, foreigners are accorded membership. The badge of the chevalier of the legion, when worn by a civilian or by a military or naval officer in civilian clothes, is a red watered ribbon fastened in the left lapel of the coat. For the higher grades, the badge is a red rosette.

Jesuits or **Company of Jesus.** A religious society of the Roman Catholic Church growing out of the work of Ignatius Loyola. It was formally incorporated by the pope in 1540. Its motto is Ad Maiorem Dei Gloriam (A. M. D. G.), "To the Greater Glory of God." The members pledge themselves to poverty, chastity, obedience, and willingness to go as missionaries wherever the pope may send them.

Novices are required to spend 18 years in preparation for admission to the order. This preparation consists of meditation, a thorough and wide course of study, and a strict regimen. Only those who have completed this 18-year preparation and have taken the four solemn vows are eligible to be generals or other high officials of the order.

The influence of the order spread rapidly. In the middle of the 18th century, it had 700 colleges with an enrollment of about 300,000 students, including many in China, Japan, Mexico, and Brazil. The attachment of the Jesuits to the papacy caused strained relations between the papacy and various Catholic nations, and the result was that, in 1773, the pope issued a bull suppressing the society. In 1814, the order was completely rehabilitated by papal order. The Jesuits now number 29,333.

Junior Achievement, Inc. Through this movement groups of high school boys and girls are sponsored by private industry and are provided with everything needed, from stock certificates to special advisers, to enable them to go into business on a small scale. Having started on a local basis at Springfield, Mass., in 1919, it has become a nationwide organization. Private industry sponsored about 4500 teenage groups in 1962. National membership exceeds 70,000 and covers approximately 300 communities in 45 states.

Kiwanis International. The international association has general supervision of Kiwanis clubs everywhere. Each club is composed of business men, usually two representatives from each occupation in a community, who are particularly interested in civic and social service. Major objects are to emphasize human rather than material values; to encourage the adoption of higher business standards; to develop more intelligent citizenship; and to promote better understanding between people of various communities. The motto of Kiwanis is "We Build."

The first Kiwanis club was organized in Detroit, Mich., in 1915. The international organization was formed in 1917.

Knights of Columbus. A fraternal beneficiary society of Roman Catholic men, organized under a charter granted by the state of Connecticut, March 29, 1882. The membership is divided into two classes,—insurance and associate. Insurance policies are issued to members of the first class between the ages of 18 and 60. Associate members are those who do not make use of the insurance feature. In addition to the insurance of members, the society is devoted to the promotion of charity and vocational education. Applicants for membership must subscribe to being opposed to Socialism as an economic system. Subordinate bodies of the order are known as councils; the governing body is the supreme council. The ritualistic work leading to full membership consists of four degrees.

Knights of Pythias. A social brotherhood founded at Washington, D. C., February 19, 1864, by Justus Henry Rathbone and four others, to promote the principles of friendship, charity, and benevolence. The fundamental tenets of the order are "toleration in religion, obedience to law, and loyalty to government." Accepted candidates are advanced through the three ranks or degrees of page, esquire, and knight. Local bodies are known as lodges; the governing body is the supreme lodge.

League of Women Voters, National. This organization of American women is an outgrowth of the National American Woman Suffrage Association, the specific object of which had been accomplished by the passing, in 1920, of the woman suffrage amendment to the Federal Constitution.

At the time of its founding, in 1921, the League chose a jury of prominent women who were requested to select, from nominations made by the League, the most noted living American women in each of twelve important departments of activity. The selection, made public in 1924, consisted of the following names: Jane Addams, Cecilia Beaux, Annie Jump Cannon, Carrie Chapman Catt, Anna Botsford Comstock, Minnie Maddern Fiske, Louise Homer, Julia Lathrop, Florence Rena Sabin, M. Cary Thomas, Martha Van Rensselaer, and Edith Wharton.

From its temporary task of urging women to use their newly-won franchise, the League soon entered upon a continuing activity in accordance with its purpose to promote education in citizenship, efficiency in government, and international cooperation for the prevention of war.

Lions International. The International Association of Lions Clubs was founded in 1917 by Melvin Jones. The Association included, in 1950, 8500 clubs in 19 countries, with about 430,000 members. It is nonpolitical and nonsectarian. Its purpose is the cultivation of a spirit of good fellowship and cooperation among its members and the direction of their organized efforts toward useful social service. Its objectives include civic improvements, citizenship, patriotism, education, sight conservation, and aid to the blind. The motto is "Liberty, Intelligence, Our Nation's Safety," the initial letters forming the word "Lions."

Loyal Legion, Military Order of the. A hereditary, patriotic organization composed chiefly of commissioned officers of the United States army, navy, or marine corps who served during the Civil War, and of their direct male descendants. The order had its beginning in 1865 at a meeting of officers of the army and navy, held on April 15, 1865, the day following the assassination of President Lincoln. Its objects are: to strengthen the ties of fraternal fellowship and sympathy formed by companionship in arms; to care for and relieve the widows and orphans of deceased companions of the order; and to promote the welfare of U. S. soldiers and sailors.

Luther League of America. A national organization having for its purpose the unification of the young people's religious societies that are connected with the Lutheran churches in America. It was founded at Pittsburgh, Pa., in 1895. The motto is "Of the Church, by the Church, for the Church."

Maccabees, The. A secret, fraternal, mutual assessment beneficiary society, organized at London, Ontario, in 1878 by the members of the Order of Foresters. The organization was incorporated in Michigan, June 11, 1881, and later became known as the Knights of Maccabees of the World. It is founded on the tradition of the followers of Judas Maccabeus, as given in several of the apocryphal books of the Old Testament. The Maccabees provide life, health, accident, and disability insurance for their members. Subordinate bodies are known as tents, while the lawmaking body is the supreme tent.

The Woman's Benefit Association of the Maccabees is an entirely independent organization.

Masons, Free and Accepted. A secret, fraternal organization which claims a very remote origin and seems to have descended from the craft guilds of operative masons that existed in the medieval period. Speculative masonry as known today dates from June 24, 1717, when four of the old lodges united at London, to form the Grand Lodge of England. Masonry was introduced into America about 1730.

The basic unit of the order is the lodge, wherein are conferred the three degrees of entered apprentice, fellowcraft, and master mason. In the United States and Canada, two systems of higher degrees, known as the York rite and the Ancient Accepted Scottish rite, are open to master masons. The degrees or grades of the York rite are conferred progressively by three distinct bodies,—the chapter, the council, and the commandery of Knights Templars. The Scottish rite, which was developed into a rite of 33 degrees at Charleston, S. C. in 1801, is organized into separate bodies called lodges, councils, chapters, and consistories. These confer the degrees up to and including the 32d. The 33d, and last, degree is restricted to active and to honorary members of the governing body known as the supreme council.

Merit, Order for, *Ordre pour le mérite.* Among the European distinctions based upon achievement, this German order is one of the most highly prized. It was the only distinction accepted by Thomas Carlyle. The order was founded in 1667 by Prince Frederick, later Frederick I of Prussia, with the name Order of Generosity. Frederick the Great gave it the present title as a civil and military order in 1740. The peace class for recognition of meritorious service to art or science, was founded in 1840 by Frederick William IV. The numbers are restricted to 30 German and 30 foreign members.

Moose, Loyal Order of. A secret, beneficiary, fraternal society founded in 1888 at Louisville, Ky., by Dr. J. H. Wilson. The society aims to furnish the advantages of fraternal membership without the necessity of accepting life insurance or of pledging to any particular cause. The society maintains a home and vocational school for needy members and their orphans at Mooseheart, near Aurora, Ill.

Odd Fellows, Independent Order of. A secret, fraternal, beneficiary society, founded in England sometime during the second quarter of the 18th century. A grand lodge of Odd Fellows for England was formed at London in 1803. In 1809 a subordinate lodge at Manchester successfully declared itself independent of the grand lodge, and, as the Independent Order of Odd Fellows, Manchester Unity, constitutes today the largest English branch.

Thomas Wildey is considered to have been the founder of the society in America, although other lodges are known to have existed before Wildey came to the United States. In 1819, Wildey and other English associates organized a lodge of Odd Fellows at Baltimore, which received a charter from the Manchester Unity. In 1843 the American order declared its independence of the older society.

Three degrees are conferred in lodges of Odd Fellows. Those who have received the third degree are eligible to membership in an encampment, where three further degrees are conferred. A uniformed degree of the order, known as the patriarchs militant, is open only to those who have received the royal purple degree of an encampment. The Rebekah degree for women members was established in 1851.

Optimist International. A men's service club organization, one of the principal objects of which is service to youth in line with the slogan "Friend of the Boy." It believes that the security of the nation depends upon the youth of today, and emphasizes citizenship training and sportsmanship in its youth program. First organized in Buffalo, N. Y., in 1911, there are now some 100,000 members in 2,000 clubs, of which a high percentage are in the United States.

Phi Beta Kappa. This honorary college fraternity in the United States is the oldest of the Greek-letter fraternities. Its title consists of the names of the initial letters of the three Greek words φιλοσοφία βίου κυβερνήτης, "philosophy the guide of life". Active membership is extended as a rule only to members of a senior class studying for a baccalaureate degree in arts or science and, within these limits, is further restricted to those of superior scholarship. Alumni and honorary members may also be chosen. The badge of membership is a specially engraved watch key.

Phi Beta Kappa was organized at William and Mary college, December 5, 1776, as a secret social club and literary society. Its secret character was subsequently abandoned by the individual chapters. Women were first admitted in 1875. A national organization was effected in 1883.

The *Sigma Xi* fraternity, organized at Cornell university in 1886, is a similar society devoted to the interests of scientific research. Its name embodies the initial letters of σπουδῶν ξυνῶνες, "companions in zealous research." The badge is also a watch key, and the colors are electric blue and white

Red Cross Societies. National organizations devoted primarily to the care of those who are wounded in battle. These associations, which now comprise millions of members throughout the world, are largely due to the activities of two Swiss gentlemen, Jean Henri Dunant and Gustave Moynier. Dunant, who, by chance, was an eyewitness of the battle of Solferino, published a book entitled *A Memory of Solferino*, in which he vividly described the horrors of the battlefield caused by the inability of the regular surgical corps to care properly for the wounded. He also suggested the need for an organization which in time of peace should train nurses and provide supplies with which to supplement the regular medical service in time of war.

The book was widely read, and the resulting agitation led to an international conference at Geneva, Switzerland, in 1863, when a provisional plan was adopted by delegates from 16 countries. The following year, diplomatic representatives from the same nations met and signed what is known as the Geneva Convention. This convention did not provide for the organization of Red Cross societies. It did make such organizations possible by providing for the neutrality of those officially engaged in relieving the wounded.

The Geneva Convention was almost immediately ratified by 14 nations, and the number was later increased to 43, the United States joining in 1882. The agreement was revised in the Geneva Convention of 1906, and its provisions have become a part of international law. The relief societies, organized as a result of the Geneva Convention, selected as their emblem the flag of Switzerland with the colors reversed, that is, a red cross on a white background.

The American Red Cross, which began in 1881 under the leadership of Clara Barton, was reorganized and chartered by act of Congress in 1905. The original idea of an auxiliary war service organization was retained, as was shown by the recreational and medical assistance given to the fighting forces in 1917–18. However, the peacetime relief work of the Red Cross in floods, fires, hurricanes, and every other kind of disaster proved that the organization was ready to meet human need in emergencies.

During World War II the wide experience of the Red Cross enabled it to serve in innumerable ways. This was done, not only through recreational centers, with their stationery, books, and literally millions of doughnuts and cups of coffee, but in such vital matters as first-aid training, blood donor service, relief to prisoners of war, and communication or travel assistance to service men and their families.

Red Men, Improved Order of. A fraternal, beneficiary, and benevolent society, organized October 14, 1833, and based upon the manners, traditions, and customs of the North American

Indians. Subordinate bodies are known as tribes, and the supreme body as the great council of the United States. Councils of Pocahontas provide for female membership in the society. The ritual work of a tribe is divided into three sections or degrees,—those of the adoption, the warrior, and the chief. Motto. "Freedom, Friendship, and Charity."

Rotary International. The first Rotary club was organized in Chicago in 1905; a national association was formed in 1910; and in 1912 an international organization was perfected. The name was adopted originally because members met in rotation at their places of business.

The general objects are the development of the ideal of service as the basis of business; the cultivation of good fellowship among members; and the promotion of international peace. Two mottoes are recognized—"Service above Self," "He profits most who serves best." The general association encourages particularly aid of underprivileged boys and relief of crippled children.

Royal Society, London. This organization dates its foundation from the year 1660, although the weekly meetings of scientists, out of which it grew, began as early as 1645. The purpose of the society is the "improvement of natural knowledge." From November to June of each year, weekly meetings are held for discussion of scientific subjects. The organization administers, for the encouragement of discovery and invention, both its private funds and Parliamentary grants. The roll of the presidents of the society includes many distinguished scientists.

Salvation Army. A religious organization founded in England by William Booth in 1865 for the purpose of bringing spiritual and material benefit to the nonchurchgoing masses of people whom conservative religious bodies do not reach. The present name, military type of organization, and style of uniform were adopted in 1878, with William Booth as the "general" in command. In 1880 George Railton was sent from England to organize the Salvation Army in the United States.

In connection with the evangelistic meetings of the army, carried on chiefly in the poorer districts of large cities, an extensive system of social relief institutions has been developed. This includes rescue homes, shelters, and boarding houses for women, shelters and industrial homes for men, slum settlements, employment bureaus, free distribution of ice and fuel, missing friends bureau, poor men's lawyers, prison department, anti-suicide bureau, day nurseries, fresh air camps, and farm colonies. The organization has developed until it now has more than 12,000 posts distributed in 73 countries and colonies. The army publishes about 80 periodicals, the printing being done in 35 different languages.

Shrine, Ancient Arabic Order of Nobles of the Mystic. A secret social organization whose members must be either knights templars or Scottish rite masons of the 32d degree. This order was first conferred at New York City, June 16, 1871.

A similar social organization open to all master masons is known as the Mystic Order, Veiled Prophets of the Enchanted Realm. A local body of this order is called a grotto.

Sisters of Charity. Under this name many Roman Catholic communities are to be included. In general, they devote their energies and resources to religious, charitable, and educational work. The oldest of such communities was founded in Paris in 1634, by Saint Vincent de Paul. In the United States, the community of Sisters of Charity was organized by Mother Seton in 1809 at Emmitsburg, Md. In 1812 the community of the Sisters of Charity of Nazareth was established near Bardstown, Ky.

Society of Colonial Wars. A patriotic organization incorporated in the state of New York, October 18, 1892, for the purpose of perpetuating the names and valor of those who participated in the warfare of American colonial history. Membership is open to the male descendants of certain classes of men who, in the period between the settlement of Jamestown and the battle of Lexington, were active in the service of the colonies which afterward became the United States of America. These classes include officials of the colonies, officers and men in the armed colonial forces, and officers and men of the British forces which served with the colonists in any colonial war.

Sons of the American Revolution. A hereditary, patriotic society in which membership is open to direct male descendants of an ancestor who actively aided the cause of the American Revolution as an officer, soldier, sailor, marine, militiaman, or minuteman. The society was organized at New York City in 1889 by members of the Sons of the Revolution and of the Sons of Revolutionary Sires, the latter society becoming the California state branch of the Sons of the American Revolution. The national society was incorporated by act of Congress in 1906. Its objects are to foster American patriotism and to perpetuate the memory of those who achieved American independence.

Sons of the Revolution. A hereditary, patriotic society organized in 1876 and reorganized in 1883, to which is eligible any male descendant from an ancestor who, between April 19, 1775 and April 19, 1783, gave active assistance to the cause of American independence. The society has been notably active in marking with suitable tablets many of the historic locations in and around New York City.

Sons of Veterans. A patriotic society founded at Philadelphia, in September 1879. It admits to membership all male descendants, not less than 18 years old, of soldiers, sailors, and marines who served with the Union forces during the Civil War. A society of similar character, for women, is known as the Daughters of Veterans.

Spanish American War, Naval and Military Order of the. A patriotic society, instituted February 2, 1899. Membership is open to commissioned officers of the United States army, navy, marine corps, and revenue-cutter service and to contract surgeons who served in the Spanish American war or the Philippine insurrection incident thereto, and to all sons of such officers.

United American Mechanics. A secret, patriotic, political, benevolent society, founded at Philadelphia in 1845. Only native Americans are eligible to membership. Among the objects of the society are: the exhibition of the American flag on public schools; the restriction of immigration; opposition to any union of church and state; practical business aid to members; and relief for their widows and orphans. It was the parent of the *Junior Order of United American Mechanics*, which was formed at Germantown, Pa., in 1853 in order to train younger members for the senior order. In 1885 the junior order separated from the older society, which it has since surpassed in size and activity. It pays sick benefits to members and funeral benefits to their beneficiaries.

United Confederate Veterans. A federation of various organizations of former Confederate soldiers and sailors, formed June 10, 1889. The first reunion was held at Chattanooga, Tenn., in 1890. The objects of the society are: to unite all Confederate veterans and to cherish the ties of friendship that should exist among those who have shared a common danger; to gather authentic dates for an impartial history of the war between the states; to preserve relics or mementos of the war; to cherish and preserve the memory of deceased comrades; and to extend aid to their widows and orphans.

United Spanish War Veterans. A patriotic society devoted to the interests of American veterans who served in the Spanish-American war, the Philippine insurrection, and the Chinese expedition. The society has been known under its present name since 1904, when the Spanish War Veterans, which was incorporated November 28, 1899, united

with the Society of Spanish American War Veterans, the Society of the Service Men of the Spanish War, and the Society of the Hispano-American War.

United Workmen, Ancient Order of. A fraternal, beneficiary society founded at Meadville, Pennsylvania, October 27, 1868, by John Jordan Upchurch. The objects of the order are expressed by the motto "Charity, Hope, and Protection." Insurance is afforded the members, who attain full membership after receiving three degrees. Local bodies are known as lodges, and the governing body is the supreme lodge.

Veterans of Foreign Wars of the U. S. A national society of ex-service men who, as members of the United States army, navy, or marine corps, have participated in wars or campaigns upon foreign soil or in foreign waters.

This society had its beginning in 1899, when the American Veterans of Foreign Service was organized at Columbus, Ohio, and the Army of the Philippines was founded at Denver, Colo. Each of these societies expanded,—the American Veterans merging with several similar Pennsylvania organizations. Finally, at a convention at Denver in 1913, they amalgamated under the name of Veterans of Foreign Wars of the United States.

The society has for its objects the preservation of comradeship among its members; the assistance of disabled or needy veterans and of the widows and orphans of deceased ex-service men; and promotion of the teaching of true patriotism and Americanism by schools and other institutions.

Volunteers of America. A religious society that is very similar in its objects and military form of organization to the Salvation Army. It was organized in New York City, March 6, 1896 by Commander and Mrs. Ballington Booth. Ballington Booth was the second son of William Booth, who originated the Salvation Army.

Among the notable social activities of the Volunteers of America are the maintenance of about 60 principal institutions where free lodgings and meals are supplied to those out of work, a free hospital in New York City, homes for friendless young women, and a prison league which endeavors to aid discharged prisoners to return to honest living.

War of 1812, General Society of the. A patriotic, hereditary association of descendants from ancestors who served in the United States army, navy, marine corps, or revenue service, or as privateersmen during the War of 1812. This society is an outgrowth of an organization of similar purpose known as the *Military Society of the War of 1812*, open only to acceptable descendants of commissioned officers who served honorably during that war.

Woman's Christian Temperance Union. An organization of women founded at Cleveland, Ohio, in 1874 as the outcome of a women's crusade against the liquor traffic in the states of the Middle West in 1870–73. Its activities became much wider, however, and it aimed to influence public opinion and legislation in regard to prostitution, the sale of habit forming drugs, and various other matters affecting the welfare of individuals or society. It was largely responsible for introducing the study of hygiene and physiology into the public schools and long worked for the consummation of national prohibition of intoxicating liquors. An international association was founded in 1883 largely through the efforts of Frances E. Willard.

Woman's Relief Corps. A patriotic society of women, composed chiefly of mothers, wives, daughters, and sisters of Union soldiers. It was organized in 1883, to aid the Grand Army of the Republic, to perpetuate the memory of their heroic dead, to extend needful aid to the widows and orphans, and to cherish and emulate the deeds of the army nurses. The national organization, having departments in 34 states, consists of 1,425 corps, with a total membership of 78,055. A similar society, organized at Chicago in 1886, as the *Ladies of the Grand Army of the Republic*, is composed of wives, mothers, daughters, sisters, nieces, and direct female descendents of Union soldiers.

Woodmen of America, Modern. A fraternal, beneficiary society organized by Joseph Cullen Root, January 5, 1883, at Lyons, Iowa. The order provides life insurance for its members to a maximum of $3000 each. The recognized women's auxiliary of this organization is known as the Royal Neighbors of America.

Woodmen of the World, Sovereign Camp. This fraternal and beneficiary order was founded June 3, 1890 at Omaha, Nebr., by Joseph Cullen Root and associates. The principal purpose of the society is to afford insurance to its members. A monument is placed at the grave of every deceased member. The organization has its headquarters in a modern 18-story building which it erected in Omaha, Nebr. The women's auxiliary is known as the Woodmen Circle.

Young Men's Christian Association. An organization founded in London, in 1844, by George Williams, a dry goods clerk, for the "improvement of the spiritual condition of young men in the drapery and other trades." Similar associations were first established in North America at Montreal and Boston, in 1851. The movement developed rapidly, and soon attention was directed to the social, mental, and physical improvement of the members, as a means of strengthening their moral and spiritual characteristics.

The organization in North America is now composed of about 1650 local associations, each of which is entirely self-governing. These co-operate under the guidance of 42 state and provincial committees, which in turn co-operate under two national councils, one for the United States and the other for Canada. An international committee acts as a holding body for the two national councils. It consists of 200 representative business men. A world organization is also maintained, with headquarters at Geneva, Switzerland. Controlling membership in the local associations is composed of those who are connected with some evangelical church. Associate membership, with all privileges except the right to vote, is open to any man of good character without regard to his church affiliations.

The symbol of the association is a red triangle, standing for the equal upbuilding of "Mind—Spirit—Body." The movement is carried on chiefly in the larger cities, where, in the Y. M. C. A. buildings, members may attend religious meetings, Bible classes, other educational classes of all kinds, recreation rooms, or well equipped gymnasiums. Special attention has been given to Y. M. C. A. work among college students, railroad and industrial employees, the men in the army and the navy, Negroes, and Indians.

As of 1954, the Y. M. C. A. had a total membership of 3,012,527 in the United States, of whom about one-fourth were boys. It owns property valued at more than $200,000,000 and has annual operating expenses of about $57,000,000. Over 167 million dollars was raised by subscription to be used for work among the soldiers and sailors during the World Wars.

Young Men's Hebrew Association. An organization founded in 1874, at New York City, having for its object the mental, moral, social, and physical improvement of Jewish young men. It has branches in many of the larger American cities.

Young Men's National Union, Catholic. A national federation of the local diocesan unions of Roman Catholic young men. It was organized at Newark, N. J., in 1875. In addition to its work of uniting and strengthening local societies, it has established night schools and reading rooms, and supplied reading material for soldiers and sailors.

Young Women's Christian Association. An organization designed to advance the physical, social, intellectual, and spiritual interests of young

women. The society had its beginning in England in 1855, when Miss Emma Robarts founded the English Prayer Union. Its existence in the United States dates from 1858, when the Ladies' Christian Association of New York City was founded. The first association bearing the present name was formed in Boston in 1866. The World's Young Women's Christian Association was organized in 1894, although a complete national organization including almost all the local associations in the United States was not perfected until 1906.

The activities of the Y. W. C. A. include religious and missionary work; travelers' aid, with especial attention to immigrant girls; the operation of rooming and lodging houses, cafeterias, restaurants, and gymnasiums; and vocational and other forms of instruction.

In the United States there are from 900 to 1000 local associations, with a total membership of 717,091, but the total constituency, numbering 2,929,583, includes many active participants who have not joined as members.

Active or controlling membership in the organization was formerly open only to those affiliated with some evangelical church. This denominational test was abandoned in 1928 and was replaced by a pledge to uphold the purposes of the organization. The symbol of the Y. W. C. A. is a blue triangle.

CALIFORNIA MISSIONS

This term is applied to a group of missions founded by Spanish missionaries from 1697 to 1823 in Lower and Upper California. A total of 17 were built in Lower California by the Jesuits, who were intrusted with complete control, religious and civil, throughout the peninsula. The arid nature of the soil and the unpromising character of the aboriginal Indians whose conversion was the object of the enterprise made the task one of extreme difficulty. In 1767, the Jesuits were expelled, and the missions were handed over first to the Franciscans and later to the Dominicans, who founded seven more missions. The work in Lower California was much less successful than that of the missions founded in the more favorable territory to the north in Upper California.

Northern Missions. In 1769, Spain took measures to make good her claims to Upper California. Father Junipero Serra, the Franciscan superior of the missions in Lower California, was encouraged to found a mission farther north, and the government planned to support the missions by a number of garrisoned forts. The first mission was founded by Serra the same year and was called San Diego. In the ensuing half century, 20 other missions were founded, which, in the order of their establishment, are as follows: San Carlos Borromeo, 1770; San Antonio, 1771; San Gabriel, 1771; San Luis Obispo, 1772; San Francisco de Asis (Dolores), 1776; San Juan Capistrano, 1776; Santa Clara, 1777; San Buenaventura, 1782; Santa Barbara, 1786; La Purisima Concepcion, 1787; Santa Cruz, 1791; La Soledad, 1791; San Fernando Rey, 1797; San Miguel, 1797; San Juan Bautista, 1797; San Jose, 1797; San Luis Rey, 1798; Santa Ynes, 1804; San Rafael, 1817; and San Francisco Solano, 1823.

The first nine of these missions were established by Serra before his death in 1784, and the remainder were founded by his successors between 1786 and 1823. They were located on carefully chosen sites in fertile valleys near streams, whose waters were often used to irrigate a part of the surrounding land. In general, they lay at intervals of about 30 miles, a full day's journey apart, and most of them were connected by a highway called El Camino Real, "The King's Highway."

Organization. As each new mission was opened, two fathers were placed in charge of it, and to them the secular governor attached a guard of five or six soldiers under a corporal. The guard was subject to the authority of the missionaries. The church, built usually of sundried brick, or adobe, and in a few cases of stone, occupied one corner of a courtyard. The quarters of the missionaries adjoined the church, and no girl or woman was admitted into them. Then followed the rooms of the attendants and cooks, who were Indian youths selected from among the converts. The sides and rear of the courtyard consisted of shops, storerooms, granaries, stables, and the apartments for the young women, who remained under the eye of a matron until they were married. The unmarried men were also kept in a building by themselves. If a young man asked for one of the girls and she was willing, a marriage ceremony was performed and the couple was housed in a hut in the village of converts which surrounded the mission. After baptism, converts were not allowed to return to their former homes without the consent of the missionaries, and then only for short periods. The administration of justice was entirely in the hands of the missionaries.

Economic Activities. The day was devoted mainly to work, by means of which the community not only supported itself but enjoyed a considerable measure of prosperity. The Indians in their wild state were acquainted with practically none of the arts that give men a measure of independence from their immediate environment. They lived on berries, seeds, roots, and sometimes fish. Under the control of the missions, however, the Indians learned to practice agriculture, tanning, weaving, and many other arts of civilization. The products of their labor included wheat, oranges, leather, cloth, soap, furniture, some ironware, and a little wine and olive oil. They possessed immense herds of cattle and sheep. At the time of their greatest prosperity, these communities sheltered, clothed, and gave instruction to about 30,000 Indians.

Final Results. As a permanent Christianizing process, the enterprise failed in its main purpose; when the missions were later disrupted, the Indians relapsed into barbarism. Nevertheless, the work of Serra and of his associates and his successors transformed the lives of a large part of these Indians over a period of half a century, and about 90,000 in all were baptized. This achievement stands out as perhaps the greatest missionary accomplishment on the American continent.

Disruption of the Missions. Soon after Mexico threw off its allegiance to Spain, the California missions were secularized and their property was confiscated. The final decree for their disestablishment was signed in 1823, and, for the next ten years, the lands, buildings, and goods of the missions fell a prey to unscrupulous speculators and politicians. The Indians, unable to carry on by themselves the economic activities that had been directed by the missionaries, were speedily reduced in numbers by hardship and starvation.

Later Influence. The style of architecture used in the California missions has been extensively imitated in many public buildings and residences in the Pacific states, especially in southern California. It is characterized by a rugged strength combined with charming simplicity and harmony of design.

Modern Remains. Most of the original mission buildings are now in a state of more or less complete ruin, although a few, such as the Santa Barbara mission and the San Gabriel mission, are well preserved and several have been partially restored. The work of restoration owes much to the labors of various organizations formed for the purpose, conspicuous among which is the Landmarks club, founded by Charles Fletcher Lummis. All these missions which have visible remains continue to attract thousands of visitors and tourists annually.

The following paragraphs contain information of historical or general interest regarding each of these missions, the names of which are given in the order of their location from south to north.

San Diego, 6 miles east of the city of San Diego, was the first mission founded by Serra. He labored for a whole year at this point before making his first convert. In 1775, an attack by the Indians resulted in the ruin of most of the buildings and the death of several of the defenders. Better buildings were erected and, by 1800, there were 1523 converts living around the courtyard. A dam was built about 3½ miles above the mission in order to irrigate the land. Today the mission is in a ruined condition, although the walls remain standing and the dam may also be seen.

San Luis Rey, about 85 miles south of Los Angeles, is similarly in a ruinous state. It has a perfectly proportioned dome over the chancel and beautiful groined arches on each side of and over the altar. A Byzantine pulpit is one of the few ornaments of which the building has not been despoiled. At the time of its greatest prosperity, this mission numbered 2869 resident Indians. About 1200 bushels of grain were raised yearly, and the flock of sheep owned by the community comprised about 29,000 animals. The accessory mission of San Antonio de Pala is 25 miles from Oceanside.

San Juan Capistrano, 58 miles south of Los Angeles, is one of the best preserved of the missions, although the church was damaged by an earthquake in 1812. Some parts of the mission, however, are still habitable. It has several large bells, which were imported from Chile. This mission was founded in 1776 and, by 1800, there were 1046 Indian residents. These Indians were taught to weave by a Spaniard named Mendoza, who was sent from Monterey under contract from the government to work for $30 a month. Instructions were given by the government that, if he neglected his work, he was to be chained up at night.

San Gabriel, in the town of San Gabriel, is 8 miles east of Los Angeles. The tribes surrounding this mission were numerous, but for a considerable period they were hostile to the Spaniards, partly on account of the treatment they received at the hands of the soldiers comprising the guard of the mission. The earlier buildings were badly damaged by earthquake in 1812; the steeple of the church and the main altar were thrown down, and the walls were cracked. A new church was built as a result. It consisted of rubble stone as far as the windows, and the upper part was of brick. The mission celebrated 7709 baptisms in the course of its history.

In 1912, the first performance of the famous mission play was given at San Gabriel. The drama tells vividly a story of the early mission settlements For the periodical presentation of the play a well equipped theater was erected.

San Fernando Rey, 20 miles northwest of Los Angeles, is in a state of almost complete ruin. A Spaniard connected with this mission, Francisco Lopez by name, is said to have been the original discoverer of gold in California. In 1841, when digging up some wild onions, he found a piece of gold. This and other discoveries soon attracted prospectors from all parts of the continent.

San Buenaventura is about 75 miles northwest of Los Angeles. In 1893, the old church was so renovated as to lose most of its distinctively historic characteristics. The largest population of this mission was attained in 1830, when it amounted to 1330. In that period, it owned about 4500 horses and 13,000 sheep.

Santa Barbara, in the city of the same name, is still in the hands of the Franciscans. It is well preserved and has a carefully cultivated garden, into which no woman may enter except the wife of the president of the United States. The walls, which are six feet thick, consist of irregular limestone blocks and are further strengthened by solid stone buttresses measuring nine by nine feet. This mission has a very fine fountain ornamented with carvings.

Santa Ynes is about 25 miles northwest of Santa Barbara. It is in a ruined condition, but two reservoirs may be seen which were formerly used for laundry and bathing purposes, being supplied with water brought by a conduit from a point several miles distant. In 1835, the mission was secularized, but was restored to Franciscan control in 1843. It never became as prosperous, however, as it had previously been. The maximum number of cattle owned was 7300 and of sheep, 6000.

La Purisima Concepcion is about 40 miles northwest of Santa Barbara. It is one of the most desolate of the ruins, consisting now of one long, low adobe building with a few arches of the corridor. The maximum population of the mission was reached in 1803, when it housed 1522 people. The earliest buildings were destroyed by earthquake in 1812.

San Miguel, about 210 miles southeast of San Francisco, is notable for the completeness of its interior decorations. There were 2917 Indians baptized in the course of the mission's history.

San Luis Obispo is in the town of the same name about 250 miles southeast of San Francisco. Being founded in 1772, it was one of the earliest missions. The first buildings had roofs of bulrushes, to which hostile Indians twice set fire by discharging burning arrows upon them. As a protection against this mode of attack, tile roofs were made and, from San Luis Obispo, this practice was adopted by all the other missions. The greatest population attained by San Luis Obispo was 946. This was the figure for 1794 and, in that year, the live stock owned by the mission consisted of 6500 head of cattle and horses and 6150 sheep. The church has been restored in a form quite different from the old church, the likeness of which is known from an old painting.

San Antonio de Padua, about 180 miles southeast of San Francisco, near the quaint village of Jolon.

La Soledad is about 45 miles south of San Francisco and 4 miles from the town of Soledad. The original buildings are in complete ruin.

San Carlos Borromeo, also called Carmel mission, is about 125 miles southeast of San Francisco and 6 miles from the town of Monterey. The original roof has collapsed. In this mission is the tomb of Father Junipero Serra.

San Juan Bautista, 6 miles from Sargent and 87 miles south of San Francisco, is one of the better preserved missions. It has been partially restored, but many of the original features remain, including a bell cast in 1809 and several figures of saints. The greatest population was reached in 1823, when 1248 people were attached to the mission.

The *Santa Cruz* mission, 80 miles south of San Francisco, has virtually disappeared and a modern parish has been built on the site. It was one of the less successful of the missions, never having included more than 644 persons. Its history is clouded by certain charges and countercharges of cruelties and murders.

Santa Clara, in the town of the same name, near San Jose, has been restored and has been used in recent times as a college. It contains an old picture representing Jesus multiplying the loaves and fishes. The mission at one time had a population of 1464, but, after 1820, it began to decline and, at the time of its secularization, the number of live stock was less than one-third the 17,806 which had been owned in 1820.

The four remaining missions are all in advanced stages of ruin. They are *San Jose*, 14 miles from the city of San Jose; *San Francisco de Asis*, on 16th and Dolores streets in San Francisco; *San Rafael*, in the town of that name; and *San Francisco Solano*, in Sonoma about 45 miles north of San Francisco.

HEROIC DEEDS AND EXPLOITS

HERO is derived from the Greek word *heros*, applied to those who were more than men but less than gods. Heroes were capable of performing exploits that were above the capabilities of mere men. In modern English, the word designates a person distinguished for deeds that appear to demand a courage not possessed by the average man. The most heroic deeds are generally acknowledged to be those in which the actor voluntarily risks his dearest possession—his life—in order to attain a highly important result, such as the preservation of other people's lives or the safety of his country.

For rewarding acts of heroism performed in the United States, Canada, or Newfoundland, the Carnegie hero fund was established in 1904 by Andrew Carnegie. The commission administering the fund awards medals to persons who, upon conclusive evidence, are shown to have risked their lives voluntarily in some heroic effort for the benefit of others. Acts thus recognized must have been performed outside the regular course of a person's occupational duties. Medals are presented to the heroes themselves or to their surviving dependents or nearest relatives. In case of need, the commission pays money grants also, not exceeding $1000 in any one year, for the support of the hero, if he is disabled, or of his widow and children. Special grants are frequently made for educational and other worthy purposes.

The following pages contain a selection of the more noteworthy deeds of heroism performed from early times down to the present. The great number of such deeds that have been recorded makes it necessary that this selection should be limited to acts of especial distinction or impressiveness. Many others will be found in the Department of Biography. Among these latter are, for example, the stories of Edith Cavell, Grace Darling, Joan of Arc, Leonidas, Richmond P. Hobson, and many others whose acts entitle them to a place in the roll of heroes. Others will be found in appropriate passages of the Department of Geography and Travel. The ride of Lady Godiva, for example, is dealt with under *Coventry* on page 792, and the heroic conduct of the Swiss guards of Louis XVI is narrated under *Lucerne*, page 798, where a memorial to their valor is de cribed.

Alfred the Great in the Danish Camp. Among the many heroic tales of Alfred is this one of his playing the spy among the Danes. Having gathered enough soldiers to make practicable an attack upon the invading Danes, he approached the Danish camp in the guise of a musician and was allowed to wander through it at will, so excellently did he play the harp and sing. What he learned enabled him to lead a successful attack. It is said that, after the victory, he enjoyed the pleasure of disclosing his identity to the captured Danish chief by singing for him again the song which the chief had previously heard from the wandering musician.

Arnold von Winkelried (*är'nôlt fôn vĭng'kĕl-rēt*). A national hero of Switzerland. The Swiss cantons were compelled to fight for their independence against Austria in 1386. In the battle of Sempach, when the day was too hot for fighting in armor and the Swiss forces had beaten in vain against the serried array of Austrian spears, Arnold von Winkelried persuaded his compatriots to form in the shape of a wedge while he took his place at its point. In this formation, they charged the Austrian army. When at close quarters, von Winkelried gathered as many Austrian spears as he could reach by his outstretched arms and concentrated them against his own breast. He thus fell transfixed, but he had opened a breach, into which his friends rushed. The Austrian army was routed, and the liberty of the Swiss cantons was preserved.

The authenticity of this early incident has not been positively established. Nevertheless, unlike the tradition of William Tell, the story involves no mythical or impossible elements.

Betty Zane, the Heroine of Fort Henry. In the days of the Revolutionary War, the Indians were frequently induced by the British forces to attack the American settlements in the western wilderness. Fort Henry, situated near the present site of Wheeling, West Virginia, was at that time assaulted by about 500 Indians led by Simon Girty, a white man who had lived with the Indians since childhood.

On the approach of the Indians, the settlers hastily took refuge within the fort. After beating off the first attack, the defenders found that they were short of powder, a small keg of it having been left behind in a hut outside. The commander asked for a volunteer to fetch the precious explosive. Betty Zane, the young daughter of one of the settlers, urged that, since she was of no value as a combatant, she should be permitted to undertake the venture. Realizing the value of every fighter in the crisis, the men consented. The girl boldly crossed the open space, found the powder, carried it through the midst of whizzing bullets, and returned safely to the fort. This powder enabled the men to beat back all attacks until help arrived.

Borromeo (*bôr'rô-mē'ō*), **Saint, Cardinal of Milan.** An outstanding example of the few heroic souls that have had the courage to minister to the sick and dying in time of plague. Milan was devastated by this terrible disease in 1576. Infected houses were marked with a cross and were carefully guarded, the inhabitants being left within to perish in the order in which the plague or starvation and thirst should carry them off.

Cardinal Borromeo, conceiving it to be his duty as bishop to minister to the sick and dying, resisted the admonition of his friends and, with his 28 priests, continued, throughout the 4 months in which the plague raged, to visit the stricken and to perform the last rites over those claimed by death. Neither the cardinal nor the priests were attacked by the disease. A statue 112 feet high stands in a park at Arona, Italy, erected to the memory of the cardinal.

Captain Smith and the Elsie. Captain John W. Smith, commanding his little boat, the *Elsie*, succeeded in effecting a heroic rescue of a number of survivors of the wreck of the *Larchmont*. The *Larchmont*, a side-wheeler from Providence, R. I., was making its way in a stormy midwinter night through the eastern entrance of Narragansett bay when a schooner drove into its side and the ship sank. Its hurricane deck, being torn from the hull, continued to float, carrying a few men who had not been able to get into the lifeboats.

In order to save these survivors, Captain Smith, a fisherman who had learned of the disaster from the occupants of one of the lifeboats, set out with the *Elsie* and seven helpers. Hours were spent in battling with the storm. The ice-incrusted survivors of the wreck had to be lifted into a dory which the *Elsie* had in tow and into which four of the fishermen had climbed in order, with it, to approach the raft. When the party reached land two hours later, every one on board was almost helpless from the cold. One of the rescued men died later from the exposure. Each of the fishermen received a Carnegie gold medal, and funds were made available for the education of their children.

Carlyle and the Loss of His Manuscript. After Thomas Carlyle had produced the manuscript for the first volume of his French Revolution, expending on it the passionate pains characteristic of his rugged spirit, he loaned the manuscript to John Stuart Mill. The latter's servant girl, not

understanding the unique value of the paper littering her employer's desk, consigned the manuscript to the flames. Mill was compelled to inform his friend of what had happened. When Carlyle heard the tragic news, he remained silent and for several days did not utter a word. Then with undaunted spirit, he set about rewriting the book. Mill persuaded him later to accept $500 indemnity for the loss of his work.

Catharina the Heroic. After the battle of Muhlberg in 1547, Charles V desired to have his Spanish army pass through the Thuringian town of Schwarzburg, which was governed by the countess Catharina. She gave him the right of passage and agreed to provision his troops at a fair price on condition that her people should not be molested.

When the army arrived at Schwarzburg, the emperor's general invited himself to the countess's castle for entertainment. While he and his aides were dining, their arms laid aside, a messenger arrived, announcing that the Spaniards were looting the houses of the town and taking the cattle. The countess immediately armed her retainers and secretly locked all the doors and gates. She then protested to the general and asked him to restrain the soldiers. Her only satisfaction was his explanation that the troops were merely following the custom of war. "Very well," replied the countess, "but my poor subjects must have their own again, or prince's blood shall be given for oxen's blood." The general found himself helpless and was compelled to order his men to make full restitution and then pass on before he was allowed to leave the castle.

Cecil Rhodes in Rhodesia. The British diamond miner and imperialist Cecil Rhodes set out in 1896 to colonize the African territory now called, after him, Rhodesia. The natives, judging themselves wronged by the British settlers, took up arms and, after several months of hostilities, retreated to an almost impregnable position in the Matoppo hills. With characteristic daring and candor, Rhodes undertook to end the war single-handed.

Moving his tent away from the British troops to the base of the Matoppo hills, he encamped alone and without weapons for six weeks, in the power of the enemy if they chose to attack. Word was circulated among the natives that he had come alone and undefended to hear their side of the case. He was invited to attend a council held by the natives in the midst of their camp. He accepted without hesitation and rode unarmed into their midst. After mutual concessions were agreed upon, Rhodes asked them, "Now for the future, is it peace or war?" The chiefs, laying down their weapons, replied, "We give you one word; it is peace."

Chivalry of Sir Philip Sidney. The story told by Lord Brooke of Sir Philip's conduct after the battle at Zutphen illustrates the character of this mirror of knighthood. As he was being borne from the field, severely wounded, he called for water, which was brought to him. Then, seeing a poor wounded soldier look longingly at the bottle, he forbore to drink, giving the water instead to the soldier, with the words, "Thy need is greater than mine."

Conquerors of Yellow Fever. When, at the close of the Spanish American war, the United States army assumed control of the city of Havana, that capital was still subject to the dread tropical scourge of yellow fever. No one knew how the disease was transmitted, although a Havana physician had suggested that it was carried by a certain kind of mosquito. In 1900, the government of the United States appointed a yellow-fever commission to study the disease. This task, which involved a thorough test of the "mosquito theory," was in charge of four physicians—Major Walter Reed, James Carroll, Jesse W. Lazear, and Aristides Agramonte.

Since yellow fever is a disease that attacks human beings only, it was necessary to find those who would volunteer to be made the subject of experimentation. Dr. Lazear and Dr. Carroll consented and permitted themselves to be bitten by infected mosquitoes. Both contracted the fever, and Dr. Lazear died, leaving to Dr. Carroll the account of his experience and his observations. In memory of this hero of science a tablet was erected in Johns Hopkins hospital at Baltimore. Dr. Reed's health was so broken that he succumbed to fever the following year.

Besides the physicians, however, there were several men from the army and from civil life who sacrificed themselves in the hope of conquering the disease. Among the latter were two young soldiers from Ohio, John Kissinger and John Moran, who, refusing money compensation, entered a room containing infected mosquitoes in order to make a further test. They contracted the fever, while men in a room with no mosquitoes remained in health. Equally heroic were Dr. Robert Z. Cooke and his two companions, who, to prove that the fever was not carried by clothing, slept for many nights under blankets used by yellow-fever patients.

Such deeds of deliberate heroism deserve perhaps to rank above acts of a more impulsive courage. Assuredly few sacrifices have been so valuable to the human race. Through these experiments, it was proved that the germ of yellow fever is carried by the mosquito *Aëdes ægypti*. Consequently, by taking means to prevent the breeding of these mosquitoes, the disease has been virtually stamped out. See *Mosquitoes*.

Escape of Grotius (*grō'shĭ-ŭs*). Although sentenced to life imprisonment for his religious views, Grotius, the jurist and author, was permitted to have his wife with him in captivity. After he had been confined in a castle for nearly two years, she contrived a means for his escape.

Grotius was in the habit of having books sent to him from a friend, and the trunk in which they arrived was returned with clothing to be washed and books which the author no longer required. His wife persuaded him to feign illness and, when the guards brought the trunk, she asked them not to disturb the invalid. On their withdrawal, she locked Grotius in the trunk, making holes to admit air. The guards who came to remove the trunk supposed the sick man was still in bed. The trunk was sent to the friend's house, and Grotius, disguised as a miller, escaped to safety.

His wife dressed in her husband's clothes in order to delay discovery. When the guards did not appear for some time, however, she went to them, told them of the escape, and took them to task for failure in their duty. They were so taken aback that she was enabled to walk from the castle unmolested.

Garibaldi's Summons to His Troops. After Rome had surrendered to the French in 1848, this indomitable hero of Italian liberty addressed his men in the square of Saint Peter's: "I offer you hunger, thirst, cold—no pay, no barracks, no rations—forced marches, bayonet charges, battles, death. Whoever loves Italy in his heart, and not with his lips only, let him follow me! We leave from the Lateran gate." Four thousand men followed him.

Geneviève. The patron saint of Paris. About 450, news reached Paris that Attila the Hun was approaching. The people would have fled, had not Geneviève stood on the bridge over the Seine and urged them to return and to pray for and defend their homes. A present arrived at that moment for her from the bishop Germanus, and the people were so impressed that they turned back. Attila never reached Paris, but was stopped at Chalons.

Later the city was besieged by the Franks and was suffering cruelly from hunger. Geneviève embarked in a small boat on the Seine river, begged

the people outside to send food, and brought into the city a convoy of boats laden with provisions. The Franks did not molest her, apparently believing her person to be sacred.

On another occasion, when the Franks had taken Paris while Geneviève was outside, the chief of the Franks gave orders that she should not be admitted into the city since he feared her power. Dressed in a shepherdess' gown, she entered unnoticed and, making her way to the spot where the chief was holding revelry, she begged for the safety of the citizens and of the prisoners that had been taken. Her prayer was granted. She lived to see Clovis, the king of the Franks, embrace Christianity.

Golyer's Ben and the Indians. Before the days of railroad travel in the Western states, one of the regular stage routes was covered by Golyer's Ben, an intrepid young man whose real name was unknown and who was called Golyer's because he had worked for a man named Golyer.

On one occasion, a child recently orphaned was being taken on the stage to relatives who had volunteered to care for him. He wished to sit with Golyer's Ben, who made a place for him on the driver's seat. When the coach was nearing the end of the day's trip, the air was suddenly rent with the fierce yells of Indians. The driver, crouching down to cover the body of his companion, urged on the horses through the hail of bullets that the Indians sent after their escaping victims. When the stage reached its destination, the passengers were all found to be safe, including the child, but the driver had been pierced by three bullets. He expired shortly, having saved the life of his young charge.

John Maynard. The pilot of a passenger steamer on Lake Erie whose heroism saved all on board. The incident occurred before the general use of effective safety devices on steamers.

One night when his ship was plying at some distance from the shore, fire broke out near the bow. The captain gave orders to steer for the shore. The lifeboats were hastily manned but were found unseaworthy. The only remaining hope was that the ship might traverse the intervening three miles of water and come to shore before the flames overcame those on board. Twice the pilot house took fire, but the conflagration was extinguished by means of fire hose. The hose burst later and, when the ship was safely beached, the flames were wreathing about the pilot house. John Maynard was seen to be still clinging to the wheel, but he was dead. The passengers were all taken safely ashore.

John Paul Jones and the Bon Homme Richard. The conflict between the English *Serapis*, under Captain Pearson, and the American *Bon Homme Richard*, commanded by John Paul Jones, on September 23, 1779, is famous in naval annals for the bravery of both commanders. The daring of Captain Jones won the battle. With his old and rotten ship riddled below the water line, four feet of water in the hold, all guns but three silenced, the intrepid captain heard amid the smoke and hail, "Have you struck?" Instantly he replied, "I have not yet begun to fight." Matching the word with the deed, by seizing a favorable chance, he boarded and captured the *Serapis*, while the *Richard* sank with colors flying.

Kate Barlass. A name given to Katherine Douglas, a maid of James I of Scotland, in allusion to her brave attempt to save the king.

When the king was staying at the abbey in Perth and his men were scattered about the city, certain conspirators bribed the servants of the abbey to leave the door unbarred. That night a noise of arms was heard. The king surmised his danger and concealed himself beneath some boards in the floor. In order to obtain time for the replacing of the boards, Katherine placed her arm in the bolt rings of the door, thus replacing the missing barlass, or bolt. At the same time she begged the men to keep out since only ladies were in the room and they were disrobing. The conspirators, however, forced open the door, thereby breaking the maid's arm. The king was discovered and murdered.

Lafayette in Prison. In the course of the French Revolution, the Jacobins dismissed Lafayette from the army, declared him an exile, and offered a reward for his capture. While attempting to escape to America, he was taken at Liege and was then imprisoned in Germany. When he fell ill in prison, he was offered freedom on condition that he would join in a plot against France. His heroic reply, which brought him long confinement in an Austrian prison, was "Never! I am still Lafayette."

Medals for Valor in World War II. Space does not permit a complete listing of the noteworthy examples of heroism which earned recognition for American fighting men in World War II. In many instances, it was the courage and teamwork shown by groups that called for special notice. To mention only a few, these included the heroic defenders who held out to the last at Corregidor, then made the "Death March of Bataan;" the fliers led by "Jimmie" Doolittle, who bombed Tokyo early in the war; the daring Marines who raised the Stars and Stripes over Iwo Jima under heavy shell fire; the four Navy Chaplains, Catholic, Protestant, and Jewish, who gave their life preservers to others and went down with their ship; the small band of American soldiers, hopelessly isolated, who held out at Bastogne until the tide of battle turned. Two of the group mentioned have already been made the subject of commemorative postage stamps.

The records are filled with instances of heroism shown by individuals. The typical cases cited below, representing different branches of the service, are matched by many comparable instances of high courage displayed throughout the war.

At the beginning of the war with Japan, during an engagement off the Philippine coast, Captain Colin Kelly led a dive-bombing attack upon a battleship of the Kongo class. Although he was killed in a crash while returning, he had succeeded in sinking the Japanese warship. The Congressional Medal of Honor, awarded posthumously, was given to Captain Kelly's son.

In the fighting on Okinawa, like courage was shown by Hospital Apprentice 1/c R. E. Bush, who disregarded mortar and machine-gun fire during a Japanese counterattack, while he administered plasma to a wounded Marine officer. With his pistol, and later with a discarded carbine, Bush assisted in repelling the counterattack and accounted for six of the enemy while suffering serious wounds and the loss of one eye. This exploit won him a Congressional Medal.

Pfc. Lloyd C. Hawks received the Congressional Medal of Honor for rescuing wounded men who were lying in an exposed position during the fighting near Carano, Italy, in January, 1944. Another aid man had already been wounded in an attempt to relieve the two men. Pfc. Hawks crawled 50 yards under fire to administer first aid to his wounded comrade, then proceeded 50 yards farther to reach the two casualties. An enemy machine-gun bullet penetrated his helmet and knocked it from his head, momentarily stunning him. Thirteen bullets passed through the helmet while it lay on the ground beside him. He crawled the rest of the way to the casualties, gave first aid to one and dragged him to a covered position 25 yards away, then returned for the other man. As he raised himself to obtain bandages from his aid kit, his hip was shattered by a burst of machine-gun fire, and a second burst splintered his left forearm. Nevertheless, he completed bandaging the casualty and dragged him to cover where he had taken the first man. Pfc. Hawks then crawled 75 yards in an effort to regain his company, reaching the ditch in which his fellow aid man was lying. He was still on crutches at the time when the Medal was awarded

Man Who Saved Saint Helier, The. Edward Touzel, a carpenter connected with the fort at Saint Helier, in the island of Jersey, preserved the town from a disastrous explosion on June 4, 1804. A celebration of the coronation of King George IV of Great Britain took place on that day, and the sticks dipped in brimstone, by means of which the guns of the fort had been fired, were returned and locked in the powder magazine.

In the evening, smoke was noticed issuing from beneath the great door of the magazine. Edward Touzel, asking his brother Thomas to hasten to the commander for the keys, seized a crowbar and, with the help of a soldier named Ponteney, forced open the door. The sticks had taken fire, but he carried them out at the cost of severe burns. At the same time, the soldiers of the fort brought water and succeeded in extinguishing the flames that were already curling ominously about the barrels of gunpowder.

Men of the Birkenhead, The. Of the many instances of heroism exhibited during shipwrecks, one of the most impressive is that which occurred off the west coast of Africa in 1852, when the steamer *Birkenhead* struck a hidden rock and foundered. The ship was carrying a detachment of soldiers intended for garrison duty in South Africa, and with them were a number of women and children.

The small boats had been launched and had pushed off with the women and children. The ship broke in two, and the captain called to the soldiers to swim for the boats. The military officer, however, seeing that to do so would swamp the boats and mean the death of all, kept the soldiers drawn up in their ranks. As the ship sank lower, they calmly and heroically awaited death in the engulfing waves.

Oates and the South Pole Tragedy. Captain Scott's party reached the south pole on January 18, 1912, a few weeks after Amundsen had won the honor of its discovery. The expedition had encountered such difficulties that all the pack animals had been lost or killed before arrival at the pole. The return journey without the help of dogs was likely to be beyond human endurance.

L. E. G. Oates was taken sick after some weeks of traveling. Perceiving that delay might cause the death of the whole party, he arose unobserved, and, leaving the shelter where his companions slept, he wandered out into the night in order to court death in the blizzard. This sacrifice proved unavailing, however, for the whole party perished later a few miles from a relief post. The diary of Captain Scott, narrating this incident, among other records, was recovered by a search party and was made the basis of a recent book entitled *The Worst Journey in the World.*

Perry at the Battle of Lake Erie. Among the many heroic exploits of American naval officers and men, that of Commander Oliver Hazard Perry in the battle on September 10, 1813, is unique. When, after desperate fighting, his flagship, the *Lawrence,* was hopelessly shattered, Perry seized his blue ensign, bearing the legend "Don't Give Up the Ship," and, with eight men and his 12-year-old brother, made his way in a small boat, among the battling ships, to the *Niagara.* Commanding from this vessel, within a few minutes he forced the British to surrender their fleet. "We have met the enemy and they are ours—two ships, two brigs, one schooner, and one sloop," was Perry's report concerning the battle.

Regulus (*rĕg'ū-lŭs*). A Roman general who became a type of heroic endurance and of patriotism. In 255 B. C., he was defeated near Carthage and was taken prisoner. According to a later account, he was kept in prison for two years and, after a defeat of the Carthaginians by the Romans, was sent to Rome on parole to negotiate a peace or to effect an exchange of prisoners. Before leaving Carthage he was compelled to swear that he would return in case he was unsuccessful in persuading his compatriots at Rome.

On arrival in Rome, Regulus urged the Senate that they should continue the war and dissuaded them from exchanging the numerous Carthaginian officers for him, whose strength had already been undermined in Punic prisons. True to his oath, he then returned to Carthage, where he was tortured to death.

Robert Emmet. The character of Robert Emmet is a favorite with his countrymen. Particularly famous is his heroic speech before the court that condemned him to death. The revolt which he led in Dublin having failed through treachery, he turned back in flight to see his sweetheart, Sarah Curran, who had refused to go to America with him. Betrayed and captured, he refused to defend himself in court lest Miss Curran's name be dragged in. "What have you to say?" asked the clerk when the verdict of guilty had been rendered. Then, facing ignominious death, Emmet's defiant eloquence in the cause of liberty blazed out in a historic speech, which closed with the words, "When my country takes her place among the nations of the earth, then, and not till then, let my epitaph be written."

Sergeant York. An American hero of World War I. In the battle of the Argonne forest, October 8, 1918, the body of troops in which Alvin C. York (1887–1964) was a sergeant was ordered to attack a German position. The expected preparatory barrage failed to take place, and the charging troops were decimated by the German machine guns. Sergeant York and 17 other survivors made their way to a German machine gun nest. Most of the 17 were killed or wounded, but York himself succeeded in capturing the whole German body of about 90 men. Then, marching his prisoners before him toward a second machine gun stronghold, he captured that also, taking in both places a total of 132 captives and 35 machine guns.

Marshal Foch stated that this feat was the greatest thing accomplished by any noncommissioned soldier of all the armies in Europe. On his return, Sergeant York received a farm in his native state of Tennessee and a York foundation was established at his request, the proceeds of which were to be used for the support of primary schools in the mountains of Tennessee.

Stephen Girard, Hospital Nurse. It was during the terrible epidemics of yellow fever in Philadelphia in 1793 and 1797 that his fellow citizens discovered the true nobility in the character of the great merchant Stephen Girard. His reputation had previously been that of a cold, heartless moneymaker. When the epidemic of 1793 broke out, however, he not only gave liberally of his wealth, but entered the hospitals himself, risking all the danger of infection, and tenderly nursed the sick. During the second scourge of the fever, Girard again gave his services courageously. To hundreds of children orphaned by the plague he became a second father, and out of this interest grew his purpose which found expression in the establishing of Girard college.

Vincent de Paul. This French priest, known as the slaves' friend, had learned by experience in northern Africa the hard lot of a slave. After his escape, he visited a gang of convicts on a galley at Marseille. Seeing a broken-down man in chains, Vincent was so moved with pity that he offered to take the man's place. The guard agreed, and the priest became a galley slave. Though he was soon released, the hardships then suffered affected him for many years. The remainder of his life was devoted to ameliorating the lot of convicts and slaves, and he founded the orders of the Lazarists and the Sisters of Charity.

SOBRIQUETS AND NICKNAMES

These terms refer to names given in place of real names. They have much the same meaning, although their origins are diverse. Sobriquet is a French word of uncertain derivation; it is sometimes explained as having originally meant an affront. Nickname is derived from an Old English term *ekename*, "additional name," or "surname." "An ekename" was pronounced like "a nekename," just as, in conversation, "an ice man" is easily confused with "a nice man." The form nekename later became nickname.

Nicknames may express derision, affection, sportive familiarity, or various other feelings. They arise in ways too numerous to catalogue, but their essential features are that they should be graphic and should have a certain inevitable fitness about them which makes their use contagious and enduring.

Sobriquets may be applied, not only to individuals, but, in some cases, to nations or to an imaginary person typifying a nation, such as Uncle Sam, Jack Canuck, or John Bull. A particular type of person also is frequently designated, in malice or otherwise, by some picturesque name, such as Bluestocking. The more common sobriquets of these and other types will be found in the following section, in which also, wherever possible, their origin, application, and explanation are stated.

Almighty Dollar. The earliest use of this Americanism is attributed to Washington Irving. It is to be found in *A Creole Village*, published in 1837. The phrase pungently expresses the old idea of the power of wealth. Ben Jonson is credited with a similar phrase, "almighty gold."

Amen Corner. A small locality in the neighborhood of Paternoster Row, London, England. In Pre-Reformation days a procession of clergy and people on the feast of Corpus Christi foregathered at the end of Cheapside. There the first two words of the Our Father, or Paternoster, were intoned, and the prayer continued as the procession passed through the full length of the street. When the Paternoster came to an end and the word Amen was sung, the procession stopped to turn down Ave Maria Lane. Hence the stopping place came to be called Amen Corner.

American Sphinx. One of numerous nicknames applied to General Grant on account of his uncommunicative, enigmatic attitude while in command of the army during the Civil War.

Anzac (*ăn'zăk*). A composite word made from the initials of the Australian-New Zealand Army Corps, the British troops whose gallant, though unsuccessful, attempts at Gallipoli form one of the most brilliant pages in the history of the World War.

Apostate, The. The Roman emperor Julian (331–363) was so designated by Christian writers, and the sobriquet has since become virtually a surname of the ruler. He had been educated as a Christian but renounced that religion in favor of Neoplatonism and tried to restore the pagan worships in the Roman Empire.

Apostle of Free Trade. Richard Cobden (1804–65) was so called because of his effective advocacy of the policy of free trade in England.

Attic Bee. This sobriquet has been often applied in ancient and modern times to Sophocles, the Athenian dramatist. Athens is situated in Attica, and the word bee alludes to the sweetness of Sophocles' poetry. Plato also is sometimes so designated.

Beggars. A nickname applied to deputies in Holland who protested against the establishment of the Inquisition in 1556. The name was later adopted by the Dutch patriots.

Black Friday. Good Friday; so called from the black vestments worn by the clergy on that day. The term has also been applied to any Friday on which some public calamity has happened. In England, Dec. 6, 1745, the date of the Pretender's landing in London, was called by this name. In the United States, Sept. 24, 1869, and Sept. 19, 1873, occasions when great financial panic occurred, were each known as Black Friday.

Black Maria. A term used colloquially both in England and in the United States to denote the closed van, or wagon, in which prisoners are conveyed to or from jail.

Black Monday. In English history, the name given to Easter Monday, April 14, 1360, when numerous soldiers in the army of Edward III died from cold before the city of Paris. English schoolboys apply this name to the first Monday after the long vacation, when they are forced to resume studies. The term is applied also in reference to Monday, March 30, 1209, when the Irish made an onslaught on the English settlers in Ulster and put some thousands to the sword.

Blighty. A corruption of a Hindustani word used to designate England or Europe in general. During the World War, it was introduced into the British army by troops who had seen service in India. It gained popularity at once with the rest of the British "Tommies," who thereafter used "Old Blighty" as the slang term for their native land.

Blood and Guts, Old. A name given to General George Patton, Jr., commander of the American Third Army in the invasion of Continental Europe in World War II. As applied by his soldiers, this name was regarded as a tribute to General Patton's aggressiveness and his colorful personality.

Blood and Iron, The Man of. A nickname of Prince Bismarck, taken from a phrase in a speech delivered by him in 1862.

Bluestocking. Applied to one, particularly a woman, who makes a pretentious or unnecessary display of erudition. The expression, it is said, originated in Dr. Johnson's time from the fact that Mr. Stillingfleet invariably wore blue stockings when attending Mrs. Vesey's or Mrs. Montagu's celebrated literary receptions.

Bobby. See *Peeler*.

Bohemian. This term is applied to an artist or a literary person who leads a free and easy life and gives but little heed to the conventions of society. Ignoring its distinctions and despising its formalities, his heart and studio door are ever open to friend and stranger alike.

Boy Orator. This sobriquet and also the longer one, "Boy Orator of the Platte," were applied to William Jennings Bryan, on his entrance into national politics, in reference to his remarkable oratorical power and his youth. The longer phrase carries reference to his home state, Nebraska, in which the Platte river is an important stream.

Brother Jonathan. A nickname used in England to designate an American of the United States. Its origin is obscure and has never been satisfactorily explained.

Buffalo Bill. The well-known sobriquet of William F. Cody. The name was applied to him in consequence of his success in supplying immense quantities of buffalo meat to the construction gangs when the Union Pacific railroad was being built.

Bull Halsey. Admiral William F. Halsey was so called because, in his command of the fleet attacking Japan, he was a symbol of dogged determination.

By declaring his purpose to ride the Japanese emperor's white horse, he dramatized the main objective of the American Naval forces, the capture of Tokyo.

Calamity Jane. A person who sees only the darker side of events, a prophet of misfortune and doom.

It was the nickname of Mary Jane Canary (c. 1852–1903), notorious in the annals of Deadwood, South Dakota, in frontier days. How she came to be called Calamity Jane is not clear. She dressed as a man, was a crack shot, and claimed to have led a life of danger and daring as a pony express rider and scout.

Canuck or **Jack Canuck.** A type name applied to Canadians. It referred earlier to Canadians of French descent, but outside Canada, and recently in Canada, its application has widened to include any inhabitant of that country. The origin of the name is uncertain. Some scholars derive it from an Indian word; others say that it was originally applied by the French to the English and is a corruption of Connaught.

Carpet Knights. Civilians knighted in the old days were so called because they received this honor in times of peace as they knelt on a carpet before the king in his royal chamber. They were also known as "knights of the green cloth" to distinguish them from warriors who were dubbed knights on the field of battle. The expression as now used is one of contempt to denote the drawing-room or easy-chair soldier who wins all his battles "on the carpet."

Cincinnatus, The American. A sobriquet of George Washington, given in allusion to his services in saving the country like the Roman statesman Cincinnatus, who was called from his agricultural labors to be dictator of Rome.

Commoner, The Great. The sobriquet by which William Pitt, Earl Chatham, is best known. It was occasioned by his outstanding skill and authority as a leader of the English House of Commons.

William Jennings Bryan also was so called, apparently because of his appeal to the common people.

Czar Reed. This title was given to Thomas Brackett Reed, former speaker of the House of Representatives. He won it by his ruling that all members present, though not voting, should be counted toward a quorum.

Desert Fox. In the campaign for North Africa during World War II, the German General Erwin Rommel earned this name by his elusiveness. Rommel's British opponents, and particularly Prime Minister Winston Churchill, paid tribute to him for his cleverness in using the Fabian tactics of swift attack and skillful retreat.

Dixie. A popular name used to designate the southern United States. The most plausible origin of the name is that to be found in the folklore of old New York, which shows that Manhattan island was called Dixie Land by the Negroes in the early 19th century. Dixie was a slave owner on the island and was a kind and beneficent master; hence Dixie, or Dixie's Land, among the Negroes came to mean paradise. When sentiment for abolition began to grow, Dixie sent many of the slaves south. They bitterly regretted the change and expressed a longing to remain in "Dixie's Land." Their distress inspired D. D. Emmett in 1859 to compose the famous "Dixie" ballad, later the war song of the Confederates.

Dumb Ox. The sobriquet given to Saint Thomas Aquinas by the Dominican novices in the monastery at Cologne. They found the nickname well suited to the young monk, who was shy, retiring, and somewhat rotund. However, Albertus Magnus, their master, once interrogated him on some very deep and abstruse metaphysical problems. The answers given by Thomas displayed so profound an intellect that the great master, addressing the other students, said: "You call him 'the dumb ox'; one day his bellowing will be heard throughout the world."

Easy Boss. The American politician Thomas Collier Platt (1833–1910) earned this title by the lack of ambition for wealth or preferment which he displayed in spite of the fact that he dominated Republican politics for many years.

Expounder of the Constitution. A sobriquet of Chief Justice John Marshall. Its appropriateness was due to his great influence in determining the interpretation of the Constitution.

Eye of Greece. The ancient city of Athens has been so designated because it was long the center of the brilliance and intellect of the Greek world.

Father of His Country. The most popular of the sobriquets applied to George Washington. It is said to have been used of him first in an almanac printed at Lancaster, Pa., in 1799.

This name, it should be noted, has been applied to many national heroes in the course of history. The first instance of its use within strictly historical times is the application of the title *Pater Patriæ* to Cicero by the Roman Senate.

Father of History. Herodotus was so called because he was the earliest writer to raise historical narrative to the level of literature. The name was first applied by the Roman orator Cicero.

Father of the Constitution. James Madison was so called because of the leading part he took in the formation and adoption of the Constitution of the United States.

Fourth Estate. A term analogous to the *tiers état*, "third estate," of the French Revolution period. Fourth estate is used humorously to designate the press, the laboring classes, or other elements of a state which exercise a great, but unofficial, power in politics.

Gadfly of Athens. A term applied to Socrates. It arose from a simile attributed to him when on trial for his life. According to Plato, Socrates declared that, in rousing the Athenians from intellectual apathy by means of questioning, he was like a gadfly stinging a lazy horse into activity.

Gods, Gallery. In the old days, the ceiling of the Drury Lane theater, London, was painted to represent a blue sky with clouds and the conventional cupids and cherubs disporting themselves thereon. Since the ceiling extended over those seated in the gallery, such occupants were said to be "among the gods." Subsequently, "the gods" or "gallery gods" came to mean those who occupied the uppermost seats in any theater.

Golden Mouthed. The Greek church father Saint John received the surname Chrysostom, "Golden Mouthed," because of his conspicuous oratorical ability.

Grand Old Man. A sobriquet of William E. Gladstone. It expresses the affectionate admiration inspired by his long career of political leadership in England.

Gringo. A contemptuous term applied by Spanish Americans to foreigners, especially to Englishmen or to Americans of the United States. The word is from the Spanish meaning gibberish, or unintelligible speech, and is possibly a variant of *Griego*, the Spanish word for Greek.

Honest Old Abe. This is perhaps the most widely known of the sobriquets applied to Abraham Lincoln. During the Civil War, the Confederates applied to Mr Lincoln the term "Old Abe," and to the Negroes he was "Uncle Abe."

Iron Duke. This sobriquet was conferred on the Duke of Wellington to express admiration for his determination and vigor that resulted in the

victories over Napoleon's forces in Spain and at Waterloo.

Jingo. This word has been found within recent years to be a transliteration of a Basque word *Jinko* which means "God." It is not at all improbable that *by jingo* was heard as an oath among the Basques by British sailors in foreign parts. The word came into especial prominence in the year 1878, when Disraeli, then English prime minister, announced his resolution of defending Turkey against the advance of Russia. In a topical song composed at the time, and sung by "the Great Macdermott," occurred these lines:

"We don't want to fight, but by jingo, if we do,
We've got the ships, we've got the men, we've got the money too."

In a flash, the expression became a happy catchword for the opponents of Disraeli, whose followers there and then were christened Jingoes and whose policy thereafter was known as jingoism. The word still retains this meaning of national aggressiveness and braggadocio.

John Bull. A popular nickname for England and the English people. It was used first by Arbuthnot in the title of his satire *The History of John Bull*, published in 1712. F. C. Gould, the celebrated cartoonist of the *Pall Mall Gazette*, has long since made the figure of John Bull familiar. He is depicted by the artist as a stout old gentleman, wearing a "tile" hat, cutaway coat, riding breeches, and boots.

Kickshaws. A corruption of the French word *quelquechose* meaning "something" and analogous to *vol-au-vent*, a light and airy trifle which a breath of wind can blow away. It is used half contemptuously of certain dainty and delicate French dishes which fascinate the eye but give no substantial support to the "inner man."

King Maker. The earl of Warwick was so designated because of his decisive influence in the Wars of the Roses. He succeeded in having Henry VI deposed in favor of Edward IV, whom he later drove from the country and supplanted by restoring Henry VI to the throne.

Last Cocked Hat. This nickname was applied to President Monroe in reference to his being the last of the presidents to wear the characteristic hat of the Revolutionary period.

Laughing Philosopher. The Greek philosopher Democritus was so called He believed all happenings in the universe to be dependent on the mechanical interaction of atoms. He therefore regarded the drama of mankind's activities as a mere puppet show, in which the actors thought they moved themselves and followed their own purposes, but Democritus, believing that he and Nature knew better, is said to have professed ceaseless amusement at the spectacle.

Lion of Sweden. Johan Gustafson Banér, a Swedish field marshal (1596–1641), was so called because of his military prowess.

Lion of the North. The sobriquet of Gustavus Adolphus of Sweden (1611–32), whose extraordinary successes in the Thirty Years' war made this appellation appropriate.

Little Corporal. A sobriquet applied to Napoleon Bonaparte after the victorious battle of Lodi in 1796. On this occasion, Napoleon, who was only 5 feet, 2 inches tall and had begun his career as a corporal, led his troops across a bridge against a greatly superior number of Austrians.

Longshanks. The nickname of Edward I, king of England, 1272–1307. He was a tall man with long legs.

"Mad Anthony" Wayne. The popular nickname applied to General Anthony Wayne during the Revolution on account of his energy and reckless daring.

Maiden Queen. This name is frequently applied to Queen Elizabeth, who ruled England from 1558 to 1603. Disregarding the wishes of her advisers, she persistently refused to choose a husband.

Maid of Orleans. The name given to Joan of Arc after the relief of Orleans in 1429.

Mantuan Bard. So Virgil is often called in allusion to Mantua, his birthplace.

Mill Boy of the Slashes. A popular nickname applied to Henry Clay. It originated in his boyhood, when he was frequently seen driving a donkey on which was loaded a bag of meal being brought to his home from a mill on the Pamunky river. His home at that time was situated in low, marshy ground, known as slashes.

Old Hickory. The nickname is probably the earliest of the numerous names applied to Andrew Jackson. The use of the name is traced to the soldiers under his command in 1813, who, observing his endurance, remarked that he was as tough as hickory. The sobriquet developed from this beginning.

Old Lady of Threadneedle Street. The humorous appellation given to the Bank of England, obviously from its location in a street formerly called Three Needle street. The name of the street owes its origin, according to some authorities, to the circumstance that the Merchant Tailors' Company have their hall in it; others trace the name to the three needles on the coat of arms of the Needlemakers' Company in Crooked lane.

Old Man Eloquent. His eloquent defense of the right of petition in Congress occasioned the application of this sobriquet to John Quincy Adams.

Old Rough and Ready. General Zachary Taylor, president of the United States, 1849-50, was so called by his soldiers during the Mexican war.

Pearl of the East. Zenobia, queen of Palmyra, was so designated. A closely allied sobriquet, Pearl of the East Indies, is applied to Java in allusion to its natural beauty.

Peeler. A nickname given by the Irish to the police constabulary formed under the secretaryship of Sir Robert Peel (1812–18). It was thereafter applied to policemen in England until 1828, when Peel, who was then home secretary, introduced the new Metropolitan Police act. The former slang name then was changed to "Bobby," the perversion of Peel's first name, which is now regularly used in England to designate a policeman. In Ireland, however, the old name "Peeler" still obtains.

Perfidious Albion. In the French form *Albion perfide*, this appellation is said to have been applied to England by the emperor Napoleon I, who thereby expressed his attitude toward his chief antagonist. Albion was an ancient name for the island of Britain, probably derived from the Latin *albus*, "white," and applied in allusion to the white chalk cliffs on the southeastern coast of England. The name Albion is still often used in poetry to designate England.

Plumed Knight, The. The striking sobriquet applied by his admirers to James G. Blaine. It was first used in 1876 as a rhetorical comparison in a speech by Robert G. Ingersoll when nominating Blaine for the presidency.

Prince of Skeptics. This name is frequently applied to Voltaire, who rejected Christianity and devoted his life to the crushing of the spirit of intolerance which characterized the Church of his day.

Printer's Devil. A term applied to a young apprentice who does the odd chores in a printing office. The innocence of a black appearance resulting from printer's ink has alone earned for him this invidious

appellation. In England a junior legal counsel serving a barrister without pay, or any literary hack, is likewise referred to as a "devil."

Rail-Splitter. The origin of this sobriquet of Abraham Lincoln is traceable to the Republican state convention in Illinois in 1859, when two rails said to have been split by Thomas Hanks and Abraham Lincoln were presented to the convention. The nickname immediately became popular.

Rare Ben. Ben Jonson is often so referred to in allusion to the inscription on his tombstone, "O rare Ben Jonson," erroneously ascribed to Shakspere. "O rare" (*orare*) is Latin, meaning pray for.

Roe and Doe. The names given to fictitious parties in a suppositious case devised by Chief Justice Rolle in the reign of Edward III of England. By the framing of this imaginary lawsuit between Richard Roe and John Doe, a plaintiff who claimed title was saved the costly procedure of a *real action* against the wrongful possessor of an estate and could sue through the simple *action of ejection.* Hence arises the expression "John Doe proceedings."

Roughrider. The sobriquet applied to Theodore Roosevelt in reference to his organization of the so-called Roughriders, a regiment of volunteer cavalry in the Spanish American war.

Sage of Monticello. This sobriquet of Thomas Jefferson contains an allusion to his Virginia estate and his great reputation for statesmanship and political wisdom.

Scourge of God. The terror aroused in Europe by Attila the Hun in the 5th century is reflected in this appellation applied to him by medieval writers.

Serpent of the Nile. Cleopatra has been so called. In the 1st century B. C., she ruled Egypt, the habitable part of which is confined to the vicinity of the Nile river. A serpent was the ancient symbol of Egyptian royalty.

Sir Veto. The name applied to Andrew Johnson because of the unusual number of his vetoes of Congressional bills.

Son of Liberty. A sobriquet of John Adams occasioned by his direct descent from some of the first New England immigrants.

Spellbinders. A sobriquet which seems to have assumed its particular present day sense of a political orator during the presidential campaign of 1888. It is said to have been applied by a member of the Republican national committee to speakers who reported that they held their audiences "spellbound."

Swan of Avon, Sweet. A name sometimes applied to William Shakspere, who was born at Stratford on Avon. The swan is traditionally a bird sacred to the Greek god Apollo, who was the father of all the Muses, and its song is accordingly regarded as due to inspiration from the god. The epithet was used first by Ben Jonson.

Teddy. The most popular of the several nicknames applied to Theodore Roosevelt during his vigorous career.

Tenth Muse. This sobriquet is often applied to women poets and, by implication, raises them to the dignity of the nine muses of Greek mythology. The earliest and most appropriate use of the term was that made by Plato, who so designated the Greek poetess Sappho.

Tiger. The famous French statesman, Georges Clemenceau, earned this sobriquet early in his career. It was applied to him because of his watchful, dangerous, and relentless character in political conflict. The fitness of the name was emphasized by the determined patriotism he exhibited as a publicist and as premier of France during the World War.

Tippecanoe. The popular nickname applied to William H. Harrison during the campaign which resulted in his election to the presidency. The name refers to his military success at the battle of Tippecanoe, Nov. 7, 1811.

Tuxedo. A name given to the ordinary dinner jacket and said to have originated with a country club at Tuxedo Park, New York.

Uncle Joe. Joseph Gurney Cannon received this familiar name in the course of the 46 years which he spent as a member of Congress.

Uncle Sam. A sobriquet for the United States, which probably originated during the War of 1812. A commissarial contractor named Elbert Anderson had his store yard at Troy on the Hudson. Samuel Wilson, who, with his brother, superintended the examination of provisions, was known as "Uncle Sam" among the workmen. As each case or package of provisions was passed, it was marked with letters EA—U. S. A wag among the longshoremen, being asked what the initials meant, replied that they stood for Elbert Anderson and "Uncle Sam." The joke spread at once throughout the country. The name since that time has passed current as a personification of the United States among other countries.

The first cartoon of Uncle Sam appeared in the comic weekly, the New York *Lantern* of March 13, 1852. The artist was F. Bellew. Thomas Nast, cartoonist for *Harper's Weekly*, about 1870 added whiskers and put stars on the vest.

Unconditional Surrender. The sobriquet applied to General Grant on account of his famous message to the commander of Fort Donelson in 1862, "No terms other than unconditional and immediate surrender can be accepted."

Watchdog of the Treasury. William Steele Holman, long a member of Congress from Indiana, earned this title by his persistent opposition to unnecessary appropriations.

Weeping Philosopher. The Greek philosopher Heraclitus was so described, who, in the early 5th century B. C., taught that there is nothing permanent except change. The realization of the transient character of all things human produced in him a sadness memorialized by this sobriquet.

Whig and **Tory.** Names applied to political parties in British and early American history. Whig was originally an opprobrious term, being derived, it is said, from the Scotch word for whey. Tory is derived from the Irish *Tar a Ri*, "Come, Oh King!" The Tories were Royalists.

Wisest Fool in Christendom. This appellation, first applied to James I of England by the French statesman Sully, attained wide celebrity. It expresses the combination of the king's considerable range of learning and his notable weakness of character.

Wizard of Kinderhook. A nickname applied to Martin Van Buren in reference to his reputation for political sagacity and skill.

Yankee. Throughout the British Empire, this name is applied to any inhabitant of the United States. In its narrower meaning in America, however, it is limited to the people of the New England states. During the Civil War, the name was applied generally to Northerners. Various derivations have been given to account for the origin of the word. It has been traced to a corrupt pronunciation of the word *English* or the French word *Anglais* by the North American Indians; also, and more appropriately, to the Scotch word *yankie*, meaning "shrewd, sharp, clever." A more probable source still, however, is that of the Dutch diminutive *Jankin*, "Johnny," a name which the Dutch settlers of New York gave to the English colonists of Connecticut.

NATIONAL AND STATE EMBLEMS

The human sentiments of fealty to rulers and of tribal or national loyalty have been embodied in many different symbols. On the other hand, for rulers and reigning houses there have been evolved, through the science of heraldry, elaborate emblems and arms. Heraldry has devised an extensive and intricate system of patterns and colors by which to depict the relationships and the history of families.

In the Old World, national coats of arms have often combined the personal emblems of rulers with symbols of the composition and the authority of the state. Primitive tribes had their totems, or figures of animals or birds, which served as tribal symbols. These emblems carried more or less religious meaning. In the ancient Eastern nations, the emblem of the ruler was frequently some animal form which represented a deity.

For the Romans, the *fasces*, or rods, of the lictor became the symbol of civil authority, while the eagle was adopted as the sign of the conquering might of Roman legions. Both these symbols have persisted down to modern times. The official seal of France, for example, carries a seated female figure representing the republic, bearing the fasces. Recent coinage of the United States bears the same emblem.

The eagle and the lion have been the favorite animal emblems of European states. The Byzantine emperors adopted the double-headed eagle as representing their sovereignty over the East and the West. The black double-headed eagle was the emblem of the former Austrian and Russian empires. Montenegro also made it the chief feature of her national arms. Imperial Germany and Italy use the single black eagle; the arms of Serbia bear a silver eagle. In the New World, Mexico and Chile each show a gold eagle in their official arms.

American Eagle, The. The white-headed or bald eagle is the emblem on the coat of arms of the United States, and is also the adopted badge of the order of the Cincinnati. Owing to the alleged cowardice and predatory habits of the white-headed eagle, Benjamin Franklin is said to have expressed regret that it had been chosen as America's national emblem. Geographically, however, the choice of this bird is appropriate, since its habitat extends over the whole of North America, so that veritably it is the American eagle.

Among European states, the lion as a heraldic device symbolizes power and has shared honors with the eagle. The arms of Great Britain, Belgium, Bulgaria, Holland, and Norway bear each a golden lion; those of Denmark carry blue lions; while those of Spain bear a red lion. Rumania and Sweden have in their arms both an eagle and a lion. On the arms of Czechoslovakia, two gold lions support a shield, in the quartering of which appear eagles. In the middle ages, travelers' stories about the courage of a fabulous animal called the unicorn, from the one horn in its forehead, were widely current. Belief in these tales doubtless accounts for the adoption of the unicorn into the royal arms of Scotland and its incorporation in the British arms after the union of the kingdoms of England and Scotland.

Latin American states have generally avoided in their emblems all suggestions of Old World royalty. In their official arms, the liberty cap and flags frequently appear. For Bolivia, Colombia, and Ecuador, the condor, native to these countries, takes the place which the eagle holds in the heraldry of other nations.

Greece and Switzerland have a cross as the chief emblem in their arms, the former silver, the latter white. In Japan, the imperial emblem is the golden chrysanthemum. The national emblem of China is very complicated, its central element being a hatchet, with a flowery bird on the right and a green dragon on the left.

Flowers or plants have frequently been chosen as national emblems. The following list gives those that by tradition have come to be regarded as emblems of various nations.

Australia	Golden Wattle
Canada	Maple Leaf
China	Narcissus
Egypt	Lotus
England	Rose
France	Fleur-de-lis
Germany	Cornflower
Greece	Violet
India	Lotus
Ireland	Shamrock
Italy	White Lily
Japan	Chrysanthemum
Mexico	Nopal Cactus, or Prickly Pear
Persia	Rose
Scotland	Thistle
Spain	Pomegranate
Switzerland	Edelweiss
United States	Goldenrod (by popular choice)

Practically all the American states have chosen official state flowers and state birds. These will be found in the table *State Mottoes, Nicknames, Birds, and Flowers*, on pages 2067 and 2068.

NATIONAL FLAGS

In ancient times, just as a motto was usually a slogan, or battle cry, an emblem or a banner was a symbol of religious or patriotic devotion that was calculated to rouse the fighting spirit of a group of warriors. Banners with tribal or national significance are mentioned in Biblical references, as in Psalm 20:5, 60:4, and Isaiah 13:2. There is abundant evidence that similar devices were used by Persian, Greek, and other national armies among the ancients. Sometimes an emblem was restricted to a particular group or leader, but with the merging of military units there was need for a symbol to stand for the army as a whole, and for the nation which it served. Thus the eagle became the official emblem for all the Roman legions and was recognized as the symbol of national authority throughout the Roman empire. In medieval times the standard often took the form of a banner borne upon a lance, or "flagstaff," and in appearance was comparable to a pennant flying from the mast of a ship. The standard might be a religious banner, or "oriflamme," but could also be a symbol of personal leadership or political authority.

Reminders of these early flags are seen today in school or college pennants, and, as noted above, the history of particular standards and mottoes is closely bound up with traditions of heraldry. To trace the evolution of a nations flag is to review many important details of that nation's history. How the British flag came to incorporate with the Union Jack the crosses of St. George, St. Andrew, and St. Patrick, is a fascinating story. In it many literary allusions as well as historical references will be encountered. Conspicuous among these is the well-known passage from Shakespeare's Henry V, in which the king's stirring address to his troops closes with the words:

"Follow the spirit; and upon this charge
Cry 'God for Harry! England and St. George!' "

The evolution of the present American flag is described in detail in another part of this work. The history of the Star-Spangled Banner, like that of the British flag, is reflected in many literary allusions.

Design of National Flags

Modern national flags are to be distinguished principally by the colors they display. Different arms of the national service, however, and various officers and dignitaries usually have flags of special designs. Thus, the merchant marine flags are generally different in design from the naval flags and ensigns. On board naval vessels, each rank of admiral has its appropriate flag. In the United States navy, the admiral's flag is a solid blue field bearing four stars. The flag of the president is a blue banner bearing in its center the arms of the United States.

The official flags of the principal countries of the world are here briefly described. For United States flags, see page 383 and illustrations opposite page 384.

Afghanistan. The national flag of Afghanistan has three vertical stripes, black, red, and white. In the center stripe is a white crescent.

Argentina. In the flag of Argentina are three horizontal stripes. The top band is blue, the center white, and the bottom blue. Upon the naval ensign a golden sun appears in the white bar.

Belgium. For both the naval and the merchant marine flag of Belgium, the vertical tricolor,—black next the staff, yellow in the middle, and red on the outer margin,—is employed. This is the ancient standard of Brabant. The royal ensign bears the king's coat of arms in the yellow stripe.

Bolivia. The Bolivian flag is a tricolor with horizontal bars. At the top is red; in the middle, yellow; at the bottom, green. The naval flag shows the national arms in the center of the yellow band.

Brazil. The national standard is a green field in the center of which appears a yellow lozenge. Upon the lozenge is a blue circle in which is represented a heavenly constellation. Across the blue circle runs a white band bearing the motto, *Ordem e progresso*, "Order and Progress."

Bulgaria. The naval flag, which is the national ensign, has three equal horizontal stripes,—the upper white, the middle green, the lower red. The gold crowned lion appears on a red ground, in the upper corner next the staff. For the merchant marine, the plain tricolor is used.

Chile. In the Chilean flag are two wide horizontal bars, the upper white, the lower red. Upon the blue canton, next the staff, appears a five-pointed white star.

China. The national flag of China, formerly the naval flag, has a red field and a blue canton bearing a white sun.

Colombia. The upper half of the Colombian flag is a horizontal yellow band. Below this is a blue stripe, and under the latter a red band. In the center of the naval flag are the state arms; in the same position, the merchant ensign bears a white star on a blue ground set in a red oval.

Costa Rica. The flag is composed of five horizontal bands. The topmost band is blue, with a white stripe below it. At the bottom is a blue stripe, with a white band above it. The center stripe, broader than the others, is red. In the naval flag, the red stripe bears the Costa Rican arms.

Cuba. The standard of Cuba bears next the staff a red triangle, upon which is a white star. From the triangle run alternating horizontal stripes, two white and three blue.

Denmark. The flag of Denmark, the Dannebrog, is a red field bearing a white cross dividing the field in quarters. This is the oldest national flag design in the world, said to date from 1219. The naval ensign is swallow-tailed.

Dominican Republic. The field of this flag is divided by a white cross. The upper quarter next the staff is blue; the upper outer quarter is red. The lower outer quarter is blue; the lower, next the staff, is red.

Ecuador. The upper half of the flag of Ecuador is a yellow horizontal band. The lower half is divided equally between a blue and a red band, the latter being at the bottom. The national ensign bears the arms of the state.

Egypt. The flag of Egypt has a green field. In the center is a white crescent moon, the horns of which point away from the staff and half surround three white stars.

Finland. The national flag of Finland, similar in general design to the standards of Norway and Sweden, carries a blue Latin cross imposed upon a white field.

France. The flag of France is the tricolor, composed of three vertical stripes of equal width,—blue next the staff, white in the middle, and red at the outer edge. The French Revolution, in 1789, gave rise to this standard, which combines the colors of the city of Paris with the white of the former monarchy.

Greece. The national flag is a white rectangular cross on a dark blue field. The naval ensign has four white and five blue alternating horizontal stripes, with a canton of blue upon which appears the white cross, with a crown in the center. The merchant flag is like the naval, but lacks the crown.

Guatemala. This state has a flag of three vertical bars,—blue, white, blue. On the central white band, in the national ensign, appear the state arms.

Haiti. The Haitian merchant flag has two horizontal bands,—blue above, red below. At the center of the naval ensign appear the national arms in a white rectangle.

Honduras. The Honduran national ensign is three horizontal bars,—blue, white, blue. On the central white stripe are the national arms surmounted by five gold stars.

Hungary. The flag of the Hungarian state is a tricolor. It is made up of horizontal bars,—the upper being red, the center white, and the bottom green. Formerly, the lower stripe of the Austro-Hungarian flag carried the red of Austria in the half next the staff and the green of Hungary in the other.

Iran. The Iranian imperial flag is blue with a white circle in the center bearing the national arms. The military ensign, as well as the merchant flag, is a tricolor, with horizontal stripes,—green above, white in the center, and red at the bottom.

Ireland. The flag of the Irish republic is green, white, and orange vertical stripes.

Israel. White with two horizontal blue stripes, the blue shield of David in the center.

Italy. The Italian flag consists of three equal vertical bands,—green next the staff, white in the middle, red at the outer border. On the white stripe is a blue-bordered red shield, bearing a white cross, the latter being the arms of Savoy. On the naval flag, a crown surmounts the shield.

Japan. The flag of the mikado is a rectangular field of red bearing a gold chrysanthemum in the center. For the merchant marine, a white field with a red disk in the center is used. On the naval flag, the rayed, red disk is placed just out of the center of the white field, toward the staff.

Liberia. The ensign of the Negro republic has 11 horizontal alternating red and white stripes, with a union of blue containing a large white star.

Mexico. The flag of Mexico is a vertical tricolor. The green bar is next the staff; the central stripe is white; the outer one is red. On the naval ensign, the white stripe bears the national arms.

Netherlands, The. The design of the naval and merchant flag of Holland is a tricolor of three equal horizontal bands,—red above, white in the middle, blue at the bottom.

Nicaragua. A flag of three horizontal stripes, white between blue. In the central white stripe of the naval flag are the state arms; on the merchant ensign, a blue anchor.

Norway. The merchant flag of Norway is red and bears a blue cross edged with white. The field of the naval ensign is red and bears a broad blue cross. This latter flag is swallow-tailed, with the end of the cross projecting in the angle of the swallowtail.

Panama. This republic has a flag of four quarters. The upper, inner quarter is white and bears a blue star; the upper outer quarter is red; the lower inner quarter is blue; the lower outer quarter is white, bearing a red star.

Papal State (Vatican City). Two equal vertical stripes of yellow and white, charged with the insignia of the Papacy on the white stripe, a triple crown, or tiara, over two crossed keys, one of gold and one of silver, tied with a red cross and two tassels.

Paraguay. The Paraguayan flag is a tricolor of horizontal stripes. The upper bar is red; the lower is blue; the center, white. On the white band are the national arms, and on the reverse a lion with the inscription *Paz y Justicia*. This is the only flag in the world with differently designed sides.

Peru. A flag of three stripes is the national ensign. The inner and the outer bar are red. On the center, white, band are the national arms.

Poland. The Polish flag is a simple banner of two equal horizontal stripes,—white above, red below.

Portugal. The field of the Portuguese flag is made up of a green and a red portion divided in the proportion of two to three, the green being next the staff. Over the dividing line are placed the arms of Portugal, a red-bordered white shield on a gold armillary circle, the latter commemorating the fame of the explorer, Prince Henry.

Rumania. Three equal vertical bars,—blue next the staff, yellow in the middle, red in the fly,—constitute the national ensign. In the naval flag, the yellow band bears the national arms.

Russia. The banner of Soviet Russia is a plain red field, whose upper corner next the staff has a golden five-pointed star in outline and, below, in gold, a sickle and a hammer, symbolizing agriculture and industry.

Salvador. The national flag has three horizontal stripes. The upper and the lower bar are blue; the center band is white, bearing the national arms and, in Spanish, the legend, Republic of Salvador and Central America.

Spain. The flag of the Spanish republic is a tricolor, having three horizontal bars. The uppermost bar is red, the center is yellow, and the lowest is purple. Alternating horizontal bars, three yellow and two red, constitute the merchant flag.

Sweden. The merchant flag of Sweden is a rectangular blue field bearing a yellow cross. The naval ensign is of the same colors, but swallow-tailed, with the cross projecting in the angle of the swallowtail.

Switzerland. The Swiss flag has a rectangular red field charged with a white cross. The ends of the cross do not touch the edges of the flag.

Thailand (Siam). The national flag of Thailand consists of five horizontal bars. From top to bottom, they are red, white, blue, white, and red.

Turkey. The Turkish flag is a red field on which, in white, is the historic emblem of a star and the crescent moon. The symbol of star and crescent was the ancient emblem of Byzantium (Istanbul), said to have been adopted by the city when, by the light of a crescent moon, a night attack by Philip of Macedon was foiled. Mohammed III appropriated the device after the Turkish capture of Istanbul in 1453.

United Nations. The flag of the United Nations is blue and white. In the center of a light blue field is a white global map of the world supported by two olive branches, symbols of peace. Adopted in 1947, it was first flown by armed forces at war in July 1950, when the Security Council authorized its use by General Douglas MacArthur in Korea.

Uruguay. The flag of Uruguay is made up of nine alternating white and blue stripes,—five white and four blue,—with a white canton bearing a golden sun.

Venezuela. The Venezuelan naval flag is a horizontal tricolor. The upper stripe is yellow, the center blue, the lower red. On the yellow stripe, at the end next the staff, appear the national arms. In the center of the flag are grouped seven white stars.

Yugoslavia. A horizontal tricolor is the national flag of Yugoslavia. The top bar is blue; the middle one is white; the bottom, red.

STATE MOTTOES, NICKNAMES, BIRDS, AND FLOWERS

State	Motto, with Year of Adoption	Translation	Nickname of State	State Bird	State Flower
Alabama	Audemus Jura Nostra Defendere.	We Dare Defend our Rights, 1939	Cotton	Yellowhammer	Camellia
Alaska	None		"The Last Frontier"	Willow Ptarmigan	Forget-me-not
Arizona	Ditat Deus. 1863	God Enriches	Grand Canyon	Cactus Wren	Saguaro Cactus
Arkansas	Regnat Populus. 1864	The People Rule	Wonder	Mocking Bird	Apple Blossom
California	Eureka.	I Have Found It	Golden	Valley Quail	Golden Poppy
Colorado	Nil sine Numine	Nothing without the Deity	Centennial	Lark Bunting	Rocky Mountain Columbine
Connecticut	Qui Transtulit Sustinet 1842	He Who Transplanted Continues to Sustain	Constitution (Nutmeg)	Robin	Mountain Laurel
Delaware	Liberty and Independence		Diamond (Blue Hen)	Blue Hen Chicken	Peach Blossom
Florida	In God We Trust. 1846		Peninsula	Mocking Bird	Orange Blossom
Georgia	Wisdom, Justice, Moderation		Cracker	Brown Thrasher	Cherokee Rose
Hawaii	Ua Mau Ke Ea O Ka Aina I Ka Pono	The life of the land is perpetuated in righteousness.	Aloha	Nene (Hawaiian goose)	Hibiscus
Idaho	Esto Perpetua. 1886	Mayest Thou Endure Forever!	Gem	Mountain Bluebird	Syringa

STATE MOTTOES, NICKNAMES, BIRDS, AND FLOWERS—Con.

STATE	Motto, with Year of Adoption	Translation	Nickname of State	State Bird	State Flower
Illinois	State Sovereignty, National Union. 1818		Prairie (Sucker)	Cardinal	Native Violet
Indiana	The Crossroads of America		Hoosier	Cardinal	Peony
Iowa	Our Liberties We Prize, and Our Rights We Will Maintain		Hawkeye	Eastern Goldfinch	Wild Rose
Kansas	Ad Astra per Aspera. 1861	To the Stars through Difficulties	Sunflower (Jayhawker)	Western Meadow Lark	Native Sunflower
Kentucky	United We Stand, Divided We Fall. 1792		Blue Grass (Corncracker)	Cardinal	Goldenrod
Louisiana	Union Justice, and Confidence		Pelican (Creole)	Eastern Brown Pelican	Magnolia
Maine	Dirigo	I Guide	Pine-Tree	Chickadee	Pine Cone and Tassel
Maryland	Scuto Bonæ Voluntatis Tuæ Coronasti Nos	With the Shield of Thy Good-Will Thou Hast Covered Us	Old-Line	Baltimore Oriole	Black-eyed Susan
Massachusetts	Ense Petit Placidam sub Libertate Quietem. 1780	By the Sword We Seek Peace, but Peace only under Liberty	Bay (Old Colony)	Chickadee	Mayflower
Michigan	Si Quæris Peninsulam Amœnam Circumspice. 1835	If You Seek a Pleasant Peninsula, Look around You	Wolverine	Robin	Apple Blossom
Minnesota	L'étoile du Nord. 1858	The Star of the North	Gopher	American Goldfinch	Moccasin Flower
Mississippi	Virtute et Armis. 1894	By Valor and Arms	Bayou (Magnolia)	Mocking Bird	Magnolia
Missouri	Salus Populi Suprema Lex Esto. 1822	Let the Welfare of the People Be the Supreme Law	Show-Me	Bluebird	Hawthorn
Montana	Oro y Plata. 1864	Gold and Silver	Treasure	Meadow Lark	Bitterroot
Nebraska	Equality before the Law. 1867		Corn Husker (Tree-Planter)	Western Meadow Lark	Goldenrod
Nevada	All for Our Country. 1866		Sagebrush (Silver)	Mountain Bluebird	Sagebrush
New Hampshire	Live free or die		Granite	Purple Finch	Purple Lilac
New Jersey	Liberty and Prosperity. 1776		Garden	Eastern Goldfinch	Violet
New Mexico	Crescit Eundo. 1850	It grows as it goes	Sunshine	Road Runner	Yucca Flower
New York	Excelsior. 1809	Higher	Empire	Eastern Bluebird	Rose
North Carolina	Esse quam Videri. 1893	To Be rather than to Seem	Tar Heel (Turpentine)	Cardinal	Dogwood
North Dakota	Liberty and Union, Now and Forever, One and Inseparable		Sioux (Flickertail)	Western Meadow Lark	Wild Prairie Rose
Ohio	With God, all things are possible. 1959		Buckeye	Cardinal	Scarlet Carnation
Oklahoma	Labor Omnia Vincit	Labor Conquers All Things	Sooner	Scissortailed Flycatcher	Mistletoe
Oregon	The Union		Beaver	Western Meadow Lark	Oregon Grape
Pennsylvania	Virtue, Liberty, and Independence. 1809		Keystone*	Ruffed Grouse	Mountain Laurel
Rhode Island	Hope. 1864		Little Rhody	Rhode Island Red	Violet
South Carolina	Animis Opibusque Parati.	Ready in Soul and Resource	Palmetto	Carolina Wren	Yellow Jessamine
South Dakota	Under God the People Rule		Coyote	Ringnecked Pheasant	Pasque Flower
Tennessee	Agriculture and commerce. 1797		Volunteer	Mocking Bird	Iris
Texas	Friendship. 1930.		Lone-Star	Mocking Bird	Bluebonnet
Utah	Industry		Beehive	Seagull	Sego Lily
Vermont	Freedom and Unity. 1866		Green Mountain.	Hermit Thrush	Red Clover
Virginia	Sic Semper Tyrannis	Thus ever to Tyrants	Old Dominion	Cardinal	Dogwood
Washington	Alki	By and By	Evergreen	Willow Goldfinch	Western Rhododendron
West Virginia	Montani Semper Liberi. 1863	Mountaineers Are Always Free Men	Panhandle	Cardinal	Big Rhododendron
Wisconsin	Forward		Badger	Robin	Violet
Wyoming	Cedant Arma Togæ. 1868	Let Arms Yield to the Gown	Equality	Meadow Lark	Indian Paintbrush

*Reference is to situation at apex of arch formed by states from North Carolina to New England.

FESTIVALS AND HOLIDAYS

THE word festival still carries the joyous sense of the Latin word *festum*, "feast," from which it is derived. The etymology of the word holiday, so commonly associated nowadays with business and national life, suggests in the old form, "holyday," the religious significance of all feasts and days of cessation from labor among early peoples. Popular customs, especially among more backward nations, still bear witness to the origin of popular festivals.

At the very dawn of history we find the widespread cult of the dead, accompanied with banquets at which, in the act of eating, there was believed to be communion with departed spirits. Thus the striking fact and mystery of death became the occasion of social and religious observance. Similarly, nomadic tribes, whose habits were vitally affected by the variation of light due to the phases of the moon, developed lunar feasts, in which they celebrated with joy the return of the new moon. Out of such recognition of the phases of the moon probably came originally the Jewish Sabbath, or "day of rest," which in turn gave rise to the Christian Sunday, dedicated to rest and religious observance. At a later stage of civilization, the mysterious succession of the seasons, governing human activity, occasioned the observance of festive days at planting time and at harvest. All these celebrations assumed a religious character.

The commemoration of notable events in the history of peoples and nations has given occasion for patriotic holidays. Many cities and other local communities maintain certain civic holidays upon which notable features of the community life and enterprise are celebrated. Such are the flower festivals of European and of some American cities. Colleges and schools observe many of their own holidays in celebration of their founding and of various stages of the school year.

Many of the modern festivals and holidays preserve, according to their season, much of the character of very ancient nature feasts. Recent years have seen fruitful efforts to give the festival a more effective place in modern community life. Under wise direction, it has become in many places an occasion for community expression in music, drama, and other forms of art. The ancient purpose of the holiday and the festival in æsthetic and spiritual education is thus happily being recaptured. In the following section, the observances of the most notable of the world's festal days and seasons are described, and the occasions of the most important modern national holidays are explained.

April Fools' Day or **All Fools' Day.** The first day of April, when for centuries throughout Christendom it has been customary to play irresponsible tricks on one's neighbors. Many and varied explanations have been vouchsafed for the origin of this practice, but all seem to lack the stamp of authenticity. The most convincing surmise, however, is that the custom owes its origin to the French, who adopted the Gregorian calendar in 1564. Prior to this date the French were wont to pay formal visits to their friends on April 1. On the change of the calendar these visits took place on January 1, but mock visits continued to be paid on April 1, especially on those who might forget the new order of things. The French term for this custom, *poisson d'avril*, is more euphemistic and appropriate than our own. It means an "April fish," that is, a young fish, consequently one that is easily caught.

Arbor Day. This annual tree-planting day is now generally observed throughout the United States and in parts of Canada and Britain. In some of the states, it is a legal holiday. The particular date selected varies necessarily with the climate and season, from January in Florida to April or May in most of the Northern states. To Mr. J. Sterling Morton, former commissioner of agriculture, belongs the credit for the suggestion of a definite Arbor Day. In 1872, he induced the authorities of his state, Nebraska, to set apart a day for tree planting.

Arbor Day is now the occasion of impressing upon children in the schools the importance of forestry. Its observance has grown from the simple school exercises and the planting of single trees to beautify school grounds or streets to the planting of thousands of seedlings.

Armistice (Veterans) Day. November 11. This day commemorates the signing of the armistice which ended hostilities in World War I. The armistice became effective at 11 A. M., which hour is observed in many countries by a salute of guns or one minute of complete suspension of the usual activities.

Ash Wednesday. The first day of the forty days of Lent according to modern observance. The name is significant of the custom of the Jews, who were wont to garb themselves in rough sackcloth and sprinkle their heads with ashes. It refers, however, in particular to the ritual observed by the Catholic Church. On this day the priest, before beginning mass, blesses a quantity of ashes made from the palms blessed on the Palm Sunday of the previous year. The people approach the altar rails, and the ashes are placed on the forehead of each one in the manner of a small cross, the act being accompanied by the words: *Memento homo quia pulvis es, et in pulverem reverteris*, "Remember, man, that thou art dust and unto dust thou shalt return." This custom dates from early in the 8th century.

Bank Holiday. In Great Britain, a secular day when by law banks are closed, and parties are exempt from presentment or payment of negotiable paper. The bank holidays in England, established by act of Parliament in 1871, are Easter Monday, Whitmonday, the first Monday in August, and Dec. 26 (boxing day). In Scotland, New Year's Day, the first Monday in May, the first Monday in August, and Christmas Day are bank holidays. In the United States and Canada, the term means legal holiday.

Candlemas Day. In its ecclesiastical meaning, Candlemas is the feast of the Purification of the Virgin Mary, and is observed on February 2. This festival is very strictly kept by the Roman Catholic Church, there being a procession with many lighted candles, and those required for the service of the ensuing year being consecrated on that occasion; hence the name Candlemas Day. The candles symbolize the words spoken by Simeon of the Infant Christ, "a light to lighten the Gentiles."

Popular observance of this date seems, however, to have prevailed in pre-Christian times. The Romans were accustomed to burn candles on February 2 to the goddess Februa. In modern times many traditions have attached themselves to the day. Among these is the belief that a fair Candlemas Day indicates a long winter. This is expressed in the Scotch lines:

"If Candlemas is fair and clear,
There'll be twa winters in the year."

In the United States the day is popularly known as Ground-hog Day, in reference to the fancy that if on this day the ground hog, or woodchuck, comes out of his burrow and sees his shadow, he will go back for another six weeks. In Canada, the bear is commonly substituted for the ground hog in this fanciful belief. A popular rural proverb runs thus:

"February, second day,
Have half your corn
And half your hay."

Carnival. The word comes from the Latin through the Italian *carnevale*, meaning "farewell meat!" It is applied to a season of feasting and merrymaking observed, especially in Italy, Spain, and France, as an offset to the gloomy forebodings which the forty days of approaching Lent

are said to bring. It is probably a relic of a pagan festival held in honor of Saturn. The period of carnival extends from the feast of the Epiphany, or Twelfth Day, to the eve of Ash Wednesday; but it is on the last three days, known as high carnival, that the spirit of revelry is supreme. Arrayed in whatever garb fancy may suggest, masked revelers with music and song parade the streets and give themselves up to act of irresponsible folly. Rome has always been thesrecognized home of carnival; but, among all the cities in which this reign of abandoned merriment holds sway, Venice stands unrivaled for its scenes of picturesque splendor and romantic pageantry such as are to be witnessed by day or night on the Grand Canal. In 1830, carnival was established in New Orleans, and has since grown in popularity each succeeding year. See *Mardi Gras.*

Christmas. This name, meaning Christ's Mass, is applied to the festival commemorating the birth of Christ celebrated on December 25.

The exact day of the birth of Jesus is unknown. It was not until the 3d century that his birth anniversary was celebrated to any appreciable extent by Christians, nor was there then any general agreement regarding the date on which it should be celebrated. January 6 and December 25, however, were commonly chosen in the 4th century. The general adoption of December 25, first in the West and a little later in the East, dates from the 5th century. December 25 was already a festive day for the sun god Mithra and appealed to the Christians as an appropriate date to commemorate the birth of Jesus, the "Light of the world." Theaters in the Roman Empire were ordered closed on Christmas as early as 400 but the day did not become a legal (court) holiday until 534.

In Germany the Yule feast, held at the winter solstice, had been celebrated in pre-Christian times, and many customs of the earlier festival were transferred to the Christian holiday. To replace some of these, dramatic representations of Jesus' early life were instituted; hence arose the medieval "manger songs" and Christmas carols. The Yule log first became a public ceremony in England in 1577. Plum puddings and mince pies had long since been associated with the day. The exchange of gifts at Christmas had its origin in early medieval times, but the use of Christmas cards dates from the latter half of the 19th century.

The Christmas tree is believed to have its origin in the ceremonial use of the palm tree in the worship of the Egyptian goddess Isis. A palm with twelve shoots, one to represent each month of the year, was carried in a festival of Isis at the winter solstice, celebrating the completion of one year and the beginning of another. In northern climates, this association of the palm tree with the celebration of December 25 was modified by the substitution of a fir tree.

The Christmas stocking comes from an Italian practice associated with January 6. The fairy Befana is supposed on that night to fill the stockings of children with gifts in accordance with their deserts, the naughty children receiving only ashes.

Chrysanthemum, Feast of. A celebration day observed by the Japanese, toward the end of October, when as a rule the chrysanthemum is to be found blooming in almost solitary splendor. The *Kiku-no-sekku*, as the feast is called by the Japanese, partakes of the nature of a public holiday. Gay crowds, wearing kimonos and dalmatics that take on the colors of the rainbow, pass through the streets on their way to the flower shows where gorgeous specimens of this favorite flower are on view. It is the custom on this day to sprinkle chrysanthemum leaves over the tables spread for tea, to which quaint and picturesque practice is attributed the virtue of conferring longevity.

Coconut Day. A festival observed among the Hindus for the purpose of propitiating Varuna, the god of the waters and the floods. With the Brahmans at their head, vast multitudes wend their way in procession to the sea or a river, singing hymns and reciting prayers. On the arrival at the shore or river bank, lighted tapers together with garlands of flowers and innumerable coconuts are cast into the waters. By this means, Varuna is conciliated, and, in consequence, it is believed, the earth bears fruit plentifully.

Dead, Festival of the. Among the Japanese the belief is held that the dead return once a year to visit their living relatives. In honor of such visitation a festival is celebrated from the 13th to the 15th of July. In all the temples and private shrines, fruit and other delicacies are placed upon the altars, and from time to time tea is poured out for the refreshment of the unseen visitors. Many prayers meantime are recited, and, when night sets in, tapers are lighted to guide the footsteps of the unseen, and innumerable lanterns are hung along the streets and in the cemeteries. From this picturesque display, the Festival of the Dead has come to be known among strangers as the Feast of Lanterns.

Dead, Festival of the Unforgotten. This festival among the Chinese corresponds to that of the Christian All Souls' Day. The Chinese have always been noted for their filial piety, and this love does not cease with the death of relatives, but rather is increased; hence ancestor worship forms an essential doctrine of the Chinese religion. The Festival of the Unforgotten Dead is celebrated twice a year, in the third and seventh months. On these occasions the people pay solemn visits to the tombs of their ancestors, and, after adorning these houses of the dead with flowers, they place thereon food, paper money, and paper figures representing servants. The worshipers then prostrate themselves and perform many devotions at the altars erected before each tomb, and, when the prayers are ended, wine is poured over the altars, and fireworks and crackers are lighted to exorcise the evil spirits. Finally, the pious celebrants seat themselves and partake of the material portion of the viands provided, the spiritual elements of which have already been consumed by the dead.

Dolls, Festival of. A gala day celebrated in Japan for the delectation of little girls and their dolls. The festival usually takes place toward the latter end of April. It is at this time that the sakura trees, somewhat akin to our peach trees, begin to blossom. The children and their mothers don holiday attire and proceed to decorate a special room in the house with sakura blossoms and other festoons for the reception of the waxen visitors. A banquet is then prepared for the protégées of the little foster mothers, and friends are invited to the feast. When the dolls have been admired, petted, and flattered, they are then supposed to partake of as many luxuries as they are able to consume; whatever delicacies may be left over, the children and the grown-ups finish by way of economy.

Dominion Day. The national holiday in the Dominion of Canada. It is celebrated on July 1 and commemorates the formation of the Dominion, which took place in 1867 in accordance with the British North America act, previously passed by the British Parliament. By this act, Upper Canada (Ontario), Lower Canada (Quebec), Nova Scotia, and New Brunswick were united under one Federal government.

Easter. The season which commemorates the death and resurrection of Jesus Christ is universally regarded as the chief of Christian festivals. The Venerable Bede, who was the great scholar of the early English churches, is authority for the derivation of the word Easter from the name of the Anglo-Saxon or Norse goddess of spring, Eostre or Ostara, to whom the month Eostur, corresponding to our April, was sacred. The French name *pâque*, as well as similar names in other languages, is derived through the Greek from the Aramean *pascha*, which

signifies "passing over." In apostolic times, the Christians continued to celebrate the Jewish pass over, giving to the feast a Christian significance. Hence the retention of the ancient name.

Between the Jewish Christians and the Gentile Christians there arose very early a dispute as to the proper date for the celebration of the resurrection. The former adhered to the 14th day of the month *Nisan*, while the latter adopted the Sunday following. A wide variation soon arose in the date observed and, despite a decision of the Council of Nice in 325, uniformity was not attained until the 7th century. The date fixed by this council, now universally accepted, was the first Sunday after the full moon which follows the vernal equinox. If that full moon falls on a Sunday, Easter is the following Sunday.

The times of the movable feasts in the Church calendar are reckoned from the date upon which Easter falls in each year. In this connection, four periods closely connected with Easter should be mentioned: Lent, or the forty days preceding Easter Sunday; the period of Holy Week, beginning with Palm Sunday and ending with Easter; the Octave of Easter, extending from Easter to the following Sunday; Eastertide, the season from Easter Sunday to Whitsunday, or Pentecost, 7 weeks after Easter.

In addition to the ecclesiastical observances of Easter, numerous ancient pagan customs have persisted in more or less altered form. These latter are such as were connected with the primitive spring festival celebrating the return of the goddess of spring and the signs of rebirth in the world. The Easter egg was a symbol of reviving life, often colored for flowers or, by Christians, for the blood of Christ. Egg rolling at Easter was a game played at Greenwich hill, England, from early times. The custom was introduced on the lawn of the White House by President Madison. See *Calendar*; *Freya*.

Ember Days. So called from an Old English word *ymbryne*, signifying a recurring period of time although the name is commonly regarded as a corruption of the Latin *quatuor tempora* "four seasons." The Ember Days are four periods of fast and abstinence appointed by the Church, and can be traced as far back as the early part of the 3d century. Originally there were only three, but in the time of Pope Gelasius I (492–496) a fourth had already been added. These Ember Days were definitely prescribed by Pope Gregory VII (1073–1085) to be observed by the whole Church in the four seasons of the year; namely, Wednesday, Friday, and Saturday following (1) December 13 (Feast of Saint Lucy), (2) the first Sunday in Lent, (3) Whitsunday, (4) September 14 (Exaltation of the Cross).

Empire Day. See *Victoria Day.*

Father's Day. Celebrated chiefly in the United States on the third Sunday of June, this date being generally accepted since 1924. The movement is said to owe its origin, in 1910, to Mrs. John Bruce Dodd, of Spokane, Wash., as a tribute to her father, William J. Smart, who had brought up his children orphaned of their mother. The ministerial association of Spokane, newspapers, and various commercial interests promoted the acceptance of the idea, which was facilitated by the existing popularity of Mother's Day.

Feast of Lanterns. See *Dead, Festival of the.*

Flag Day. A holiday observed in the United States to commemorate the adoption of the stars and stripes by the Continental Congress, June 14, 1777. The observance of the day was first advocated by Dr. B. J. Cigrand (1876-1932), who founded an association in 1895 to promote it. This patriotic anniversary has become an important one in the calendar of the schools. On this day also, it is generally customary to display the flag on residences and business houses.

Flowers, Battle of. The most fascinating feature of all the carnival celebrations. It originated at Nice, where it is always to be witnessed to best advantage. Carriages and vehicles of all descriptions and sizes come into requisition. Those of the wealthy are adorned with a profusion of flowers, while those of the humbler classes are decked out in white calico on which are sewed rosettes of various hues and colors. The vehicles drive up and down the *promenade des anglais*, and the occupants, as they pass, salute their friends by hurling bunches of flowers at them. The greeting is returned in the same way, and so the battle begins and is continued for many hours.

In many places on the continent of Europe, these battles of flowers take place outside carnival, generally in April, May, or June. At Ventnor, in the Isle of Wight, a famous battle takes place every year the first week of April.

Fools, Feast of. One of several strange and amazing celebrations which were permitted to take place with the sanction of ecclesiastical authority during the latter part of the middle ages. This "feast" was a development of a celebration observed by the subdeacons, on or about the Feast of the Circumcision (Jan. 1), who on this day were allowed, by way of relaxation, to assume the dignity and privileges of the higher clergy. This feast of the subdeacons was later taken up by the lower clerics called *esclaffardi*, and also by guilds and brotherhoods of "fools." It was then that it turned into a blasphemous extravaganza ending often in sacrilegious orgies and riots. Eventually it was suppressed by ecclesiastical authority.

Good Friday. The Friday before Easter, celebrated in commemoration of the crucifixion of Jesus. It was made a legal holiday by Constantine the Great in the early fourth century and is still so observed in England, Ireland, Canada, and certain parts of the United States. The eating of "hot cross buns" on Good Friday goes back to very early times.

Halloween. The name of the popular, boisterous autumn celebration means "holy eve," the occasion being the eve of "All Hallows'" or All Saints' Day, November 1. These names represent a Christian appropriation of an ancient pagan festival of autumn. Indeed the familiar customs of our Halloween—the games and pranks of children and grown-ups, together with the ghostly tales by the firelight—are relics of ancient pagan days. Long before Christian times, the Romans celebrated, at about the Halloween season, the festival of Pomona, goddess of gardens. The druidic autumn feast fell at about the same time Hence, in western Europe and in England, Roman customs were added to the druid observances and perpetuated in the popular festivities of modern times.

Jackson's Day. The popular name given to the anniversary celebration of the defeat of the English at New Orleans, January 8, 1815, by General Andrew Jackson, who afterward became seventh president of the United States. It is a legal holiday in Louisiana, and is observed by the Democrats in general throughout the United States.

Jubilee. From the Hebrew word *jobel* or *yobel*, which means a "ram" or "ram's horn" and, by extension, "the blast of a trumpet." According to the Jewish law mentioned in Leviticus XXV, the year following each seventh Sabbatical year was to be announced by the sound of trumpets on the Day of Atonement as a year of remission and universal pardon. The year of Jubilee occurred, therefore, once in every 50 years.

The year of Jubilee was instituted in the Christian Church by Pope Boniface VIII in 1300. From the year 1450, the Jubilee has been held every 25 years, with but three exceptions due to political upheavals.

July First. See *Dominion Day.*

July Fourteenth. The national festival of France, which practically corresponds to Independence Day in America. The Bastille, a huge fortress built in the 14th century, and used as a prison for political offenders and victims of those in power,

had long since become the symbol of despotism and oppression to the French people. Goaded by the memory of centuries of persecution and tyranny, the mob of Paris, on the morning of July 14, 1789, stormed and took this hitherto impregnable fortress. The taking of the Bastille was the tocsin of the Revolution, for on the ruins of the old régime typified by this hated structure was to be built at no distant date the Republic of France.

The first anniversary of the capture of the Bastille was called the Feast of Federation, at which the unfortunate Louis XVI swore allegiance to the Revolutionary constitution, which oath was later to be sealed by his blood. Only in 1880 was July 14 proclaimed by the National Assembly a general holiday. Since then, the Republican anniversary is celebrated with unabated enthusiasm and rejoicing, such as the French, especially those of Paris, know so well how to manifest.

July Fourth. The birthday of American independence and the greatest holiday of all those observed in the United States. On this day in the year 1776, the Declaration of Independence, as prepared by a committee of five, of which Thomas Jefferson was chairman, and amended by the Congress, was adopted.

Kermis or **Kirmess.** As the name indicates, *kirmess* or *kirkemesse*, that is, Church mass, was an old religious festival which took place on the anniversary of the dedication of a church. After the mass, the people gave themselves up to merrymaking and general feasting. The Kermis has lost its former devotional significance, being in the nature of an annual fair where music and dancing are the order of the day. The idea of the kermis has been adopted in America, and under this name fairs and open-air bazaars are frequently organized for the benefit of some hospital or other charity.

Kiteflying Festival. Once a year, the Chinese, young and old, devote a day to kiteflying. This day is called *Teng Kao*, or "Feast of High Flight," which is celebrated on the ninth day of the ninth month of the Chinese calendar. If the kiteflier be guilty of wrongdoing, the kite will fly away with the penalty due to it. Accordingly, when the kite is sky-high, the Chinaman cuts it loose, and settles down once again with an easy conscience.

Labor Day. In America, the celebration of the first Monday in September with parades and demonstrations in the cause of improved labor conditions was begun by the Knights of Labor in 1882 under the leadership of P. J. Maguire of Camden, N. J. The plan was adopted by other organizations. Since 1887, when the first act making the day a legal holiday was passed in Colorado, Labor Day has been established in all of the states of the Union and in Canada, the first Monday in September being the usual date adopted. In Europe, since about 1890, May 1 has been observed as Labor Day. See *Holidays in the United States*; *Holidays in Canada*.

Leap Year. The custom of women proposing marriage in leap year goes back at least as far as 1288, when a law in Scotland gave any unmarried woman the right to propose marriage in leap year. The eligible man to whom a proposal was made must accept or pay a maximum fine of one pound. Similar laws were passed in France, Genoa, and Florence.

Lent. A word from the Anglo-Saxon *lencten* meaning "springtime." It is employed to denote the forty days preceding Easter, the period observed in the Catholic Church as a fast. From the earliest times this custom of fasting was enjoined on Christians. But the law requiring of all Catholic Christendom the fast from Ash Wednesday to Holy Saturday (Sundays excluded) was not promulgated until the beginning of the 9th century.

In those early days the law of fasting was very strictly enforced and kept. Only one meal a day, and that to be taken in the evening, was permitted. In the course of succeeding centuries many relaxations and concessions were allowed, and in modern days the pope is accustomed to grant various dispensations lightening the burdens of strict observance. However, those whose health will permit are still bound to but one meal a day, two ounces of solid food being allowed as *frustulum* or *break-fast* in the morning, and a collation of eight ounces sometime before or after the chief meal.

Wednesdays and Fridays throughout Lent, and also the days of Holy Week, except Maundy Thursday, are days when flesh meat is forbidden. By special indult, the Holy See grants faculties to bishops in the United States, whereby workingmen and their families may use flesh meat once a day throughout the year, except on Fridays, Ash Wednesday, Holy Saturday, and during the vigil of Christmas.

Lupercalia. A name signifying "the festival of the wolf," which was celebrated by the ancient Romans on the 15th of February in honor of Lupercus, the protector of shepherds. Goats and young dogs were sacrificed on this day by the Luperci or priests of Lupercus. Clothed in the skins of the slaughtered animals and armed with thongs, they ran through the street striking all whom they met. Such blows were welcomed by women in the belief that thereby they were preserved from sterility.

Mardi Gras (*mär'dē grä'*). The French name for Shrove Tuesday, and, by extension, for the celebration of that day in the European carnival. In the United States, the most elaborate festival of Mardi Gras is that held annually at New Orleans, in which much of the Old World carnival spirit is preserved. The principal feature of this festival is a magnificent civic procession and pageant. See *Shrove Tuesday*; *Carnival*.

Maritime Day. May 22, the anniversary of the departure in 1819 from Savannah, Ga., of the *Savannah*, the first vessel equipped with steam propulsion to make a successful trip across the Atlantic Ocean. In accordance with a resolution of Congress approved in May 1933, the president proclaims annually the observance of this day, which is celebrated by the display of flags.

Marriage of the Adriatic. After the victory of the Venetians over the Imperial fleet in 1177, Pope Alexander III sent to the doge a gold ring as a symbol of the city's dominion over the sea. Thereafter the annual celebration of the victory took place on Ascension Day, when the doge from his state barge cast into the sea a consecrated ring, with the words: "We wed thee, O Sea, in sign of true and everlasting dominion." Thus, as a bride to her husband, the sea became subject to Venice. This picturesque ceremony was called by the Venetians, *il sposalizio del mare*, or "espousal of the sea."

May Day. The first day of May, which in olden times in England, France, and Germany was celebrated with much show of rejoicing and merrymaking. This festival is said to be a survival of an ancient one observed by the Romans in honor of Flora, the goddess of flowers.

Though the custom of keeping May Day still survives in country districts and attempts are being made to revive it in the schools, as a general celebration it may be said to be moribund. In medieval England, lads and lassies sallied forth on May Day morning to gather the hawthorn blossom or "May" along the country lanes. With it they crowned the fairest maiden of them all and proclaimed her "Queen o' the May." They then set up the Maypole decked with garlands, and danced the morris dance all day.

Toward the end of the 19th century, the various labor organizations in Europe adopted May Day as the occasion of annual demonstrations. In some countries, the day was frequently marked by clashes between the workingmen and government troops. More recently the First of May has been observed in an orderly manner as Labor Day.

Memorial Day or **Decoration Day.** This annual memorial takes place on May 30 throughout the Northern states, where it is observed generally

as a legal holiday. On a local basis, according to tradition, the custom of strewing flowers on the graves of soldiers originated spontaneously at various places, both in the South and in the North. For example, Boalsburg, Pa. claims to have held its own Memorial Day as early as 1864. In 1868, General John A. Logan, then commander in chief of the Grand Army of the Republic, issued an order designating May 30 as a day for the decorating of soldiers' graves. Since that time, the 30th of May has become the occasion in most states for the commemoration of American soldiers and, in many localities, of all dead.

Middle Kingdom, Feast of the. This is a feast celebrated among the Chinese usually about the middle of the second month according to their calendar. On this occasion, branches of the cactus tree with bunches of sago plant and garlic are hung outside the doors. The women bake a special cake, the chief ingredient of which is the poison-fish plant. These cakes are to be eaten sitting, as thus they are efficacious against evil spirits. The cakes are frequently sent also to friends who have emigrated to other countries.

Mother's Day. This day is celebrated on the second Sunday of May by the wearing of a carnation—red if one's mother is living, white if she is dead. Frank E. Hering of South Bend, Ind., proposed before conventions of the Eagles lodge, first at Indianapolis on February 7, 1904, that a day should be set aside by lodges for honoring mothers. Miss Anna Jarvis (d. 1948) of Philadelphia proposed the manner and time of celebration in a public meeting in 1907. Philadelphia was the first city to observe the day—May 10, 1908. By presidential proclamation dated May 8, 1914, flags were flown on government buildings in honor of the day. The observance was introduced into England in 1913.

Navy Day. Since 1922, the anniversary of Theodore Roosevelt's birthday, October 27, has been observed as Navy Day in the United States. Its purpose is to educate the people in navy policy. Addresses are given by public men setting forth the requirements of sea service, the defense value of the navy, and its importance in international affairs.

New Year's Day. The celebration of the first day of the calendar year is one of the oldest of festivals. The reason of its observance has varied, of course, with the different calendar systems. Its holiday character is today well-nigh universal in civilized countries. In China and Japan, and generally throughout the Orient, the customs attending New Year's Day are elaborate, and in the air of rejoicing and the exchange of gifts the festival partakes of the nature of the Western Christmas celebrations.

New Year's Day in Scotland, as well as in France and some other countries of Europe, is a more important holiday than Christmas. In America, observance of the day has varied with the sections of the country and the traditions of the people.

Generally, New Year's Eve and New Year's Day are occasions of visiting and entertainment; in many communities, churches observe New Year's Eve with watch night services. The arrival of the new year is generally signalized by the noise of bells, sirens, whistles, and horns. Since Washington's time it has been the custom for the president of the United States to hold a reception at the White House. In Philadelphia, the mummers' parade, with the marchers in fancy dress, is a colorful annual fixture that has become famous.

Olympic Games. These contests formed the most notable of the four Greek festivals of ancient times, and citizens from all the Grecian states were eligible to take part in them, provided they gave proofs of civic and personal integrity. The games took place on the plain of Olympia in Elis every fourth year, and consisted of wrestling, throwing of the discus, chariot racing, and foot racing. The names of the victors were kept on record, and great honors were shown them. Each successful competitor was crowned with a garland of wild olive and received a palm branch, the emblem of victory. Moreover, their statues were erected in the Altis, or central enclosure of the sacred precincts of Olympia. The year 776 B. C. was taken as the date of the first Olympic games, and Greek dates were reckoned from that time.

In 396 A. D., the Olympic games were suppressed by order of Theodosius, the Roman emperor. After a lapse of 15 centuries, they were revived, and in 1896 a great international contest of athletes was organized at Athens, to be the forerunner of a long series of such competitions. The outstanding feature of the modern Olympic games is the Marathon race, over a course of 26 miles, 385 yards—the distance from Marathon, Greece, to Athens. This race commemorates the famous run of Phidippides, the messenger who brought to Athens the report of the Greek victory over the Persian army at Marathon in 490 B. C. Phidippides is said to have expired immediately after delivering the message. The dates and places of holding the modern Olympic games are as follows: 1896, Athens, Greece; 1900, Paris, France; 1906, Athens, Greece; 1908, London, England; 1912, Stockholm, Sweden; 1920, Antwerp, Belgium; 1924, Paris, France; 1928, Amsterdam, Netherlands; 1932, Los Angeles, U. S.; 1936, Germany; 1948, England; 1952, Helsinki, Finland; 1956, Melbourne, Australia; 1960, Rome, Italy; 1964, Tokyo, Japan. Mexico City has been chosen as the site for the 1968 games.

Pan American Union Day. This day is observed on April 14 in the United States and the Latin American republics of America. It was proclaimed by the governments of these countries for the first time in 1931. Exercises are held in schools, colleges, and municipalities.

Passover. The most important of the Jewish festivals, called also the Feast of Unleavened Bread. It is observed in commemoration of the liberation of the Hebrews from bondage in Egypt. This feast begins on the 14th day of the month known as *Nisan*, the first of the Jewish year, corresponding to parts of March and April, and lasts until the 21st. The first and last days of the feast are observed as holydays. During this week Passover cakes, made simply of flour and water and baked hard, are eaten. For many centuries this festival has been begun with a festal meal, at which appear symbols of the meaning of the celebration.

Red-Letter Days. Saints' days and other holidays were formerly, and usually are still, marked in Church calendars with a red letter. From this custom comes the expression "red-letter day," meaning an especially fortunate or happy one.

Rose Festival. The annual civic celebration held in Portland, Oregon, during a week in the early part of June, when the roses, for which the city is noted, are at the height of their splendor. The festivities include a pageant of roses, a water carnival, and a program of athletic games.

Sabbatical Year. According to ancient Jewish law, every seventh year the Israelites allowed their fields to lie fallow, neither tilling nor sowing them, and even refraining from gathering the vintage. By extension, this term is applied to prolonged vacations which, in some colleges, are allowed to professors about every seventh year for the purpose of travel and research.

Saint Patrick's Day. March 17, the day on which the Irish commemorate their great national saint, who died at Saul (Sabhal), County Down, March 17, 493, at the patriarchal age of 106. He was buried at the chieftain's dun or fort two miles outside the town. From all parts, it is recorded, bishops, priests, and people gathered round his tomb to honor the venerable father of their faith.

Saint Valentine's Day. A festival called also popularly Valentine Day, falling on February 14. The origin of the observance of this day is

altogether uncertain. Equally vague are the circumstances that led to its connection with Saint Valentine. Among the many interesting folk customs of medieval France and England was a gathering of the young people on Saint Valentine's eve. Names were drawn by chance from a receptacle, the person whose name was on a slip becoming the "valentine" or sweetheart of the holder for the ensuing year. Some antiquarians find a precedent also in certain similar customs connected with the ancient Lupercalial which occurred in February.

Saturnalia (*săt'ŭr-nā'lĭ-ă*). An ancient festival among the Romans, held in honor of Saturn and celebrated about the middle of December. It usually lasted several days beyond the date set apart for the official rites. A king was chosen to preside over the feasting, which was a mixture of mirth and license, when masters and mistresses were wont to wait on their slaves. The term is now used to designate any festivity where the manner of merrymaking is of an unrestrained and intemperate nature.

Shrove Tuesday. The Tuesday before Ash Wednesday, which is the equivalent for the French *mardi gras* and the Italian *martedi grasso* (fat Tuesday), the last day of carnival in the greater part of southern Europe. The English term shrove comes from "to shrive," or hear confessions, and is further explained by a quotation from the *Ecclesiastical Institutes*, translated by Abbot Ælfric, 1000 A. D.: "In the week immediately before Lent every one shall go to his confessor and confess his deeds, and the confessor shall so shrive him as he then may hear by his deeds what he is to do (by way of penance)."

The English custom of eating pancakes on this day arose from the economy of using up the eggs and fat which were formerly forbidden articles of diet during the forty days of Lent; hence also the origin of the name Pancake Tuesday, or Pancake Day.

Sunday or **Sabbath.** The first day of the week, called Sunday, is recognized by Christians as a holy day. By the church, the sanction of the fourth commandment has long been invoked for the observance of Sunday by worship and by cessation of ordinary labor. The Jewish Sabbath, or "day of rest," coincides with Saturday in the modern calendar. The word Sabbath is also frequently applied to the first day of the week. Following precedents of English common law, Sunday is generally recognized as a legal holiday throughout the United States.

Terminalia (*tûr'mĭ-nā'lĭ-ă*). An ancient Roman festival held annually on February 23 in honor of Terminus, the god of boundaries. Neighbors on adjoining lands met at the boundary stones and there united in offering up sacrifices, after which they gave themselves up to feasting, games, and dances.

Thanksgiving Day. In the United States, a day set apart annually and appointed by the president and by the governors of the various states for giving thanks to God for the favors and mercies of the year past. It is essentially a harvest festival and owes its origin to the Pilgrim Fathers. Despite the lean harvest of the summer of 1621, Governor Bradford decreed a day of thanksgiving and rejoicing after the scanty crop had been gathered in.

In the course of the Revolution, Congress frequently recommended days of thanksgiving and prayer. After the close of the war many of the states adopted the custom of an annual day of thanksgiving. There was, however, no uniformity of date for holding this festival. Owing, however, to the persistence of Mrs. Sarah Josepha Hale, President Lincoln in 1863 appointed Thursday, August 6, "as a day for national thanksgiving, praise and prayer." From 1864 until 1939, the last Thursday in November was proclaimed annually by the president as the day of national thanksgiving. In 1939–41, President Roosevelt moved the date forward one week to leave more time between Thanksgiving and Christmas. A number of states retained the later date.

In December 1941, through a joint resolution adopted by the United States Senate and House of Representatives and signed by President Roosevelt, the fourth Thursday of November was officially designated as the date for Thanksgiving Day.

Tournament of Roses. At Pasadena, California, on January 1 of each year, is held a festival to which the floral wealth of southern California contributes in lavish profusion. The fête is a civic enterprise of the city of Pasadena, in which neighboring communities, large and small, participate. A brilliant pageant of flower-decked floats, automobiles, and carriages forms the principal feature of the celebration, which includes also games and races. Since its inauguration in 1890, this festival has become a famous event which attracts thousands of visitors from all parts of the world.

Victoria Day. The birthday of Queen Victoria, May 24. A movement to celebrate this date as Empire Day was initiated by Reginald Brabazon, earl of Meath, an English philanthropist. The aim of the proposal was to emphasize the unity of interest among the parts of the British Empire. Both the observance and the name of Empire Day have gained wide acceptance in Canada and in other parts of the British Commonwealth of Nations.

Wedding Anniversaries. Anniversaries of the wedding day are named from a custom (generally observed in all civilized countries) of giving certain kinds of presents as each anniversary comes about. The three most important anniversary celebrations are known as the silver wedding, after twenty-five years; the golden wedding, after fifty years; and the diamond wedding, after sixty, seventy, or seventy-five years. Other anniversaries of different periods have various other names, but are observed only locally, as in England. For instance, the first anniversary is known as the, *paper* or *iron* wedding; the second, *straw*; the third, *candy*; the fourth, *leather*, the fifth, *wooden*; the seventh, *floral;* the tenth, *tin;* the twelfth, *linen;* the fifteenth, *crystal;* the twentieth, *china*; the thirtieth, *pearl;* the thirty-fifth, *coral*; the fortieth, *emerald;* and the forty-fifth, *ruby*. These latter names are now practically moribund and are seldom used.

Yom Kippur This "Day of Atonement" is the holiest day of the Jewish religious year. It occurs on the 10th day of Tishri, the seventh Hebrew month, between the middle of September and the first of October. It marks the close of the ten Penitential Days, which begin with Rosh Hashanah, the first day of the Jewish New Year.

HOLIDAYS IN THE UNITED STATES

Although the term "national holiday" is popularly applied to the Fourth of July and other generally observed holidays, the term is really a misnomer. Congress can point the way by legislating holidays for the District of Columbia and the territories under Federal control, but legal holidays are established by statute in the various states, as shown in the following list. Unless otherwise stated, Labor Day is the first Monday in September.

HOLIDAYS IN THE VARIOUS STATES

Alabama.—Jan. 1; Jan. 19 (Lee's birthday); Feb. 22 (Washington's birthday); Mardi Gras; Apr. 13 (Jefferson's birthday); Apr. 26 (Confederate Memorial day); June 3 (Jeff. Davis's birthday); July 4; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Alaska.—Jan. 1; Feb. 12 (Lincoln's birthday); Feb. 22; Mar. 30 (Seward day); May 30; July 4; Oct. 18 (Alaska day); Thanksgiving day; Dec. 25.

Arizona.—Jan. 1; Feb. 14 (Admission day); Feb. 22; May 30; July 4; Labor day; Oct. 12 (Columbus day); General Election day; Nov. 11; Thanksgiving; Dec. 25; Arbor day.

Arkansas.—Jan. 1; Jan. 19; Feb. 22; June 3; July 4; Oct. 12; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

California.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Sept. 9 (Admission day); Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Colorado.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Aug. 1 (Colorado day); Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Connecticut.—Jan. 1; Feb. 12; Feb. 22; Good Friday; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Delaware.—Jan. 1; Feb. 12; Feb. 22; Good Friday; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 7 (Delaware day); Dec. 25; Arbor day.

District of Columbia.—Jan. 1; Jan. 20 (Inauguration day); Feb. 22; May 30; July 4; Labor day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Florida.—Jan. 1; Jan. 19 (Lee's birthday); Feb. 22; Mardi Gras; Good Friday; April 26 (Confederate Memorial day); June 3 (Jeff. Davis's birthday); July 4; Labor day; Oct. 12, General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Georgia.—Jan. 1; Jan. 19 (Lee's birthday); Feb. 12 (Georgia day); Feb. 22; Apr. 26 (Confederate Memorial day); June 3; July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Hawaii.—Jan. 1, May 30, June 11, July 4, Labor Day, Thanksgiving Day, Dec. 25.

Idaho.—Jan. 1; Feb. 22; May 30; June 15 (Pioneer day); July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Illinois.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Indiana.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Iowa.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Kansas.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Kentucky.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Louisiana.—Jan. 1; Jan. 8 (anniversary of the battle of New Orleans); Feb. 22; Mardi Gras; Good Friday; June 3 (Jeff. Davis's birthday); July 4; Labor day; Oct. 12; Nov. 1 (All Saints' day); General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Maine.—Jan. 1; Feb. 22; Apr. 19 (Patriots' day); May 30; July 4; Labor day; Oct. 12; General Election day (Courts only); Thanksgiving day; Dec. 25; Arbor day.

Maryland.—Jan. 1; Feb. 22; Mar. 25 (Maryland day;) Good Friday; May 30; July 4; Labor day; Sept. 12 (Defenders' day); Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Massachusetts.—Jan. 1; Feb. 12; Feb. 22; Apr. 19 (Patriots' day); May 30; July 4; Labor day; Oct. 12; Thanksgiving day; Dec. 25; Arbor day.

Michigan.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Minnesota.—Jan. 1; Feb. 12; Feb. 22; Good Friday; May 30; July 4; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Mississippi.—Jan. 1; Jan. 19; Feb. 22; Apr. 26 (Confederate Memorial day); June 3; July 4; Labor day; Thanksgiving day; Dec. 25; Arbor day.

Missouri.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 1 (Missouri day); Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Montana.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Nebraska.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Nevada.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; Oct. 31 (Admission day); General Election day; Thanksgiving day; Dec. 25; Arbor day.

New Hampshire.—Jan. 1; Feb. 22; fast day appointed by the governor; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

New Jersey.—Jan. 1; Feb. 12; Feb. 22; Good Friday; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

New Mexico.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Arbor day.

New York.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

North Carolina.—Jan. 1; Jan. 19; Feb. 22; Apr. 12; May 10 (Confederate Memorial day); May 20 (anniversary of the signing of the Mecklenburg declaration of independence); July 4; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

North Dakota.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Ohio.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Oklahoma.—Jan. 1; Feb. 22; May 30; July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Oregon.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Pennsylvania.—Jan. 1; Feb. 12; Feb. 22; Mar. 4 (Pennsylvania day); Good Friday; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day: Dec. 25; Arbor day.

Puerto Rico.—Jan. 1; Feb. 22; Mar. 22 (Emancipation day); Good Friday; May 30; July 4; July 25 (Occupation day); Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Rhode Island.—Jan. 1; Feb. 22; May 30; July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

South Carolina.—Jan. 1; Jan. 19 (Lee's birthday); Feb. 22; May 10 (Confederate Memorial day); June 3 (Jeff. Davis's birthday); July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Dec. 28 (Woodrow Wilson's birthday); Arbor day.

South Dakota.—Same as in North Dakota, excepting Oct. 12.

Tennessee.—Jan. 1; Jan. 19; Feb. 12; Feb. 22; Good Friday; May 30; June 3; July 4; July 13 (Gen. Bedford Forrest's birthday); Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Texas.—Jan. 1; Feb. 22; March 2 (anniversary of Texas independence); Apr. 21 (anniversary of battle of San Jacinto); June 3 (Jeff. Davis's birthday); July 4; Labor day; Oct. 12; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Utah.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; July 24 (Pioneer day); Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Vermont.—Jan. 1; Feb. 22; May 30; July 4; Aug. 16 (Bennington Battle day); Labor day; Oct. 12; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Virginia.—Jan. 1; Jan. 19; Feb. 22; May 30; June 3; July 4; Labor day; General Election day; Nov. 11; Thanksgiving day; Dec. 25; Arbor day.

Washington.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; Oct. 12: General Election day; Thanksgiving day; Dec. 25; Arbor day.

West Virginia.—Jan. 1; Feb. 12; Feb. 22; May 30; June 20 (West Virginia day); July 4; Labor day; Oct. 12; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Wisconsin.—Jan. 1; Feb. 22; May 30; July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Arbor day.

Wyoming.—Jan. 1; Feb. 12; Feb. 22; May 30; July 4; Labor day; General Election day; Thanksgiving day; Dec. 25; Arbor day.

HOLIDAYS IN CANADA

The following holidays are generally observed in the Dominion of Canada with the closing of banks and public offices and the cessation of business: Jan. 1, Good Friday, Easter Monday, May 24 (Victoria day or Empire day), July 1 (Dominion day), first Monday in September (Labor day), Dec. 14 (King's birthday), Dec. 25 (Christmas day). Thanksgiving day is fixed by proclamation of the governor-general, usually the second Monday in October.

RELIGIOUS BODIES—FACTS AND PHILOSOPHIES

For understandable reasons, statistics concerning church organizations are subject to frequent revision. Variations from year to year are explained partly by the growth of population, by increased or decreased activity of church bodies, and sometimes, particularly in the United States, by the merging of related sects. Owing to changes in classification, a detailed comparison of statistical tables by decades is not practical. However, a summation of totals reported by the various groups gives a fairly accurate picture of church membership as of a particular date.

The assembling of information concerning 259 religious organizations in the United States is a continuing process which depends upon voluntary reporting of statistics by the various groups. At present the compiling is done by the Bureau of Research and Survey of the National Council of the Churches of Christ in the U.S.A. The membership data thus collected, along with many additional facts, can be found in the *Yearbook of American Churches*. In this volume, and in *Statistical Abstract of the United States*, which summarizes information from it, a breakdown of membership figures is given, both for groups numbering 50,000 or more and for branches and smaller organizations.

CHURCHES IN THE UNITED STATES

(A partial list of larger groups)

Name	Members	
	1946	1960
Adventists	244,157	354,184
Assemblies of God, General Council	241,782	508,602
Baptist Bodies, Grand Total	15,084,530	21,374,126
Brethren (German Baptist, Dunkers)	182,947	248,249
Church of Christ, Scientist	*	*
Churches of God	——	392,635
Church of the Nazarene	201,487	307,629
Churches of Christ	——	2,163,493
Congregational Christian Churches	1,140,824	75,000
Disciples of Christ	1,889,066	1,801,821
Eastern Orthodox (Eight groups)	711,517	2,718,110
Evangelical and Reformed	695,029	809,000
Evangelical United Brethren	——	751,763
Friends	113,465	126,233
Jewish Congregations	4,641,000	5,500,000
Latter Day Saints	911,279	1,647,524
Lutheran (All branches)	5,089,986	8,101,306
Mennonite (Combined totals)	105,764	158,998
Methodist (All branches)	8,430,146	12,585,394
Presbyterian (All branches)	3,044,800	4,277,947
Protestant Episcopal	*	3,444,265
Reformed Bodies	310,852	485,025
Roman Catholic	24,402,124	42,104,899
Salvation Army	205,881	273,319
Unitarian	74,789	151,557

* Membership figures not available.

Some groups not represented in the foregoing table are given below, with their latest available totals:

African Orthodox, 6,000; Buddhist Churches of America, 20,000; Christian Union, 7,300; Churches of God in Christ, 392,635; International Church of Four Square Gospel, 82,624; Jehovah's Witnesses 273,131; Moravian Bodies, 61,368; New Apostolic Church of North America, 12,204; Pentecostal Assemblies, 416,327; Polish National Catholic Church, 282,411; Reformed Episcopal, 7,652; United Brethern, 21,663; Universalist Church of America, 71,000; Volunteers of America, 28,320.

BIBLIOGRAPHY ON WORLD RELIGIONS

Since the formation of the United Nations organization, comprising member countries with widely divergent religious backgrounds, new impetus has been given to the study of world religions, their traditions and philosophies. For the guidance of persons seeking information concerning this field of knowledge, a "Committee on College Reading" has recently compiled a carefully selected group of references dealing with various aspects of the subject.* By permission, the following titles, with the Committee's descriptive notes, are given here.

Apocrypha (tr. by Goodspeed) *Univ. Chicago Press*
Religious writings similar to the books of the Old and New Testament, but not universally accepted.

Ballou, Robert (Ed.)—World Bible . . . *Viking*
Comprehensive selections from basic texts of Hinduism, Buddhism, Confucianism, Taoism, Zoroastrianism, Judaism, Christianity, and Mohammedanism.

Bates, E. S. (Ed.)—The Bible Designed to be Read as Living Literature . . *Simon and Schuster*
Largely the King James version, but modernized and arranged chronologically by subject matter.

Browne, Lewis—This Believing World. *Macmillan*
An objective summary and analysis of the chief religions of the world.

Brunini, John G.—Whereon to Stand . . *Harper*
Handbook on the Roman Catholic Church and its doctrines. Statement by a layman for non-Catholics who want facts without controversy.

Burrows, Miller—The Dead Sea Scrolls.

Fosdick, Harry E.—A Guide to Understanding the Bible . . . . . *Harper*
Traces the development of concepts of God, man, right and wrong, suffering, fellowship with God, and immortality.

Goodspeed, E. J.—The Story of the Bible. *Univ. of Chicago Press*
An account of the manuscripts that form the Bible.

James, William—Varieties of Religious Experience. *Modern Library*

Jurgi, E. J. (Ed.)—The Great Religions of the Modern World . . . . . *Princeton Univ. Press*
Ten essays, each by an authority, on the ten great living religions.

Roth, Cecil—The Jewish Contribution to Civilization . . . . . *Harper*
An authoritative account of the part that the Jewish people have played in western civilization.

Sheen, Fulton J.—Preface to Religion . . *Kenedy*
A presentation of the Catholic philosophy in answer to the quest for happiness and peace.

Williams, Michael—Christian Classics . *Liveright*
An anthology of religious autobiography, of spiritual counsel, of English mysticism and of religious poetry.

*Published by Hendricks House, Farrar Straus, N. Y. (library edition). New American Library, N. Y. (pocket book)

RELIGIONS OF THE WORLD (1960 est.)

Name	North America	South America	Europe	Asia	Africa	Oceania	Total
Christians	184,176,306	131,131,141	480,079,626	47,276,172	34,836,280	11,303,501	888,803,026
Jews	5,780,000	673,160	3,714,300	2,057,650	543,180	68,500	12,836,790
Moslems	35,500	353,500	12,802,000	328,238,000	88,791,000	105,000	430,325,000
Buddhists	165,000	135,000	10,000	151,500,000			151,810,000
Hindus	27,500	306,000		331,388,500	636,500	112,200	332,470,700
Confucianists, Taoists	101,000	112,000	62,000	350,000,000	8,700	60,000	350,343,700
Shintoists				50,500,000			50,500,000
Animists	50,000	1,000,000		45,000,000	75,000,000	100,000	121,150,000
Miscellaneous*	69,356,244	2,513,479	80,376,324	326,828,958	41,783,270	3,476,799	524,335,074

*Includes atheists where, as in Russia, government is officially atheist.

POPULAR SUPERSTITIONS

THE term superstition, like religion, is a word of uncertain origin. The process by which the Latin word, *superstitio*, literally "standing over," acquired the sense of "awe" or "excessive devotion" is a matter of conjecture. In modern times, especially within the recent scientific period of thinking, superstition has borne two related meanings. As contrasted with the development and application of scientific knowledge, superstition is a relic of the prescientific ages,—of the childhood thought and fancy of the race. As compared with the orderly, systematic conceptions of science about the world and human conduct, superstition accepts a strange, disorderly world of chance, in which men must encounter the play of unknown forces with traditional rites and irrational charms. The practices of primitive superstition are usually directed to propitiation or control of mysterious and lawless powers.

The early history of the human race produced a huge mass of superstition, born of ignorance and fear. Much of this body of beliefs and practices is yet in vogue among primitive tribes, and not a little of it persists in the backward sections of civilized nations. Indeed recent studies have shown that few even of the most highly educated men and women are free of traces of superstition. Many of these appear, however, merely as survivals of childhood practices; others are retained as amusing, playful fancies.

Because of the fact that many superstitions arise from efforts to explain phenomena and to adapt human activity to the explanations, a close relationship between superstition and science is observable. This fact is particularly evident in the connection between the pseudo science astrology and the science astronomy. Astrology, like alchemy, mingles much true scientific observation with superstitious reasoning.

As science advances, superstition recedes. For science brings increasing freedom through comprehension and rational use of natural forces, while superstition holds the human mind in bondage to blind magic and fear. The progress of education is indicated by the disappearance of superstitions.

In the following pages, a large number of the most prevalent superstitions are briefly treated. Some of these examples are drawn from the lore of primitive peoples, but most are popular superstitions found today in America and Europe.

Astrology. The pseudo science which purports to explain human character and to forecast conduct by the supposed influences of the planets and the stars. The practice of the art of casting *horoscopes*, or predicting the course of a person's life by reference to the positions of heavenly bodies at the time of his birth, is almost as ancient as civilization. By means of great circles passing through the poles, the astrologers divided the heavens into 12 "houses," each house having a planet as lord. That "house" which, at the moment of a person's birth, was about to appear above the horizon was said to be in ascendant, and to be most powerful in its influence. The point just visible on the ecliptic was called the horoscope. If, for example, the house of Mars was in ascendant at a child's birth, it was prophesied that the child would become warlike. Other qualities and fortunes were predicted from various relations of the planets and constellations.

Astrology is the most elaborately organized of superstitions. It was practiced as a means of livelihood by the celebrated astronomer Kepler. It became more and more discredited in Europe during the 17th century, although it still has its devotees in all countries.

Basilisk (*băz'ĭ-lĭsk*; *băs'-*). A serpent. lizard, or dragon, mentioned in fable, whose hissing could drive away all other snakes. By its very look, it was said to fascinate to helplessness, and its breath meant death to its victims. To have the eye of a basilisk means figuratively to attract others by one's gaze and to have a mysterious sway over them.

Birds and Beasts, Superstitions about. In Holland and in other northern European countries, the *stork* is welcomed about homesteads. Platforms are often erected on the roofs of houses to induce the birds to build their nests. The birds are fabled to bring children, and there is a prevalent fancy that where the storks nest no fire will come.

According to the ancients, the seven days prior to and the seven days following the winter solstice, the shortest day of the year, were halcyon days. During this period the *halcyons*, or kingfishers, are said to build their floating nests upon the sea and hatch their young, "so that by their privilege we have seven days and seven nights in the very heart of winter, wherein we may sail without danger." Hence the expression "halcyon days" is used figuratively to mean a time of rest and tranquil enjoyment.

In Ireland is found the belief that a *robin* entering a peasant's house is a sign of severe frosts and snow. In the Kentucky mountains, the flight of a bird into a house is a sign of bad luck, particularly an omen of death.

The common *dragon fly* is the object of several curious superstitions. Perhaps the most prevalent is that this beautiful insect will get into children's hair and sew up their ears. Hence the name "devil's darning needle."

Around the *petrels* many superstitions have gathered. These birds are supposed by sailors to be under the Virgin Mary's protection. Each is said to represent the soul of a mariner lost at sea. The coming of one species near a ship is believed to forbode storm; hence the name "storm petrel."

Certain Eskimo tribes are said to bury a *dog* with a dead child, that the dog may guide the child in another world.

Among the Negroes of the southern United States, much superstitious lore about animals is current. It is regarded as an omen of bad luck, for example, to have a *rabbit* cross one's path from right to left; if the rabbit crosses from left to right, good luck will follow. The left hind foot of a rabbit is held to be a lucky talisman. While possession of a horseshoe is lucky, finding a mule shoe is most unlucky.

Birthstones. In addition to their value as ornaments, certain precious stones have been endowed with fancied lucky qualities and worn as talismans. Astrologers have developed an elaborate symbolism of gems, and out of this has arisen the widely prevalent fancy of birthstones, or jewels supposed to be magically appropriate to the month of one's birth. Several lists of these lucky gems are current, the most common being the following: January, garnet; February, amethyst; March, aquamarine, bloodstone; April, diamond; May, emerald; June, pearl, alexandrite, moonstone; July, ruby; August, peridot, sardonyx; September, sapphire; October, opal; November, topaz; December, turquoise, zircon.

Bugaboo (*bŭg'ā-bōō'*), **Bogie** (*bō'gĭ*). Names with which nurses in former times were wont to frighten recalcitrant infants into being "good." The origins of the words seem to be doubtful, though bugaboo (and possibly bogie) may be traced to the Celtic word *pouca* (pooka) meaning a mischievous phantom; or to the Old French *bugibu*, the name of a demon.

Caul (*kôl*), **Lucky.** The caul is a membrane found sometimes enveloping the head and face of a child at birth. It is regarded as an omen of good luck and as a talisman against drowning. Sailors

are known to give large sums of money to be in possession of "lucky cauls." Whence the superstition arose is a mystery, but its antiquity is vouched for by no less a personage than Saint John Chrysostom (347–407 A. D.), who tells us that the midwives of his time sold these cauls for the purposes of magic.

Charms. Belief in magic gives rise to faith in the power of various objects to produce unusual effects, especially in either bringing on or warding off evil. Among primitive folk, probably the most potent charms are believed to reside in material upon which magic words have been written. Extraordinary virtue also is ascribed to objects of unusual form, especially if they resemble the human body or some of its parts. Thus the ginseng root is said to be especially prized among the Chinese if it suggests the form of the body.

Through long years of tradition, certain stones, gems, bones, and pieces of metal have acquired a popular reputation as charms which, when worn on the body, will ward off various diseases and troubles. As words are held to be of greatest magical poteney, so their evil effects may often be obviated by touching some substance. The common, jocular custom of rapping on wood when a possible disaster is mentioned is a survival of this ancient superstition.

The pain and the crippling effects of rheumatism have occasioned the wearing of many kinds of charms against the disease. In some parts of America, cedar knots or galls from goldenrod stems are esteemed for this purpose. Elsewhere, a buckeye or horse-chestnut or a ring made of a potato is deemed efficacious. The wearing of an iron ring for a similar purpose is said to be a survival of primitive notions that the metal would draw out the disease as the magnet or lodestone attracts metal.

Dwellings also, as well as human bodies, are believed to need protection from evil influences. For this purpose, the familiar horseshoe serves. In China, certain herbs are suspended over doorways as protection against witchcraft. In rural England, hawthorn branches are similarly used.

An *amulet* is a charm worn on the person as a protection against evil. The word is of uncertain origin, being referred by some authorities to the name of a plant, *amuletum*, mentioned by Pliny as reputed to possess magic powers. A *talisman* is a charm believed to endow its wearer with power over other things and people.

A *fetish* is a charm or amulet in which the protecting spirit is supposed actually to dwell.

Clover, Four-Leaved. The fancy of luck attaching to the finding of four-leaved clovers probably springs, like so many other beliefs, from the rare or unusual occurrence of the four leaves. In Ireland, the corresponding superstitions are connected with the four-leaved shamrock. The miniature maltese cross formed by the leaves is suggested as additional reason for belief in the four-leaved clover as a talisman.

Divining or **Dousing Rod.** The belief that hidden springs and water courses may be located by means of a forked hazel or apple twig is widespread and persistent. Only certain gifted persons, however, are supposed to be able to use the method. The twig, held firmly and horizontally in the hand, is said to tilt or bend downward when the operator stands over a vein of water. Much popular evidence for the efficacy of the practice is available, but recent careful, scientific study has failed to justify the claims made for the rod.

Evil Eye. The superstitious belief persists that certain persons are endowed with diabolical powers which they exercise through looking at people. This belief and its attendant fears are found among all peoples. Certain charms and talismans are supposed to afford protection against the malignant influence of the evil eye.

Friday, Ill Luck of. The superstition which attributes ill luck to this day of the week may have originated among the Norsemen. With them, Friday was sacred to the goddess Freya, the northern Venus, after whom it was named. Anyone who undertook a journey or devoted himself to business projects on this day was looked upon as dishonoring her, and she was known to avenge herself by overwhelming him with misfortune. Among Christians, this irrational fear of Friday as a day of ill omen is no doubt associated with the death of Christ. Friday is, however, but one of many days which the strange fancies of astrology have declared unlucky.

It is interesting to note, in this connection, that Friday is the Moslem Sabbath. Among Mohammedans generally, the day is regarded as especially lucky. The Mohammedan peasants in the northwest frontier of Hindustan are said to reverence the day particularly because of a tradition that on that day God rested from the work of creation.

Horsehair Turning to Snake. Among children, especially, and even among many grown-ups, it is believed that, if a horsehair is thrown into a pool, the hair will be changed into a snake. The truth is that what people imagine to be snakes are merely what are known as hairworms, which usually breed in ditch water or in any stagnant pool. These worms belong to the genus *Gordiacea*, named in reference to the Gordian knot, because they are often found in tangled masses. The larvæ develop in the bodies of insects, whence they escape into the water. In this breeding stage, they have the appearance of threads, and measure about 10 to 30 inches in length. Their eggs are deposited in long strings in the water.

Horseshoe, Lucky. The custom of nailing a horseshoe over the door of a house, as a talisman and a charm against evil spirits, is to be found in all English-speaking countries, as well as among the Norwegians, Swedes, Danes, and several other northern races. Nor is the custom unknown in Hindustan. Among the ancient Saxons and the Irish, the horse was regarded as a creature that brought good luck, and from this belief their superstition of the power existing in the horseshoe may have arisen. Ancient authorities aver that the horseshoe must be placed with the open side up, else the luck will all run out. Finding horseshoes also is said to be lucky, and it is said that, if a maid find a horseshoe with nails in it, their number counts the years before she shall marry.

Magic. A word of very wide application. It is used to signify the entire field of primitive religion and science as well as the tricks of the modern sleight of hand performer. As a phase of superstition, magic includes the use of occult formulas and strange devices to insure success in daily affairs, to cure disease, to avert punishment or catastrophe, to punish enemies, and generally to command the aid of powerful spirits.

The use of magical words, such as are employed in the *Arabian Nights* tales, which, when pronounced, will open doors or summon genii, is a typical form of magic. Perhaps the most widespread and interesting form is the so-called sympathetic magic. This practice rests upon the idea that effects produced upon a representation or image of a thing will be accompanied by similar effects upon the thing itself. Hence arises the practice of making an image of a person one desires to injure or torment. Injury or mutilation of the image, accompanied by proper incantations, will, it is believed, result in corresponding suffering and injury to the person himself. The widely prevalent custom of hanging people in effigy probably has its origin in these beliefs.

To the kinds of magic which were employed to do harm, the name "black magic" is applied; magical practices used to summon good spirits and to counteract evil are called "white magic."

Magic in Medicine. Among many primitive tribes the mystery of death presented itself as the result of evil magic worked by some enemy. Disease also was looked upon as the work of evil spirits controlled by magicians and sorcerers. In consequence, treatment of the sick became a magical process of weird performances of the savage priest or medicine man. Among the ignorant of all countries many survivals of this primitive magic are to be found. One of the greatest tasks of modern medical science is to banish the suffering and cruelty which attach to these ancient practices.

A common practice of the savage doctor is the use of loud noises to frighten away evil spirits. For this purpose, he uses drums and rattles. The patient is often subjected to physical torture to accomplish the same results. Exorcism, or the banishment of spirits by magical formulas of words, is also a frequent practice.

Sympathetic magic finds its place in medicine also, as in the prescription of a flower resembling the eye for eye trouble, or, for disease of the brain, a nut having a shell resembling the skull and a kernel resembling the two halves of the brain. A more primitive belief leads to applying cooling remedies to a weapon that has made a wound rather than to the wound itself. Very widespread also is the belief that, by contact, or even by wishing, a disease may be passed to an animal, and thus the human sufferer be cured.

A very persistent superstition is that which ascribes potency to a medicine in proportion to its disagreeable taste,—the more uncanny and nauseating the mixture, the more efficacious it is believed to be. Similarly, the wearing or carrying of onions, pieces of sulphur, or camphor gum is superstitiously regarded as a shield against various diseases. See *Charms*.

Mascot. A word brought into prominence by Audran's comic opera "La Mascotte" in 1880. It signifies something animate or inanimate that brings good luck to the one who wears it or to whom it belongs. Thus, "for luck," baseball and other playing teams will take some animal with them on their tours. The derivation of this word is somewhat uncertain, though it has a very close analogy to the Provencal *masco*, a sorceress or witch. It has been traced also to the French term *né masqué*, said of a child born with a membrane or *caul* over its face, which was regarded even among the ancients as being extremely lucky. Though the cult of the mascot has always been cherished among sailors and soldiers, it came much more into evidence during the World War, when such was the demand for these charms that their manufacture became a thriving business. See *Caul, Lucky*.

Mistletoe, Legends of. The mistletoe is a parasitic, excrescent shrub which grows on the trunks and between the forked branches of various trees, such as hawthorn, sycamore, pear, and apple. With its white, translucent berries, the mistletoe is a great favorite at Christmastide, both as a decoration and as a license-giving sign for the harmless pastime of promiscuous kissing.

In ancient times it was regarded by the druids as sacred when it grew on the oak—which seldom happens with the European variety. It was then supposed to have all-healing properties. It had also the reputation among the early Christians of helping in cases of old age infirmities and was called *lignum Sanctæ Crucis*, "wood of the Holy Cross." In northern European mythology, Balder, the sun god, who was held to be invulnerable, was shot to death with an arrow made from this wood. In the Saturnalia of the pagans, the mistletoe played a prominent part, whence the tradition of kissing has been handed down to modern times.

Numbers, Luck of Odd. One of the most ancient types of superstition is that which is concerned with the magical significance of odd numbers. In various forms, this kind of belief is widely prevalent today. The ancient Pythagoreans regarded the unit as the father of numbers. Odd numbers were consequently held to be masculine and more worthy than the feminine, even numbers. In China, pagodas are built with odd numbers of stories, for good luck, and the Siamese construct their houses with odd numbers of floors and stair steps.

The number three has been regarded as sacred by many peoples, including the Phœnicians, the Greeks, and the Hindus as well as Christians. Multiples of three, such as nine, share in the mystical significance of three. It is said that among the ancient Mayas the number nine signified indefinite power and excellence. A very fortunate man was said to have nine souls. Thirteen, with these people, had similar significance.

Seven, likewise, has been endowed with mystic significance. It was used frequently in ancient Babylonian incantations. The astrologers divided man's life into seven parts, each governed by one of the seven planets. Indeed, the widespread reverence for the number seven is probably traceable to the speculations of ancient astronomers or astrologers.

Oak, Ash, and Thorn. In English folklore, popular beliefs about these trees represent very well the persistence of superstitions attaching to trees. These beliefs may be regarded as remnants of ancient religious ideas. Among English country folk, quaint rimes and oaths "by oak, ash, and thorn" survive. A curious old fancy is that, when the butter will not "come" promptly in the churn, the dairy maid must stir the cream with a twig of the mountain ash, or rowan, which will correct the trouble. Hawthorn branches suspended in houses were formerly deemed effective protection against witchcraft.

The oak was regarded as a sacred tree by the druids, and many curious beliefs in its power to bring good fortune are current. Among the Kentucky mountaineers, it is said that washing in water that stands in an oak stump will remove freckles. It is deemed lucky for a miner to skin his back against an oak board.

Omens and Signs. Among primitive peoples there has always flourished a belief in the prophetic nature of certain events and natural appearances. The ancient nations developed an elaborate system of foretelling the course of both public and private enterprises. Among the signs observed were the flight of birds, the behavior of animals, the growth of vegetation, and the condition of the entrails of slaughtered beasts.

The advance of human knowledge has largely done away with belief in signs having no rational connection with events in question. Many curious sayings persist, however, which still command more or less acceptance among the credulous. For example, many people deem it unlucky to pass beneath a standing ladder. Others are dismayed at the breaking of a mirror, while the hoot of an owl or the howling of a dog is affirmed to presage evil and death.

There are, however, lucky as well as unlucky omens. Thus, seeing the new moon for the first time over one's left shoulder is said to be lucky, though it is also affirmed by some that over the right shoulder is the lucky way to view the moon. The possession of a black cat with no white in its fur is fortunate. In some districts of England, the first person in a neighborhood to hear the cuckoo's song in the spring is regarded as lucky. Such a saying as this last may have arisen as a way of expressing the joy that men feel at the coming of spring. Somewhat similarly, the saying that full saltcellars on New Year's Day are omens of a lucky year may be traced to times when salt was a precious thing in the household. If it was present in plenty, the house would probably be well supplied with other things.

Palmistry. The so-called art of reading character and personal fortune by inspection of the elevations, or "mounts," and the lines on the palm of a person's hand. The elaborate principles and rules that, since the middle ages, have been developed for the practice of this type of fortune telling form a conspicuous example of a pseudo science.

Prayer Wheel. A wheel or cylinder used among Buddhists of Tibet and Mongolia for the purpose of offering up prayer. Lengthy strips of paper with seemingly interminable prayers inscribed thereon are wound around these cylinders. When a Buddhist feels piously inclined, all he has to do is to set the cylinder in motion with his hand or by some artificial means. Thus is a blessing brought down on the head of the ingenious devotee.

Rain of Toads. Because small toads or frogs are seen hopping about in great numbers after heavy rain, many people think they have dropped from the sky as an effect of the rainstorm. The simple truth is that toads go through a tadpole existence in stagnant pools or ponds, which overflow with the rain, leaving the young toads high and dry on the grass or sedgy banks.

Shoe-Throwing at Weddings. The custom of throwing an old shoe after the bride and bridegroom as they leave the church or as they start on their honeymoon is of exceedingly ancient date, though of uncertain origin. It is nevertheless strongly reminiscent of what took place among the Jews of old, who were wont to give a shoe in witness of a covenant. For instance, when property or land changed ownership, the original possessor untied his shoe and gave it to the new purchaser or inheritor in token of complete abandonment of all present and future claim. It is said that in early Anglo-Saxon marriages the father of the bride delivered one of her shoes to the bridegroom, who touched her head with it, as a symbol of his authority. Today, only the idea of luck is associated with the custom, particularly at the beginning of a journey.

Tabu or **Taboo.** Among the South Sea Islanders, from whose language this word is derived, tabu signifies a kind of consecration of objects or persons. It involves a prohibition against touching certain things or approaching certain persons except in prescribed attitudes. In its original use, the term has a distinct religious meaning, but it is commonly used in English to signify similar customs found among many primitive peoples. The hunters of some American Indian tribes, for example, were forbidden to kill the animal represented in their tribal totem. The superstitious reverence for the tabu, cultivated by savage priests and chiefs, made it a very effective instrument of tribal discipline and control.

Tar Water. A cold infusion of tar in water, used as a drug. In 1739, Bishop Berkeley, Protestant bishop of Cloyne in Ireland, found during a visit to America that the Indians of Narragansett made lavish use of tar in concocting their medical nostrums. The people of his diocese at this period were stricken with violent dysentery, and he became obsessed with the idea of the efficacy of tar water for all maladies. He wrote a treatise on the virtues of tar water, which, together with his insistent advocacy of the drug, drew down upon him the indignation of medical men and the ridicule of the American and British newspapers of the time.

Telling the Bees. A very old superstitious fancy is that, when a death occurs in a family, some one must go to the hives and tell the bees of it, else the bees will become spiteful and hard to manage. A further phase of this belief is that just before the funeral of one who owns bees the hives must be turned around. It has been suggested that these fancies had their origin in a superstitious reverence for the extraordinary intelligence of the bees. Whittier, in his verses "Telling the Bees," beautifully described the custom.

Thirteen, Unlucky. In nearly all civilized countries, this number is regarded as unlucky, not only by the simple and unlettered, but by many persons of education. By many authorities this superstitious dread is said to have had its origin in the fact that Christ and his disciples made a total of thirteen and that he was betrayed by one of them. Traces of the superstition are found, however, in the traditions of many ancient peoples as widely separated as the Norsemen and the Hindus. Among the Turks, aversion to the number thirteen is strongly marked. The French and Italians and Latin races, in general, have a distinct horror of this number. In many streets of Paris there is no house to be found bearing the number thirteen.

In America there are hotels in which the number thirteen is applied to no floor and to no rooms. Imposing lists of eminent people who were superstitious on this point have been drawn up. Equal numbers could be cited who found good luck rather than ill in thirteen. Nevertheless, the belief still lingers as one of the ancient human follies that have resisted the attacks of satire and the admonitions of reason.

Vampire. A word of uncertain origin, used to signify a kind of spectral being with a human body, which, according to a very ancient superstition, leaves the grave at night and preys upon sleeping men and women. It is said that the vampires are the ghosts of dead wizards and people of evil life, and that, by sucking the blood of their victims, they maintain in their buried bodies a semblance of life.

Witchcraft. The delivery of the modern Western world from the terrible delusion of witchcraft is one of the great triumphs of the type of scientific thought which began to exercise wide influence in the 17th century. The superstition is very ancient and widespread among untutored and savage peoples, and it assumed persistent forms in the cultures of ancient nations. The witch was supposed to be a woman leagued with evil spirits and therefore equipped with supernatural powers, not only to foretell events, but to work evil by magical means. However, among primitive folk, the terror inspired by the witch operated to protect her from harm.

In the 16th and 17th centuries in Europe, both Catholics and Protestants engaged in a systematic persecution of supposed witches. The literal enforcement of certain ancient laws of the Old Testament intensified the movement. Hundreds of old women, who had incurred the ill will of their neighbors, were executed in Europe, and the practice found an echo in New England. Stimulated by Cotton Mather and other ministers of his party, the witchcraft craze reached its climax at Salem in 1692. During the continuance of the craze, numerous persons were tortured, 19 were hanged, and one victim was pressed to death.

The growth of rational, liberal thought during the late 17th and the 18th century put an effectual check upon the continuance of this cruel delusion.

Yule Log. A great log of wood, sometimes the root of a tree, which, preparatory to the old English Christmas festivities, was brought into the house with great ceremony on Christmas Eve, laid in the fireplace, and lighted with the brand of last year's log. While it lasted, there was great drinking, singing, and telling of tales. Sometimes it was accompanied by Christmas candles, but in the cottages the only light was from the ruddy blaze of the great wood fire. The Yule log was to burn all night; if it went out, it was considered a sign of ill luck that would govern the ensuing year.

NOTABLE ACCIDENTS AND DISASTERS

Apart from the ravages of famine and disease and the fatalities incident to war, astonishing toll of human life is taken by violent natural cataclysms,—earthquakes, volcanic eruptions, storms, and floods,—as well as by fire and explosions occasioned in the course of human industry. In addition to the loss of life from these causes, the accompanying destruction of economic resources is such as to challenge attention. Only within recent years has the advance of science demonstrated how large a portion of this human and economic waste is preventable.

Sanitary engineering is today accomplishing much toward the checking of great epidemics of disease. In America, particularly in the Mississippi and Ohio valleys, the danger from floods has already been decreased through scientific construction of dams and levees. In the great river valleys of China, however, where in some years loss of life mounts into the millions, only small beginnings have been made toward flood control. The destruction of life and property by forest fires in the United States is being checked through the vigilance of the rangers in the forest service.

Fires and explosions still hold great threats to life and property. Fire losses in the United States, declined from $501,980,624 in 1930 to $285,878,697 in 1940, but during the next decade more than doubled. Losses in 1950 were $688,460,000; in 1960, $1,107,824,000. The national board of fire underwriters estimated that a large part of this loss was due to preventable causes. The cost of all this waste must be borne by all the people. It must be paid in the form of increased taxes and higher insurance rates as well as in depletion of resources. Economic reasons, therefore, prompt the co-operation of all citizens in safety movements.

MOTOR VEHICLE ACCIDENTS

Of the various kinds of accidental death or injury in the United States, those having to do with motor vehicles are by far the most numerous and important. In the year 1959, for example, the total for deaths from this source was 37,910; for injuries, 1,400,000. The economic loss resulting from these accidents was set at $3,445,000, of which $1,830,000 was property damage. The remaining $1,615,000 was the estimated cost of medical care and the value of services lost.

A breakdown of the foregoing accident statistics, as given by the National Safety Council in the pamphlet Accident Facts, shows the following distribution by location and time of occurrence.

Urban, comprising two divisions: cities of ten thousand or more inhabitants, 8,750; and smaller cities and incorporated towns, 3,750. The total for *urban* areas is 12,500; for *rural* areas, 21,200, divided as follows:

	Day	Night	Pedestrian	Non-pedestrian
Urban	4,300	8,200	7,600	4,900
Rural	9,700	11,500	4,200	17,000

In a table giving seasonal occurrence of motor vehicle accidents, the traffic deaths for December are shown to be 30 per cent higher than the average for all the other months.

A breakdown in terms of passenger-miles for 1946 shows a total of 620,000,000,000. Traffic deaths for this division totaled 24,700. This figure includes pedestrians as well as operators and passengers for both automobiles and taxis. The death rate per 100,000,000 passenger-miles was 4.0. For buses, traveling 72,000,000 miles, the total deaths was 1,000, and the rate, 1.4. In the same period the rate for motor truck fatalities was given as 10.9.

The National Safety Council estimated traffic accident fatalities for 1960 at 38,200. The highest total was 39,969 in 1941.

FIRES, EARTHQUAKES, MINING AND MARINE DISASTERS

The following lists exhibit in some detail the most notable disasters of recent times, arranged according to causes. All figures representing property losses must be regarded as approximate. Estimates of numbers killed and injured are from the best available data.

GREAT FIRES

1794	London, Eng. . .	650 houses; $5,000,000 loss.
1812	Moscow, Russia .	Set on fire at the approach of Napoleon I and the French; 12,000 houses burned, besides palaces and churches; $150,000,000 loss.
1835	New York City .	600 buildings; loss $20,000,000.
1842	Hamburg, Germany	$35,000,000 loss.
1845	New York City .	$7,500,000 loss.
1845	Pittsburgh, Pa. .	1000 buildings; loss $6,000,000.
1848	Istanbul, Turkey . . .	3000 shops and houses; $15,000,000 loss.
1850	Philadelphia, Pa.	39 killed, 100 injured; 400 buildings burned.
1851	Saint Louis, Mo..	Large part of city burned; $15,000,000 loss.
1851	San Francisco, Cal.	2500 buildings destroyed; property loss $6,500,000; many deaths.
1861	London, Eng. . .	Tooley Street fire; $10,000,000 loss.
1863	Santiago, Chile .	Church of the Campania burned, with loss of 2000 lives, mostly women.
1870	Istanbul, Turkey . . .	7000 buildings; loss $25,000,000.
1871	Chicago, Ill. . .	3½ miles laid waste; over 200 persons killed; nearly 100,000 made homeless; 17,450 buildings destroyed; loss $290,000,000.
1871	Wisconsin . . .	Forest fires; 1500 lives lost.
1872	Boston, Mass. .	600 buildings; loss $73,000,000.
1877	Saint John, N. B.	12 churches, 25 public buildings; thousands homeless, about 20 killed; $15,000,000 loss.
1889	Seattle, Wash. .	Business district almost entirely destroyed; loss $10,000,000.
1894	Minnesota . . .	Forest fires; $25,000,000 damage; 418 lives lost
1900	Hoboken, N. J. .	215 lives; $4,627,000 loss.
1900	Hull and Ottawa, Canada . . .	$10,000,000 loss; 18,000 homeless.
1901	Jacksonville, Fla.	$10,000,000 loss; 148 blocks burned; several deaths.
1904	Baltimore, Md. .	75 city blocks covering 140 acres; $85,000,000 damage.
1904	Toronto, Ont. .	130 business buildings destroyed; $12,000,000 loss.
1906	San Francisco, Cal.	Fire following earthquake; 4 square miles burned; loss $350,000,000; 452 deaths.
1908	Chelsea, Mass. .	Manufacturing and business section; $17,000,000 loss.
1911	Coney Island, N. Y.	Amusement parks; $2,225,000 loss.
1911	Porcupine Dist., Ont.	Mining property, lumber mills, etc.; loss $3,500,000.
1912	Houston, Texas .	Business district; $4,500,000 loss.
1914	Salem, Mass. . .	1700 buildings destroyed; $14,000,000 loss.
1916	Jersey City, N. J.	Railroad terminal warehouses and steamers, $11,000,000 loss.
1916	New York harbor	Black Tom Island explosion and fire; $11,000,000 loss.
1916	Ottawa, Ont. . .	Parliament buildings of Canada; $3,000,000 loss.
1917	Halifax, N. S. .	Explosion of war materials and fire; 1158 killed, 4000 injured, 20,000 homeless; property loss $50,000,000.

GREAT FIRES—Con.

1917	Kingsland, N. J.	Munition factory; $12,000,000 loss.
1918	Minnesota	Forest fires; $35,000,000 loss.
1918	Minnesota and Wisconsin	Forest fires; 1000 dead; $100,000,000 property damage.
1918	Morgan Station, N. J.	Munition plant; $20,000,000 loss.
1919	Long Island City, N. Y.	Oil works and other plants; $4,250,000 loss.
1919	Savannah, Ga.	Fertilizer factory, cotton and railroad terminals; $4,000,000 loss.
1920	Galveston, Texas	Morgan line piers and warehouses; loss $3,250,000.
1921	Hoboken, N. J.	4 piers; 20 lighters; loss $6,000 000 to $10,000,000.
1922	Smyrna, Asia Minor	City almost completely destroyed on eve of Turkish occupation; great loss of life; 100,000 homeless; $200,000,000 property loss.
1923	Berkeley, Cal.	600 residences, covering 35 blocks; $5,000,000 loss.
1923	Mexicali, Mexico	Fire starting in movie theater; 30 lives lost; $5,000,000 property damage.
1926	Lake Denmark, N. J.	Naval arsenal struck by lightning; 22 lives lost; property loss $47,000,000.
1930	Columbus, Ohio	State Penitentiary; 320 convicts killed.
1934	Chicago, Ill.	Union Stock Yards; $10,000,000 property damage; thousands homeless.
1937	New London, Tex.	Natural gas explosion in Consolidated Public School; 427 lives lost.
1946	Atlanta, Ga.	Winecoff Hotel, 121 dead.
1947	Bar Harbor, Me.	Property damage, $25,000,000.
1947	Texas City, Tex.	Fire started by explosion of nitrate-laden French freighter. Known dead, 468; missing, 302; injured, 2000.
1960	Guatemala City	Mental hospital; 225 lives.

THEATER FIRES

1811	Richmond, Va.	75 dead.
1836	Leningrad, Russia	Lehman's theater 700 lives lost.
1845	Canton, China	1670 lives lost.
1846	Quebec, Que.	200 lives lost.
1847	Leningrad, Russia	Carlsruhe theater, 200 lives lost.
1871	Shanghai, China.	120 lives lost.
1872	Trenton, N. J.	600 lives lost.
1876	Brooklyn, N. Y.	Conway's theater, 295 lives lost.
1881	Nice, France	70 lives lost.
1881	Vienna, Austria	Ring theater, 640 lives lost.
1883	Berdichef, Russia	268 lives lost.
1887	Exeter, Eng.	200 lives lost.
1887	Paris, France	Opera Comique, 100 lives lost.
1888	Oporto, Portugal	Banquet theater, 200 lives lost.
1892	Philadelphia, Pa.	Central theater. 6 lives lost.
1895	Baltimore, Md.	Front Street theater, 23 lives.
1903	Chicago, Ill.	Iroquois theater, 575 lives lost.
1908	Boyertown, Pa.	Rhode's opera house, 170 lives lost.
1909	Acapulco, Mexico	Flores theater, 250 lives lost.
1911	Bologoe, Russia	120 lives lost.
1911	Canonsburg, Pa.	Opera house, 26 lives lost.
1912	Villarreal, Spain	80 lives lost.
1913	Calumet, Mich.	Italian hall, 72 lives lost.
1913	Vervins, France	10 lives lost.
1914	Java, Netherland India	Surabaya theater, 75 lives lost.
1919	Mayaguez, Puerto Rico	60 lives lost.
1919	Valence sur Rhone, France	80 lives lost.
1921	Milan, Italy	31 lives lost.
1922	Washington, D. C.	Knickerbocker theater, 97 dead.*
1923	Cleveland, S. C.	Schoolhouse hall, 77 lives lost.
1942	Boston, Mass.	Cocoanut Grove†, 493 dead.
1960	Amude, Syria	Movie theater, 152 lives.

*Roof collapsed from weight of snow. †Night club.

EARTHQUAKES AND VOLCANIC ERUPTIONS

1755	Lisbon	About 40,000 people killed; many cities damaged.
1783	Calabria and Messina	100,000 lives lost.
1797	Quito and Cuzco, Peru	40,000 lives lost.
1812	Caracas, Venezuela	12,000 lives lost.
1822	Aleppo, Syria	22,000 lives lost.
1857	Calabria, Italy	Great Neapolitan earthquake, more than 10,000 lives lost.
1859	Quito, Peru	5000 lives lost.
1861	Mendoza, Argentine Republic	7000 lives lost.
1861	Peru and Ecuador	25,000 lives lost.
1880	Manila, Philippine Islands	3000 lives lost.
1883	Mount Krakatoa, Strait of Sunda	35,000 lives lost.
1886	Charleston, S. C.	About 100 lives lost; $8,000,000 property damage.
1902	Mont Pelée, Martinique, W. I.	Volcanic eruption annihilated the town of Saint Pierre, caused death of 30,000.
1905	Northern India	Shock felt over area of 1,600,000 sq. mi.; about 20,000 lives lost.
1906	Chile	Large area affected, especially in Valparaiso and Santiago; 5000 lives lost; property loss $100,000,000.
1907	Kingston, Jamaica	Earthquake and fire; 1100 lives lost, 2000 persons injured; $25,000,000 property loss.
1907	Turkestan	14,000 lives lost.
1908	Sicily and Calabria	Messina and Reggio destroyed; 96,000 dead, 95 injured.
1912	Guadalajara, Mexico	Great part of the city destroyed; many deaths
1912	Turkey	3000 lives lost, 6000 persons injured, 40,000 persons homeless.
1914	Sakura, Japan	Earthquake and eruption; 43 lives lost; 855 houses destroyed; 20,000 persons made destitute.
1914	Sicily	200 lives lost, 1000 persons injured.
1915	Avezzano, Italy	30,000 killed; many towns ruined.
1915	Central Italy	29,978 lives lost; 372 communes damaged; Aquila, Caserta, and Rome affected; Avezzano, largest city destroyed.
1917	Guatemala	2500 lives lost.
1918	Puerto Rico	$34,000,000 property damage; 100 killed, 300 injured; tidal wave following earthquake.
1919	Java, Netherland India	Eruption of Mount Kalut; 5000 lives lost.
1919	San Salvador, Salvador	Nearly all houses in the city destroyed.
1920	Giarre, Sicily	Both Giarre and Codadivople destroyed.
1920	Kansu province, China	100,000 lives lost; 10 cities destroyed.
1920	Mendoza province, Argentina	150 persons killed in village of La Valle.
1920	Orizaba district, Mexico	3000 lives lost.
1921	Elbassan, Albania	City obliterated; 14 killed, 300 injured, 10,000 homeless.
1922	Chile	Shocks felt over a distance of 1100 miles north and south; 1800 deaths.
1923	Japan	200,000 killed, 125,000 injured; property loss over $900,000,000.
1933	Southern California	116 persons killed, 4000 injured.
1939	Chile	30,000 lives lost.
	Turkey	Over 40,000 lives lost.
1951	New Guinea	Mt. Lamington erupted; 4000 killed and injured.
1957	Northern Iran	2500 lives lost.
1960	Chile	5700 lives lost; extensive damage by tidal waves.
1962	Iran	20,000 killed and injured.
1964	Alaska	Loss more than $750 million.

FLOODS

1811	Hungary	Overflow of Danube; 24 villages swept away.
1813	Austria, Hungary, Poland, and Prussian Silesia	4000 perished in Poland; 6000, in Silesia.
1874	Mill River valley, Mass.	Inundated by bursting of dam; 144 drowned.
1874	Western Pennsylvania . . .	River floods; 220 drowned.
1881	Mississippi; Ohio	$15,000,000 loss; 138 lives lost.
1883	Java and Sumatra	Earthquake wave; 30,000 dead.
1887	China	Overflow of Hwang river in Honan; 900,000 lives lost.
1889	Johnstown, Pa. .	Reservoir burst; 2200 dead.
1891	Consuegra, Spain	1781 lives lost.
1896	Japan	Earthquake wave; 27,000 lives lost; 60,000 made homeless.
1900	Galveston, Texas	4500 lives lost; $30,000,000 property damage.
1903	Kansas City, Mo., and Mississippi River towns .	Millions of dollars in property destroyed; many lives lost.
1906	Hongkong, China	Typhoon; 10,000 lives lost.
1912	Mississippi valley	River floods; 200 lives lost, 200,000 homeless; property loss $45,000,000.
1913	Dayton, Ohio . .	Nearly destroyed; damage $128,000,000; 400 lives lost.
1913	Ohio and Indiana	River floods; 730 lives lost; $180,873,000 property loss; 60,000 buildings destroyed.
1915	China, prov. of Kiangsi, Kwangsi, and Kwangtung	Several thousand lives lost; $90,000,000 damage.
1915	Gulf coast . . .	300 lives lost; $20,000,000 property damage.
1915	Shanghai, China	500 dead; $5,000,000 damage.
1916	Cabin Creek valley, W. Va. . .	About 100 dead, 5000 homeless; $5,000,000 damage.
1916	South Atlantic coast	50 killed; $15,000,000 property damage.
1917	Tientsin, China .	15,000 sq. mi. inundated; $50,000,000 loss.
1919	Puerto Rico. . .	116 killed, 241 injured; $3,500,000 property loss.
1921	Pueblo, Colo. . .	120 dead, 140 missing; $20,000,000 property loss.
1927	Mississippi valley	About 310 dead; 700,000 homeless; damage $300,000,000.
1927	New England .	88 lives; damage $40,000,000.
1928	St. Francis dam, near Los Angeles	Dam failure; over 250 dead; 15,000 homeless.
1928	Lake Okeechobee, Florida	Rain and hurricane; 2000 lives lost.
1931	Central China . .	200,000 dead; property damage $440,000,000.
1934	Japan	Typhoon; 2064 dead; 13,335 injured; damage $90,000,000.
1935	Eastern United States	250 lives lost; $130,000,000 property damage.
1937	Mississippi valley	Over 500 dead; 1 million homeless; $500,000,000 damage.
1947	Mississippi river	Highest crest in 104 years; damage, $12,000,000.
1948	Columbia river .	In Idaho, Washington, Oregon; 48,000 homeless; damage to agricultural property, $21,000,000; Vanport, Oregon practically wiped out.
1950	Red river . . .	Winnipeg, Manitoba; heavy property damage.
1951	Missouri river .	In Kansas and Missouri; property damage enormous.
1953	Netherlands . .	Sea breaches dikes; 1800 lost.
1960	East Pakistan .	Tidal wave; 10,000 lives.
1963	Vaiont Dam, Italy	Flood waters caused by earth-rock landslide kill 1800.

MINE DISASTERS

1906. Courriere, France; explosion; 1060 dead.
1907. Jacobs Creek, Pa.; explosion; 239 dead.
1907. Monongah, W. Va.; explosion; 361 dead
1907. Toyooka, Japan; 400 dead.
1909. Cherry, Ill.; fire; 259 killed.
1910. Bolton, Eng.; 300 dead.
1913. Dawson, N. Mex.; explosion; 263 killed.
1924. Castlegate, Utah; 175 dead.
1928. Mather, Pa.; 195 killed.
1930. Millfield, Ohio; 79 dead.
1932. Moweaqua, Ill.; 54 killed.
1934. Wrexham, Wales; explosion; 265 dead.
1947. Centralia, Ill.; 111 killed.
1951. West Frankfort, Ill.; 119 killed.
1957. Bishop, Va.; explosion; 37 killed.

MARINE DISASTERS

1800. U. S. frigate *Insurgent* sailed from Hampton Roads and never heard from; 380 lives lost.
1831. Immigrant vessel *Lady Sherbrooke*, bound from England to Quebec, wrecked off Cape Ray; 273 lives lost.
1837. British transport *Albeuria*, foundered in Gulf of Saint Lawrence; regiment from garrison at Quebec on board; 525 lives lost
1847. Immigrant vessel *Exmouth*, bound to Quebec from Londonderry; 200 lives lost.
1850. Steamer *Royal Adelaide*, wrecked off Margate, England; 400 lives lost.
1850. Steamer *Griffith*, burned on Lake Erie; 300 lives lost.
1852. Troopship *Birkenhead*, bound from Queenstown to Cape of Good Hope, wrecked; 454 lives lost.
1854. Steamer *City of Glasgow*, Liverpool to Philadelphia; never heard from; 450 lives lost.
1854. Troopship *Lady Nugent*, from Madras, foundered in a storm; 400 lives lost.
1857. Steamer *Central America*, Havana to New York, sunk; 400 lives lost.
1858. Steamer *Austria*, Hamburg to New York, burned in mid-ocean; 471 lives lost.
1859. American ship *Pomona*, Liverpool to New York, wrecked; 400 lives lost.
1859. Steamer *Royal Charter*, wrecked on the Anglesey coast; 446 lives lost.
1865. Steamboat *Sultana* with exchanged Union prisoners of war aboard, destroyed on Mississippi river, above Memphis, by boiler explosion; 1400 lives lost.
1867. Royal mail steamers *Rhone* and *Rye* and numerous smaller vessels, wrecked near Saint Thomas, W. I.; 1000 lives lost.
1870. British warship *Captain*, foundered off Finisterre; 472 lives lost.
1873. White Star steamer *Atlantic*, wrecked off Nova Scotia; 547 lives lost.
1878. British steamer *Princess Alice*, sunk in collision in the Thames; 700 lives lost.
1887. British steamer *Wah Yeung*, burned; 400 lives lost.
1889. U. S. warships *Trenton*, *Vandalia*, and *Mipsic*, and German ships *Adler* and *Eber*, wrecked off Samoa by hurricane; 147 lives lost.
1891. British steamer *Utopia*; collision off Gibraltar; 574 lives lost.
1893. British battleship *Victoria*, sunk by collision with her sister ship *Camperdown* off Tripoli; 350 lives lost.
1894. Steamer *Norge*, wrecked on Rockall Reef in the North Atlantic; 600 lives lost.
1895. Spanish cruiser *Reina Regenta*, foundered in the Atlantic near Gibraltar; 400 lives lost.
1898. French liner *La Bourgogne*; collision off Sable island; 560 lives lost.
1898. U. S. battleship *Maine*, blown up in Havana harbor; 260 lives lost.
1904. Excursion boat *General Slocum*, burned in East river; more than 1000 lives lost.
1912. White Star liner *Titanic*; collision with iceberg off the Grand Banks, Newfoundland; 1517 lives lost.
1912. Japanese steamer *Kickermaru*, sunk off Japanese coast; 1000 lives lost.
1914. Canadian Pacific liner *Empress of Ireland*, in collision with the Danish liner *Storstad*, in Saint Lawrence river; 1024 lives lost.
1915. *Lusitania*, sunk off coast of Ireland by German submarine; 1154 lives lost.
1915. Steamboat *Eastland*, capsized at wharf on Chicago river; 812 lives lost.
1916. *Provence II*, torpedoed in Mediterranean; 3100 lost.
1917. The British warship *Vanguard*, blown up at her dock in a British port; 800 lives lost.
1919. French steamer *Chaonia*, lost in Straits of Messina; 460 lives lost.
1921. Steamer *Hongkong* hit rock near Swatow, China; 1000 lives lost.
1928. British liner *Vestris* disabled by storm, sinks off eastern U. S. coast; 111 lives lost. S. O. S. call delayed.
1934. Ward liner *Morro Castle* burned off New Jersey coast; 125 lives lost. S. O. S. call delayed.
1942. French steamer *La Moriciere* broke up in a storm off the Balearic islands; 290 lost.
1949. Canadian steamer *Noronic* burned at Toronto on vacation cruise to the Thousand Islands; 132 lives lost.
1954. Explosion and fire aboard U.S. carrier *Bennington* killed over 100.
1956. Italian liner *Andrea Doria* sinks off Nantucket after collision with Swedish liner *Stockholm*; 50 lives lost.
1959. Excursion boat *Dandarah* capsized in Nile River; 150 lost.
1960. U.S. Aircraft carrier *Constellation* (under construction) Brooklyn Navy Yard; 50 lives.
1963. U.S. atomic submarine "Thresher" lost in North Atlantic with 129 men aboard.

SOME DISCOVERIES, BEGINNINGS, AND FIRST USES

Aberration of light discovered by Bradley, 1725.
Adrenalin prepared by Takamine, 1901.
Agricultural chemistry founded by Liebig, 1840.
Air brake, railroad: George Westinghouse, 1868.
Airplane invented by Wilbur and Orville Wright, 1903.
Airplane, first transoceanic non-stop flight, America to Europe in 1919; Captain John Alcock, pilot; Lieut. W. Brown, navigator.
Airplane mail service, first regular transcontinental trip, New York to San Francisco, Sept. 8–11, 1920.
Antiseptic surgery introduced by Dr. Lister, 1867.
Armor plate for steel vessels made in U. S., 1889.
Atomic numbers determined by means of X-ray spectrums, Moseley, 1914.
Atomic pile, first one giving a self-maintaining chain reaction put into operation at Stagg Field Stadium, Chicago, December 2, 1942.
Atomic structure, concentric shell theory presented by Langmuir, 1919.
Atoms of other elements are shown by Rowley to consist of multiples of a reduced hydrogen atom, 1922.
Automobile, first steam-driven, Bridgeport, Conn., 1866.

Bacteria discovered by van Leeuwenhoek, 1680.
Baldwin locomotive, first, 1832.
Bath, Public, first free, established in Chicago, Ill., 1904.
Benzene ring theory devised by Kekulé, 1865.
Brick, first made in America, Virginia, 1612.

Carrel-Dakin antiseptic treatment of infected wounds, first used, 1915.
Cast-iron bridge in America, first, over Erie canal at Frankfort, N. Y., 1840.
Cell theory of organic structure formulated by Schwann, 1839.
Cholera bacillus discovered by Koch, 1884.
Coal first mined in America, Virginia coal mine, on James river, Chesterfield county, about 1750.
Anthracite first successfully used in American blast furnace at Mauch Chunk, Pa., 1838.
Coal-tar dye, mauve, discovered by Perkin, 1856.
Coke, first oven at Connellsville, Pa., begun, 1833.
Cotton manufacturing begun in South, about 1870.
Cotton spinning mill, first complete, in U. S., built by Samuel Slater for Moses Brown at Pawtucket, R. I.
Cotton spinning and weaving mill, first complete, built at Waltham, Mass., by Francis Cabot Lowell, 1814.
Cottonseed oil, produced by Dr. Otto, Bethlehem, Pa., 1768.

Diamond, atomic structure determined by Bragg by means of the X-ray, 1913.
Diphtheria antitoxin discovered by Behring, 1889.
Diphtheria germs discovered by Klebs, 1883.
Dynamo, first to give continuous current, constructed by Charles Wheatstone, 1841.

Electron, charge of an, measured, by Millikan, 1909.
Expansion of gases, law of, announced by Charles, 1787.

Fertilization, artificial, of eggs of sea urchin by means of chemicals, Jacques Loeb, 1910.
Fire department, first one established by Peter Stuyvesant, New Amsterdam (New York), 1659.
Fixed stars, Halley discovers the proper motions of, 1718.
Friction matches, first made in England by John Walker, 1827.

Gas, Coal, first used by William Murdoch, Cornwall, 1792.
First used for street lighting in America, Baltimore, 1821.
Germ plasm, Weismann announces his theory of, 1892.
Gold, first nugget discovered in Sutter's mill race, Sacramento river, California, 1848.
Gyrocompass: Elmer A. Sperry, 1905.

Horseshoes, first machine-made, Henry Burden, Troy, N. Y., 1835.
Hydrophobia, Pasteur introduced antitoxin treatment, 1885.

Ice, Artificial, first plant, New Orleans, La., 1866.
Ice, Dry, first manufactured commercially, 1925.
Incandescent lamp, first commercially successful, made by Thomas A. Edison, 1879.
Insulin, an internal secretion of the pancreas, is proved by Banting and coworkers to be specific for relief of diabetes, 1922.
Iron.
Angle iron, first rolled in U. S., Pittsburgh, 1819.
Blast furnace, first in Pennsylvania, Colebrookdale, near Pottstown, Thomas Rutter and others, 1720.
Blast furnace, first in Pittsburgh, 1811.
Iron discovered in North Carolina, 1585.
First exported from America, Virginia Company, 1608.
Ironworks, first successful in colonies, Lynn, Mass., 1644.
Ironworks, first in Pennsylvania, 1692.
Ore discovered in Lake Superior region, by Wm. A. Burt, government surveyor, 1844; first shipment, to Pennsylvania, 1850.
Rolling mill, first in Pittsburgh, 1811.
Shot for use of Continental army, made at Durham' Bucks county, Pa.,—shipped Aug. 25, 1775, by George Taylor, a signer of Declaration of Independence.
T-rails, rolled in U. S., Allegany county, Md., 1844.

Lavoisier, relation of metals to oxides discovered by, 1782.
Light, velocity proved by Majorana to be independent of the velocity of its source, 1919.
Logarithms invented by Napier, 1614.

Malaria, parasites discovered by Laveran in 1880.
Motion, Kepler published his three laws of, 1609–19.
Motion picture, first with regular plot and story, "The Great Train Robbery," produced by the Edison Company, 1903.
Motion Picture Theater, first to be opened, in Los Angeles, Cal., 1902. Admission 10 cents.
Mutation theory published by De Vries, 1901–03.

Nail machine, first for making cut nails, made by Ezekiel Reed, Bridgewater, Mass., 1786.
Neanderthal man skeleton found, 1856.
Newspaper, first in America, *News Letter*, Boston, Mass., April 1704.
Newspaper, first daily in London, *Daily Courant*, 1702.
Newspaper, first Sunday, London, *British Gazette and Sunday Monitor*, 1780.
Newton's famous *Principia*, in which he demonstrated the law of gravity, published, 1687.
Nitrogen atom decomposed with emission of hydrogen, when subject to action of alpha rays, E. Rutherford, 1919.

Paper mill, first one in the United States built at Germantown, Pennsylvania, 1690.
Phonograph: Thomas A. Edison, 1877.
Phosphorus, first used in matches, in England, 1833.
Pig iron produced in U. S. first exceeded that of Great Britain, 1889.
Plague bacillus discovered by Kitasato and Yersin, 1894.
Polio vaccine developed by Jonas Salk. First mass test 1954.
Porcelain, first true (hard paste) made in Europe by J. F. Böttger, about 1709; in U. S., at Philadelphia, 1825.
Printing press, first in New England, 1639.

Quantum theory of energy developed by Planck, 1901.

Radio broadcasting station, first one, "KDKA," operated at Pittsburgh, 1920, by the Westinghouse Company.
Radio typewriting, by Glen W. Watson, 1931.
Refrigerator car, first, 1869.
Relativity theory enunciated by Einstein, 1905.

Savings Bank, first in U. S., Philadelphia Savings Fund Society, 1816.
Skyscraper, first, Home Insurance building, Chicago, 1885.
Sleeping sickness shown by Bruce to be transmitted by the tsetse fly, 1903.
Steamboat, first on Great Lakes, launched at Buffalo, 1819.
Steam engine, first entirely constructed in America, Belleville, N. J., 1794.
Steam power first used for printing, London *Times*, 1814.
Steel, first made in America, Hartford county, Conn., 1728.
Basic open hearth first made in U. S., Homestead, Pa., 1888.
Bessemer steel, first produced in U. S., Wyandotte, Mich., Kelly pneumatic process, 1864.
Bessemer steel rails, first rolled, Chicago, 1865.
Open-hearth furnace, first in U. S., Trenton, N. J., 1868.
Steel screws, first in U. S., Cleveland, Ohio, 1871.
Steel wire nails, first made by Father Goebel, Covington, Ky., 1875.
Sun's atmosphere analyzed by means of the spectroscope, Kirchhoff, 1860.

Technical school first in English-speaking country, except West Point, Rensselaer Polytechnic Inst.,Troy,N.Y.,1824.
Tetanus germs discovered by Nicolaier, 1884.
Transatlantic radio-telephone service inaugurated, 1927.
Tubercle bacillus discovered by Robert Koch, 1882.
Typhoid bacillus discovered by Eberth, 1880.
Typhus fever shown by doctors Rickets and Wilder to be transmitted by body lice, 1910; the germs were first discovered by Dr. H. Plotz, 1915.

Vaccination; Dr. Jenner makes his first inoculation, 1796
Vaccination first performed in America, 1801.
Velocity of light determined by Roemer, 1675.

Wire suspension bridge, first in world, over Schuylkill river, near Philadelphia, 1816.
Wool fulling mill, first in America, John Pearson, Rowley, Mass., 1643.
Wool spinning machine in a factory, Peace Dale, R. I., 1804.

X-rays used to show molecular structure of crystals, Max von Laue, 1912.

DRAWING AND DESIGN

DRAWING may be defined as the expression of ideas or the representation of objects by means of line or color. For conveying emotion or thought, drawing is as essential to human beings as is song or speech or writing. Much of our knowledge of the customs and history of primitive peoples is derived from the study of the forms and shapes of their dwellings and utensils and the designs and pictures with which they decorated their pottery and even the walls of their cave dwellings.

An interest in the various phases of applied art is characteristic of our present-day civilization. A growing sentiment insists that there is no excuse for unsightliness in the plans of our towns and cities and in the designs of public or of private buildings. In a democratic state, beauty of dwelling and environment should be within reach of every citizen. On the other hand, citizens should feel their responsibility for maintaining standards of civic beauty. These enthusiasms call for wider diffusion of knowledge of the principles of design. To this end, the public schools and many special schools of applied art are contributing.

The subject of drawing may be divided roughly into two classes,—free-hand and mechanical. Free-hand drawing is done without the guidance of drawing instruments. Free-hand work includes the great mass of pictures and studies, etchings, engravings, and illustrations and cartoons in papers and magazines. Mechanical drawing is the applied art, growing out of free-hand drawing, which is used in industry for purely mechanical and practical working drawings.

Free-Hand Drawing. Free-hand drawings are done in charcoal, pencil, litho pencil, crayon, pastel, pen and ink, "wash," or in any combination of these mediums. In etching, engraving, and lithography, special tools are employed. Charcoal is probably the simplest medium, since it is inexpensive, easy to apply and to erase, and is, besides, susceptible of great variety of treatment. With it, many varying effects are possible, ranging from that of plain line to the highly modeled effect of oil painting, the latter being produced when the charcoal is rubbed down with the fingers or with a kneaded eraser.

The pencil ranks with charcoal for convenience as a medium of expression in drawing. It requires a harder, smoother surface than does charcoal, but it may be used on virtually any material. It does not require "fixing," and, though requiring greater skill than charcoal, since it cannot be worked over, it is better adapted to fine sketching. Its effect is brilliant and rather harsh—more positive than charcoal.

Crayon, which is a colored chalky substance, and pastel, which is a crayon of a finer texture, give the same range of effects as charcoal, but they are difficult to erase. Work in wax crayons, such as are used in architectural free-hand sketches, has great brilliancy and is impossible to erase. Pen and ink resembles the pencil as a medium, but it is more difficult of application and removal. It is the harshest medium, requiring a hard, glazed paper. "Wash" drawings are made in one tone of water color with a brush. Drawings intended for reproduction in print are generally done in black wash.

Mechanical Drawing; Design. Strictly used, the term mechanical drawing applies only to drawing done with the aid of the T square and the compass. A broader description is "drawing with the emotion left out," that is, done as if by a machine. In this wider use, it signifies the application of free-hand drawing to industry. When thus applied, the art is known as design.

The development of a design may be illustrated by the following example: An artist sketches free-hand a cluster of narcissuses, as he sees the flowers growing. A manufacturer of metal book ends, for which designs in applied silver are desired, tells the artist to *conventionalize* the form of the flower and make a drawing from which the working blue prints are to be taken. The artist then, studying the stiff character of the narcissus blossom, decides that straight lines and triangles will best represent the flower. Upon this plan, he builds up a design of triangular flower forms, draws it to a scale to fit the book ends, using his T square and triangle to make the drawing mechanically perfect, traces the design on glazed tracing linen in waterproof, nontransparent ink, and sends it to be blue-printed.

Harmony and Rhythm. The theory of design embraces those laws of harmony in line, shape, proportion, and tone, acquaintance with which is necessary to the critic or the maker of designs. Harmony is the result of a combination of elements properly related to each other by some common factor. Take, for example, a still life study, drawn within a frame form, of a group of five books, some standing, and others lying, on a table top. The books are the elements of the composition, and they are related to each other by their straight-line structure or by a common background line, such as the line marking the edge of the table. Their relation may be apparent because of a rectangular plane that is common to all of them; or they may show some pleasing direct proportional relation in size,—as 2 to 3 or 3 to 5. Certain color values in the scale from black through gray to white may be repeated on the covers of the books and on the table top to indicate a relation of the elements.

Again, if the books were done in color, certain common colors might serve as relating factors to unify the composition. For instance, we may suppose the scheme to be black, gray, and white, with the addition of one color—red. If the first book of the five, lying on the table, has a red binding, and the third, standing upright, has a small design of the same red on the cover, while the fifth has a large quantity of red showing on the edges of the pages, the eye will be carried through the composition by the three spots of color, which thus relate the book elements in harmony.

If there is harmony in a drawing, *rhythm* also will surely be present. The repetition of line, space, shape, or color will carry the eye through the details of the composition, and this directing of the eye, step by step, or from color spot to color spot, to the center of interest, constitutes rhythmical movement.

The steps may be regular, as in a repeated border design of wild geese, in which every third goose is a repetition in line, shape, and color. Or the steps through which the eye is led may occur at varying intervals in an unconventional composition,—such as a design of flamingos in a circular frame. The eye may be directed from the first flamingo to the fourth, from the fourth to the fifth, and thence to the ninth, which last holds the center of the picture stage. If the observer feels a definite arrangement in these steps that the eye has taken, then the design has rhythm.

Values. The term values refers to degrees of light and shade or of color intensity. In *chiaroscuro*, or representation in black and white, if one takes black as a unit of value, the highest values are the shades nearest to black, and the lowest values are the shades farthest removed from black.

Values in colors are spoken of in the same sense as values in the black and white scale. To determine the value of a certain object in a design,—for example, a red tomato,—one should make a set of five or six 2-inch squares ranging from black to light gray. Then, with the eyes partly closed, one can shut out from view the brightness of the red in the tomato, so that he will be able to compare its black and white value with the degrees in the black and white scale furnished by the little squares. He will find that it matches in degree of darkness one of the gray squares near black. Similarly, in the

scale from deep red to pale pink, the pink will correspond to one of the lighter gray squares, some degrees removed from white.

Applications of Design. In proportion as our state of culture develops, the range of design expands. Progressive city governments are applying the principles of design to city planning. By means of building laws, many cities are seeking to secure harmonious relations between streets, between buildings, and between streets and buildings. Some cities are attempting to make their water fronts pleasing to the eye, and to place buildings in such relations that the city sky line will be harmonious. A special problem is that of planning streets which will afford pleasing vistas, in which parks, fountains, and other decorative features may be seen to advantage.

Individuals are showing more and more interest today in landscape gardening about their own homes. The old-fashioned method of making disconnected, unrelated flower beds wherever fancy led is giving place to well planned exterior decoration. This takes into account the relation between house and grounds and makes evident the relation between one flower bed and another by their shape or location or by the color arrangement of the flowers.

The same simple, fundamental laws of harmony and rhythm which are applicable to city planning and to laying out flower beds apply to home building. One cannot depend upon the ornamentation of the entrance or upon the style of blinds to secure beauty in a house. The safe principle to apply is the test of the laws of design, by which one will secure the right proportion of roof to the entire house, of window surface to plain surface, and of masses of color to each other.

Decoration of the interior of a home affords the greatest opportunities for producing good effects. Here the laws of design can be applied to every detail. The colors and values of the walls and ceilings and floors must bear definite relations to one another. The pictures on the walls must hang in such relations of height, color, and interest as will readily direct and please the eye. It is well to let one point of interest dominate, so that the eye can find repose. A safe rule to follow in hanging pictures is to let the upper edges of the frames fall on a common horizontal line about the room, so that the centers will be at about the level of the eye when the observer is standing. A more effective method is to determine the point of interest in every picture and let those points fall upon a common line. The wall spaces between pictures should bear a harmonious relation to each other and to the pictures. The spaces should not be uniform in area, because regularity would detract from the interest of the whole arrangement.

In seeking a pleasing relation in the intervals between three paintings to be hung on one wall of a living room, the safest proportion to observe is that of 2 to 3. If two of the pictures are similar in size and the other is considerably larger, the two small ones might be hung four feet apart, the large one at a distance of six feet from the second. If, however, the larger picture and one of the small pictures are dominantly blue, while the other small one has touches of brilliant red and orange color, let the two dull blues hang together, and place the small brilliant picture at a distance, to balance the blue group in space and in color intensity.

The window treatment in line and color is important. If one has a long, narrow room with plain, unrelieved gray walls and a row of small windows across the end, the room can be made or marred by the draperies at those windows. Floor-length overdrapes of a soft material in old rose or some other one tone, presenting no horizontal lines in color, will impart to the room the appearance of a long hall, the contrast between the solid color and gray intensifying the perpendicular effect of the curtains. If, however, one introduces a starched material in a brilliant, spotty pattern, preferably with a horizontal line effect in strong color or in black, and also runs a lambrequin across the top of the windows, the room will appear wider by several feet.

Furniture should harmonize with the style of the room in which it is used. If the room has long French windows and a high ceiling, with paneled walls and gilt molding and a tapestry or two, it fairly demands furniture designed according to the style of one of the Louis periods. A delicate, gateleg dining set would be lost in a long, severely heavy, beamed and paneled dining room. Such a room requires the massive, plain monastic type of table and benches or chairs. For a room that is frankly of the modern American type, however, harmony is secured by variety in styles of furniture; no one predominating period style would be desirable.

These same principles apply to costume design. In this art there is quite as much opportunity to make lines harmonize as there is in decorating a room. For example, an unusual cut to the line of the neck of a costume may be repeated in the sleeves and thus greatly enhance the artistic effect of the whole. The following color rule applies to the designing of a costume as well as to the decoration of a room,—let the darkest color be lowest in position and the lightest color be highest.

Color Balance. In the most carefully planned buildings, rooms, and garments, the effect of their beautiful proportions may be obliterated by ill-judged use of color. For a color scheme, the safest course is to use one color with black and cream or with gray and soft ivory. If more than one color is desired, a color chart should be consulted with regard to complementary colors and color intensity. The greater the number of colors introduced into a scheme, the more difficult it is to arrive at a color balance, that is, to have enough of each primary color represented to satisfy the eye.

Red, yellow, and blue are called primary colors, because by combinations of these the other colors may be produced. Orange, green, and violet are secondary colors. The following chart exhibits the relations of these colors and supplies a guide for their use in design and decoration. Two colors marked with the same superior letter are complementary, that is, taken together they make a neutral gray. The primary colors are printed in boldface; the secondary colors, in italics.

	Yellow[a]	
Yellow-Orange[f]		Yellow-Green[b]
Orange[e]		*Green*[c]
Red-Orange[d]		Green-Blue[d]
Red[c]		**Blue**[c]
Red-Violet[b]		Blue-Violet[f]
	Violet[a]	

Two-color schemes may be carried out by using two complementary colors, in combination with some values of black. One of the colors should be given greater intensity than the other. If a three-color scheme is desired, correct combinations may be discovered by starting with any color in the chart and counting around the list, in either direction. The fifth and the eighth color in the count will harmonize with the first one chosen. One of the three should be used full strength; one, half strength; one, reduced very nearly to a neutral tone.

Good taste is, in large part, the ability to appreciate relations of harmony and rhythm of line and color. In design applied to furniture and other objects of use, good taste requires that an article, beautiful in itself, shall be appropriate to its purpose and its surroundings. One may enhance his power of appreciation by a study of the art principles outlined in these paragraphs. These principles apply to the appreciation as well as to the creation of beauty. They govern both the critic and the artist, not only in the arts already outlined, but also in those of pottery, jewelry, and textiles, and in all other forms of artistic design.

FURNITURE

FURNITURE, called "movables" in the European languages (French, *meubles*; German, *möbel*; Italian, *mobiglio*), includes those articles of convenience or decoration that are used by man to make his dwelling places more comfortable. As these articles are produced in order to satisfy certain recognized needs, the furniture of any race or country is usually indicative of the customs, skill, and degree of civilization of the people who used it.

The furniture used by royalty in ancient Egypt was well made, beautifully carved, and decorated with gold, ivory, and veneering. Chairs were frequently upholstered or covered with leather; the legs were carved to resemble those of animals. Neither the Greeks nor the Romans used a great variety of furniture. But their chairs, tables, beds, and couches were generally of pleasing form, and were frequently decorated with magnificent inlays of ivory, tortoise shell, and precious metals.

From the early period of classical antiquity to the beginning of the Renaissance in Italy, very little change or improvement took place in furniture. Beds, couches, tables, chairs, and stools were the customary pieces used by all of the civilized nations. In the great houses of medieval England, the dining table was customarily formed of boards placed on trestles. For the lord of a manor and for his lady, there were usually placed beside the table large, high-backed, covered chairs. An honored guest might be seated upon a stool, but all the common folk, those who sat "below the salt," occupied simple benches.

Gothic Style. During the late medieval period, the decorations used upon the characteristic, large, heavy furniture of the time followed closely the prevalent Gothic style of architecture. Forms were massive and rectangular; lines were predominatingly straight, usually capped by a pointed arch. Characteristic ornamental details were the trefoil and quatrefoil, together with religious figures. Wrought iron bands were frequently placed upon chests and cupboards.

Renaissance Period. During the Renaissance, as in the Gothic period, styles of furniture closely followed those of architecture. Pieces were massive, well proportioned, and elaborately carved with ornamentation suggested by the classical art of Greece and Rome. In Italy, the most characteristic domestic piece of the period was the ornamental bride's-chest, or *cassone*. As a rule, Renaissance furniture, whether of Italian, French, or English origin, is of palatial rather than of domestic character. It is, therefore, more suitable for use in public buildings or theaters than in the home. Nevertheless, the Renaissance marks the beginning of the development of modern furniture. From Italy the influence of the Renaissance spread to France and to England.

French Periods. In France the chief periods which were marked by characteristic styles of furniture were those of Louis XIV, Louis XV, Louis XVI, and the Empire under Napoleon I.

Louis Quatorze.—The magnificence of the reign of Louis XIV was reflected in the massive size, elaborate ornamentation, and lavish decoration of his furniture. The structural lines were generally rectangular; the woods used were oak, walnut, and ebony. Upholstering was commonly of tapestry or brocades with large patterns. Especially notable was the type of ornamentation known as buhlwork, after its originator André Charles Boulle. This consisted of a veneer of tortoise shell inlaid with elaborate patterns of brass. Decorative motifs included cupids, satyrs, the acanthus leaf, and the shell. The feet of chairs frequently had the form of doe's hoofs, *pieds de biche*. Marble tops were used on tables and commodes.

Louis Quinze.—At the court of Louis XV, gayety replaced formality, and the pleasure-loving, extravagant luxury of the king and his favorites, Countess du Barry and Madame Pompadour, found expression in the more graceful curved lines and the greater comfort of the furniture.

The workmanship was of the finest, and all exposed surfaces were covered with carving, gilding, inlay, metal mounts, or porcelain plaques. Interest in Chinese art, which began about 1720, resulted in Robert Martin's invention of *vernis martin*, a lacquer-like finish which was extensively used in red, brown, gold, bronze, and black. Pastoral scenes by Watteau and Boucher were often painted upon the lacquered surfaces.

Carving was most elaborate, with scrolls, shells (rococo), the curled endive leaf, flowers, ribbons, and musical instruments exhibited as predominating motifs. A distinguishing characteristic was due to what may be termed unbalanced symmetry. While masses of decoration were applied so as to appear symmetrical, the details of each mass differed from those within the others. Chairs usually exhibited the cabriole leg, with dolphin-head or leaf-scroll feet, and with no stretchers to hold the legs together. The fronts of cabinets and commodes were generally convex.

Louis Seize.—During the reign of Louis XVI, furniture design was marked by a change from extremely elaborate decoration and curved lines to a more classical straight line style, with delicate and simple ornamentation.

This change may be credited to a general reaction from the preceding period; to the refined taste of Marie Antoinette; and, most important of all, to the popular interest in classic art aroused by the discoveries of the buried cities of Herculaneum and Pompeii. By those who have seen how quickly the introduction of Egyptian motifs into current forms of personal decoration followed the discovery and opening of Tutankhamen's tomb, the effect produced upon popular fancy by the uncovering of two ancient cities can readily be comprehended.

The structural lines of the Louis Seize furniture were generally rectangular. Straight legs were fluted and tapered. Classic details formed the basis of ornamentation, the Greek band replaced rococo, and laurel or oak leaves were used instead of acanthus and endive patterns. Decorative paintings on wall panels or on furniture represented cupids, garlands of flowers, and classical subjects, rather than the pastoral scenes of the preceding period or the armor, victor's palm, and martial decorations of Louis Quatorze.

The Empire.—The styles of the First Empire, under the dominating personality of Napoleon I, also had their source in ancient times. But it was the Roman rather than the Greek that appealed to the emperor, and the motifs selected were those which suggested the imperial power of the Cæsars,—the Roman eagle, wreath, torch, fasces, and winged victory. After the expedition to Egypt, the figure of the sphinx was extensively employed. A notable characteristic of the period was the use of carved brass decorations applied to plain surfaces.

Beds changed from heavy, overdraped affairs to an uncovered, couchlike form. Chairs were comfortable, with convex backs which often prolonged the curve of the arms. The arm supports frequently were carved in the form of swans or sphinxes.

Considered as a whole, the Empire style was rich and impressive, but also rather stiff, cold, and formal. It is not extensively copied today.

English Furniture. The three great periods of English furniture making which have exerted marked influence on modern styles are the Jacobean and Restoration, the Anglo-Dutch, and the Georgian. The Jacobean, 1603–49, was separated from the Restoration by the Cromwellian period of the

Commonwealth, during which the styles acquired a Puritan sternness and severity. With the Restoration, King Charles II brought back to England a taste that had been influenced by the Flemish Renaissance and the styles of Louis XIV, so that this period was marked by an increase in ornateness and grace.

Jacobean.—Furniture of this period was chiefly of oak, with straight line structure, and a sturdy, somewhat heavy, appearance. Chairs had flat seats, and the straight, turned legs were strengthened by heavy stretchers placed near the floor. Carving was cut into flat surfaces. Characteristic ornamental designs were the running figure 8, semicircles filled with petals, a conventionalized tulip, the Tudor rose, and geometrical figures. Typical pieces were the chests and cupboards, the high-backed wainscot chairs, tables, and tall clocks.

Anglo-Dutch.—Furniture of this style is divided between the William and Mary and Queen Anne periods. The predominating Dutch influence was due to the elevation of William, stadholder of the Netherlands, to the English throne. French influence was also noticeable, because of the immigration of Huguenot refugees who left France after the revocation of the Edict of Nantes. The new styles were more suitable to comfortable, domestic use than any of those preceding. Walnut was the favorite wood; inlay, the characteristic form of ornament. Straight lines gave place to delicate curves. Legs of typical chairs were straight, with inverted cup turning, curved underbracing, and bun-shaped feet. The backs and seats were usually upholstered. Cabinets, cupboards, chests on chests, and chests on stands were characteristic pieces.

Queen Anne.—During this period the Dutch and French influences were assimilated and developed into a more national type. The structural lines were those of slender, graceful curves. Walnut was the principal wood. The turned leg was replaced by the undecorated cabriole, and the bun foot by the hoof or the claw and ball. Typical pieces were the splat-back chairs, wing chairs, gate-leg tables, chests of drawers, highboys, lowboys, cabinets, and the tall, well proportioned mirror with an elongated S-curve at the upper side. Chair backs, high and comfortably curved, were outlined by a rather narrow rim and supported by a wide fiddle-back or lyre-shaped splat. Seats were upholstered. Underframing was gradually discarded.

Georgian Furniture. The Georgian period is known as the Golden Age of English furniture. It was marked, not by the influence of the sovereign, but by that of great designers and cabinetmakers. Most notable of these were Thomas Chippendale (1705–79); Robert and James Adam, architects who designed furniture to harmonize with the interiors of their houses; George Hepplewhite (?–1786), who executed many of the Adam designs and developed characteristic types of his own; and Thomas Sheraton (1750–1806), designer and "master of inlay."

Chippendale.—The characteristic style of this master designer is best shown in his graceful, beautifully proportioned chairs. The lines of the back usually taper gracefully from top to feet, and, from a bow-shaped curve at the top, a carved, pierced splat extends to the seat frame. The seat is widest at the front. The legs are cabriole with ball-and-claw feet or straight and square. The ladder-back chair with four or five horizontal bow-shaped pieces instead of the splat is also typical. Carving is the principal method of decoration; mahogany is the preferred wood. Chinese influence is shown by fretwork in the arms and backs of some chairs. Chippendale originated the pie crust table with scalloped edged, tilting top.

Hepplewhite.—The obvious characteristic of a Hepplewhite chair is its shield-, oval-, or heart-shaped back, which does not join the seat frame, together with square tapering legs and spade feet. The top curve of the back was usually bow-shaped and smooth. A carved, three-feathered prince of Wales plume, used in the design of the back was sometimes a distinguishing feature. The structural lines were usually curved; the general appearance, slender and delicate.

Adam.—The Adam brothers designed graceful, very delicate furniture in a manner which was inspired by the classic decoration of Pompeii. The backs of Adam chairs were narrow and rather low; the legs were straight and tapered or round and fluted. Wedgewood plaques were used as inserts, and raised ornaments of plaster composition were applied. Ornamental details included the urn, vase, lyre, and acanthus, together with rosettes, festoons, and delicate fluting.

Sheraton.—Thomas Sheraton is considered by many to have been the greatest of the famous Georgian designers of furniture. The lines of his creations were usually rectangular, the general appearance graceful, dignified, and rather fragile. His principal method of decoration was inlay work. The typical rectangular back of a Sheraton chair ended with a horizontal bar above the seat frame. The top line was not regular, but broken. This use of the broken curve at the top frequently serves to distinguish one of Sheraton's shield-shaped chair backs from those of Hepplewhite. Typical chair legs, whether round or square, were tapered, frequently with fluting or reeding.

Colonial Furniture. The term Colonial, as applied to early American furniture, is properly employed to indicate furniture used in the colonies before they became states. When it is remembered that the Dutch settled in New York, the English in New England and Virginia, and the French in Louisiana, it becomes obvious that the best Colonial furniture was of three different styles. There were many good cabinetmakers in the colonies, and their products were based on the current modes of the mother countries. The Colonial style, as such, resulted chiefly from simplification, omission of ornament, and adaptation of the best European practice. That a blending of styles occurred is evident in some of the chairs of early New York, in which may be found a typical Dutch fiddle-back, Jacobean legs, and Spanish feet.

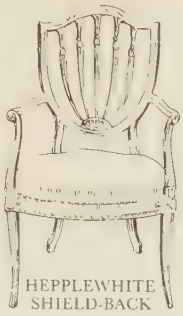
The comfortable Windsor chair, with its bow-shaped, spindle filled back, shaped seat, and turned legs set at an angle, was of English origin, but was greatly improved upon in America. The rocking-chair was an American product, but the date of its introduction is unknown.

Most important of the early cabinetwork was that of Duncan Phyfe, a Scotchman who came to America about 1784 and, after establishing himself at his trade in New York, produced, between the years 1795 and 1830, work equal in quality to that of the best European designers. Phyfe's lyre-backed chair was a characteristic piece. From 1830 to 1847 his work was not of so high a standard, he himself classifying his overdecorated mahogany as "butcher furniture."

Modern Furniture. Since furniture is part of our equipment for living, its development is closely connected with changes in our way of life and thought. New materials and processes, coupled with today's different living conditions, have in recent years brought about radical innovations in furniture design. Furnishings in extreme modern and compromise styles have become increasingly available. Because of the demand for the new forms, many manufacturers of traditional pieces are now also making furniture of modern design. What the esthetic results of these developments will be is difficult to foresee.

Meanwhile, most of the furniture made in the United States continues to follow the historic styles which have been described. There is also widespread interest in genuine old furniture, and collectors of antiques were never more numerous than they are today.

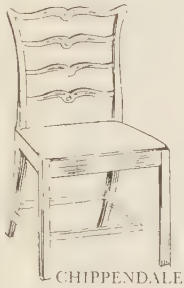
QUEEN ANNE
SIDE CHAIR



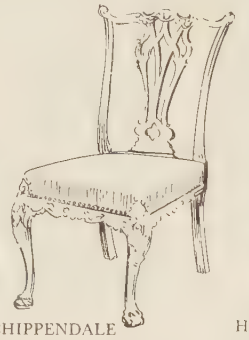
HEPPLEWHITE
SHIELD-BACK

DUNCAN PHYFE
SIDE CHAIR

SHERATON
GRECIAN CHAIR



CHIPPENDALE
LADDER-BACK



CHIPPENDALE
SPLAT-BACK

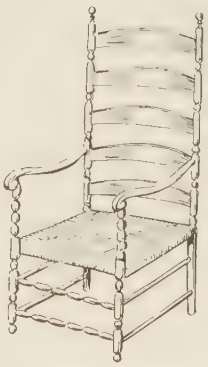
HITCHCOCK
CHAIR

HISTORIC FURNITURE STYLES

EMPIRE
FIDDLE-BACK

NEW ENGLAND
WINDSOR CHAIR

BOSTON ROCKER



SLAT-BACK CHAIR

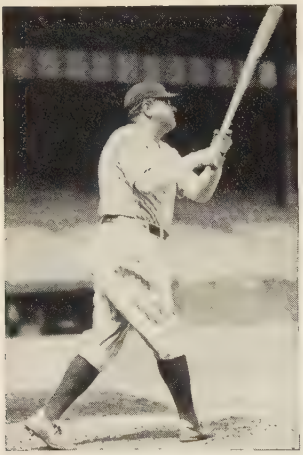
CHIPPENDALE HIGHBOY

QUEEN ANNE LOWBOY

HEPPLEWHITE CHEST

Upper left Sam Snead, a leading golfer in the past decade. Winner of the Professional Golfers' Association, the Western Open, British Open and the Canadian Open.

Jim Thorpe, outstanding track star and football player. Winner of both decathlon and pentathlon in the 1912 Olympic Games.



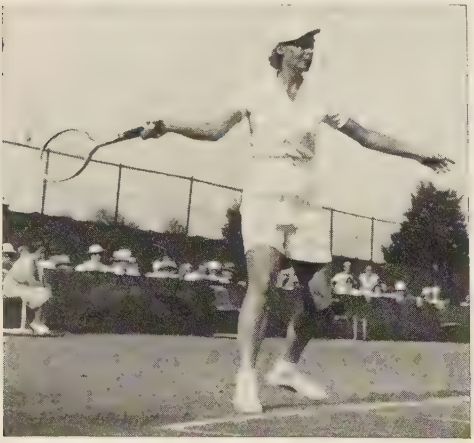
Above Jack Dempsey, professional boxer. Won boxing's heavyweight title in 1919 by defeating Jess Willard and held the title until defeated by Gene Tunney in 1926.

STARS OF SPORT

Left George Herman (Babe) Ruth, slugging outfielder of the New York Yankees. Holder of numerous records of baseball achievement.

Lower left Alice Marble, great tennis player. Won the National Women's Singles title and the National Women's Doubles title for many years.

Lower right Jesse Owens, track star. Co-holder of the world's 100 meter record and three event winner in the 1936 Olympic Games.



GAMES AND SPORTS

From the earliest times, men have engaged in various forms of more or less highly organized play activity. Athletic contests, whether for amusement and recreation, or as a means of training for the serious pursuits of life, have always been highly valued. Games of chance and of intellectual skill are also of very ancient origin. The following section presents briefly outlines of the history and important features of a number of the most popular games of the present day. The many special principles and rules under which the athletic games are played may be found in various rule books, such as those published in Spalding's Athletic Library.

Baseball. A field game played with a round wooden bat and a hard, leather-covered ball which weighs 5 ounces and is 9 inches in circumference. The game derives its name from the circuit of four bases which the batter must make in order to score after striking the ball. The bases,—home, first, second, and third,—are located at the corners of a 90-foot square, called the diamond. The pitcher stands between home and 2d base, 60½ feet from the batter. The area enclosed by the lines connecting the bases is called the *infield*. The *outfield* is the space outside the diamond and between the extensions of the lines connecting home base with first and third base respectively.

A baseball team consists of 9 players, and a game regularly continues through 9 innings. An inning is completed when each team has succeeded in "putting out" three of the opposing batters. A batter is out under the following principal conditions: if he fails three times in succession to hit a fairly pitched ball, provided that the third ball is retained by the catcher; if he hits the ball and it is caught before it strikes the ground; if the struck ball is in the hands of the first-baseman before he can run to that base; or if, when between bases, he is touched by the ball in the hands of an opponent. A score of 1 is given for each run, or completed circuit of the bases, by a player.

This national game of the United States, as it is now known, was first played at Cooperstown, N.Y., home of the Baseball Hall of Fame Museum. Major General Abner Doubleday, a resident of Cooperstown, is credited with inventing the game, or at least adapting it to something near its present form. The earliest organized clubs date from 1843, and it was about this time that the first code of rules was formulated by the Knickerbocker club of New York City. The ball used was of lively rubber, covered with yarn and leather, 10½ inches in circumference and weighing 6½ ounces.

A national association was formed in 1858. The first strictly professional club was the Red Stockings of Cincinnati. In their famous tour of 1869, they won all games. The first college circuit, including Harvard, Princeton, Amherst, Brown, and Dartmouth, was formed in 1879. The National League was organized in 1876, an American association in 1882, and the American League in 1900.

Founded in 1939, a century after the date of baseball's origin, was the "Little League" for players 9 to 12 years old, which was organized by Carl E. Stotz at Williamsport, Pa. As a concession to the size of the participants, the diamond for the Little League was made 60 feet square instead of 90, and the pitching distance was reduced from 60 feet to 44 feet 6 inches. Otherwise, the competition, usually among four teams in a local association, was conducted in the same way as in organized baseball for adults, even to the extent of having a "Little League World Series," which is held annually at Williamsport in recognition of the League's place of origin.

From a local enterprise the Little League movement has grown until in 1964, the 25th anniversary of its founding, it was represented by nearly 6000 units, two hundred of which were in foreign countries and the rest in the United States. There are Little Leagues in Canada, Europe, Latin America, North Africa, and the Near and Far East. This wide distribution gives special meaning to the term "World Series" in reference to the League's annual contest.

Basketball. The invention of this popular game, in 1891, is credited to Dr. James Naismith, at the Y. M. C. A. training school in Springfield, Mass. Designed first as a boys' game, it was soon adopted in a modified form by girls' schools. It is usually played indoors upon a rectangular court, which must not exceed 4000 sq. ft. in area. The goals are elevated "baskets," 18 inches in diameter, placed on the center line, 10 feet above the floor, one at each end of the court. The restricted number of players, 5 on each side, and the small area of the court make basketball a practicable sport for many clubs of small membership and resources.

At the beginning of the game, an inflated leather ball, 30 to 32 inches in circumference, is tossed up between two opposing players at the center of the court. A score of 2 points results when the ball is thrown into the basket guarded by the opponents. A game is usually divided into two periods of 20 minutes each.

Billiards. A game of very ancient origin. It is known to have been played before the Christian era. Saint Augustine mentions billiards in his *Confessions*, written in the 5th century, and both Shakespeare and Spenser speak of the game in the 16th century. The earliest full description of billiards is found in Cotton's *Complete Gamester*, 1674.

The modern American game of billiards is played with 3 ivory balls, on a table, the bed of which is formed of a heavy slab of slate and is surrounded by rubber cushions. Both the slate and cushions are covered with fine green cloth. A regulation table is 10 ft. long by half as wide, but smaller sizes are frequently used, especially in homes. Standard balls are 2⅜ inches in diameter; one is red, the others white, but one white ball is marked by a small black spot. The object of the game is to strike one of the white balls with the small, leather-tipped end of a tapering stick or cue, in such a manner as to cause the cue ball to strike in succession each of the two other balls, thus making a billiard, or carom.

In order to prevent the high scores that may be obtained when the two object balls are close together in a corner, "balk" lines are frequently drawn on the table at a distance of 14, 18, or 22 inches from the sides. When playing balk-line billiards, every second or every third shot must be made sufficiently hard to drive one of the object balls outside of the rectangle in which they lay when the shot was made.

Pool or pocket-billiards is played with 15 object balls and a single cue ball on a table provided with 6 pockets, the object of the game being to drive into the pockets as many of the object balls as possible.

Bowling. Outdoor bowling or bowls is one of the oldest of games, and its ancient form was closely similar to that of the present day. The early balls were of stone, one half spherical, the other oval, a shape adapted to give the course of the ball a curve. In outdoor bowling, cones were first used for marks, later being displaced by the round balls or jacks. The game was introduced in America early in the 18th century, and the Bowling Green, in the locality still known by that name, was laid out by the City of New York in 1732.

Indoor bowling probably originated in various games in which clubs were hurled at groups of bone pins. The first recorded indoor game on a covered alley took place in London in the 12th century. In America, the first recorded match game was played on the Knickerbocker alleys in New York City on January 1, 1840, and the first general code of rules was adopted in 1875.

The American indoor game is played upon a smooth board floor or alley, 42 in. wide and 60 ft. from the foul line, which the player must not cross, to the center of the first pin. The ten wooden, bottle-shaped pins, 15 in. high, are arranged in a triangle with the apex toward the bowler. Pins must weigh at least 50 ounces each, and are placed 12 in. apart from center to center. The balls may not exceed 16½ pounds in weight or 27 in. in circumference.

The object of the game is to bowl down all of the pins with one shot, the result being called a *strike*. A maximum of two shots is allowed in a *frame*, there being ten frames to a game. If the pins are all down after the second shot, the result is a *spare*. After a strike, the number of pins bowled down by the next two balls is added to the ten already scored; after a spare, the number falling from the next ball is added to the score. If, in the tenth frame, the player achieves a strike, he is allowed two additional shots; and if a spare, one additional shot. The maximum score possible for a single player is, therefore, 300. In 1963, 28 million American bowlers rolled balls on 157,713 alleys in 10,883 bowling establishments.

Cards, Playing. Cards for playing games of chance probably had their origin in the East, and are certainly of extreme antiquity. They were known to the Egyptians as well as to the Jews, and were in common use among the Hindus and Chinese long before they were introduced into Europe by the crusaders. Toward the end of the 14th century, the game of cards was in common vogue in Italy, Germany, France, and Spain, and, by the middle of the 15th, cards were even being manufactured in England. They were introduced into America by the Spaniards.

In the modern pack of playing cards, there are four suits of thirteen cards each; clubs and spades are printed black; hearts and diamonds, red. It is supposed that the figures in the various suits were originally intended as symbols of the different classes of men. Hearts represented the *gens de chœur*, that is, the ecclesiastics, or choir men; *espada*, a Spanish word for sword and indicating nobility, has become spade. Clubs represented the trefoil and symbolized the peasantry, while diamonds represented square tiles, symbolical of the merchants. This symbolism is, of course, lost today in the great variety of games of skill and chance in which cards are employed. Among these games, the following are today widely popular: auction bridge, contract bridge, five hundred, cribbage, pedro, solitaire, hearts, pinochle, and poker.

Checkers. A game played on a board like that used in chess. Each of the two players has 12 pieces, or men, which are placed on the first three rows of squares of the same color. Each piece is moved forward one space at a time in a diagonal direction. The object of the game is to capture all the opposing pieces, capture being effected by "jumping," or passing over the opponent's piece to the first space beyond it, which must be unoccupied. When a man reaches the row of squares farthest from his side of the board, he becomes a king and may then move backward as well as forward.

Checkers is called draughts in England and *les dames*, "the women," in France. It is a very ancient game. Homer refers to it, and an ancient Egyptian vase shows a lion and an antelope playing checkers, with the lion winning and seizing the prize.

Chess. The origin of chess is lost in remote antiquity. The name is a corruption of the Persian *shah*, "king." Chess is the most intellectual and the most cosmopolitan of all games of skill. National and international contests have been held regularly in the course of the past several centuries. Benjamin Franklin brought it into prominence in America.

The game is played on a chessboard divided into 64 squares colored, as a rule, alternately black and white. Each of the two players has a set of 16 pieces, or men, placed on the two rows of squares nearest the player. The two groups thus appear in opposing array, like two armies, one black and the other white. Each player has a king, a queen, 2 bishops, 2 knights, 2 rooks, or castles, and 8 pawns. Each kind of piece moves according to special rules, the object of each player being to take the men of his opponent in order to checkmate the latter's king. Checkmate is accomplished when the king cannot move without being open to attack from an opposing man. The word checkmate is derived from the Persian *Shah mat*, "The king is dead."

Cricket. In Great Britain, cricket occupies the place held by baseball in America. It is the popular game played by school and college, as well as by professional teams. The cricket ball is a hard, leather-covered ball, of about the size and weight of a baseball. The bat, usually of willow, is about 36 inches long, with a flat blade 4½ inches wide and 22 inches in length.

Cricket is played by opposing teams of 11 men each, on a turf field, in the middle of which are placed two wickets facing each other at a distance of 22 yards. Each wicket consists of three round sticks, called "stumps," standing 27 inches high, with a distance of 8 inches between the two outer stumps. In grooves upon the top of the stumps lie two light pieces of wood called "bails."

The team at bat has a batsman at each wicket. The opposing team has a bowler at one wicket and a wicket keeper behind the other, with fielders in positions surrounding both wickets. The wicket keeper corresponds to the catcher in baseball.

The bowler pitches, or "bowls," the ball, trying to place it so that, on a first bounce, it will strike the opposite wicket and dislodge a bail, so putting the batsman out. The object of the batsman at this wicket is to protect it by striking the ball. If he hits the ball, he and the other batsman run to exchange places. If they succeed, without being put out, a run is scored. Not more than six runs may be made on one hit. During an attempted run, if the bail of a wicket is displaced by a fielder holding the ball, the batsman nearest that wicket is out. The batsman striking the ball is out if the ball is caught by a fielder before it touches the ground.

When a bowler has thrown six times, another bowler takes the ball and pitches from the opposite wicket. An inning lasts until ten men of one side have been put out. A game usually allows two innings for each team. Matches frequently last for two or three days.

Football. American Intercollegiate football is played by opposing teams of 11 men each, on a field measuring 160 feet in width and 300 feet in length between goal lines. The field is marked with cross-lines at intervals of 5 yards; to the resulting appearance is due the popular name of "gridiron." A goal 18 feet, 6 inches wide is marked in the middle of each end of the field by goal posts, with a crossbar 10 feet from the ground.

The principal object of play is to carry the ball over the goal line of the opposing team. Scores are given for thus making the goal and for kicking the ball over the crossbar between the goal posts. A game is divided into 4 periods of 15 minutes each.

Although the ancient Greeks and Romans had games of a nature similar to football, the modern game is of English origin. As early as the 12th century, whole villages played a game of football, in which the ball was kicked and carried through the streets. The game was first organized in the English public schools. When introduced into America, it appeared in two forms, Association football, or soccer, in which carrying the ball is forbidden, and Rugby football. The rules of the latter game were adopted by Harvard and Yale in the early 1870's. After years of great independence and confusion as to methods of play, a general committee of colleges, united with a former committee of the University Athletic Club, formulated the rules for 1906. These rules, with some modifications tending to more open play, now govern the American Intercollegiate game.

Golf. This open-air game consists in driving a small, solid, resilient ball successively into each of a series of 9 or 18 holes arranged at varying intervals over a course, or links. The holes are placed in smooth areas, called putting greens, between which hazards, such as pits, mounds, clumps of trees, and similar natural or artificial obstacles, are placed. The object of play is to make the round of all the holes in the least possible number of shots. A great variety of clubs, with heads especially adapted to the conditions under which they are to be employed, are used to drive the ball.

The origin of the game of golf is obscure, though an ancient game of Holland and Belgium, played usually on the ice and called *Kolf*, may be its progenitor. The Scotch were among the earliest golf players, although the game was popular in England in the 15th century. The most famous Scottish links are those of Saint Andrews and of Leith. The Royal and Ancient Golf Club of Saint Andrews was established in 1754. Toward the close of the 19th century, the game was introduced into America, where at the present time both private and public links are patronized by increasing numbers.

Handball. A very ancient game, probably of Celtic origin, now played in America chiefly for the vigorous exercise it provides. The game requires a firm floor with a smooth front wall and side walls. A small, solid rubber ball is used. It is batted against the wall with the player's hand, and on rebound must strike the floor in front of a crossline called the "ace line." Each player tries to make the ball rebound from the wall in such a way that it cannot be successfully returned by his opponent. The server scores 1 point, or "ace," when his opponent fails to return the ball. Usually, a score of 21 aces wins the game.

Hockey. The ancestry of this game includes the Irish game of "shinty" and the Scottish "hurley." The Scottish game was played on hard sea beaches, with 200 or 300 players on a side. A hard knob of wood was used as a puck, and the players were armed with roots of trees. The world's first organized hockey clubs were established at Montreal in 1881.

Two games under this name are played at present—field hockey and ice hockey. Field hockey is played on a field 100 yards long and 60 yards wide, with a goal 12 feet wide and 7 feet high at each end. In this game a ball is used, and a team consists of 11 players.

In ice hockey, a hard rubber disk, called the puck, is used instead of a ball. The game, lasting through three 20-minute periods, is played on skates, a team consisting of 6 players. Goal posts are set 6 feet apart and at least 10 feet from the ends of the ice field or rink.

In both games a hook-shaped stick is used, the crooked end having flat faces. A score is made when the puck, or the ball, is driven between the opponents' goal posts.

Lacrosse. A game which probably originated among the North American Indians, and which was a favorite sport among many tribes. It is said that sometimes several hundred men would participate in a match. Before a game, the players went through a course of rigorous training. Tribes were often pitted against each other, old medicine men acting as umpires. A game might be continued for days. The sport even took on a ceremonial character. A ball of hide stuffed with hair was commonly employed. The shape of the stick used, crooked at one end like a crosier, suggested to the French explorers the name *la crosse*.

About 1840, white men adopted the game, and in Canada it rapidly grew in popularity. In 1867, rules were formulated, and the National Lacrosse Association of Canada was formed. A little later the game was introduced into the United States.

The modern game is played upon a field about 120 yards long, with a goal 6 feet square at each end. There are 12 players on a side, and the object of play is to send a small solid rubber ball into the opponents' goal. The ball is carried or thrown with the *crosse*, or stick, 3 or 4 feet long, shaped like a shepherd's crook, from the broad, curved end of which a netting of rawhide or catgut extends about halfway up the handle.

Polo. This thrilling field game is played by two teams of four players each, mounted on ponies. The field is turf, 300 yards long by 150 to 200 yards wide. The object of play is to drive a light wooden ball through the opponents' goal. A long-handled mallet is used to drive the ball. The goals are 8 yards wide between goal posts. A game commonly consists of 8 periods of 7½ minutes each.

The Persians were among the earliest players of this ancient game, as they were among the first of ancient horsemen. A definite record of a game much like the modern sport is found in China in the 6th century A. D. English officers adopted the game as they found it in India, and brought it to England, where, in 1877, the first definite rules were adopted.

Pugilism and Boxing. The sport of fighting with the fists. When gloves are used, the term boxing is applied. Sometimes the sport is known as prize-fighting, from the fact that contestants fought for money in England from the early 18th century.

The historical origin of pugilism goes back to Greece. It became a part of the Olympic games in 880 B. C. A species of weighted glove (cestus) was worn. Its purpose was to magnify the effect of blows and not soften them, as with modern gloves. The sport was popular in Rome until near the end of the empire. Then it died out for more than a milennium.

Boxing was revived in England at the end of the 17th century, about 200 years before it was taken up by other nations. The first use of the glove, beginning in practice bouts, is ascribed to Jack Broughton, who was undisputed champion from 1734 to 1750. He is looked on also as the father of the sport as an art rather than as an endurance contest. As an art, it may be defined as hitting without getting hit.

The boxing ring under American rules is a roped-off square, each side being from 16 to 24 feet long. Unless one contestant is knocked out, that is, unable to rise within ten seconds, or is unable to respond to the call of the bell, the match is decided on points. These include hits delivered and also adroit action in avoiding them. It is classed as a foul to hit below the belt, kick, wrestle, or, of course, bite and gouge. Earlier boxers made a point of keeping the left arm always extended as a guard, but recent practice is to keep both hands ready to attack while relying for defense on avoiding the adversary's blows by slipping the head, ducking, or pulling away.

Rowing. This is the oldest of organized college sports. From 1841 Oxford and Cambridge have competed in annual contests over a 4¼-mile course. The first American college boat club was organized at Yale in 1843. Harvard followed the next year. Their first meet was a 2-mile race on Lake Winnepesaukee, New Hampshire. Since 1878 the annual Yale-Harvard race has been rowed on the Thames River at New London, Conn.

The Hudson River at Poughkeepsie was from 1895 the scene of the famous Poughkeepsie Regatta of the Intercollegiate Rowing Association; but in 1950 and 1951 the regatta was held on the Ohio River at Marietta, Ohio, and in 1952, 1953, and 1954 on Onondaga Lake, Syracuse, New York. There are other annual crew racing regattas, and single rowing contests between amateur oarsmen.

Skiing. Conspicuous as a feature of the Winter Olympic Games, the sport of skiing is also indulged in by many young and older persons of differing skill and agility on a purely recreational basis. The skier's long, narrow runners, a special form of snowshoes worn skate fashion, make possible a smooth gliding movement over snow-covered surfaces with great speed and, in some cases, with a high degree of gracefulness. Difficult feats performed by the skier include climbing a slope by side stepping,

downhill and slalom gliding, and making long jumps followed by uninterrupted forward movement after landing. Under rules laid down by the ski associations, championship matches are held in which points are scored representing credits for distance, speed, good form, and execution of difficult maneuvers.

One of the more difficult events is the slalom, in which the course downhill is marked by flags arranged in more or less intricate patterns. The contestant earns points by speed and skill in negotiating the paths thus marked. In the Giant Slalom, the course is longer, the flags are farther apart, and the vertical descent is at least 1000 feet.

Competition in skiing is regulated by such organizations as The United States Ski Association and the *Federation Internationale de Ski.*

Swimming and Diving. It is often pointed out that swimming is an acquired accomplishment, no more natural or instinctive than playing the violin. In the early history of the race, and in the life of every individual, it begins as a survival measure, an effort to keep afloat by "treading water," after the manner of certain land animals that swim by instinct. Beyond this elementary stage, man has developed both swimming and diving into an art as well as a universally popular competitive sport in which proficiency is measured by established standards of skill and gracefulness, and in which points are awarded for such matters as distance and speed. As in many other forms of competition, endurance is also a factor.

The history of swimming may be considered in terms of individual feats such as that of Captain Matthew Webb, a breaststroke artist, who in 1875 became the first person to swim the English Channel. Or the history may be reviewed in the story of numerous organizations that have promoted contests, prescribed requirements, and maintained records made by leading contenders. Over the years there has been a marked increase in the range and variety in styles of swimming and in the execution of difficult movements, particularly in diving.

Typical events for which specifications are prescribed are shown in regulations for the AAU Annual Championships, which include freestyle, breaststroke, butterflystroke and backstroke contests, representing distances of 100 and 220 yards, both for individuals and for relay teams. Correspondingly, the regulations for springboard diving events, to be executed as announced from a standing position or with a running approach, prescribe the scoring of points for smooth performance in a variety of difficult movements such as somersaults, reverse dive half twist, and many others.

Tennis, Lawn. A game usually played by 2 or 4 players upon an outdoor court. The court is 78 feet long and 27 feet wide, with an extra 9 feet of width when 4 are playing. A light racket and a small inflated ball are used.

The game consists in driving the ball back and forth over a net stretched across the court midway of its length. Each player tries to direct, or place, the ball within his opponent's court, so that it cannot be returned. His first successful attempt gives him a score of 15; the second makes the score 30; the third, 40; and the fourth wins the game, unless the opponent also has made 40. In this case, the score is deuce, and the winning of two successive points is necessary to win the match. Games are usually played in sets; the player who first wins 6 games wins the set unless his opponent ties the score at 5 all, in which case the winning of two successive games is necessary to win the set.

Before 1870, tennis as an indoor game, now called court tennis, had been first played in modern times by the French. The name is by some authorities derived from the word *tenez*, meaning "seize it" or "play." Modern lawn tennis, however, was patented by Major Wingfield in England in 1874. The present great popularity of the game dates from about 1880.

Track. In England, competition in running, jumping, and other track and field sports is mentioned as early as the 12th Century. Such contests are referred to later from time to time, but it was not until the 19th Century that track competition came into its own, with more systematic organization, more definite regulations and performance standards, and also more numerous branches or divisions. In 1834, typical standards of excellence were adopted, calling for such accomplishments as the running of 440 yards in 60 seconds and of a mile in 5 minutes, for a broad jump of 20 feet, and for a high jump of 5 feet 6 inches. Athletic clubs, colleges, and other organizations welcomed the adoption of specific rules and the establishing of performance standards. In keeping with these developments, the various branches of track competition grew steadily in popularity and in number of participants.

Although some track events call for team effort, there has always been much emphasis on achievement by a particular individual. In many cases the contestant performs in rivalry with other individuals, but at the same time he is always competing with himself, in an effort to improve upon his previous record. The range of opportunities open to him is indicated by the names of some typical events, such as the quarter-mile race (440 yards), the mile relay race (each participant running a quarter mile), the high and low hurdles, the high and broad jump, the pole vault, the discus throw, the shot put, and so on.

In the Sports encyclopedias and in the annual compilations of latest records, one may note a rising curve of achievement in track events, sometimes with dramatic instances of exploits by individual participants. To recall one or two examples, the 5-minute mile cited above as a performance standard in 1834, was gradually whittled down toward a 4-minute basis, which in turn was eclipsed in 1858 by Roger Bannister's record-breaking time of 3:59.4 —a mark that has since been equaled or bettered by others. Names like Jesse Owens, Bon Richards, Rafer Johnson, Wilma Rudolph, and many others are associated with the establishing of new records in various tract events. A standing challenge to athletes is to prove that even the seemingly ultimate records are only temporary.

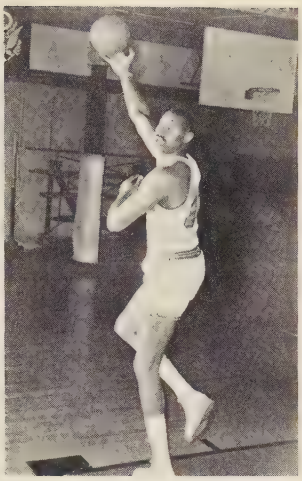
Volley Ball. A game, usually played indoors, in which 5 or more players on a side may engage. A spherical, leather-covered ball is used. The object of play is to volley the ball, striking it with the hand, back and forth over an elevated net. The failure of one side to return the ball scores a point for their opponents.

Wrestling. The antiquity of wrestling as a favorite form of exercise and as a competitive sport is attested by researchers and is verified by the "action poses" that were caught by sculptors and have been preserved by statues dating back 5000 years or more. The popularity of wrestling with the ancient Greeks and Romans is well known. Whatever may be said of modern professional wrestling as it has come to be associated with questionable maneuvers staged primarily for entertainment, wrestling as an amateur sport has maintained its traditional high standing and has held its place in physical fitness programs of schools, colleges, and athletic clubs.

Catch-as-catch-can, or "free-style" wrestling has long been the preferred form for amateur competition in the different weight classifications. On a mat 24 feet square, the two contestants grapple, and each attempts to bring his opponent down and pin his shoulders to the mat, then hold them there during the referee's count of "three." If neither contestant is "pinned" within the time of the match, which is usually nine minutes, the referee may designate the winner on the basis of points awarded for a "takedown," a clever escape from a defensive position, or some other difficult maneuver.

James Brown, fullback on the Cleveland professional football team, has made highest records in ground-gaining, having passed a career total of 20,000 yards in 1964.

Young American swimmer Cathy Ferguson won the women's 100-meter backstroke in the 1964 Olympics at Tokyo.

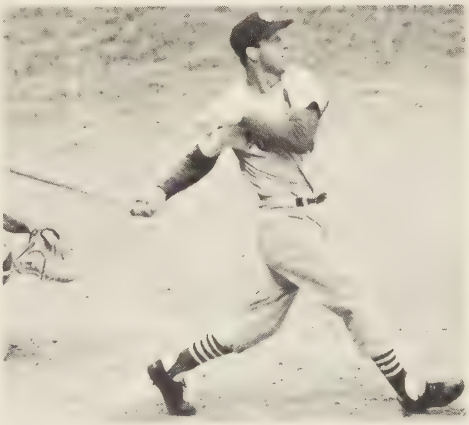


Thanks to his great height, agility, and accurate shooting, "Wilt" Chamberlain has maintained his place as a leader in professional basketball.

Recognized as one of the country's leading jockeys, William Shoemaker is identified with Native Dancer, Determine, and other outstanding winners.

GAMES AND SPORTS FIGURES

Three distinguished golfers, remembered from the U.S. Open and other championship contests, are *(left to right)* Gary Player, Jack Nicklaus, and Arnold Palmer.



Retired after a fabulous career in professional baseball, "Stan" Musial, of St. Louis, continues active in promoting physical fitness for American youth.

Left Maple Leaf Gardens—Toronto, Canada

Olive Peacock Photography Ltd

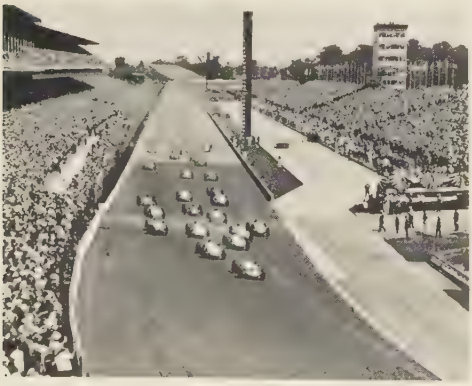
Above left Harris County Sports Stadium—Houston, Tex.

Above 1952 Olympics Statue in Helsinki, Finland

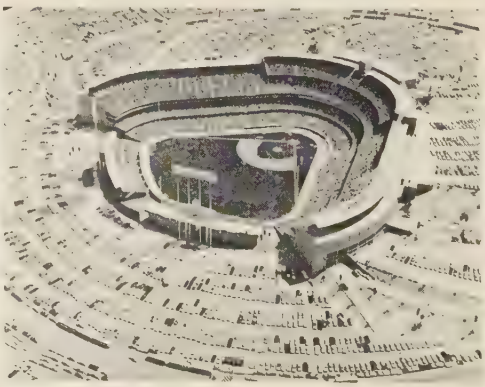
SPORTS CENTERS

Komazawa Olympic Park—Tokyo, Japan

Shea Stadium—Flushing, N. Y.



Indianapolis Motor Speedway—Speedway, Ind.



Dodger Stadium—Los Angeles, Calif.

Academy. This name was applied originally to an olive grove of ancient Athens used as a gymnasium. The name was given also to the estate of Plato, which was situated near by, and to the school which he founded at his house. In later times, the name has been used as a common noun to designate either an institution of learning or an association of scholars or artists.

Among the earliest of the innumerable academies, in the sense of associations of scholars, were the academy of Alcuin and other friends of Charlemagne about 800 A. D., one at Constantinople in the 11th century, and the Platonic academy at Florence in the 15th century. In 1635, Richelieu organized the French academy, which survives to the present day as one of the constituent societies which went to form the institute of France. The American Academy of Arts and Letters is the most notable society of this type in America. The name academy has also been frequently used in America to designate a certain type of high school or preparatory school.

According to Hoyle. Edmond Hoyle, an Englishman who lived from 1672 to 1769, was the first to systematize the laws of whist, and he was considered the highest authority on the game until 1862, when the modernized form of play was introduced by Cavendish. Now applied colloquially in any field, and meaning "according to the strict rules" obtaining in that field.

Air Cushion Vehicles. Invented by Christopher S. Cockerell, a British radio engineer who had taken up boat-building, the so-called "hovercraft" is a novel form of transport in which a vessel rides on a cushion of air between it and the water or other surface over which it flies. Cockerell based his idea for the craft on his observation of hydroplanes skimming lightly on the surface of the water and using much less power than would be required to propel them against the friction of the water if they were partially submerged. His idea was to go a step farther and bring the boat clear out of the water. This he accomplished by means of jets around the periphery which directed the air downward and inward to build a cushion of air at a pressure of 10 to 15 pounds a square foot. The hovercraft designed by Cockerell was built by Saunders-Roe, Ltd., of Cowes, Isle of Wight, and was financed by the National Research Development Corporation of Great Britain. The experimental model built by Saunders-Roe was a flat, raft-like vessel having an area of 24 by 30 feet. Larger ones are planned for further experimentation, but the principle of operation will be the same.

When tested at slow speeds, Cockerell's hovercraft showed a wave-generating "drag" not greatly different from that of a boat similar in size and shape. At such speeds a great deal of energy was required simply to maintain the cushion. But above a certain critical speed the craft no longer produced waves and could be driven with a small expenditure of power, less than would be needed to drive a conventional boat at the same speed.

Other experiments with the air cushion form of transport have been made by Curtis Wright, who has demonstrated a so-called "Air Car," by a Finnish engineer, who has developed an "air sled," and even by an inventive physician in Illinois, Dr. William R. Bertelson, who constructed a "do-it-yourself" working model of an "Aeromobile." The Ford Motor Company has been developing a "Levacar," which may have possibilities for traveling on rails, or rather on a thin cushion of air between it and the track.

Inasmuch as the hovercraft is still in the experimental stage, it may be a little early to speak of its practical uses. Among applications of the principle which suggest themselves are its military use in assault craft against beaches, its convenience for flying just above the surface of a swamp in spraying to destroy mosquitos, and especially its usefulness in exploring undeveloped territory which lacks roads or bridges. Its use in passenger transportation, though not considered likely for the immediate future, is nevertheless seen as a distinct possibility.

Alchemy. The chemistry of the Middle Ages. It most frequently took the form of a search for the "philosopher's stone," which should transform all baser metals into gold, cure all diseases, and restore youth. For this last property, it was sometimes called the elixir of youth. The search for this philosopher's stone led to many important practical discoveries in chemistry. They were long unavailable for classification and general use, however, because the alchemists kept them as profound secrets.

Alliance for Progress. Called by President Kennedy "the great adventure of the Americas in our time," the Alliance was created by the Charter of Punta del Este, signed in Uruguay August 17, 1961 by representatives of 20 Western Hemisphere nations, omitting Cuba. Its purpose was "to promote economic growth with freedom" in the participating nations. It was stipulated that each country should draw up a ten-year development plan in order, through self-help, to make most effective the assistance to be given by the United States. Emphasis was placed on projects beneficial to peasants and urban workers.

Soon after the signing of the Charter, the United States advanced a total of $139,500,000 in Development Loans to 18 countries. Because the nations differ widely in economic conditions and political stability, only time will tell the overall effectiveness of the Alliance.

Almanacs. In modern times, almanacs have been books, pamphlets, or tables containing a calendar showing the days, weeks, and months of the year, various festivals, and astronomical facts.

The first almanac in America is said to have been *Bradford's*, issued in Philadelphia. Benjamin Franklin's *Poor Richard's Almanac*, published for about 25 years from 1732, became famous for its wit and wisdom. At the present time, several famous almanacs that are really useful handbooks of current information are issued annually in Europe and America. The *Almanach de Gotha*, which was published first in 1763, is devoted to political information about the countries of the world. *Whitaker's Almanack*, published in England, and several American almanacs issued by newspapers, such as the *World Almanac*, are compact summaries of current events.

Antibiotics, Antivirotics, and Corticosteroids. *Antibiotics* are chemical substances produced by various species of microorganisms (bacteria and fungi) which suppress and even destroy the growth of other microorganisms. There are hundreds of antibiotics, but only a small number have been used in the treatment of infections. Most of the bacterial diseases, all of the known rickettsial diseases (such as Rocky Mountain fever), and a number of virus and fungus infections have been treated successfully with antibiotics.

The first antibiotic to become available was penicillin. Although the fungus penicillium had been known previously, it remained for Dr. Alexander Fleming in 1928 to observe that this mold contained an active antibacterial substance, which he named *penicillin*. In 1941 penicillin was first employed in the treatment of human disease, and by 1943 its clinical value was fully established. Several varieties of penicillin are currently being used as antibiotics of choice in the treatment of pneumococcal and streptococcal infections, gonorrhea, and syphi-

lis. It has also been used effectively in the prevention of rheumatic fever by control of streptococcal infections.

Penicillin has been of only limited value in the treatment of staphylococcal infections because of the development of resistant organisms which produce penicillinase. A new penicillin, sodium methicillin (or staphcillin) is highly refractory to the action of penicillinase and has proved to be a valuable adjunct in the treatment of penicillin-resistant staphylococci.

Streptomycin was the second important antibiotic to be discovered, having been first isolated in 1944 by Dr. Selman A. Waksman and his co-workers. Although it is effective against the same group of bacteria as penicillin, it is not as widely used because of the ease with which bacterial resistance develops. It has a second disadvantage in that its prolonged use may cause vertigo and deafness. Today the chief use of streptomycin is in the treatment of tuberculosis.

The next antibiotic to be used extensively was chlortetracycline, more commonly known by its commercial name *Aureomycin*. The discovery of this antibiotic ushered in the era of broad spectrum antibiotics which are effective against a wide range of microorganisms. Newer tetracyclines have been developed over the past decade. Recently a new phosphate complex salt of tetracycline, marketed under the trade names of *Achromycin V* and *Tetrex*, has been found to be more effective clinically because it is absorbed more rapidly and efficiently into the blood stream. These antibiotics have been used successfully in the treatment of many infectious diseases, including pneumonia, brucellosis, tularemia, the rickettsial diseases, and psittacosis.

Chloramphenical, better known as *Chloromycetin*, is another broad spectrum antibiotic that is widely used today. It has a range of usefulness similar to that of the tetracyclines and is the drug of choice in the treatment of typhoid and paratyphoid fever. *Erythromycin*, another widely used antibiotic, has been a welcome adjunct in the treatment of patients who have developed a sensitivity to penicillin.

Antibiotic drugs have been responsible for the saving of untold lives, but unfortunately they have not controlled all infectious diseases, particularly the fungus diseases and the virus diseases. Consequently, other types of antimicrobial agents have been developed, the newest at this writing being *Amphotericin B*, the first really effective agent for the treatment of systemic fungus infections, and *Isoniazid*, a significant advance in the management of tuberculosis. *Griseofulvin* should also be mentioned because of its effectiveness in the treatment of superficial fungus infections, such as "athlete's foot."

Antivirotics. Although some virus diseases have been controlled by immunization, it was not until 1962 that clinical cure of herpes simplex keratitis in rabbit corneas was accomplished by Dr. Herbert E. Kaufman. He used an anticancer agent, 5-Iodo-2'-Deoxyuridine (IDU). This drug, the first antivirotic agent capable of killing a virus, represents a real scientific landmark.

The Corticosteroid Hormones, cortisone, hydrocortisone and ACTH (adrenocorticotrophic hormone), unlike antibiotics, are not antibacterial but produce therapeutic results by some unknown alteration of the body's glandular balance. Cortisone was first used as a therapeutic agent in 1948 at the Mayo Clinic by Dr. Philip S. Hench in rheumatoid arthritis. In 1950 Hench shared the Nobel prize in medicine with Dr. Edward C. Kendall and Dr. Tadeus Reichstein for their work in isolating the hormone from the adrenal cortex. ACTH, which is extracted from animal pituitary glands, stimulates the adrenal cortex of the patient to produce its own cortisone or cortisone-like substance. ACTH, cortisone, and hydrocortisone have similar clinical effects, but the latter two have had wider application, having proved valuable in the treatment of rheumatoid arthritis, rheumatic fever, bronchial asthma, and other inflammatory and allergic disorders.

Astronautical Terms. Communication regarding developments in astronautics has required a whole new vocabulary of scientific and descriptive words. In addition to strictly technical terms used by specialists, there are many expressions that are becoming familiar to the general public. Some typical examples are found in the following list.

Aerobee. A research rocket vehicle used in upper-atmosphere investigations, at altitudes of 70 to 75 miles, in obtaining biomedical data and information concerning cosmic rays.

Anti-missile Problem. The early detection and destruction of enemy missiles assumes a theoretical flight time of not more than 42 minutes for the trajectory of a ballistic missile fired halfway around the earth. This figure is half of 84 minutes, the minimum duration for an object in a keplerian ellipse oriented around the earth.

Apogee. The point in the orbit of an earth satellite which is farthest from the earth. (See *Perigee.*)

Astronaut. A person who travels through interplanetary space.

Astronautics. The art and science of flying through space or sending guided vehicles or missiles through space.

Atlantic Missile Range. The path of missiles launched from Cape Kennedy, formerly Cape Canaveral. Included among its downrange stations are auxiliary Air Force bases at Jupiter, Florida; Grand Bahama Island; San Salvador; Mayaguez, Puerto Rico; St. Lucia, Windward Islands; Fernando de Noronha Island, Brazil; and Ascension Island.

Autopilot. An automatic control mechanism for keeping a missile in level flight or causing it to maneuver.

Ballistic Missile. A missile which, in traveling toward a surface target, follows a trajectory similar to that of an artillery shell. However, its initial propulsion, range, and guidance suggest comparison with a rocket. In its free fall after the propulsive force has been spent, the missile is affected by gravity, atmospheric friction, and other influences tending to modify its course.

Balloon Satellite. A large lightweight reflecting object whose path and position can be observed optically.

Booster. A rocket used to increase the speed or altitude of the vehicle to which it is attached.

Capsule. A container designed for separation or escape from superspeed high altitude craft or for re-entry into the earth's atmosphere from orbit flight.

Communications Satellite. A satellite that is used for relaying signals to the earth. The active type of communications satellite carries its own transmitting equipment; a passive one merely reflects, or "bounces back" radiation from the earth.

Cosmic Rays. Powerful rays capable of penetrating 18 inches of solid lead or 200 feet of water. They are thought to be high-energy atomic nuclei from outer space.

Count-down. The measured sequence of events in the final preparation and launching of a missile. In a sequence ranging down from ten, the actual launching point is zero.

Doppler Effect. The apparent change in wave length of any electromagnetic radiation when the distance between the observer and the source of radiation is increasing or diminishing owing to the motion of either or both.

Drag. The resistance of the air which prevents a plane or other object from going forward. It is overcome by thrust.

Escape Velocity. The velocity needed for a space vehicle to escape from a planet's gravitational field. If launched from the earth, the object would

have to reach a speed of approximately 6.9 miles per second in order to break away.

Guidance. A system for determining the course of a missile or space ship. Guidance may be initial, mid-course, or terminal, according to whether the course is pre-set, modified during flight, or influenced by circumstances connected with the target toward which the object has been directed.

Homing. A device or system which guides a missile toward a particular target, such as a light or a hot object.

Ionosphere. A layer of ionized air about thirty miles above the earth which can bend or reflect radio waves back to the earth.

Launching Pad. A concrete platform on which a rocket is placed prior to launching. A "firing table" supports the rocket that is to be launched, and a "blast deflector" channels the exhaust from the rocket.

Mach Number. The ratio of the velocity of an object in motion to the speed of sound. Mach 1 represents the speed of sound (sonic speed), which is 761 miles an hour at sea level and about 660 miles an hour at 35,000 feet altitude.

Nose Cone. The separable payload part of a long-range missile. In case it is to be released from an orbiting satellite in order to re-enter the earth's atmosphere, the nose cone is especially constructed to withstand the heat of friction and other stresses incident to its return.

Observation Satellite. Especially equipped for mapping, photographing, reporting cloud cover or doing other kinds of reconnaissance, observation satellites have peacetime, and possibly military, uses which are only beginning to be realized.

Perigee. The point in the orbit of a satellite at which it is nearest to the planet around which it revolves. (See *Apogee.*)

Propellants. Active chemicals in either solid or liquid form which are used to give impetus and powerful thrust to rockets and missiles. To produce this effect, chemicals capable of creating high-temperature exhaust gases are needed.

Retro-rocket. A special rocket which can be fired opposite to the main power units in order to retard the progress of the vehicle in which they are carried.

Stratosphere. A layer between ten and twenty miles in altitude which lies above the earth between the troposphere and the ionosphere.

Supersonic. That phase of aerodynamics which deals with speeds above the speed of sound.

Tracking. The observing of an object's progress in flight. Observations may be made either optically or by radar.

Troposphere. The layer immediately above the earth's surface and below the stratosphere. The troposphere extends through an altitude of five to ten miles and contains approximately 75 per cent of the weight of the earth's atmosphere.

Astronauts. Plans for space exploration made by the National Aeronautics and Space Administration (NASA) called for the development, concurrently, of several related forms of preparation, all of them essential to the success of projects that were being undertaken. To put a man and a piece of hardware in space and return them intact would require improved fuels, special metals, reliable controls, and a carefully worked out sequence of operations. To obtain the scientific data sought would require sensitive recording and measuring instruments designed to function in time with the progress of the vehicle and under varying and sometimes unpredictable circumstances of its flight. Complex but reliable electronic instruments would make most operations automatic, but for insuring control of the vehicle at all times and for improvising measures to meet unforeseen conditions, decisive action would sometimes need to be taken by the astronaut himself.

Soon after the creation of NASA by act of Congress in the summer of 1958, preparations were begun for selecting the men who would be sent on the difficult and hazardous missions of space exploration. This was a matter requiring much time and careful consideration. It was recognized that the men chosen would have to meet the most rigorous requirements—physical, mental, and temperamental. Even to qualify for the preliminary tests, a man should be a university graduate who had specialized in the physical sciences or in engineering. He would have to be a test pilot of approved training and experience, with 1500 hours or more of flying time to his credit. Besides being in perfect physical condition, he should be alert and intelligent enough to master the scientific and technological intricacies of a highly complex operation.

Out of 500 test pilots in service with the armed forces of the United States, NASA's Aeromedical Committee chose a preliminary list of 110 names. Eliminations reduced the number first to 56, then to 32. After an elaborate series of tests and a thorough study of each man's aptitudes and attributes, a final narrowing down resulted in the choice of the seven Astronauts who became identified with Project Mercury. The men chosen are listed below.

Name and birth date	*Home address*
Carpenter, Malcolm Scott (1925)	Boulder, Col.
Cooper, Leroy Gordon, Jr. (1927)	Shawnee, Okla.
Glenn, John Herschel, Jr. (1921)	New Concord, O.
Grissom, Virgil I. (1926)	Mitchell, Ind.
Schirra, Walter Marty, Jr. (1923)	Hackensack, N.J.
Shepard, Alan Bartlett, Jr. (1923)	Derry, N.H.
Slayton, Donald Kent (1924)	Sparta, Wis.

In the training that the astronauts received after their appointment to the Space Group, every conceivable aspect of space travel was studied and tested. With special reference to the tasks ahead, each man was given a well-rounded education in astronomy, astrophysics, ballistics, fuels, geography, guidance, meteorology, space biology, and other related subjects. At the same time, his personal fitness for the coming assignment was determined by experiments testing his ability to adapt himself to weightlessness and other variations in the pull of gravity. Tests were made of his visual perception, his capacity to orient himself in simulated space flight, his familiarity with controls, and his response to numerous ingeniously contrived exercises to indicate his poise and to predict his ability to make a flight that would combine safety with maximum scientific value.

Astronauts—Later Groups. Following the original group of astronauts chosen in 1959, a second group of 9 was named September 17, 1962. The appointment of 14 additional candidates was announced October 18, 1963, bringing the total to thirty. The average age for the groups was 34.5 for the first, 32.5 for the second, and 30.9 for the third. Although the same high standards were maintained throughout, with continued emphasis on test pilot experience, a good deal of variety was shown in the backgrounds and qualifications of the second and third groups. In addition to practical training, several of them had acquired college degrees in aeronautical engineering. One had a Ph.D. degree in science and aeronautics from the Massachusetts Institute of Technology.

The personnel of the later groups was as follows: *Second Group*: Neil A. Armstrong, civilian, Littlerock, Cal.; Frank Borman, AF Major, Edwards AFB, Cal.; James A. Lovell, Jr., Navy Lt., Virginia Beach, Va.; James A. McDivitt, AF Capt., Edwards AFB, Cal.; Elliot M. See, Jr., civilian, Lancaster, Cal.; Thomas P. Stafford, AF Capt., Edwards AFB, Cal.; Edward H. White II, AF Capt., Fairborn, O.; and John W. Young, Navy Lt. Comdr., Miramar Naval Air Station, Cal.

The *Third Group* included two civilians: R. Walter Cunningham and Russell L. Schweickart. Of the

others, those chosen from the Air Force were Major Edwin E. Aldrin, Jr., Capt. William A. Anders, Capt. Charles A. Bassett II, Capt. Michael Collins, Capt. Donn F. Eisele, Capt. Theodore C. Freeman, and Capt. David R. Scott. Chosen from the Navy were Lt. Alan L. Bean, Lt. Eugene A. Cernan, Lt. Roger B. Chaffee, and Lt. Commander Richard F. Gordon, Jr. Appointed from the Marine Corps was Capt. Clifton C. Williams, Jr.

Barber's Pole. A pole striped slantingly with alternate bands of red and white and placed as a sign outside the door of a barber's shop. In former times, barbers practiced bleeding and leeching. The red striping on the pole symbolized the blood; the white, bandages.

Benefit of Clergy. By an ordinance enacted in 1087 in England, any man sentenced to death could save his life if he could prove that he was a clerk, or man of learning. This might be done by reading a certain verse of Scripture proposed to him. The privilege was known as the benefit of clergy. It was officially withdrawn in the 18th century.

Bessemer Steel, Invention of. Bessemer steel is produced by blowing air through a mass of molten pig iron. During the process of blowing, the carbon and silicon, together with some of the other impurities contained in the iron, are burned to forms which pass away as gases or are retained in the slag so that they may be separated from the liquid metal. The heat formed by the combustion of these impurities, especially the silicon, is so great that, instead of being cooled by the blast of air, the liquid actually becomes hotter.

The product which remains after the treatment with air is not steel but is in many respects similar to wrought iron. In order to obtain steel, a certain amount of spiegeleisen, containing known percentages of iron, manganese, and carbon, is added to the molten iron. See *Steel*, page 977.

This process of removing the carbon and silicon from pig iron was invented by the great English ironmaster, Henry Bessemer, who received his patent in 1855. The process of recarburizing the molten iron and removing oxygen by means of spiegeleisen was patented by Robert Mushet.

When, in 1856, Bessemer took out patents for his process in the United States, his claims were immediately contested in the courts by William Kelly. It then developed that Kelly, who operated an iron refinery and foundry at Eddyville, Ky., had during the years 1846-47 independently invented the pneumatic process of refining pig iron. The United States courts decided that Kelly was the prior inventor, and he received a patent which was later renewed. Bessemer's patents were not renewed.

Bible, Modern Translations of. No manuscript of the Old Testament in Hebrew is extant that dates before the 9th century, and none of the New Testament in the Greek is earlier than the 4th; but critics are agreed that we possess the text of the 1st century substantially entire. Of the versions in modern languages, among the earliest was an Italian version prepared by the Waldenses in the 13th century. The first printed Bible in Italian was issued at Venice in 1471. A printed Bible in Spanish appeared at Valencia, Spain, in 1478. The New Testament in French was first printed in 1477, at Lyon; in 1487, a large edition of the whole Bible was issued. The Louvain Bible, 1550, became the popular French Catholic version; the translation by Olivetan, 1535, was the corresponding Protestant version. Eighteen printed editions of the Bible had been issued in Germany before Luther's translation appeared in 1534.

The first complete English translation was made from the Vulgate, or Latin version. It was issued about 1382, and is known as the Wiclif translation because John Wiclif did much of the work and sponsored the version. His friend, John Purvey, revised this version within the next few years, producing what is known as the Wiclif-Purvey Bible. William Tyndale issued (1525-26) the first printed English New Testament translated from the Greek. Between this date and 1536, he translated from the Hebrew the Pentateuch and other parts of the Old Testament.

Miles Coverdale published the first complete printed English Bible in 1535. Subsequent important English versions are: Matthew's Bible, 1537; the Great Bible, 1539; Cranmer's Bible, 1540; the Genevan Bible, so called because prepared by English exiles at Geneva, Switzerland, 1560; the Bishops' Bible, 1568; the Authorized Version, or King James Bible, 1611; the Reims New Testament (Catholic), 1582; the Douai Bible (Catholic), 1609; the Revised Version, 1881 and 1885; American Revised Version, 1901. A new American Revised Version was published in 1952. A new and complete version of the Bible is at present in the course of preparation at Rome. The first eight books of the Old Testament were published in 1952. An excellent English version of the Jewish scriptures was issued in 1917. Notable modern translations of the Bible are those of James Moffat (Protestant) and Ronald Knox (Roman Catholic). Several versions of the New Testament in modern English have appeared in recent years. See *English Literature*.

Capital Punishment. In the United States, capital punishment, as the extreme penalty for crime, prevails throughout the Union except in Alaska, Hawaii, Maine, Michigan, Minnesota, North Dakota, Rhode Island, and Wisconsin. A number of states have abolished, and later restored, capital punishment. These include Arizona, Colorado, Iowa, Missouri, Oregon, South Dakota, Tennessee, and Washington. Hanging is the mode of execution in 8 states. In 24 others, electrocution is the legal method. In Arizona, California, Colorado, Maryland, Mississippi, Missouri, Nevada, New Mexico, North Carolina, Oregon, and Wyoming, lethal gas is used. The first execution by this method took place in 1924. In Utah, condemned persons may elect to be shot by a firing squad.

CEMETERIES IN EUROPE, (AMERICAN WAR)

Name	Location	Interments
Aisne-Marne	Belleau, Aisne, France	2,288
Brookwood	Brookwood, Surrey, England	468
Flanders Field	Waereghem, Belgium	368
Meuse-Argonne	Romagne-sous-Montfaucon (Meuse), France	14,246
Oise-Aisne	Seringes-et-Nesles, Aisne, France	6,012
St. Mihiel	Thiaucourt, Meurthe-et-Moselle, France	4,152
Somme	Bony, Aisne, France	1,837
Suresnes	Suresnes, Seine, France	1,541
	Total	30,9 2

CEMETERIES AND MEMORIALS—World War II

Location	Interments
Neuville-en-Condroz, Belgium	5,250
St. James-Manche, Brittany	4,410
Cambridge, England	3,811
Epinal, Vosges-France	5,255
Florence, Italy	4,402
Henri-Chappelle, Belgium	7,989
St. Avold-Moselle, Lorraine	10,489
Hamm, Luxembourg	5,076
Manila, Philippines	17,182
Margraten, Netherlands	8,301
St. Laurent-Calvados, Normandy	9,386
Carthage, Tunisia	2,840
Draguignan-Var, France	861
Nettuno, Italy	7,862
Suresnes, Seine-France	24
Hato Tejas, Puerto Rico	69
Honolulu, Hawaii	13,376
Sitka, Alaska	77
Total	106,660

CEMETERIES, NATIONAL

Name and Location	Area Acres	Interments
Alexandria (Pineville), La.	8.24	4,936
Alexandria, Va.	5.50	3,586
Andersonville, Ga.	117.06	13,752
Andrew Johnson (Greeneville), Tenn.	15.00	122
Annapolis, Md.	4.125	2,583
Antietam (Sharpsburg), Md.	11.00	4,809
Arlington (Ft. Myer), Va.	408.33	49,601
Balls Bluff (Leesburg), Va.	.057	54
Baltimore, Md.	72.227	774
Barrancas, Fla.	7.07	2,513
Baton Rouge, La.	7.50	3,598
Battle Ground, Dist. of Columbia	1.033	45
Beaufort, S. C.	28.92	9,826
Beverly, N. J.	7.20	386
Camp Butler (Springfield), Ill.	6.02	1,759
Camp Nelson (Nicholasville), Ky.	9.70	3,724
Cave Hill (Louisville), Ky.	4.33	5,680
Chattanooga, Tenn.	129.53	15,157
City Point (Hopewell), Va.	8.19	5,233
Cold Harbor (Richmond), Va.	2.17	1,981
Corinth, Miss.	20.00	5,774
Crown Hill (Indianapolis), Ind.	1.37	1,100
Culpeper, Va.	6.37	1,386
Custer Battlefield, Mont.	640.00	1,759
Cypress Hills (Brooklyn), N. Y.	18.14	17,786
Danville, Ky.	.31	371
Danville, Va.	3.50	1,377
Fayetteville, Ark.	6.01	1,509
Finns Point (Salem), N. J.	2.50	2,677
Florence, S. C.	3.76	3,042
Fort Bliss, Texas	15.00	648
Fort Donelson (Dover), Tenn.	15.34	688
Fort Gibson, Okla.	6.83	2,830
Fort Harrison (Richmond), Va.	1.55	821
Fort Leavenworth, Kans.	14.60	4,867
Fort McPherson (Maxwell), Nebr.	20.00	1,175
Fort Rosecrans, Calif.	8.01	1,525
Fort Sam Houston, Texas	60.11	1,326
Fort Scott, Kans.	10.26	1,178
Fort Smith, Ark.	15.83	2,767
Fort Snelling, Minn.	178.56	914
Fredericksburg, Va.	12.005	15,294
Gettysburg, Pa.	14.87	3,818
Glendale (Richmond), Va.	2.12	1,205
Golden Gate (San Bruno), Calif.	161.547	0
Grafton, W. Va.	3.21	1,386
Hampton, Va.	26.531	14,530
Jefferson Barracks, Mo.	29.00	16,896
Jefferson City, Mo.	2.00	967
Keokuk, Iowa	2.75	1,095
Knoxville, Tenn.	9.83	4,201
Lebanon, Ky.	2.83	883
Lexington, Ky.	.75	1,383
Little Rock, Ark.	23.12	7,849
Long Island (Farmingdale), N. Y.	175.00	2,956
Loudon Park (Baltimore), Md.	5.60	6,218
Marietta, Ga.	24.56	10,952
Memphis, Tenn.	43.91	15,919
Mexico City, Mexico	2.00	1,563
Mill Springs (West Somerset), Ky.	3.50	759
Mobile, Ala.	6.91	2,772
Mound City, Ill.	10.50	5,658
Nashville (Madison), Tenn.	65.00	17,088
Natchez, Miss.	11.07	3,790
New Albany, Ind.	5.46	3,509
New Bern, N. C.	7.69	3,543
Perryville, Ky.	4.39	0
Philadelphia (Germantown), Pa.	13.32	7,438
Poplar Grove (Petersburg), Va.	8.65	6,281
Port Hudson (Zachary), La.	8.00	3,862
Quincy, Ill.	.459	327
Raleigh, N. C.	7.83	1,307
Richmond, Va.	9.74	6,849
Rock Island, Ill.	7.12	1,086
Salisbury, N. C.	6.00	12,279
San Antonio, Texas	3.63	3,880
San Francisco (Presidio Sta.), Calif.	28.34	19,573
Santa Fe, New Mexico	9.63	1,796
Seven Pines (Richmond), Va.	1.90	1,408
Shiloh (Pittsburg Landing), Tenn.	10.05	3,652
Sitka, Alaska	1.19	132
Soldiers Home, D. C.	15.89	9,836
Springfield, Mo.	11.03	2,990
St. Augustine, Fla.	1.36	2,024
Staunton, Va.	1.15	777
Stone River (Murfreesboro), Tenn.	20.10	6,197
Vicksburg, Miss.	40.00	17,551
Wilmington, N. C.	5.00	2,489
Winchester, Va.	5.00	4,583
Woodlawn (Elmira), N. Y.	7.36	3,405
Yorktown, Va.	3.00	2,204
Zachary Taylor (Matthews), Ky.	16.43	473
Total	2,799.584	452,272

Chemical Warfare. The use of poisonous, asphyxiating, or irritating chemicals in warfare was attempted as early as 425 B. C., when the Spartans burned sulphur near the walls of besieged Athenian cities with the intention of driving the defenders from their positions. In modern warfare, employment of poisons or poisonous weapons was expressly forbidden by the rules of the Hague Congress of 1907. The Allied armies were therefore totally unprepared when, at the battle of Ypres on April 22, 1915, the Germans let loose a dense cloud of greenish yellow chlorine gas upon the junction of the French and the British lines.

This first onset was followed by others, and a race began to improve this new weapon and to develop protective devices. The principal gases used were mustard, or blistering gas, lachrymators, or tear gases, chloropicrin, or vomiting gas, and chloroarsine, or sneezing gas. The chief defense was by masks, which permitted breathing through a canister filled with chemicals and absorbent charcoal.

In a protocol signed at Geneva in 1925, thirty-nine member countries of the League of Nations renounced the use of "asphyxiating, poisonous and other gases and all analagous liquids, materials, and devices." However, because it was known that Germany had built up reserves of chemicals that could be used in poison gas warfare, Great Britain and other countries, including the United States, made extensive preparations with improved gas masks and other protective devices.

Also, while refraining from initiating the use of gas as a weapon, they perfected deadly gases with which to retaliate in kind if their Axis enemies should begin this form of warfare. Either foreknowledge of this preparation or some other cause prevented the Axis powers from resorting to the use of poison gas, so that World War II was fought without chemical weapons being employed by armies in the field. Yet the contribution of chemistry to military effectiveness was extremely important. In the development and manufacture of insecticides like DDT, of drugs like atabrine, of incendiary substances and of industrial materials like synthetic rubber, to say nothing of its aid in preparing and preserving food products, chemical science showed great progress.

Chronology. The science of determining historical dates and the correct arrangement of the records of events in order of time. The development of this branch of knowledge, so necessary to the modern writing of history and in the conduct of affairs, involves, first, a material means of keeping records and, secondly, a definite unit of time measurement. A third factor has proved to be necessary in practice, that is, a definite date or epoch from which to reckon intervals of time. For the historian, problems of chronology arise, particularly in the ancient and medieval periods, from the prevalence of different methods of reckoning, as well as from inaccuracies of record.

Ancient Eras. Perhaps as early as the 8th century B. C., the Babylonians adopted the year of the accession of Nabonassar as the epoch from which to reckon time. The beginning of the Babylonian era falls, therefore, in 747 B. C. It is interesting that the other two generally accepted eras of antiquity are both dated from years within the 8th century B. C. The Greeks reckoned in olympiads, counting from the accepted date of the first Olympic games, 776 B. C., while the Romans counted from the supposed date of the founding of Rome, 753

B. C. However, the Greek olympiad was four years in length, while there was a discrepancy in length between the Babylonian and the Roman year. Besides, both the Greek and the Roman system were introduced several centuries after the epochs taken as their beginnings.

The Christian Era. It is evident that the task of synchronizing dates in the history of the ancient world, where records were kept according to these varying systems, would not be easy. These and several other modes of reckoning periods longer than a year were in general use when, in 533 A. D., Dionysius Exiguus, a Roman abbot, introduced into Italy the system of the Christian era, according to which dates are reckoned forward and backward from the birth of Christ. This method of chronology came into use in France and England in the 8th century. There were still, however, considerable variations in the fixing of dates.

Dionysius used the year 754 A. U. C. as the year of the birth of Christ, and fixed the beginning of the Christian era at March 25 of the preceding year, dating from the Annunciation. Subsequently throughout the Middle Ages, in church and secular records, various dates for the beginning of the year,—March 25, March 1, Easter, and Christmas, for example,—were in use. Not until 1752 was the present date of January 1 in general use as the first day of the year. The fact that Dionysius placed the birth of Christ in 754 A. U. C., instead of 750, the commonly accepted year among early Christians, accounts in part for the necessity of reckoning that Christ was born in 4 B. C., instead of 1 A. D.

Modern chronology has been further complicated by the use of different calendars. The calendar having a year of 365 days, authorized by Julius Cæsar and known as the Julian calendar, was corrected by a council of astronomers summoned by Pope Gregory XIII in 1582. The new Gregorian calendar gradually came into use in western Europe, being finally adopted in England in 1752 and in the American colonies about the same time.

In eastern Europe, however, where the Greek Church was dominant, the Julian reckoning was retained. In 1917, Turkey adopted the Gregorian calendar; Russia followed in 1918; and, in 1923, a congress of the Eastern Orthodox Church decreed the adoption of the reckoning used by the rest of the world. Bulgaria and Greece accepted the change. The Nationalist Government of China adopted the same calendar in 1928, thus making its use uniform throughout the civilized world. See *Calendar*.

Several attempts have been made to construct, by the use of the Old Testament records, a Creation era. The best-known of these is that which was computed by Archbishop Ussher (1650), in which the date of creation of the world is fixed as 4004 B. C. Other assumed dates of the creation vary from 3483 B. C. to 6984 B. C.

The eras mentioned above, as well as others that have been widely used in the Western world, are given in the following table.

Era	Beginning B C.
Era of Constantinople	Sept. 1, 5508
Alexandrian Era	Aug. 29, 5502
Mundane Era of Antioch	Sept. 1, 5492
Julian Period	Jan. 1, 4713
Mundane Era of Ussher	Oct. 19, 4004
Jewish Mundane Era	Oct. 3761
Era of Abraham	Oct. 1, 2015
Era of the Olympiads	July 1, 776
Roman Era (A. U. C.)	April 24, 753
Grecian or Syro-Macedonian Era	Sept. 1, 312
Era of Maccabees	Nov. 24, 166
Tyrian Era	126
Sidonian Era	Oct. 110
Spanish Era	Jan. 1, 38
Augustan Era	Feb. 14, 27
	A. D.
Christian Era	Jan. 1, 1
Mohammedan Era	July 16, 622

Oriental Reckoning. In both Hindu and Chinese chronology, the cycle of 60 years is employed. The Hindus assume four ages, three of which elapsed before the beginning of the present age, called *kali-yug*, 3101 B. C. Various eras, dating from different reigns or events, are used in different parts of India. The Chinese cycles of 60 years begin with 2277 B. C. However, since 163 B. C., Chinese writers have followed the practice of dating events according to periods beginning with the accession of some emperor.

Mayan Calendar, The. The ancient Mayas of Central America developed a remarkably elaborate and accurate system of chronology. Their inscriptions which archeologists have examined appear to have been almost exclusively devoted to the reckoning of periods of time. In the Mayan system, the day is the basal unit. Cycles of about 52 years were employed, and, at intervals of approximately 5 years (1800 days), monuments were erected. The inscriptions on each set of monuments appear to constitute a 5-year almanac. So complete was the Mayan reckoning that it is said to be capable of locating any date in a range of 370,000 years.

Codes. Messages written by means of a secret arrangement of letters or figures so that such communications may not be deciphered by a third party. This device is widely used in diplomacy, war, and business. One of the commonest ways of forming these codes is to make an arbitrary sentence containing 26 letters, each letter of the alphabet occurring once, and to use these in their order as the ordinary alphabet. Thus if c were the 14th letter of the key sentence, it would be employed in the code writing for n, the 14th letter of the alphabet.

Communistic Societies. Most primitive tribes held much of their property in common. In more advanced stages of civilization, private ownership has played a much larger rôle. At the same time, idealists and religious leaders have looked toward a communistic organization as an escape from the evils that accompany private ownership of property. One of the most notable exponents of the common possession of property was Plato, who advocated communism in wives and husbands also.

In the United States, there have been numerous experiments of this order. Among the first were the communities of Shakers, who derived their inspiration from the religious leader Ann Lee. She came to America in 1774 and founded several societies, the members of which were celibates. Fifteen of these societies are said to exist to the present day. The Harmony Society, or Harmonists, practiced communism and celibacy, beginning in 1805. They were located first in Butler county, Pa.; in 1814, they founded New Harmony, Ind., whence, in 1824, they removed to Economy, Pa., where the society continued until formally dissolved in 1906.

The most famous of American communistic societies was that called the Brook Farm at West Roxbury, Mass. It was actively supported by such prominent figures as Hawthorne, Emerson, and Horace Greeley. Founded in 1841, it was later modeled on the views of the French writer Fourier. Waning enthusiasm and a disastrous fire hastened its dissolution in 1856.

The Amana community originated in 1842. Its members were German and Swiss immigrants who represented an organization going back almost to 1700. They still survive in Iowa. Their manner of life is ascetic and forbidding.

The Oneida community was founded in 1848 by J. H. Noyes. Communism in it extended not only to property but also to sex relationships. It later became a commercial organization. See *Noyes, John Humphrey*. The Icarian community, founded in 1848, owed its origin to Cabot, the author of the utopian work entitled *Icaria*. It lacked the rigid

regulations of most of the others. Located in Illinois for some time, it later moved to Iowa.

Computers—Electronic Data Processing (EDP). Since World War II, machines with brains, that is, "thinking" machines with "memories," have appeared on the scene of everyday life. These ingenious "robots" are challenging and outdoing man at his work, and may soon outthink him. Heralding a wave of automation, sometimes referred to as "a new industrial revolution," they are able not only to design airplanes but to "fly" them as well. They are directing assembly lines, predicting elections, running banks, and doing a host of other tasks.

The most familiar of the robots, known as "electronic computers," vary widely in size, complexity, and special uses. They range from desk models that can be bought for a mere $50,000 to giant installations that fill a multi-story building and cost up to $8 million. To the casual observer, each computer is a mass of flickering lights, a jungle of switches and buttons, a battery of transistors, and a web of connecting wires. Investigation reveals that each computer has a memory, or internal storage system which accumulates items of information, and that it carries out "programs" fed into it on tapes or punch cards, which instruct the electronic circuitry to keep track of the items, compare them, and/or use them in performing calculations.

Following this introduction to the construction and functions of the computer, the observer learns of its uses and the steps leading up to its operation. By far the most common use, with which the average person is already familiar, is the processing of so-called "raw" data. Lightning-fast assembling and sorting of information makes possible the analysis and interpretation of school records, sales data, election returns, and innumerable other kinds of information. In data processing, it is pointed out, the basic stages are *input*, *processing*, and *output*. The first of these steps, which supplies source data or information, is usually done by a card punch. This information must be handled in an orderly, planned manner within the system, so a sorting machine arranges and files the information (*processing*). An accounting machine which accumulates and prints is next used to make the information available (*output*). The ultimate need beyond this stage is for a machine or a series of interconnected machines to perform a complete data processing and recording operation as described above with one pass of cards through the machine. The mechanism that performs all these operations is a *computer*.

The first large-scale computers were developed in university laboratories. The first machine in the United States, the ENIAC (Electronic Numerical Integrator and Calculator) came from the University of Pennsylvania. The first in Europe, the EDSAC (Electronic Delay Storage Automatic Computer) was developed at Cambridge, England. In these machines vacuum tubes perform the switching and control functions formerly performed by relays, as in some earlier calculating machines. The changeover from the relatively slow movements of relays and electromechanical devices made it possible for machines to perform computations 1000 times faster than before.

Progress in the improvement of computers has been rapid. In the early models, the input data entered the computer from punched cards and paper tapes. Later a method of using magnetic tape like that used on tape recording machines was perfected. The use of tape increased input speeds from 50 to 75 times that of cards. Another major development came in the early 1950's with the introduction of magnetic cores, which made possible significant advancement in the storage of information. A magnetic core is a small ring of ferromagnetic material strung on a matrix of fine wires. These cores, some magnetized in one direction and some in the other, can hold great volumes of information that is easily located and ready for processing in millionths of a second.

Shortly after core storage was introduced, magnetic drum storage was developed. A magnetic drum is a steel cylinder enclosed in a copper sleeve. The copper surface is plated with a composition that can be magnetized to store information in a manner similar to that of magnetic tape.

The next computer development, which also came in the early 1950's, was the random access system. In this system, up to 20 million characters representing information can be stored on a stack of magnetic discs having the shape of phonograph records. Access arms move quickly to any point on a disc in order to deposit or read information. With the rapid retrieval of data from the disc, information can now be introduced into or removed from the machine in random sequence.

The latest and perhaps the most significant improvement in computers has been the replacement of vacuum tubes with transistors, which can be packed into smaller units, and which also are more reliable. Early in 1964 an announcement was made of a revolutionary advancement in the computer field, having to do with transistors. This innovation, known as the "*solid-logic circuitry*" is the nucleus of a new system of computers which features the so-called "chip" transistors, smaller than the head of a pin, and circuit speeds up to 400 per cent greater than those of earlier computers. The sharply reduced size of the transistor, together with new circuit fabrication, has made possible revolutionary techniques in miniaturization and packaging. In the development of these new circuits the speeds of transistors and diodes have increased sufficiently to attain character-cycle time measured in "nano" second, that is, in billionths of a second. Although present-day computers would seem to have reached the ultimate in advanced data processing, research scientists continue their never-ending search for ways to improve them still further.

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In 1954 the United States became a party to the Universal Copyright Convention by which work first published in any member nation will get in other nations the same protection it receives at

home. Books in English by foreign authors no longer have to be manufactured in this country to hold U.S. copyright, but books and periodicals of U.S. authorship or by U.S. residents must still be printed here. Foreign works need not be subject to the U.S. requirement of deposit and registration.

Cosmic Rays. The earth is constantly being bombarded with high energy radiation which seems definitely to be coming neither from the sun nor from other stars, but from interstellar space. In its passage through the earth's atmosphere, the radiation seems to have two components, a "soft" component and a more penetrating "hard" one. The soft component consists chiefly of high energy electrons and of electromagnetic radiation similar to high energy X-rays or gamma rays. The hard component has properties unlike those of any other particles known, and is believed to consist of charged particles, called *mesons*, of roughly 200 times the mass of an electron.

Both the hard and the soft components are, at least for the most part, created in the earth's atmosphere. The electromagnetic radiation, called gamma rays just as in radioactivity, arises from the slowing down or stopping of electrons just as X-rays arise. The electrons themselves are created from the gamma rays—the gamma rays strike matter and have their energy converted into electrons and positrons in equal number. The mesons are the result of something like a nuclear disintegration.

The exact nature of the primary radiation, that is, the radiation from space which originally creates the electrons, gamma rays, and mesons in the earth's atmosphere, is not known. From measurements performed with equipment carried by balloons to very high altitudes and from the deflections of the incoming radiation by the earth's magnetic field, it is generally agreed now that the primary radiation, at least in large part, consists of positively charged particles—possibly protons.

Cross. The chief symbol of Christianity. As a sacred symbol, however, the cross is of much earlier origin and of much wider diffusion, being found in its more primitive forms in every part of the world. The Spanish conquerors of South America were astonished to find the cross an object of worship there. The swastika, , and the *crux ansata*, "handle-shaped cross," , are the principal early forms, the latter being still found among the Copts of Egypt as a symbol of Christianity. Among most early peoples, the cross symbolized the life-giving principle in nature.

The cross was also used as an instrument of torture and execution from early times, particularly among the Romans as a penalty inflicted on slaves and others who could not claim citizenship. From the fact that Jesus was put to death in this manner, the cross, already an object of religious veneration, assumed a new significance for the Christians.

Crusades, The. The several religious and military expeditions undertaken by European powers in the middle ages to rescue the holy places of Palestine from the Mohammedans. Below the dates, leaders, and results of the chief crusades are summarized. See also *Children's Crusade*, page 560.

1096–1099. Chief leaders, Godfrey of Bouillon and Robert, duke of Normandy. Established kingdom of Jerusalem.

1147–1149. Chief leaders, Conrad III of Germany and Louis VII of France. No result.

1189–1192. Chief leaders, Emperor Frederick I, Richard the Lion-hearted, and Philip II of France. Capture of Acre.

1202–1204. Chief leaders, Baldwin, count of landers, and Boniface, marquis of Montferrat. Lati empire founded.

1218–1221. Urged by Pope Innocent III (d. 1216) and his successor Honorius. Led by Cardinal Legate Pelagius. Emperor Frederick II did not give promised support. Resulted in a truce.

1228–1229. Chief leader, Frederick II, emperor. Jerusalem regained.

1248–1254. Chief leader, Louis IX of France. No result.

1270. Chief leader, Louis IX of France. Fruitless.

Cryogenics. Recently much has been heard about the so-called "super-cold" science that is known by the Greek-derived name "Cryogenics." Applications of low-temperature technology range from industrial uses, as in the making of powerful magnets and of bearings free from friction, to the performance of delicate surgical operations and the solution of difficult problems in biophysics. At temperatures around – 450° F., some metals become superconductive for the transmission of electric current. Liquefaction of gases is accomplished readily by the low-temperature technique. Living cells can be stored and kept in a state of suspended animation for indefinite periods. Banks of blood and various frozen tissues can preserve their contents for future use when desired. Developments in this new and rapidly growing science are described in a book, *Cryogenic Engineering*, by Russell B. Scott.

Culture—Definition and Appraisal. Like "beauty," "success," and other abstract terms that are often used and seldom defined, the word "culture" suffers from vagueness of interpretation. Persons most likely to be credited with possessing culture might be too modest to accept such a description of themselves. In any case, they would probably have difficulty in defining the term. To say that "culture" represents a certain degree of all-round attainment for an individual, just as "civilization" does for a nation, is one way of emphasizing its importance. Such a statement, though useful, is not a definition.

While he was president of Harvard University, Abbott Lawrence Lowell worked out a concise definition of culture that proved helpful in clarifying the meaning of the word. It also lent itself to expansion and exemplification by those who sought a yardstick for measuring culture. Lowell's definition is as follows:

> Culture is enjoyment of the things that the world has agreed are beautiful; interest in the knowledge that mankind has found valuable; and comprehension of the principles that the race has accepted as true.

This concise summary covers the principal elements of culture, including not only areas of subject matter, but also attitudes and attainments on the part of individuals, who are being tested, or who wish to test themselves, for the possession of culture. In order to make the test more searching, Lowell's definition has been made the basis of the following comprehensive outline, representing the "ABC's" of culture:

A. Enjoyment of the things that the world has agreed are beautiful.	*The Fine Arts* Architecture Decoration Music Painting Sculpture *Literature* Biography Drama Essay Fiction Poetry *History*
B. Interest in the knowledge that mankind has found valuable.	*Exact Science* Astronomy Biology Botany Chemistry Geology Mathematics Physics Zoology

	Approximate Science
	Economics
	Political Science
	Psychology
	Social Science
C.	*Philosophy*
Comprehension of the principles which the race has accepted as true.	Aesthetics
	Ethics
	Logic
	Religion

On examination of the foregoing outline, it will be noted that cultural values may be found in all the subjects included, and that a monopoly of cultural benefit cannot be fairly claimed for any particular division of the field. In fact, the divisions themselves are not always easy to separate and keep apart, nor does a strict confinement of them in water-tight compartments seem desirable. As the divisions which neighbor one another are considered together, evidence of the essential unity of knowledge is always cutting across artificial barriers which have been erected between areas of subject matter.

History is given its central position and typographical emphasis because of its "common denominator" relationship to all the other subjects. On the side of form, or style or presentation, its affiliation with literature is evident, especially its nearness to essay and biography. Because history provides not only a factual narrative but also an interpretation of circumstances and events, its relationship to art, literature, and philosophy seems as important as its identification with recorded knowledge.

The more one considers the relationship between subject matter and values, the more evident it becomes that the spirit in which it is approached is what gives a study its cultural importance. It appears, however, that cultural development is most likely to result from contact with subjects which emphasize value judgments. The Humanities, including such subjects as Philosophy, Greek and Roman Classics, and Literature in English, German, and the Romance languages, will be found to have this critical emphasis to a marked degree.

In the consideration of various cultural subjects and their values, the greatest stress is placed on the spirit and attitude of the reader or student who comes in contact with them. Cultural development may be encouraged by teachers or associates, but it cannot be forced on anyone. In the strict sense, it cannot be taught, since it is a byproduct of the individual's contact with a body of knowledge or an aesthetic experience. This contact must evoke some sort of spontaneous reaction within the person himself, or it is worthless. A self-starting attitude and a genuine interest are necessary, even though an inspiring teacher or a well-selected book may be the catalyst that brings about the most effective reaction. If appreciation and intellectual initiative cannot be directly transferred, they can be awakened. It is here that the student may benefit most from the guidance, not only of other people, but also of encyclopedias and similar works designed to promote and facilitate self-education.

Date Line, International. A line, following approximately the 180th meridian, on opposite sides of which the reckoning of the date differs by one day. As one travels from west to east, standard time advances one hour for each 15°, that is, each twenty-fourth of a circle of longitude about the earth. In passing completely around the earth, therefore, one gains twenty-four hours, or one complete day. The 180th meridian is chosen as the one at which this change of date should be made because it is farthest from the first, or Greenwich, meridian and because, passing near the center of the Pacific Ocean, it avoids inhabited lands, where it might cause serious confusion. The date on the American side of the line is one day behind the date on the Asiatic side.

DEW Line. Operating since midsummer 1957, the chain of radar stations called the DEW (Distant Early Warning) line is maintained jointly by the United States and Canada. Extending approximately 3,000 miles inside the Arctic Circle from Point Barrow to Baffin Island, this electronic barrier can give more than two hours' warning of approaching hostile planes. It is supplemented by the Mid-Canadian line on the 55th parallel and the "Pine Tree" line on the U.S.-Canadian border.

Dictionaries. The modern dictionary is the result of a long evolution. The earliest work of the kind mentioned was made at Nineveh in the 7th century B. C. and was impressed in cuneiform letters on clay tablets.

The earliest Greek and Latin dictionaries were not meant to contain all the words in the language but embraced only more difficult words and phrases, which needed explanation. Some were confined to words in special fields, such as those of Homeric expressions, of words used in cooking, or Zenodotus' dictionary of the cries of animals. Only in modern times have attempts been made to compile explanations of all the words used by the Greeks and Romans.

The first dictionary aiming to give a complete collection of English words was published in 1721 by Nathan Bailey, and was called *The Universal Etymological English Dictionary.* This work was also the first in English to trace on a large scale the derivation of words and to mark accents as an aid in pronunciation. It was the standard until the famous dictionary of Dr. Samuel Johnson appeared in 1755. This latter work began the custom of illustrating the use of words by quotations from the best writers. The most scholarly and authoritative work today is the *New English*, or *Oxford Dictionary.*

The greatest American lexicographer was Noah Webster. His *American Dictionary of the English Language*, published in 1828, has been repeatedly revised. Under its present name, *Webster's New International Dictionary*, it is provided with many features not included in the older dictionaries, such as illustrations, synonyms, sections containing biographical and geographical information, lists of abbreviations, and numerous other useful additions.

Dollar Mark. This mark has been traced through early manuscripts back to the old Mexican abbreviation for peso, P^s. During the spread of the sign in commercial relations between the West Indies, New York, the Mississippi, and other regions, the "S" was placed over the "P" and evolved in the form $. The use of two vertical lines instead of one arose later and gave rise to the mistaken idea that the sign was a corruption of an "S" placed over a "U" and was an abbreviation for United States.

Einstein's Theory of Relativity. The principle of relativity is as old as mechanics. It is the easiest to state the principle by using the expression "frame of reference." A *frame of reference* is a coordinate system used to locate a particle or system of particles in space. A frame of reference is called an *inertial* frame if Newton's first law of motion is valid in that frame of reference; i.e., if a particle which is not acted upon by a force has no change in velocity as measured with respect to the frame of reference. Since Newton's second law involves only acceleration or change of velocity, and not velocity itself, it follows that if the law holds in one frame of reference, it will hold in a second frame moving with constant velocity with respect to the first. As far as mechanics is concerned, there is no one frame of reference which is better than all others. This is the relativity priciple.

As the wave theory of light was being developed, the relativity principle was dropped and absolute motion was assumed to have meaning. Light was

assumed to be a wave motion in the ether, and the ether, presumably, defined a primary frame of reference, the frame of reference which determined the absolute velocities. Maxwell's development of the electromagnetic wave theory of light was assumed to support this view, as his theory predicted a speed for light, and this speed had to be measured with respect to something—the ether. There were two possibilities:

1. The relativity principle is invalid.
2. The relativity principle is valid, but either Maxwell's theory or Newtonian mechanics is wrong.

People chose the first alternative. Attempts were made to measure absolute velocities. In every case, the attempt met with failure, but the theory of the ether was always then modified to explain this failure. Finally, in 1881, Michelson and Morley attempted to measure the speed of the earth by a method involving interference of light. The basic idea of the experiment was to detect, by interference means, the difference in different directions of the speed of light with respect to the earth. The speed of light with respect to the earth should depend, the argument went, on whether the light was traveling in the same direction as the earth through the ether, or in some other direction. This experiment also met with failure, even though the precision of the experiment was such that the experimenters expected to detect at least the motion of the earth about the sun. It was too much to assume the earth standing still with the sun revolving around it, so another explanation was sought. Theories were advanced that objects, when moving through the ether, contract just enough to remove the difference in time looked for by Michelson and Morley. Finally, in 1905, Einstein offered an explanation of the failure of this attempt, and, in fact, of all attempts to measure absolute velocity.

Einstein adopted the relativity principle; i.e., he assumed that all motion is relative and that there is no such thing as absolute velocity. He then had to make a choice between Maxwell's theory and Newtonian mechanics, and he chose to consider Maxwell's theory as right and Newtonian mechanics as wrong. He made this choice by assuming that the relativity principle applies to light and that the speed of light is the same in all inertial frames of reference. On the basis of these two assumptions, Einstein reached some conclusions which were startling to physicists of the time. The concepts of space and time had to be modified. No signal can be propagated, and hence no material object can move, with a speed greater than the speed of light. Newtonian mechanics is invalid for large velocities; the masses of objects change as their speeds increase, and velocities cannot be added by the methods of Euclidean geometry. There is an equivalence between mass and energy. Einstein's results have been borne out by experiment, however. The change in mass of protons has to be taken into account in the design of a cyclotron, for example. The conversion of mass into energy and electromagnetic energy into mass has been observed in the laboratory. The enormous energy of the atomic bomb comes from the conversion of a small fraction of the mass of the bomb into energy.

Espionage. The first organized systems for procuring by secret means information likely to give the government procuring it an advantage over countries from which it was procured date back to Richelieu and Cromwell. Among the most efficient modern systems were the Russian OGPU and the German Gestapo, these being used for social revolutionary purposes as well as national ends. Most countries have their secret services. Counter-espionage, or spying on enemy spies, results in agents often being in the pay of opposing systems at the same time. Death is the usual penalty for espionage in time of war, and in 1954 Congress passed a law permitting the death penalty or up to life imprisonment for espionage in peacetime. If diplomats are involved, their recall may be asked.

Exobiology. Recently the special aspect of space exploration known as "exobiology" has received increased attention from scientists. The question of whether extra-terrestrial life exists and, if so, in what forms, is being studied in depth by persons familiar with the latest research in both astronomy and biochemistry. Reflecting the present attitude of leading scientists toward this subject is the following statement quoted from the report made by a study group which met in the summer of 1962 at the State University of Iowa under the auspices of the Space Science Board of the National Academy of Sciences:

> "Of all the discoveries which have come from or can now be anticipated from man's efforts in space science, none more easily captures the imagination or is more likely to focus interest and acclaim than the empirical proof that there is in this universe of biota other than our own. On solid scientific grounds, on the basis of popular appeal, and in the interests of our prestige as a peace-loving nation capable of great scientific enterprise, exobiology's goal of finding and exploring extra-terrestrial life should be acclaimed as the top-priority scientific goal of our space program."

The realistic appraisal by present-day scientists of the problems connected with an investigation of extra-terrestrial life is in marked contrast to the traditional popular approach, which was hypothetical, speculative, and often fanciful, or at best was a case of reasoning from analogy, thus: Since life is present in our solar system, it could conceivably exist in other solar systems, of which there are many comparable to our own. If the planet called "earth" can support life, why may not the same be true of other planets, including possibly some within the local area surrounding our sun?

Major categories in the work of the current Exobiology Program are summarized in the book *Men in Space* by Shirley Thomas (pp. 150–152) as follows: 1) Meteorite collection and analysis; 2) Sterilization of spacecraft; 3) Infrared spectroscopy of planets; 4) Space biology and exobiology institutes; 5) Microbial analysis of the upper atmosphere; 6) Design, development and testing of life detectors; 7) Studies in evolutionary and theoretical biology. This planned research on several different but related fronts is not a spectacular "crash program" but a calm co-ordinated study by scientists who are accustomed to weighing both positive and negative evidence dispassionately and who are willing to follow truth wherever it may lead. With continued accumulation of verified data, both from laboratory experiments and from instrumental and personal contacts with outer space, important discoveries in Exobiology may be confidently expected

Fallout. One of the consequences of exploding an atomic bomb is the generation of large quantities of radioactive material consisting principally of the fission fragments. When the bomb is exploded, this radioactive material is carried to great heights by the powerful updraft caused by the heat of the explosion. Once carried to such heights, this radioactive material slowly settles back to earth spreading its radioactivity over an extensive area. Depending on the altitude at which the bomb is exploded and the atmospheric conditions during the days following the explosion, the fallout may occur over an area of a few hundred square miles or may fall slowly over a large fraction of the entire earth's surface.

This radioactivity spread over large areas constitutes one of the serious hazards of Atomic Warfare. Long after an atomic bomb has exploded and the immediate effects of the blast and the associ-

ated instantaneous radiation are over, the fallout from the explosion continues to generate lethal radiation. Protection against this radiation until such time as its intensity has decayed to a safe level is afforded by underground shelters whose walls and top covering are thick enough to absorb most of the radiation coming from the fallout.

FAMOUS SIEGES

Acre. Besieged for 2 years by the Crusaders. Surrendered July 1191.

Alesia, Gaul. Besieged for a month by the Romans under Julius Cæsar. Surrendered, 51 B. C.

Antwerp. Besieged for 14 months by Spaniards. Belgians surrendered, 1585.
Besieged for 15 months by populace. Dutch garrison surrendered, Dec. 23, 1832.
Besieged for 10 days by Germans. Belgians surrendered, October 9, 1914.

Arcot. Besieged for 50 days by French and Sepoys. Siege raised, 1751.

Boston, Mass. Besieged by American forces for 8 months. Evacuated by British, March 17, 1776.

Candia, Crete. Besieged for 2 years by Turks. Venetians surrendered, September 1669.

Carthage. Besieged for 2 years by Romans; fell 146 B. C.

Constantinople. Besieged by Saracens for 5 years. Siege raised, 677.
Besieged by Saracens for 1 year. Siege raised, 718.
Besieged by Turks for 54 days. City surrendered, May 29, 1453.

Delhi. Besieged by British for 131 days. Indian mutineers surrendered, Sept. 20, 1857.

Gibraltar. Besieged by Spaniards 3 years, 7 months, 12 days. Siege raised, Sept. 13, 1782.

Jerusalem. Besieged by Mohammedians for 4 months Byzantine garrison surrendered, 637.

Kimberley. Besieged by Boers for 126 days. British garrison relieved, Feb. 15, 1900.

Kut-el-Amara. Besieged by Turks for 144 days. British surrendered, April 29, 1916.

Ladysmith. Besieged by Boers for 118 days. Britsh. garrison relieved, Feb. 28, 1900.

La Rochelle. Besieged by forces of Richelieu for 14 months. Huguenots surrendered, October 28, 1628.

Leiden. Besieged by Spaniards for 4 months. Dutch cut dikes. Siege raised, Oct. 3, 1574.

Leningrad. Besieged by Germans for 30 months during World War II. Russians successfully defend city.

Lucknow. Besieged by Indian mutineers for 149 days. City relieved finally, Nov. 25, 1857.

Mafeking. Besieged by Boers for 217 days. City relieved, May 17, 1900.

Mantua. Besieged by Napoleon for 8 months. Austrians surrendered, Feb. 2, 1797.

Orleans. Besieged by English for 10 months. City relieved by Joan of Arc, May 8, 1429.

Ostend. Besieged by Spanish for 3 years. Flemish garrison surrendered, Sept. 28, 1604.

Paris. Besieged by Germans 135 days. City surrendered, Jan. 28, 1871.
Besieged by French national troops for 46 days.
Communist insurrection suppressed, May 28, 1871.

Peking. Foreign legations besieged by Boxers for 55 days. Relieved, August 14, 1900.

Plevna. Besieged by Russians and Rumanians for 144 days. Turks surrendered, Dec. 10, 1877.

Port Arthur. Besieged by Japanese for 241 days. Russian garrison surrendered, Jan. 2, 1905.

Przemysl. Besieged by Russians for 182 days. Austrians surrendered, March 22, 1915.

Richmond. Besieged by Federal troops for 287 days. Evacuated by Confederates, April 3, 1865.

Saragossa. Besieged by French troops for 62 days. Siege raised, August 15, 1808.
Besieged by French a second time for 62 days. City capitulated, Feb. 20, 1809.

Sebastopol. Besieged by allies for 355 days. The city fell, Sept. 8, 1855.

Syracuse. Besieged by Romans for 2 years; fell 212 B. C.

Troy. Besieged by Greeks for 10 years; captured 1184 B. C.

Tyre. Besieged by Nebuchadnezzar for 13 years. Siege raised, 572 B. C.
Besieged by Alexander for 7 months; captured 332 B. C.

Vicksburg. Besieged by Federal troops for 186 days. City surrendered, July 4, 1863.

Vienna. Besieged by Turks. Siege raised, 1529.
Besieged by Turks. City relieved, Sept. 12, 1683.

Yorktown. Besieged by American and French forces for 20 days. British surrendered, Oct. 19, 1781.

Federal Bureau of Investigation (F.B.I.). This bureau in the Department of Justice was established in 1908 by order of Attorney General Charles J. Bonaparte. Special Agents investigate violations of Federal laws, collect evidence in cases in which the United States is or may be a party in interest, and perform other duties prescribed by law. To be a Special Agent, the applicant must be at least 25 years old and not more than 41. He must also be a graduate of an accredited law school or school of accounting. If accepted, he is given 16 weeks' training, during which he learns to handle firearms.

One of J. Edgar Hoover's first steps when he became director of the F.B.I. in 1924 was to start a centralized collection of fingerprints. The F.B.I. Identification Bureau now has more than 130 million fingerprint cards. The F.B.I. Laboratory, established in 1932, carries out scientific studies of evidence in criminal cases. In 1935 the F.B.I. National Academy was created. Selected police officers from all states and some foreign countries attend this school. See *Hoover, J. Edgar.*

Fire, Methods of Making. One of the most important steps in the development of civilization was man's discovery of a means of producing fire.

One of the earliest methods of kindling fire was to rub together two pieces of dry wood until the violent friction caused the emission of sparks. This device was much more laborious than the so-called bowstring method, which is now often used by boy scouts in fire lighting competitions. A bowstring is looped once about a notch in a hard, sharpened stick. This stick is held with the sharp end pressing against a piece of softer wood surrounded by tinder. As the bow is drawn back and forth, the stick revolves rapidly, and the heat so developed causes the tinder to ignite.

A later means of making fire was to strike together two pieces of flint or a piece of flint and a piece of steel. This method was used as late as the beginning of the 19th century. See *Match.*

Fuel Cell. The fuel cell is essentially a battery which, similar to the more familiar batteries (e.g. dry cells or storage batteries), generates electrical energy from chemical energy through the mechanism of an oxidation reaction taking place at one electrode and a reduction reaction taking place at a second electrode within the battery. The fuel cell however differs from the conventional batteries in that both the fuel that is oxidized and the oxidant are not constituents of the electrodes, but are continually supplied to the electrodes from a source external to the cell.

Thus in the operation of the fuel cell no part of the cell is consumed in the operation and the cell will function indefinitely as long as fuel and an oxidant are supplied to it. One of the attractive features of the fuel cell is that it can operate on a large variety of fuels that are both readily available and relatively inexpensive. Fuel cells using either air or oxygen gas for the oxidant have been successfully operated using such fuels as hydrogen, gaseous hydrocarbons, and alcohol. By operating the fuel cell at high temperatures it is even possible to use such fuels as ordinary coal.

Garden Clubs. In addition to numerous special groups formed to promote the developing and exhibiting of particular flowers, such as dahlias, roses, etc., there are several flourishing general organizations, national in scope, which co-ordinate the activities of affiliated local societies. Especially prominent and influential are the following: *Garden Club of America* for amateur gardeners, with a reported membership of 11,000; *Men's Garden Clubs of America*, having 11,156 members, with 256 local groups; and the *National Council of State Garden Clubs* whose membership of 411,345 is drawn from all the states and the District of Columbia. Affiliated are 3290 junior clubs, with

61,350 members. All the organizations aforementioned publish magazines, news-letters, and special bulletins.

Geiger Counters (*Geiger-Mueller Counters*). A Geiger counter is a device used for the detection of ionizing particles such as those emitted by radioactive materials. Basically the Geiger counter consists of a hollow conducting cylinder along the axis of which, and insulated from it, is mounted a fine wire. This structure is enclosed in a glass envelope which can be evacuated of air and filled to any desired pressure with other gases. A mixture of argon and alcohol vapor at a pressure of from one-tenth to one-fifth of an atmosphere is commonly used. The insulation between the cylinder and the wire is such that a high electric potential (800 to 1200 volts) can be applied between them without producing appreciable flow of charge from cylinder to wire. However, any ionizing particle traversing the counter will initiate an electrical discharge causing a surge of current lasting for about one one hundred thousandth of a second. This current surge can, by the use of the proper electronic circuits, be made to produce a click in a headphone or operate a recording device.

The credit for making the first counters of this type is given to Hans Geiger and Walther Mueller, who produced such counters in 1928. As early as 1908, however, E. Rutherford and Geiger produced a counter similar to the present-day counters.

Geophysical Year. The International Geophysical Year extended from July 1, 1957 to December 31, 1958, during which time 67 nations co-operated in a program of scientific observation of natural phenomena associated with the earth, its form and structure, and its atmosphere.

The subjects on which data have been collected and are being studied include meteorology, temperature, humidity, and wind in the upper air; ozone measurement; solar and atmospheric radiation; geomagnetism; aurora and air glow; the ionosphere, including its absorbing power, atmospheric noise, and drift over the earth's surface by the winds; solar activity; cosmic radiation; variations affecting time signals; glaciology; seismology; gravity measurements, and oceanography.

Three world data centers handled the information collected, one in the United States, one in the U.S.S.R., and a third divided between Western Europe and Japan. Observations have been made in all parts of the world, including the arctic and antarctic. Although it may be years before the full significance of all the data can be determined, several unexpected conclusions have already emerged; a greater store of ice in the polar regions than had previously been estimated (largely because Antarctica now appears to be a group of island chains rather than a single large land mass); a more extensive solar atmosphere; considerably higher air density and higher cosmic- and X-ray intensities in the upper reaches of the earth's atmosphere; and unexpected jets of electric current circling the earth in the equatorial regions at some 60 to 75 miles above the earth's surface.

Although the International Geophysical Year was terminated December 31, 1958 as originally planned, the co-operative effort of the various nations in the program was extended for another year which was designated "International Geophysical Co-operation—1959." In this period many of the investigations undertaken during the International Geophysical Year were continued.

EARLY SATELLITE LAUNCHINGS

U.S.S.R.	Sputnik I	Sputnik II	Sputnik III
Launched	Oct. 4, 1957	Nov. 3, 1957	May 15, 1958
Weight	184 lbs.	1120 lbs.	2925 lbs.
Shape	sphere	cylinder	conical
Size	23 Inches	50 feet	12 feet
Payload	Instruments	Live dog & instruments	Instruments
Apogee	560 miles	1056 miles	1168 miles
Perigee	145 miles	150 miles	150 miles
Fell	Jan. 4, 1958	April 14,1958	December 1959

U.S.A.	Explorer I	Vanguard I	Explorer III
Launched	Jan. 31, 1958	Mar. 17, 1958	Mar. 26, 1958
Weight	31 lbs.	3 lbs.	31 lbs.
Shape	tube	sphere	tube
Size	80 inches	6.4 inches	80 inches
Payload	Instruments	Instruments	Instruments
Apogee	1575 miles	2466 miles	1741 miles
Perigee	219 miles	405 miles	117 miles
Fell			June 27, 1958

Earth Satellites. One aspect of the program that has attracted much attention has been the launching, by the U.S.S.R. and by the United States, of a series of earth satellites. Sent aloft by three-stage rockets, the satellites travel in elliptical paths around the earth at speeds of approximately 18,000 miles per hour, circling the earth in periods ranging from 96 to 135 minutes. Eventually slowed down by atmospheric resistance, they gradually lose altitude and finally burn up as does a meteor entering the denser part of the earth's atmosphere. Of historical importance are the early satellites placed in orbit by the United States and Russia.

A total of 29 successful satellite launchings had been carried out by August 25, 1960; 24 by the U.S.A. and 5 by the U.S.S.R. In addition to these satellites, there have been 5 successful launchings of space missiles; two by the U.S.A. and three by the U.S.S.R. Of these missiles, the two launched by the U.S.A. and one of those by the U.S.S.R. went into orbit about the sun. One U.S.S.R. missile landed on the moon and one orbited around the moon obtaining and radioing back to the earth pictures of the back side of the moon.

Each of the satellites that has been launched was designed to accomplish some particular objective. These objectives include: obtaining scientific data concerning the Earth and the region of space around the Earth, studying cloud formations over the surface of the Earth as possible means of forecasting weather, to serve as navigational reference points, to detect the firing of missiles on the surface of the Earth, to serve as reflectors of radio waves to facilitate long distance transmission, and to study the problem of the re-entry of satellites into the Earth's atmosphere. Successful re-entry of capsules ejected from satellites has been accomplished three times by the U.S.A. and once by the U.S.S.R. The capsule from the U.S.S.R. satellite carried two dogs along with a number of lesser animals all of which survived their space voyage and the re-entry. The re-entered capsules of the U.S.A. satellites contained three mice and data-gathering equipment.

Ghetto. In the middle ages, when the Jews were obliged to live apart from the rest of the community, the quarter of the city in which they dwelt was known by the name of *ghetto*. The earliest is said to have been instituted at Venice in 1516. At various times since then, and in different cities of Europe, such segretated districts have been maintained. A comparatively recent example is the ghetto in Warsaw, which was restored in 1940 after Germany conquered Poland.

Guided Missiles. Ever since the last days of World War II, when parts of England, especially London, were ravaged by the German vengeance weapons, the V-1 and the V-2, the leading nations of the world have been experimenting with guided missiles. The V-1 was a robot bomb, a small jet-propelled pilotless airplane with a gyroscope steering system; while the V-2 was a rocket which could ascend to a height of over 60 miles and descend at supersonic speed. The United States carefully studied captured specimens of both types, and has since made great progress in developing new missiles. Although information concerning the research and actual production of these weapons is largely secret, some facts about them have been disclosed.

Guided missiles may be divided into four main groups:

Surface-to-surface. These missiles can be fired from the sea or from the land against targets on

land or sea at relatively close or extremely long range. Like the German V-1's and V-2's, they have great speed and terrific blasting power. They can be equipped with atomic warheads or those carrying orthodox explosives.

Surface-to-air. These are anti-aircraft weapons for defense against enemy atom bombers and guided missiles, the type that will be used to guard our cities.

Air-to-surface. These are launched from aircraft, and are actually guided aerial bombs which can seek out a target on land or sea, no matter how obscured it may be by atmospheric conditions. It is descended from the radar-guided type of missile successfully developed during World War II.

Air-to-air. These guided missiles are for bomber defense against speedy fighting planes, and also for use by interceptors in breaking up enemy bomber attacks. The greatly increased speed of planes has rendered machine guns and cannon far less effective than they were in air combat.

Some fifty different types of missiles are in various stages of development; several are already operational. Some of the successes achieved with missiles include the shooting down of supersonic missiles by both Bomarc-B and Nike-Hercules surface to air missiles, successful firing of Polaris missiles from a submerged submarine, and several successful firings of Atlas Intercontinental Ballistic Missiles with ranges up to 9000 miles.

Hall of Fame. A hall erected on University heights, New York, in 1900 for use as a memorial to great Americans. It is a semicircular colonnade 500 feet in length at New York university. Within it is provided space for 150 panels, which are to contain bronze tablets bearing the names of such Americans as shall be judged most famous in their respective fields by an electorate of eminent American citizens appointed by the senate of the university. The hall is a gift of Helen Gould.

Only persons who shall have been dead 25 or more years are eligible to be chosen. Fifty names were to be inscribed on the tablets at the beginning, and five additional names every fifth year thereafter until the year 2000, when the 150 inscriptions will be completed. By 1955, 86 names had been chosen.

The rules prescribe that New York university shall invite nominations from the public. Every nomination seconded by a member of the university senate shall then be submitted to an electorate of one hundred eminent citizens selected by the university, and their votes determine the choice.

In 1900, 29 names were chosen. They were as follows: George Washington, Abraham Lincoln, Daniel Webster, Benjamin Franklin, Ulysses S. Grant, John Marshall, Thomas Jefferson, Ralph Waldo Emerson, Henry W. Longfellow, Robert Fulton, Washington Irving, Jonathan Edwards, Samuel F. B. Morse, David G. Farragut, Henry Clay, Nathaniel Hawthorne, George Peabody, Robert E. Lee, Peter Cooper, Eli Whitney, John J. Audubon, Horace Mann, Henry Ward Beecher, James Kent, Joseph Story, John Adams, William E. Channing, Gilbert Stuart, and Asa Gray.

In 1905, the following 8 names were added: John Quincy Adams, James Russell Lowell, William Tecumseh Sherman, James Madison, John Greenleaf Whittier, Mary Lyon, Emma Willard, and Maria Mitchell.

The third election was held in 1910, and 10 new members were elected. Their names are Harriet Beecher Stowe, Oliver Wendell Holmes, Edgar Allan Poe, James Fenimore Cooper, Phillips Brooks, William Cullen Bryant, Frances E. Willard, Andrew Jackson, George Bancroft, John Lothrop Motley.

Nine members were added in 1915: Mark Hopkins, Francis Parkman, Elias Howe, Joseph Henry, Rufus Choate, Daniel Boone, Charlotte Cushman, Alexander Hamilton, and Louis Agassiz.

The election of 1920 resulted in 7 new members: Samuel L. Clemens (Mark Twain), James B. Eads, Patrick Henry, William T. G. Morton, Alice Freeman Palmer, Augustus Saint-Gaudens, and Roger Williams. Edwin Booth and John Paul Jones were added in 1925; James McNeill Whistler, James Monroe, Matthew F. Maury, and Walt Whitman in 1930; William Penn, Simon Newcomb, and Grover Cleveland in 1935; Stephen Foster in 1940; Booker T. Washington, Thomas Paine, Walter Reed, and Sidney Lanier in 1945. Six were chosen in 1950, namely, Theodore Roosevelt, Dr. William C. Gorgas, Josiah Willard Gibbs, Alexander Graham Bell, Woodrow Wilson, and Susan B. Anthony.

In 1955, three were elected—Wilbur Wright, Thomas Jonathan (Stonewall) Jackson, and George Westinghouse. In 1960, three were elected—Thomas A. Edison, Henry D. Thoreau, and Edward A. MacDowell.

The Hall of Fame is not to be confused with the National Hall of Statuary in the Capitol, Washington, in which each state is entitled to erect a statue to her most distinguished deceased citizen.

Hinduism. The religion of the Hindus of India. It has grown out of the more ancient Brahmanism, but contains many modifications and additions, influenced by Buddhistic and other elements. Siva, or Shiva, the third member of the Brahman trinity, has been elevated to the position of Maha-deva, the "great god," or the destroyer. Under his many aspects he bears more than 1000 titles.

A prominent feature of Hinduism has been the caste system. Originally, there were four great castes: the Brahmans, or priestly class; the Kshatriyas, or warriors; the Vaisyas, or husbandmen; and the Sudras, or servants. Each Hindu has his own place in the social system and must observe the laws peculiar to it. Formerly, the chief distinction between castes appears to have been that of occupation, but now many mixed castes have arisen. The highest law which concerns the devout Hindu is to eat correctly, to drink correctly, and to marry correctly, that is, to do these things in accordance with the rules of his caste. Hinduism embraces more than 200 million adherents, or about two-thirds of the population of India.

Hobson's Choice. A synonym for no choice at all. The phrase owes its origin to Thomas Hobson, an old carrier and livery stable keeper, who plied between Cambridge and London in the 17th century. When a man came to Hobson's stable for a horse, he found that he was obliged invariably to take the one nearest the stable door.

Hyde Park. A national shrine, the ancestral home and last resting place of the late President Franklin Delano Roosevelt. It is situated on the east bank of the Hudson river on Route 9 (Albany Post Road) between Poughkeepsie and Staatsburg, in the center of a picturesque region rich in historic interest. Near the close of his second term, the president and his mother, Sara Delano Roosevelt, deeded twelve acres to the United States Government, and the president offered to donate to the government all his official and private papers. The offer was accepted by joint resolution of the United States Senate and House of Representatives. To house the books and documents in the Roosevelt collection, the Library, costing $350,000, was built by private subscription. The building and grounds were presented to the government in 1940.

Hydrogen Bomb. In contradistinction to the fission process (see page 947), whereby very heavy nuclei break down into lighter ones with a consequent loss of mass and release of energy, there is the fusion process in which similar loss of mass and release of energy accompanies the building up of heavier nuclei from lighter ones. It is now believed that reactions of this type are the source of the tremendous energy constantly being generated in the sun and other stars. In a large volume of nuclei of low atomic number if the temperature and the pressure are extremely great, such as are known to

exist in the interior of stars, fusion reactions will occur spontaneously with the consequent generation of energy.

The temperatures and pressures necessary to start the fusion reaction are normally not found on the earth, except in an exploding atomic bomb. Even there it appears that the temperature is not high enough to initiate the fusion reaction with the most abundant hydrogen isotope, but the process can work with the heavier hydrogen isotopes, *deuterium* and *tritium*. These isotopes are rare, but means are available to produce them in quantity.

The so-called hydrogen bomb has certain advantages over the fission bomb, in that the materials are less dangerous to handle and store and can be made in any desired size.

Ideology (*īd'ē-ol'ō-jĭ*). Historically, a term used by the French philosopher Antoine Tracy, the word now refers chiefly to political belief and doctrine. Tracy, a friend of Lafayette, was imprisoned during the Terror and spent his time studying philosophy. As a result, he wrote *Elements d'ideologie*, a description of man's psychological as well as his physiological nature.

Ides of March. In Shakespeare's *Julius Cæsar* the soothsayer warns Cæsar to "beware the ides of March." The ides were the halfway date in the month in the Roman calendar, which in March, May, July, and October fell on the 15th; in the other months, on the 13th. Cæsar was murdered March 15, 44 B. C.

Immigration. Shortly after World War I, immigration into the United States was definitely restricted. This move may be said to have brought to an end the era in which the population was recruited in large numbers from abroad.

Immigrants numbered over one million in 1910. Very few came during the war. By 1920, over 400,000 were admitted. Then a national policy of strict limitation was adopted. Immigrants, except those from the Western Hemisphere, were admitted only in definite quotas from each country. In 1931, for the first time in U. S. history, the number of immigrants was less than the number of departures, the net loss being 94,474.

Refugees and Displaced Persons. One of the great problems following World War II was the care, repatriation, and resettlement of 1,600,000 refugees and displaced persons. This work was done by several organizations, notably the United Nations Relief and Rehabilitation Administration (UNRRA) and later the International Refugee Organization (IRO).

In June 1948, President Truman signed the Displaced Persons act granting asylum in the United States to 205,000 victims of European wars and persecutions. In June 1950 a new bill was passed expanding the entries to a total of 415,744. Early in 1952, IRO was disbanded. On President Eisenhower's recommendation, Congress, in July 1953, authorized the entry of an additional 209,000 refugees to the United States during a three-year period. Of those who were admitted under the act, the largest number were Hungarian refugees. Recent revisions of the immigration laws have made liberal provisions for the admission of orphans on application by their adoptive parents.

As of December 1, 1961, quotas listed by the visa office of the U.S. Department of State reflected a marked preference for immigrants from Western Europe as contrasted with countries in Asia and Africa, most of which were assigned a nominal quota of 100. Countries with large quotas included Gt. Britain-Northern Ireland, 65,361; Germany, 25,814; Ireland, 17,756; Poland, 6,488; Italy, 5,666; Sweden, 3,295; and Netherlands, 3,136.

Iwo Jima Flag Raising. On February 23, 1945, U.S. Marines captured Mount Suribachi on Iwo Jima and raised a flag on its summit. The incident was recorded for posterity by Associated Press photographer Joe Rosenthal. The picture was widely publicized at the time and was reproduced as a U.S. Marine Memorial in the form of a large bronze statue, dedicated in 1954, which stands north of the National Cemetery at Washington. The sculptor was Felix Weldon.

The flag raisers shown in the Rosenthal photograph are Private First Class Ira H. Hayes; Private First Class Franklin R. Sousley; Sergeant Michael Strank; Navy Pharmacist's Mate Second Class John H. Bradley; Private First Class Rene A. Gagnon; and Corporal Harlon H. Block.

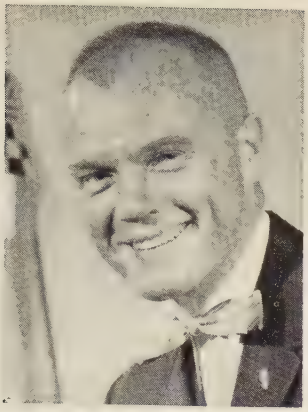
Jihad or **Jehad** (*jē-häd'*). A religious war which Mohammedans are urged in the Koran to make on all infidels and in which every person that refuses to accept Islam or to pay a poll tax is to be put to the sword. Souls of the faithful who fall in such a war are taken directly to paradise.

Laser (*lā'zĕr*). (**l**ight **a**mplification by **s**timulated **e**mission of **r**adiation). The laser is a device with which it is possible to obtain the amplification of light by utilizing the phenomenon of stimulated emission of radiation. This phenomenon is best described on the basis of Bohr's Theory of the atom. (See *Atomic Spectra*). When the electrons in the atoms of certain elements are excited, that is, raised from their normal energy levels to higher energy levels, the electrons do not immediately jump back down to the lower energy levels, but linger for a while in the higher levels. In a volume containing a large number of such excited atoms of a particular element, the spontaneous return of the electrons to their lower energy levels, which act is accompanied by the emission of a quantum of radiation, is a completely random process and the quanta of radiation emitted, while they will all have the same energy (and frequency), since they originate from the same kind of atom, will be emitted at different times and in different directions yielding what is referred to as incoherent radiation.

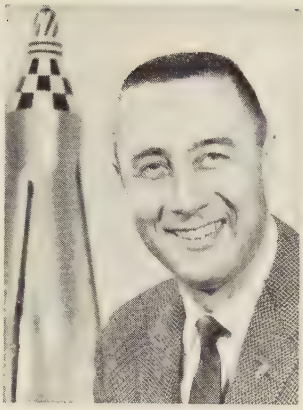
It is, however, a property of an excited atom that the return of the electron to its lower energy state can be stimulated by an encounter with a quantum of radiation whose energy is exactly equal to the energy of the quantum the electron itself will emit when it jumps to its lower energy level. Furthermore, the quantum emitted by the electron will be in phase (that is, time-wise) identical with the stimulating quanta and will travel in the same direction. Thus in a volume containing a large number of identical excited atoms the spontaneous jump of an electron to its lower orbit in one of the atoms will emit a quantum of radiation. If before this quantum escapes from the volume it encounters another excited atom, it will stimulate that atom to emit a quantum, the result being two quanta traveling together. Continuing on, every excited atom encountered will be stimulated to add its quantum to the others, the net effect being a continual build-up of the number of quanta in the beam of radiation.

Unfortunately in any reasonable volume of material most of the quanta emitted will escape from the volume before encountering very many if any excited atoms. Thus there is normally little build-up of radiation in this fashion. This difficulty, however, is overcome in the laser.

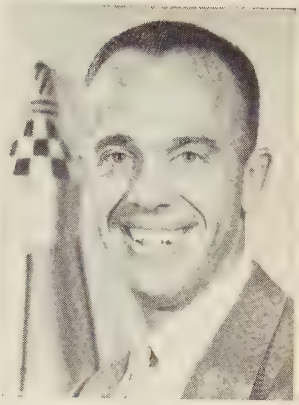
In a laser the active volume of excited atoms is in the shape of a long cylinder. At each end of the cylinder there is a mirror set perpendicular to the axis of the cylinder. Thus when an atom emits a quantum parallel to the axis of the cylinder, the quantum cannot escape on hitting the end of the cylinder, but will be reflected back along the length of the cylinder. As a consequence, the quantum will travel back and forth along the length of the cylinder stimulating the emission of quanta by other excited atoms resulting in the build-up of a very great number of quanta all moving together and forming a very intense beam of radiation. Of course unless this beam can get out of the laser, it will be of little value. For this reason the mirror at one end of the laser volume is made only partially



John H. Glenn, Jr.



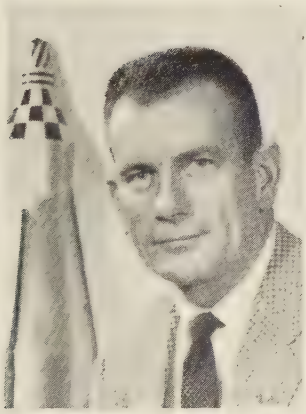
Virgil I. Grissom



Alan B. Shepard, Jr.

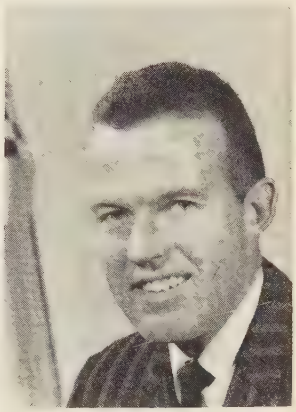
THE SEVEN ASTRONAUTS

Official NASA Photos



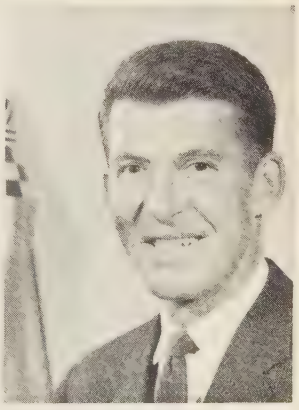
Donald K. Slayton

On this page are photos of the first astronauts chosen by NASA for the Mercury project. In the center is the Mercury capsule used for their space flights. It was designed for maximum safety of the astronaut and for completeness of equipment as a space laboratory. *McDonnell Aircraft Corp.*

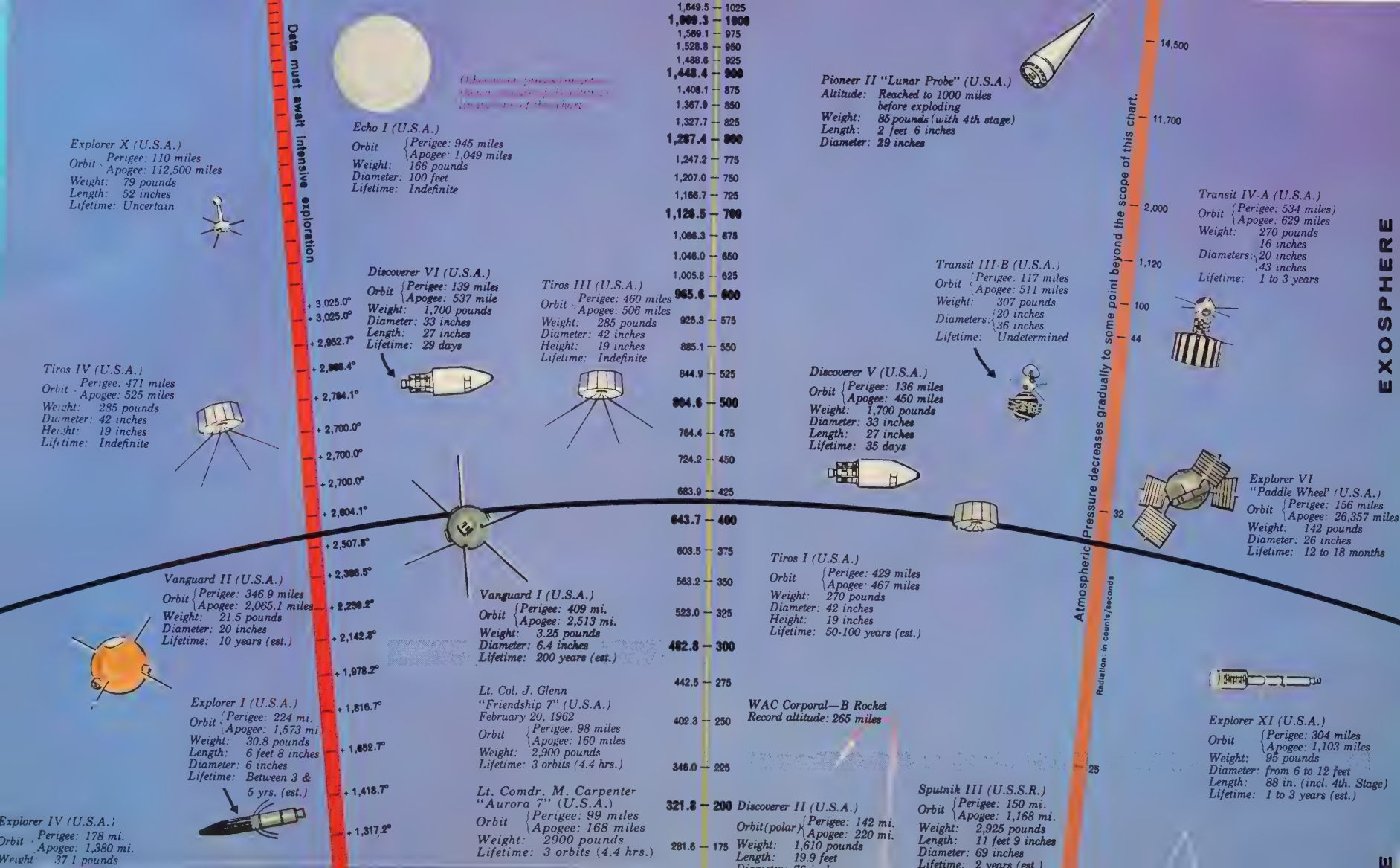


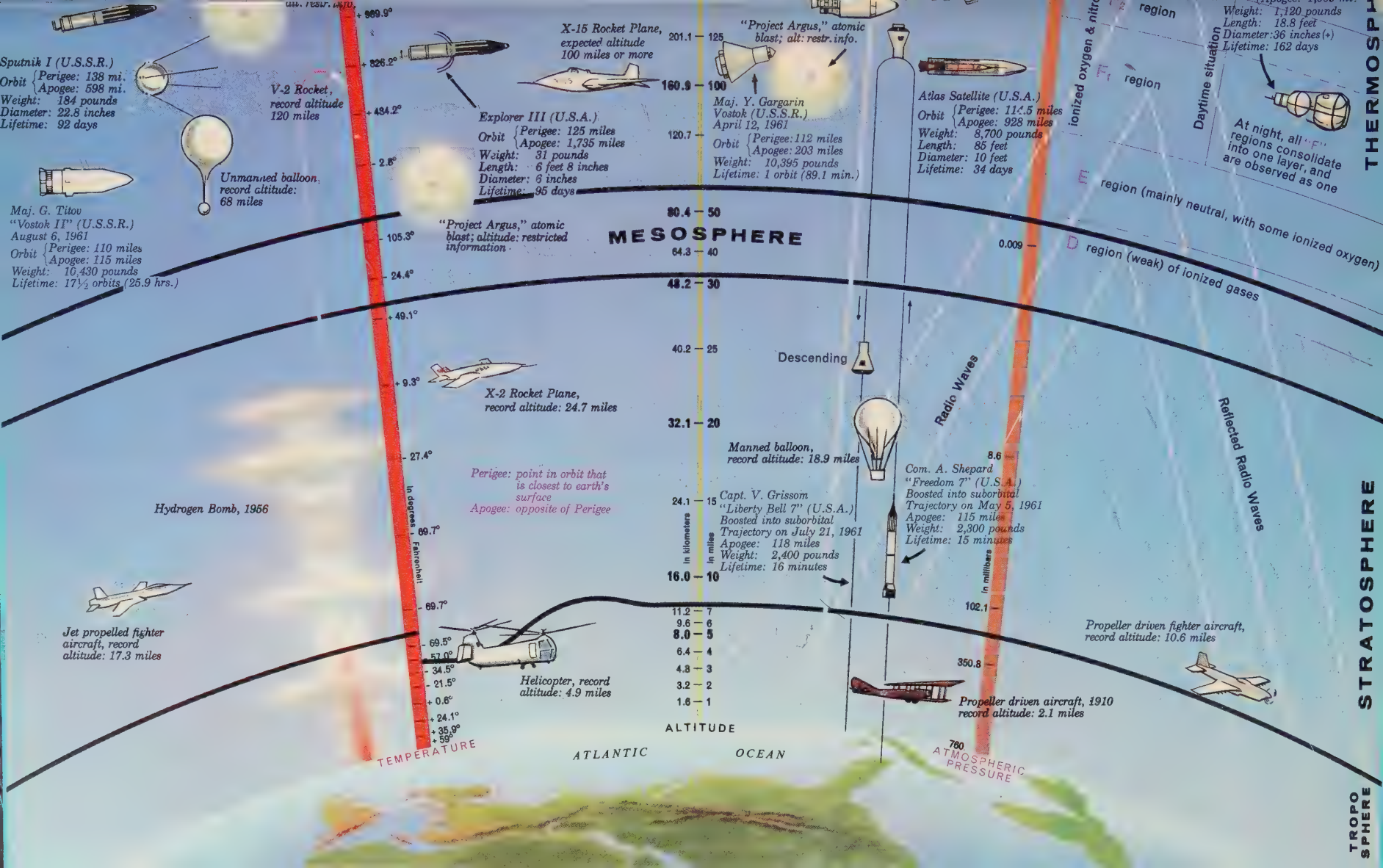
Leroy G. Cooper

Malcolm S. Carpenter



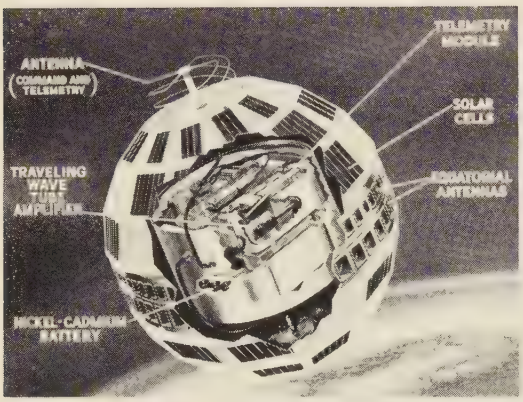
Walter M. Schirra


Data must await intensive exploration
Atmospheric Pressure decreases gradually to some point beyond the scope of this chart.
Radiation: in counts/seconds
EXOSPHERE
1,649.5 — 1025
1,609.3 — 1000
1,569.1 — 975
1,528.8 — 950
1,488.6 — 925
1,448.4 — 900
1,408.1 — 875
1,367.9 — 850
1,327.7 — 825
1,287.4 — 800
1,247.2 — 775
1,207.0 — 750
1,166.7 — 725
1,126.5 — 700
1,086.3 — 675
1,046.0 — 650
1,005.8 — 625
965.6 — 600
925.3 — 575
885.1 — 550
844.9 — 525
804.6 — 500
764.4 — 475
724.2 — 450
683.9 — 425
643.7 — 400
603.5 — 375
563.2 — 350
523.0 — 325
482.8 — 300
442.5 — 275
402.3 — 250
346.0 — 225
321.8 — 200
281.6 — 175
14,500
11,700
2,000
1,120
100
44
32
25
+ 3,025.0°
+ 3,025.0°
+ 2,952.7°
+ 2,866.4°
+ 2,784.1°
+ 2,700.0°
+ 2,700.0°
+ 2,700.0°
+ 2,604.1°
+ 2,507.8°
+ 2,366.5°
+ 2,236.2°
+ 2,142.8°
+ 1,978.2°
+ 1,816.7°
+ 1,652.7°
+ 1,418.7°
+ 1,317.2°
Pioneer II "Lunar Probe" (U.S.A.)
Altitude: Reached to 1000 miles before exploding
Weight: 85 pounds (with 4th stage)
Length: 2 feet 6 inches
Diameter: 29 inches
Explorer X (U.S.A.)
Orbit { Perigee: 110 miles / Apogee: 112,500 miles
Weight: 79 pounds
Length: 52 inches
Lifetime: Uncertain
Echo I (U.S.A.)
Orbit { Perigee: 945 miles / Apogee: 1,049 miles
Weight: 166 pounds
Diameter: 100 feet
Lifetime: Indefinite
Transit IV-A (U.S.A.)
Orbit { Perigee: 534 miles / Apogee: 629 miles
Weight: 270 pounds
16 inches
Diameters: { 20 inches / 43 inches
Lifetime: 1 to 3 years
Discoverer VI (U.S.A.)
Orbit { Perigee: 139 miles / Apogee: 537 mile
Weight: 1,700 pounds
Diameter: 33 inches
Length: 27 inches
Lifetime: 29 days
Tiros III (U.S.A.)
Orbit { Perigee: 460 miles / Apogee: 506 miles
Weight: 285 pounds
Diameter: 42 inches
Height: 19 inches
Lifetime: Indefinite
Transit III-B (U.S.A.)
Orbit { Perigee: 117 miles / Apogee: 511 miles
Weight: 307 pounds
Diameters: { 20 inches / 36 inches
Lifetime: Undetermined
Tiros IV (U.S.A.)
Orbit { Perigee: 471 miles / Apogee: 525 miles
Weight: 285 pounds
Diameter: 42 inches
Height: 19 inches
Lifetime: Indefinite
Discoverer V (U.S.A.)
Orbit { Perigee: 136 miles / Apogee: 450 miles
Weight: 1,700 pounds
Diameter: 33 inches
Length: 27 inches
Lifetime: 35 days
Explorer VI "Paddle Wheel" (U.S.A.)
Orbit { Perigee: 156 miles / Apogee: 26,357 miles
Weight: 142 pounds
Diameter: 26 inches
Lifetime: 12 to 18 months
Tiros I (U.S.A.)
Orbit { Perigee: 429 miles / Apogee: 467 miles
Weight: 270 pounds
Diameter: 42 inches
Height: 19 inches
Lifetime: 50-100 years (est.)
Vanguard II (U.S.A.)
Orbit { Perigee: 346.9 miles / Apogee: 2,065.1 miles
Weight: 21.5 pounds
Diameter: 20 inches
Lifetime: 10 years (est.)
Vanguard I (U.S.A.)
Orbit { Perigee: 409 mi. / Apogee: 2,513 mi.
Weight: 3.25 pounds
Diameter: 6.4 inches
Lifetime: 200 years (est.)
Explorer XI (U.S.A.)
Orbit { Perigee: 304 miles / Apogee: 1,103 miles
Weight: 95 pounds
Diameter: from 6 to 12 feet
Length: 88 in. (incl. 4th. Stage)
Lifetime: 1 to 3 years (est.)
Explorer I (U.S.A.)
Orbit { Perigee: 224 mi. / Apogee: 1,573 mi.
Weight: 30.8 pounds
Length: 6 feet 8 inches
Diameter: 6 inches
Lifetime: Between 3 & 5 yrs. (est.)
Lt. Col. J. Glenn
"Friendship 7" (U.S.A.)
February 20, 1962
Orbit { Perigee: 98 miles / Apogee: 160 miles
Weight: 2,900 pounds
Lifetime: 3 orbits (4.4 hrs.)
WAC Corporal—B Rocket
Record altitude: 265 miles
Lt. Comdr. M. Carpenter
"Aurora 7" (U.S.A.)
Orbit { Perigee: 99 miles / Apogee: 168 miles
Weight: 2900 pounds
Lifetime: 3 orbits (4.4 hrs.)
Discoverer II (U.S.A.)
Orbit(polar) { Perigee: 142 mi. / Apogee: 220 mi.
Weight: 1,610 pounds
Length: 19.9 feet
Sputnik III (U.S.S.R.)
Orbit { Perigee: 150 mi. / Apogee: 1,168 mi.
Weight: 2,925 pounds
Length: 11 feet 9 inches
Diameter: 69 inches
Lifetime: 2 years (est.)
Explorer IV (U.S.A.)
Orbit { Perigee: 178 mi. / Apogee: 1,380 mi.
Weight: 37.1 pounds


Sputnik I (U.S.S.R.)
Orbit {Perigee: 138 mi. / Apogee: 598 mi.
Weight: 184 pounds
Diameter: 22.8 inches
Lifetime: 92 days
V-2 Rocket, record altitude 120 miles
Unmanned balloon, record altitude: 68 miles
Maj. G. Titov "Vostok II" (U.S.S.R.)
August 6, 1961
Orbit {Perigee: 110 miles / Apogee: 115 miles
Weight: 10,430 pounds
Lifetime: 17½ orbits (25.9 hrs.)
X-15 Rocket Plane, expected altitude 100 miles or more
Explorer III (U.S.A.)
Orbit {Perigee: 125 miles / Apogee: 1,735 miles
Weight: 31 pounds
Length: 6 feet 8 inches
Diameter: 6 inches
Lifetime: 95 days
"Project Argus," atomic blast; alt: restr. info.
Maj. Y. Gargarin Vostok (U.S.S.R.) April 12, 1961
Orbit {Perigee: 112 miles / Apogee: 203 miles
Weight: 10,395 pounds
Lifetime: 1 orbit (89.1 min.)
Atlas Satellite (U.S.A.)
Orbit {Perigee: 114.5 miles / Apogee: 928 miles
Weight: 8,700 pounds
Length: 85 feet
Diameter: 10 feet
Lifetime: 34 days
"Project Argus," atomic blast; altitude: restricted information
MESOSPHERE
X-2 Rocket Plane, record altitude: 24.7 miles
Perigee: point in orbit that is closest to earth's surface
Apogee: opposite of Perigee
Hydrogen Bomb, 1956
Manned balloon, record altitude: 18.9 miles
Capt. V. Grissom "Liberty Bell 7" (U.S.A.)
Boosted into suborbital Trajectory on July 21, 1961
Apogee: 118 miles
Weight: 2,400 pounds
Lifetime: 16 minutes
Descending
Radio Waves
Reflected Radio Waves
Com. A. Shepard "Freedom 7" (U.S.A.)
Boosted into suborbital Trajectory on May 5, 1961
Apogee: 115 miles
Weight: 2,300 pounds
Lifetime: 15 minutes
Jet propelled fighter aircraft, record altitude: 17.3 miles
Helicopter, record altitude: 4.9 miles
Propeller driven fighter aircraft, record altitude: 10.6 miles
Propeller driven aircraft, 1910 record altitude: 2.1 miles
STRATOSPHERE
TROPOSPHERE
ALTITUDE
TEMPERATURE
ATMOSPHERIC PRESSURE
in degrees Fahrenheit
in kilometers
in miles
in millibars
ATLANTIC OCEAN
ionized oxygen & nitrogen
region
Daytime situation
At night, all regions consolidate into one layer, and are observed as one
region (mainly neutral, with some ionized oxygen)
region (weak) of ionized gases
THERMOSPHERE
Weight: 1,120 pounds
Length: 18.8 feet
Diameter: 36 inches (+)
Lifetime: 162 days

The X-15 rocket plane is constantly setting new records for speed, beyond an earlier mark of more than 4000 mph, and for altitude, approximating 67 miles.

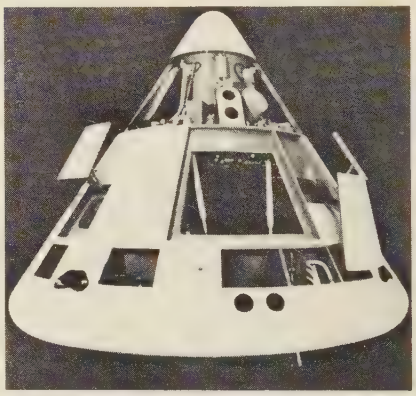
NAVIGATION IN SPACE

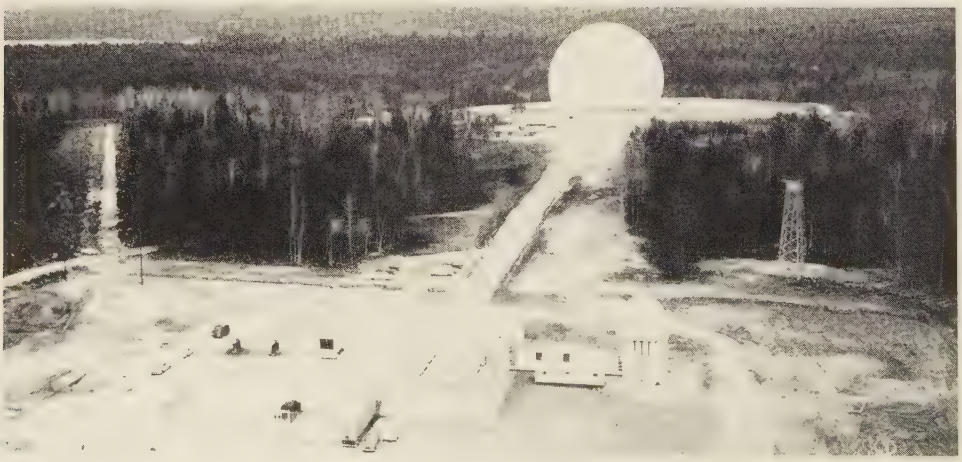


The communications satellite TELSTAR, above, built jointly by the U. S. government and the American Telephone & Telegraph Co., has made possible the sending and receiving of live international telecasts as well as telephone messages. Its American base of operations is the dome at Andover, Maine shown below.

Demanding the ultimate in sophisticated electronic systems, Apollo will carry three astronauts into lunar orbit and back to earth. The epoch voyage to the moon is scheduled for 1970.

NASA





Dome at Andover, Maine

AT&T

reflecting so it will be partially transparent allowing a portion of the laser beam to escape out of the laser volume. It is this radiation that escapes that constitutes the output beam of the laser. Not only is this output beam extremely intense, but it has the property of being coherent. This means that, although the beam is made up of quanta emitted by a very great number of atoms randomly distributed throughout the laser volume, the beam acts as though it were emitted by a single source.

Liberty, Statue of. The colossal statue, representing a female figure of Liberty holding aloft an immense torch, erected on Liberty Island, New York harbor, a national monument called Statue of Liberty. The statue, which was unveiled in 1886, was a gift from the people of France to the United States in commemoration of the 100th anniversary of American independence. The cost of the pedestal was met with funds raised by popular subscription in the United States, as the statue itself, designed by M. Frédéric Bartholdi, was paid for by popular subscription in France.

Libraries and Museums. Libraries are primarily collections of books and the buildings which house them. The term includes also, however, those collections of written records assembled before the invention of books, such as clay tablets and papyrus rolls. Museums are properly collections of other objects of interest, relating either to science, to history, or to the arts.

Early Libraries. The temples of the Sumerians were their 'libraries" for texts, treatises, hymns, and prayers written on clay tablets as far back as 5000 to 3000 B. C. One of the earliest libraries dates from about 2500 B. C., when clay tablets began to be collected at the temple of En-Lil in Nippur, Babylonia. Some 40,000 tablets or fragments have been discovered there, consisting of temple records, textbooks, mathematical tables, and literary works. Both tablet and papyrus collections were made by Rameses II at Thebes, Egypt, about 1300 B. C. The library of Sardanapalus in Babylon, collected about 650 B. C., contained 30,000 tablets. The Ptolemies in Egypt, beginning in the 4th century B. C., collected in Alexandria the greatest ancient library of Greek literature, consisting of 700,000 rolls of papyrus. The last remnants of this library are said to have been destroyed by the Arabs in 640 A. D.

During the middle ages, rolls were superseded by parchment or vellum bound in book form. Various monasteries collected and copied manuscripts, notably those of Monte Cassino in Italy, Cluny and Corbie in France, Fulda and Saint Gall in Germany, Canterbury and York in England, and Mount Athos in Greece. The number of books in each library, however, seldom exceeded 1000.

Great Modern Libraries. With the manufacture of paper in the 12th century and the invention of the printing press in the 15th century came a rapid increase in the production of books. The Vatican library in Rome, the Laurentian library in Florence, and other libraries at Leningrad, Oxford, London, and Munich grew rapidly and now have irreplaceable collections of manuscripts and early printed books. The greatest modern libraries, in point of size, include the Library of Congress (considered the largest in the world with over 12 million volumes and pamphlets), the National Library at Paris, and the British Museum. The New York Public Library and Harvard University collections exceed 6 million volumes each.

Public Libraries. The recent history of libraries is largely the story of making books easily available to all people desirous of reading or consulting them. Benjamin Franklin initiated in 1732 the first membership library—the Library Company of Philadelphia. Subscription (circulating), apprentice, mercantile, and atheneum, or culture society, libraries followed, but these were largely supplanted by tax-supported libraries. The first of these, established in 1833, is claimed by both Peterborough, N.H. and Salisbury, Conn. Library taxes were authorized by law in Massachusetts in 1848. Andrew Carnegie donated over 60 million dollars to found nearly 2000 free libraries in the United States besides 660 in Great Britain, 156 in Canada, and 49 elsewhere. Benefactions have come from many people, including J.P. Morgan and Henry C. Folger, and from foundations like the ones established by Rockefeller and Ford.

The American Library Association. Although an American Library Convention was held in New York City in 1853, the *Association* was organized in Philadelphia in 1876, with membership open to libraries and individuals. Its present membership exceeds 20,000. Its purpose is to foster the establishment and development of libraries and to promote the use of books and other materials. It has served as a clearing house for many helpful innovations in all phases of library services, such as a decimal system of indexing books, devised by Melvil Dewey, who also helped to found a library journal and instituted training courses for librarians. Shelves open to readers, first used in Cleveland about 1890, children's departments, branch libraries, help for study groups, records, slides, Braille volumes, and special assistance to school students are among the extensions of library service that have been introduced. An important part of the Association's work has been the conducting of surveys to improve services and to inaugurate additional ones. The increased emphasis on education, the vast accumulation of new knowledge in the space age, and the need for retraining workers due to automation are among the challenges faced by an increasing number of libraries.

Many rural and suburban readers are served by traveling libraries, yet from a recent report more than 700 counties in the United States are without library service, despite about 1500 bookmobiles in operation. The more populous centers are reached by 3770 public libraries, many with suburban branches, and by over 2000 special libraries. In colleges, junior colleges, and universities there are more than 2000 libraries. Libraries are maintained in military establishments in the United States, and as of 1962 the United States Information Agency listed 182 USIA libraries in 84 countries.

To make all this service effective, there has been a constantly increasing demand for trained librarians. Statistics reported in 1962 show 268 colleges in the United States offering library courses and 32 ALA-accredited schools offering complete training for librarianship.

Museums of Art. The growth of art museums belongs mainly to the late 19th and the 20th century, although the beginnings of a number of notable art collections date from earlier periods. The National museum at Florence contains collections made by the de' Medici family at the time of the Renaissance. The art treasures of the Vatican and the Dresden museum likewise date, in part, from the 15th and 16th centuries. The Louvre in Paris contains many masterpieces taken by Louis XIV and Napoleon as prizes of war. The systematic arrangement of exhibits, however, based on research and aiming at instruction, was entirely a development of the 19th century and has been most thoroughly carried out in British, Scandinavian, and particularly in American museums.

Among the world's greatest art museums not already mentioned are the Luxembourg, Paris; the National Gallery and the Victoria and Albert Museum, London; the Hermitage, Leningrad; the Metropolitan Museum of Art, New York; the Philadelphia Academy of Fine Arts; the Boston Museum of Fine Arts; and the National Gallery of Art, Washington.

Museums of Science. In the front rank of the world's museums of science are the British Museum,

LEGAL WEIGHTS (IN POUNDS) PER BUSHEL

(From Bureau of Standards, Department of Commerce)

States	Apples										Corn											Peaches								
	Apples	Dried Apples	Barley	Beans	Beets	Bran	Buckwheat	Carrots	Clover Seed	Coal	Corn in Ear	Shelled Corn	Corn Meal	Cotton Seed	Flaxseed (Linseed)	Hemp Seed	Hungarian Grass Seed	Millet	Oats	Onions	Orchard Grass Seed	Parsnips	Peaches	Dried	Pears	Peas	Potatoes	Sweet Potatoes	Rye	Timothy Seed	Tomatoes	Turnips	Wheat
Federal Statutes*	50	..	48	..	..	..	..	..	..	..	..	56	..	..	56	..	..	..	32	..	..	..	..	..	..	60	..	..	56	..	..	..	60
Alabama	50	24	47	60	50	20	50	50	60	80	70	56	..	32	56	44	..	50	32	57	14	45	50	..	50	60	60	55	56	45	56	55	60
Arkansas	50	24	48	60	..	20	52	..	60	..	70	56	48	33⅓	56	..	..	50	32	57	14	..	..	33	..	60	60	50	56	60	..	57	60
California	..	..	50	..	..	..	40	..	..	..	..	52	..	..	..	..	..	..	32	..	..	..	..	..	..	..	..	..	54	..	..	..	..	60
Colorado	..	..	48	60	..	..	52	..	60	80	70	56	50	..	..	44	..	..	32	57	..	..	..	..	..	..	..	..	56	45	..	..	..	60
Connecticut	48	25	48	60	60	20	48	50	60	..	..	56	50	30	55	..	..	..	32	52	..	45	52	33	52	60	60	54	56	..	56	50	60
Delaware	..	..	..	..	..	..	..	..	..	..	..	56	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	60
District of Columbia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Florida	48	24	48	60	..	20	..	..	..	..	..	56	48	32	..	..	..	50	32	56	..	..	54	24	55	..	60	56	56	..	..	54	60
Georgia	..	24	47	60	..	20	52	..	60	80	70	56	..	30	56	44	..	..	32	57	..	..	..	..	..	60	60	55	56	45	..	55	60
Idaho	48	24	48	60	56	20	50	50	60	..	70	56	48	..	56	44	50	50	32	57	..	50	48	33	..	60	60	50	56	45	56	55	60
Illinois	47	24	48	60	60	20	52	50	60	80	70	56	48	32	56	44	50	50	32	57	14	50	48	33	58	60	60	50	56	45	56	55	60
Iowa	48	24	48	60	56	20	48	50	60	80	70	56	48	..	56	44	50	50	32	52	14	45	48	33	45	60	60	50	56	45	50	55	60
Kansas	48	24	48	60	56	..	48	50	60	..	70	56	..	..	56	44	..	50	32	55	..	48	48	33	50	60	60	50	56	45	56	55	60
Kentucky	..	24	47	60	..	20	56	..	60	76	*a*70	56	50	..	56	44	50	50	32	57	14	..	..	39	..	60	60	55	56	45	..	60	60
Louisiana	..	..	32	..	..	..	..	..	..	..	..	56	..	..	..	..	..	..	32	..	..	..	..	..	..	..	..	..	32	..	..	..	..	60
Maine	44	25	48	60	60	20	48	50	60	..	..	56	50	30	56	44	48	50	32	52	14	45	48	33	58	60	60	54	56	45	56	50	60
Maryland	50	28	48	60	..	20	48	50	60	80	70	56	48	..	56	44	50	50	32	54	14	..	40	..	..	60	60	60	56	45	60	60	60
Michigan	48	22	48	60	56	..	48	50	60	80	70	56	50	..	56	44	50	50	32	54	14	50	..	28	..	60	60	56	56	45	..	58	60
Minnesota	50	28	48	60	50	..	50	45	60	..	70	56	..	..	56	50	48	48	32	52	14	42	48	28	45	60	60	55	56	45	50	55	60
Mississippi	..	26	48	60	..	20	48	..	60	80	72	56	48	32	56	44	50	50	32	57	..	..	..	33	..	60	60	54	56	45	..	55	60
Missouri	48	24	48	60	..	20	52	50	60	80	70	56	50	33	56	44	48	50	32	57	14	44	48	33	48	60	60	56	56	45	45	42	60
Montana	45	..	48	60	50	20	52	50	60	76	70	56	50	..	56	44	50	..	32	57	..	50	..	..	45	60	60	..	56	45	..	50	60
Nebraska	48	24	48	60	56	20	50	50	60	80	70	56	48	..	56	44	..	50	32	57	14	50	48	33	45	60	60	50	56	45	56	55	60
Nevada	48	24	48	60	56	20	50	50	60	..	70	56	48	..	56	48	50	50	32	57	..	50	48	33	..	60	60	50	56	45	56	56	60
New Hampshire	48	25	48	60	60	20	48	50	60	..	..	56	50	..	56	..	..	..	32	52	..	45	48	33	58	60	60	54	56	45	56	55	60
New Mexico	45	24	48	60	56	20	52	50	60	80	70	56	50	32	56	44	50	50	32	57	14	42	48	33	48	60	60	50	56	45	50	56	60
New York	..	25	48	60	..	20	48	50	60	..	..	56	50	30	55	..	..	..	32	57	..	..	..	33	..	60	60	54	56	45	..	..	60
North Carolina	..	24	48	60	50	20	50	50	60	80	70	56	..	30	56	44	48	50	32	57	14	50	50	25	56	60	56	56	56	45	56	50	60
North Dakota	50	28	48	60	60	20	42	45	60	80	70	56	..	..	56	50	48	50	32	52	14	42	..	28	45	60	60	46	56	45	50	60	60
Ohio	48	24	48	60	56	..	50	50	60	70	68	56	48	..	56	44	50	50	32	56	..	50	48	33	..	60	60	50	56	45	56	60	60
Oklahoma	48	24	48	60	60	20	52	50	60	80	70	56	50	32	56	44	48	50	32	57	14	44	48	33	48	60	60	55	56	45	45	42	60
Pennsylvania	45	25	48	60	56	20	48	50	60	76	70	56	50	..	56	44	50	50	32	50	14	50	48	..	50	60	60	54	56	45	56	56	60
Rhode Island	48	25	48	60	50	20	48	50	60	80	70	56	50	..	56	44	50	50	32	50	..	50	48	33	..	60	60	54	56	45	56	50	60
South Carolina	50	24	48	60	50	20	50	50	60	80	70	56	..	30	56	44	48	50	32	56	14	50	50	25	36	60	60	50	56	45	56	50	60
South Dakota	48	24	48	60	56	..	48	50	60	..	70	56	50	..	56	44	50	50	32	52	14	48	48	33	45	60	60	54	56	45	50	55	60
Tennessee	50	24	48	60	50	20	50	50	60	80	70	56	..	28	56	44	48	50	32	56	14	50	50	26	56	60	60	50	56	45	56	50	60
Texas	50	28	48	60	60	20	52	50	60	80	*b*70	56	50	32	56	44	48	50	32	57	14	50	50	28	58	60	60	50	56	45	56	55	60
Vermont	48	25	48	60	60	..	48	50	60	..	70	56	50	..	55	..	50	50	32	52	..	45	48	..	58	60	60	54	56	45	56	60	60
Virginia	45	28	48	60	..	20	48	50	60	80	70	56	48	30	56	44	48	50	32	57	14	50	..	..	..	..	..	60	56	56	45	60	55	60
Washington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
West Virginia	48	24	48	60	56	20	48	50	60	80	*c*68	56	48	32	56	44	50	50	32	55	14	42	48	33	50	60	60	50	56	45	56	55	60
Wisconsin	44	25	48	60	50	20	50	50	60	..	..	56	50	..	56	44	48	50	32	50	..	44	48	33	48	60	60	54	56	45	56	42	60
Wyoming	48	..	48	60	56	..	..	50	..	..	70	56	..	..	56	..	..	..	32	57	..	50	48	..	..	..	60	50	56	..	56	55	60

* Weights fixed for customs purposes. *a* From Nov. 1 to May 1 following; 68 pounds from May 1 to Nov. 1 following new crop before Dec. 1. *b* Seventy pounds after Dec. 1, and 72 pounds for *c* In ear, dry; 72 pounds in ear, green.

London; the National Museum, Washington; the American Museum of Natural History, New York; the Carnegie Institute, Pittsburgh; and the Chicago National History Museum.

Beginning as private collections of curiosities, science museums have become public institutions for research and popular education. In America, especially, exhibits have been arranged so as to display rock formations and composition, the habits, habitats, and evolution of plants and animals, technological processes, tribal customs and costumes, periods of civilization as reflected in implements and objects of art, as well as useful facts in sanitation and dietetics. Exhibits are frequently supplemented by public lectures and the loan of pictures, films, and records.

Little Church Around the Corner. In 1870 a clergyman declined to conduct a burial service for George Holland, comedian, and referred Holland's friend to "the little church around the corner." The church so designated was the Protestant Episcopal Church of the Transfiguration in 29th Street, New York City. The rector, Dr. Houghton, acquiesced, and the name has since clung to the church as a term of affection.

Lunar Probes. Unfolding rapidly year by year is man's determined effort to learn more about the moon and eventually to put a man on the lunar surface and bring him back safely to earth. In the space program of the United States, the manned expedition known as "Project Apollo" is gradually being developed toward a blast-off, hopefully not too long after 1967, and at least by 1970. This ambitious undertaking envisions the launching of a space vehicle with three men aboard which, quoting from Richard Witkin's description in the book, *America's Race to the Moon*, will "soar, weightless, on an elliptical path aimed, like a duck hunter's shot, in front of the moon's line of travel."

As lunar gravity eventually pulls their spacecraft toward the moon's cratered surface, the astronauts will fire a rocket to swerve themselves into a circular orbit around the moon. Next, the crewmen assigned to the task will enter a lunar ferry, or "bug," detach it from the command vehicle, and land on the moon's surface for a stay of a few hours or possibly as much as two days. After this first-hand investigation they will return to the "mother craft" for a voyage back to earth. Meanwhile the "ferry," which has served its purpose, will be cut loose from the command vehicle.

The step-by-step process of making ready for a manned space probe involves innumerable details. Some of them relate to the design and testing of rockets and landing craft, the choice of fuels, with investigation of the possibility of nuclear propulsion, the perfection of telemetry, the achievement of rendezvous in space, the conducting of preliminary unmanned probes by instruments—all this in addition to countless details having to do with the comfort, safety, and survival of the astronauts. None of the precautionary measures can be described as "minor," since every piece of equipment must function perfectly on schedule.

Preceding the manned exploration now being prepared there have been numerous early probes made by both Americans and Russians. Something has been learned from each of these experimental ventures, even from those that were conducted frankly on a trial-and-error basis. The Pioneer series and other small rockets launched initially by the United States from Cape Canaveral (now Cape Kennedy) and the Lunik rockets launched by Russia from the Kyzyl Kum Desert, paved the way for lunar exploration by more sophisticated space vehicles, each with more sensitive equipment designed to add new information about the moon and the way to reach it.

A Russian rocket launched September 12, 1959 made impact on the moon's surface 37 hours after take-off. Then Lunik III, launched October 7, 1959, photographed the sunlit side of the moon opposite the dark side facing the earth. Of the United States Ranger series, Nos. III and IV, launched in January and April, 1962, showed marked progress in control and performance. The capsule of No. IV is believed to have impacted on the moon's far side. A great advance in all respects was shown when Ranger VII, launched from Cape Kennedy on July 28, 1964, made a completely successful flight, responding in mid-course to corrections in a most impressive demonstration of remote control. Ranger VII was equipped to take closeup pictures of the moon's surface and relay them back to earth. It had a two-camera battery for large pictures and a four-camera battery for smaller ones. The latter pictures were snapped until Ranger VII had come within 1000 feet of the lunar surface, immediately before crashing. The pictures have proved helpful by indicating a possible landing area for a manned expedition.

Mausoleums. From the earliest times it has been the custom among civilized nations to perpetuate the memory of the noble deeds of great men by the erection of sepulchral monuments of imposing architectural magnificence. The mausoleum of Halicarnassus erected in memory of Mausolus, king of Caria, in 353 B. C. was known as one of the "seven wonders of the world," and from the name of this king is derived the word mausoleum.

Other ancient and notable mausoleums are those of Augustus, 28 B. C.; of Hadrian, now the Castle of San Angelo; and of Cecilia Metella, on the Appian Way at Rome. The Taj Mahal, made of white marble and located at Agra in India, was built by Shah Jehan in the 17th century as a monument for his favorite wife, Mumtaz Mahal.

More modern monuments are those of the Bourbons at Dreux; of Queen Victoria and the prince consort at Frogmore, near Windsor; of Napoleon III at Farnborough; of the House of Hanover at Herrenhausen; and of Frederick William III at Charlottenburg. In America, the most striking specimens of this kind of memorial are Grant's tomb in New York City, which resembles in general outline the tomb of Cecilia Metella, and Edward Bok's Singing Tower in Florida.

Mechanical Translation. In early stages of development, but indicating some promise, is the application of mechanical and electronic devices to certain problems of translation. Experiments in this field are not concerned with literary works, whose translation is a challenge to the creative ability and artistic taste of a perceptive human being. They deal with scientific articles, which appear in constantly increasing number and whose content needs to be made available quickly to the many research workers who cannot read them in the original. It is believed that a good many routine, repetitive processes involved in the translation of scientific documents can be speeded up electronically, leaving refinements of phrasing and interpretation to the human brains that have been relieved of such time-consuming tasks. In fact, some current research is concerned with the possibilities and limitations of translation as such, in an effort to determine what part of the work can be turned over to the electronic brain and how much must be left to a human agent.

As might be expected, a good deal of the experimental translating has dealt with Russian scientific documents. The Harvard Computation Laboratory, for example, is operating a Russian-to-English automatic dictionary of electronics and mathematics which produces word-for-word translations. Studies are being extended to such matters as word sequence and multiple meanings, in order to improve the quality of the results. At Georgetown University, research is being done on the translation of Russian chemical and French physics texts. Research workers at the University of California

have been making similar studies of Russian documents in the field of biochemistry.

A typical procedure in the mechanical translation of an article in Russian has been described as follows. The Russian text is first recorded on magnetic tape. A Univac I computer takes the text apart, breaking up words into their stems and affixes, then runs through the dictionary alphabetically to get the English equivalents, which are then arranged in the sequence of the original Russian text. At this point the work is taken over by a human "post-editor," who is presumably an alert person with a good scientific background. His comparatively simple task is to supply the articles, prepositions, prefixes, and suffixes needed to convert the "fractured" text into conventional English.

MEMORIAL COINS, AMERICAN

Denomination	Year authorized	Number of Pieces
Fifty-Dollar (gold):		
Panama-Pacific Exposition		
Round	1915	1510
Octagonal	1915	1509
Two-and-one-half-Dollar (gold):		
Panama-Pacific Exposition	1915	10,017
Sesquicentennial Exposition	1925	200,226
Dollar (gold):		
Louisiana Purchase Exposition	1902	250,258
Lewis and Clark Exposition	1904	60,069
Panama-Pacific Exposition	1915	25,034
McKinley Memorial	1916	30,040
Grant Memorial	1922	10,016
Dollar (silver):		
Lafayette Memorial	1899	50,026
Half-Dollar (silver):		
Columbian Exposition	1892	5,002,105
Panama-Pacific Exposition	1915	60,030
Illinois Centennial	1918	100,058
Maine Centennial	1920	50,028
Pilgrim Tercentennial	1920	300,165
Alabama Centennial	1920	70,044
Missouri Centennial	1921	50,028
Grant Memorial	1922	100,061
Monroe Doctrine Centennial	1923	274,007
Huguenot Tercentennial	1924	142,080
Stone Mountain	1924	2,314,709
Battle Lexington-Concord	1925	162,099
California Diamond Jubilee	1925	150,200
Fort Vancouver	1925	50,028
Sesquicentennial Exposition	1925	1,000,528
Battle of Bennington	1925	40,034
Oregon Trail	1926	264,250
Hawaiian Discovery	1928	10,008
Daniel Boone Bicentennial	1934	108,000
Maryland Tercentennial	1934	25,015
Texas Centennial	1934	304,000
Arkansas Centennial	1935	94,800
Spanish Trail	1935	10,008
City of Hudson, N. Y.	1935	10,008
California-Pacific Exposition	1935	430,000
Connecticut Tercentennial	1935	25,000
Providence Tercentennial	1936	50,000
Cincinnati 50th Anniversary	1936	15,016
Long Island Tercentennial	1936	100,053
Bridgeport Centennial	1936	25,000
Albany, N. Y., 250th Anniversary	1937	25,013
Battle of Gettysburg	1937	50,028
Great Lakes Exposition	1937	50,030
Columbia, S. C., Sesquicentennial	1937	25,023
Elgin, Ill., Centennial	1937	25,015
Lynchburg, Va., Sesquicentennial	1937	20,013
New Rochelle, N. Y., 250th Anniversary	1937	25,015
Roanoke Island	1937	50,030
San Francisco-Oakland Bridge	1937	100,055
Delaware Tercentennial	1937	25,015
Wisconsin Centennial	1937	25,015
York County, Me., Tercentennial	1937	25,015
Robinson (Arkansas)	1937	25,000
Norfolk	1937	25,000
Antietam	1937	50,000
Iowa Centennial	1946	100,057
Booker T. Washington	1946	1,700,938
Washington Carver	1951	*
Quarter-Dollar (silver):		
Columbian Exposition	1893	40,023

*No limit to number minted.

Miniaturization. An important trend in modern manufacturing is toward producing smaller and more compact units of equipment for a great variety of uses. Typical of this development is the reduction in size of radio receiving sets. With equal or greater range and clarity of reception, the sets have become small, compact, and conveniently portable—in many instances even pocket-size. The perfecting of transistors has made possible almost unlimited reduction in the bulk and weight of these products. Similarly, in space exploration, where weight is a vital factor, and in various types of industrial operations, battery-operated units and other small automatic equipment has proved effective in accomplishing results that could not possibly be achieved by so-called "standard-size" units. A related "anti-bulk" development is the microfilm copying of documents, records, and even books, for convenience of storage, with facilities for reading in magnified form when desired.

Mint, The United States. The United States mint was established by act of Congress, April 2, 1792. It is now a bureau of the department of the treasury, and is under the supervision of the director of the mint, who is appointed by the president. The principal purpose of the mint is to coin money for the country. It frequently makes coins for other countries, notably those of South and Central America; it makes the dies and prepares the official medals issued by the armed services; it issues commemorative coins authorized by Congress; and it refines and sells large amounts of gold and silver bullion to be used for industrial purposes.

Two coinage mints are now operated by the bureau, one the original mint established in 1793 at Philadelphia, the other at Denver, Col., which has been coining money since 1906. Assay offices are located at New York City and San Francisco. In addition, there are two depositories for bullion, one for gold at Fort Knox, Ky., and one for silver at West Point, N. Y.

The first coins officially made by the United States mint were the large copper cents of 1793. From that year to 1940 coins with a value of $6,338,742,298.96 had been turned out. The coinage of gold was discontinued in 1934, but the mint has continued to produce silver, nickel, and copper coins.

Memorial coins of special design must be authorized by an act of Congress, as the law provides that the design of standard coins may be changed only once in 25 years. The design of the current Lincoln cent was made by Victor David Brenner Memorial coins of the United States are shown in the accompanying table entitled *American Memorial Coins.*

Months, Names of. The months of the year received their English names from corresponding Latin names. Those from September to December are so called from the numerals *septem*, "seven"; *octo*, "eight"; *novem*, "nine"; and *decem*, "ten." September was the seventh month when the year began with March. July was formerly called Quintilius, from *quintus*, "fifth"; but, when Julius Cæsar reformed the calendar, he changed the month's name to Julius in his own honor. Julius became July in English. Similarly, Sextilius, from *sextus*, "sixth," was named Augustus after the emperor of that name and became our August.

January was named from Janus, god of entrances. February is derived from *februa*, a festival of purification held in that month by the Romans. Martius is the month of Mars, who was originally a god of agriculture, his month being the one when crops were ordinarily planted. The origin of April is not known. May is named from Maia, the mother of the Roman god Mercury. June is derived from Juno, the goddess of women and of marriage.

Motor Vehicles, State Laws. Although local traffic regulations may vary widely and, in addition, are subject to rather frequent changes, the laws of states concerning motor vehicles have become well established. This is particularly true of laws relating to the issuance of licenses, the legal age of drivers, and other general matters. The following table shows the status of such legislation in 1965.

MOTOR VEHICLE LAWS AS OF 1965

Source: *American Automobile Association.*

State	Date New License Plates Can Be Used	Driver's License Required	Minimum Age of Drivers	State Gasoline Tax	% State Tax[1]	Certificate of Title Required
Alabama	Oct. 1	yes	16	$.07	1½	no
Alaska	Feb. 15	yes	16	.08	..	yes
Arizona	Dec. 1	yes	18	.06	3	yes
Arkansas	Jan. 1	yes	14	.065	3	yes
California	Jan. 1	yes	16	.07	3	yes
Colorado	Jan. 1	yes	17	.06	2	yes
Connecticut	On issue	yes	16	.06	3½[2]	yes
Delaware	[3]	yes	16	.06	..	yes
District of Columbia	Mar. 1	yes	16	.06	2	yes
Florida	Feb. 1	yes	16	.07	2	yes
Georgia	Jan. 1	yes	16	.065	3	yes
Hawaii	Jan. 2	yes	15	.05	..	yes
Idaho	Dec. 1	yes	16	.06	..	yes
Illinois	Dec. 1	yes	16	.05	3½	yes
Indiana	Jan. 2	yes	16½	.06	2	yes
Iowa	Dec. 1	yes	16	.06	2	yes
Kansas	Jan. 1	yes	16	.05	2½	yes
Kentucky	Dec. 29	yes	16	.07	3	no[5]
Louisiana	Dec. 1	yes	15	.07	2	yes
Maine	Dec. 25	yes	17	.07	4	no
Maryland	Mar. 1	yes	16	.06	3	yes
Massachusetts	Jan. 1	yes	16	.055	[6]	no
Michigan	[7]	yes	16	.06	4	yes
Minnesota	Nov. 15	yes	16	.05	..	no[8]
Mississippi	Nov 1	yes	15	.07	2	no
Missouri	On issue	yes	16	.05	3	yes
Montana	On issue	yes	15	.06	1½	yes
Nebraska	Jan. 1	yes	16	.07	..	yes
Nevada	Dec. 1	yes	16	.06	2	yes
New Hampshire	Mar. 1	yes	16	.07	..	no
New Jersey	On issue	yes	17	.06	..	yes
New Mexico	Dec. 15	yes	18	.06	1½	yes
New York	Jan. 1	yes	18	.06	..	no
North Carolina	Jan. 1	yes	16	.07	1½[9]	yes
North Dakota	Nov. 5	yes	16	.06	2¼	yes
Ohio	Mar. 1	yes	16	.07	3	yes
Oklahoma	Dec. 11	yes	16	.065	2	yes
Oregon	On issue	yes	16	.06	..	yes
Pennsylvania	Mar. 15	yes	18	.07	5	yes
Rhode Island	Mar. 1	yes	16	.07	3½	no
South Carolina	Sept. 8	yes	16	.07	3	yes
South Dakota	Jan. 1	yes	16	.06	2[4]	yes
Tennessee	Mar. 1	yes	16	.07	3	yes
Texas	Feb. 1	yes	16	.05	2	yes
Utah	Dec. 15	yes	16	.06	3½	yes
Vermont	Feb. 1	yes	18	.065	3	no
Virginia	Mar. 15	yes	18	.07	..	yes
Washington	Jan. 2	yes	16	.075	4	yes
West Virginia	June 1	yes	16	.07	3	yes
Wisconsin	On issue	yes	16	.06	3	yes
Wyoming	On issue	yes	15	.05	2	yes

[1] Applicable to car sales. [2] Sales or use tax on first registration of new or used cars. [3] Three months before current registration expires. [4] Registry tax on first registration in state. [5] Bill of sale must be filed. [6] Excise tax based on car value. [7] At discretion of Secretary of State. [8] Required for initial registration of vehicles previously registered in other states. [9] $120 maximum. NOTE: Speed limits are not given in the above table because they vary widely within each state, depending on the kind of road, the condition of the road, the weather, the light, local ordinances, etc. In many states no maximum speed is specified, the requirement being what is "reasonable and proper."

NATIONAL HYMNS AND ANTHEMS

Argentine Republic. *Oíd, mortales, el grito sagrado* (Hear, O Mortals, the Sacred Call). Music by D. V. Lopez.

Belgium. *La Brabançonne.* Words by Jenneval; music by F. van Campenhout.

Brazil. *Hymno da Proclamacão da Republica* (Hymn of the Proclamation of the Republic). Words by Medeiros e Albuquerque; music by Leopoldo Miguez.

Canada. "God Save the King." Also "O Canada," composed in French by A. B. Routhier and translated into English by R. S. Weir; music by C. Lavallée.

Chile. *Dulce Patria;* national air, by Carnicer.

Costa Rica. *De la Patria.* Words by J. M. Zeledón; music by M. M. Gutierrez.

Czechoslovakia. *Kde Domov Muj* (Where is My Homeland?) Words by J. R. Tyl; music by F. Skroup.

Denmark. *King Kristian stod ved höien Mast* (King Christian Stood beside the Mast). Words by Ewald; music by Hartmann.

Ecuador. *Salve, O Patria.* Words by J. L. Mera.

Egypt. *Salaam, Effendi* (March of the Khedive).

Finland. *Vårt Land* (Our Land). Words by J. L. Runeberg; music by F. Pacius.

France. *La Marseillaise.* Words and music by Rouget de Lisle.

Germany. *Deutschland über Alles* (Germany over All). Words by H. von Fallersleben; music by J. Haydn. The Nazi anthem is the *Horst Wessel* song, by Ernst Hanfstaengl.

Great Britain. "God Save the King." Composed by Henry Carey. The words were in part adapted from verses written by others; the air was adapted from the French.

Greece. "Sons of Greece, Come, Arise." The words and air date from the Greek war for independence, 1821–29.

Hungary. *Isten áld meg a Magyart* (Lord Bless the Hungarian). Music by F. Erkel.

Iran. *Salamati Shah.* Music by A. Lemaire.

Italy. Decadel Hymn. Composer, U. Giordano.

Japan. *Kimi Ga Yo Wa.* Composer, Hayashi Hironokami.

Latvia. *Dievs sveti Latviju* (God Bless Latvia).

Mexico. *Mexicanos, al grito de guerra* (Mexicans, at the Cry of War). Words by F. G. Bocanegra; music by James Nunó.

Netherlands, The. *Wilhelmus van Nassouwe* (William of Nassau) and *Wein Neerlandsch Bloed* (Old Dutch Blood), the latter by H. C. Tollens.

Nicaragua. National air, by Blas Villatas.

Norway. *Sang for Norge* (Song for Norway). Words by Björnstjerne Björnson.

Peru. *Somos libres, seámoslo siempre* (We Are Free, Let Us Be So Ever).

Poland. *Jeszcze Polska Nie Zginela* (Poland's Not Yet Dead).

Rumania. *Traeasca Regale* (Long Live the King).

Russia. "The International." Words by E. Pottier.

Salvador. *Saludemos la Patria* (Let Us Hail Our Country). Words by J. J. Canas; music by J. Aberle.

Sweden. *Ur Svenska Hjertans djup* (From the Depths of Swedish Hearts). Words by Strandberg; music by Lindblad.

Switzerland. *Dem Vaterland* (To the Fatherland). Words by J. R. Wyss. The music is that of "America."

United States, The. "Star-Spangled Banner," officially adopted in 1931. Words by Francis Scott Key. Music adapted from an old drinking song, "To Anacreon in Heaven."

"America." Words by Samuel F. Smith; music that of "God Save the King."

Uruguay. *Orientales, la patria ó la tumba* (Uruguayans, fatherland or death). Words by Juan Coppetti.

Venezuela. *Gloria al bravo pueblo* (Honor to a Brave Nation). Words by V. Salvias; music by J. Landaeta.

Yugoslavia. Combination of Serbian *Boze Pravde*, Croatian *Liepa Nasa Domovina*, and Slovene *Napred Zastava Slave.*

Newspaper Press Associations. Within the past century the collection and distribution of news has become a vast organized business. While each newspaper usually maintains its own staff of editors and reporters and may employ its own special correspondents, virtually all newspapers now depend upon the service of organized news agencies. These agencies have their trained correspondents in all parts of the world and control facilities for more complete, rapid, and economical transmission of news than any one paper could enjoy alone.

The first news agency appears to have been that organized by Charles Havas in Paris in 1835. Havas began by translating articles for the French press. In 1840, he established news service by carrier pigeons between Paris, London, and Brussels. The Havas agency is now subsidized by the French government. It supplies stories and special articles as well as news to the French press.

The Reuter News Agency was organized in 1849 by Julius Reuter, a Prussian government messenger. In 1851, he established his headquarters in London, and, in 1865 and 1866, he gained control of several cable lines. Reuter's is now the greatest of European news agencies.

In the United States, there are several news service agencies. The Associated Press, which, in its present organization, dates from the year 1900, is a co-operative association of American newspapers. It has contracts for the distribution of copy through Reuter's, the Havas, and the Wolff agency in Europe. Two associations, United Press and International News Service, which had been operating independently for several years, were merged to form a single agency called United Press International. On May 24, 1958, the first news dispatch using this name announced the merger. The North American Newspaper Alliance provides special articles and reports designed to supplement, with interpretation and explanation, the items of general news reports which have been obtained through other channels.

Nobel Prizes. Five annual prizes, amounting to about $40,000 each, awarded to persons who, in different fields of activity, have made the greatest contributions to the progress and the welfare of the world. The prizes are made available by a fund of about $9 million bequeathed for the purpose by Alfred Bernhard Nobel, a Swedish philanthropist and the inventor of dynamite.

The prizes are awarded for distinguished work in (1) chemistry, (2) physics, (3) physiology or medicine, (4) literature, and (5) the cause of international peace. In chemistry and physics, the awards are made by the Swedish Royal Academy of Sciences; in medicine, by the Caroline Institute of Stockholm; in literature, by the Swedish Academy; and for peace, by a committee appointed by the Norwegian Parliament.

Awards were made first in 1901 and continued through 1939, then suspended until 1944, when some of the prizes for 1943 and 1944 were awarded. The peace prize was suspended during World War II. In several years some of the prizes were not awarded; in other cases they have been divided.

The total number of awards to the end of 1964 was 336, including 7 awards of the peace prize to institutions: Institute of International Law; League of Red Cross Societies; International Peace Bureau of Switzerland; International Red Cross; Nansen International Office for Refugees; American Service Committee; and Friends Service Council. The remaining 329 awards may be classified as follows according to the nationality of the recipients: United States, 86; Germany, 54; England, 58; France, 33; Sweden, 16; Switzerland, 12; The Netherlands, 10; Italy, 10; Denmark, 8; Austria, 7; Norway and Belgium, 5 each; Spain, Hungary, and Canada, 4 each; India, Poland, Finland, Argentina, Australia, and Eire, 2 each; Chile, Portugal, Japan, Iceland, and Czechoslovakia, 1 each. Of the total of 329

personal and 7 institutional awards, 75 have been for physics; 67 for chemistry; 79 for medicine; 58 for literature, and 57 for peace.

Twelve women have won Nobel prizes. One of these, Madame Curie, in 1903, shared in the prize for physics, and in 1911, she received the full prize for chemistry. Linus Pauling is the first person to receive two full awards. See *Nobel, Alfred Bernhard; Nobel Prize Winners.*

Occupations—Present and Future. A comprehensive survey of the kinds of employment available at any particular time gives a clear picture of the economic, social, and industrial situation in the region on which the study is based. The findings are necessarily subject to constant revision because of day-to-day changes in economics and technology. These changes, which have been accelerated in recent years, often call for the elimination of certain jobs and, in some cases, for the creation of new occupations to meet previously non-existent demands.

As a result of the modern industrial revolution brought about by automation, many jobs requiring little education or skill are being taken over by mechanical devices. On the other hand, some opportunities are being opened up by newly developed industries and by demands for new types of service that could not have been foreseen in the recent past. It is a constantly changing picture, bewildering or possibly disheartening to some, but challenging and stimulating to others. Although the exact kinds of future employment may not always be predictable, one fact concerning the new jobs is evident. They will require specialized training, and they will be more likely to be filled successfully by persons having a good educational background.

Not only for young people, their counselors, and their parents, but also for adult workers who may be displaced by technological changes, a study of the occupational situation is highly important. The most comprehensive and helpful source of up-to-date information in this field is the United States Department of Labor's report entitled *Occupational Outlook Handbook, 1963-64 Edition.* This complete survey covers approximately 700 jobs, which are classified under such main headings as Professional, Administrative, Clerical and Service, Skilled Trades, and Sales. Also listed in detail are occupations belonging to the major industries. Separate categories account for jobs in Agriculture, and in various forms of Government Service, including both civilian classifications and the armed forces.

The text matter of the Handbook, covering 774 pages, includes an explanation of each of the principal kinds of jobs and an estimate of the future demand for them. Trends in demand affecting the prospects for occupational changes in the fifteen years between 1950 and 1965 are summarized as follows:

1) A continuing rapid growth in white-collar occupations, especially in the professional and technical occupations.
2) Among blue-collar workers, about average growth in skilled occupations, a slower-than-average growth in semi-skilled occupations, and no change in employment in unskilled occupations.
3) A somewhat faster-than-average growth among service workers.
4) A further decline in the number of farmers and farm laborers.

Within the four major areas of employment thus outlined, there is unlimited scope for examining specific jobs which may be of interest to particular individuals. For example, the mention of rapid growth in professional and technical occupations is a reminder that many new inventions or newly developed processes create not only new jobs but sometimes completely new types of occupation. Even the mechanical or electronic contrivances, by means of which the semi-skilled jobs in group (2) are eliminated, create some demand for workers to manufacture, operate, and service the new equipment. Thus it will be found that at least part of the employment lost through automation is compensated by the labor-saving device itself. The chief difference is that the new occupations added will call for more education and for specialized training. Even robot-like creations which have "memories" and respond to commands are not so automatic as to be independent of control by human intelligence.

Although it is important to know about the changes in the outlook for employment as reflected in the Department of Labor's report, and to make adjustments accordingly, it is also natural for an individual to have occupational preferences. He is not in a position to make demands, but he can make a study of employment as it relates to his tastes, aptitude, interests, and personal characteristics. In this connection, a starting point could be a list of general characteristics like one used by a counselor who was particularly successful in charting young people's careers. Some of the predominating characteristics were grouped in contrasting pairs, for example:

(a) Mental	(e) Original (creative)
Manual	Imitative
(b) Settled	(f) Adaptable
Roving	Self-centered
(c) Indoor	(g) Deliberate
Outdoor	Impulsive
(d) Directive	(h) Dynamic
Dependent	Static

Other characteristics can readily be added to the foregoing examples, if the first thing considered is the individual's make-up as related to different types of occupation. Another approach would be to start with an examination of specific jobs and their requirements in order to determine whether the individual's characteristics would best fit the specifications. Whatever the approach, there is no more fascinating or important study than the question of employment in its range from short-time jobs to lifetime careers.

Oceanography, Popular. Comparable to the way in which space exploration has fascinated the public and has turned people into amateur astronomers is the widespread appeal made by recent explorations of the sea and by the interpretation of oceanic phenomena in language intelligible to the layman. Within strictly scientific areas there are many difficult calculations, experiments, and conclusions that can hardly be shared with the general public. But, as noted by R. E. Coker, author of *The Great and Wide Sea,* oceanography is a large field of study, "not a science in itself but rather a correlation of various sciences—geographical, geological, physical, chemical, and biological, along with some astronomy and mathematics unlimited."

The average person may have gained an almost poetic appreciation of the ocean by reading Rachel Carson's *The Sea Around Us.* He may have had his romantic imagination stirred by reading accounts of buried treasure recovered through the use of new equipment for detection and salvage. From a practical standpoint he may have been impressed by progress recently made in desalting sea water and making it potable or in the recovery of valuable mineral substances long held in solution.

In justice to the typical amateur oceanographer, it should be noted that his interest usually extends to matters including or bordering on the advanced technical research that has long occupied the attention of scientists. Examples are such matters as the submerged mountain ranges that have been discovered and mapped, and the deep valleys such as the Marianas trench or the Philippine trench. From a biological standpoint he may wish to know

about the living organisms brought up from the ocean floor at great depths by improved methods of trawling. In this connection he would probably be interested to learn how the "zero" line of organic life, below which no life was supposed to exist, has gradually been lowered from an initial estimate of 1800 feet to 35,000 feet in the deepest part of the Philippine trench. In other words, the average modern reader wishes to broaden his knowledge for the sake of knowledge. As he studies the findings of research institutions like those at La Jolla, Calif., Seattle, Wash., and Woods Hole, Mass., and learns more about the sea in its various aspects and inexhaustible riches, he realizes that this is really a vast new world to be explored—not remote like the planets or perhaps quite so dramatic, but no less challenging to his powers of comprehension.

Passion Play. This form of religious drama in which are portrayed the sufferings and death of the Savior originated in the ritual prescribed by the Catholic Church on Good Friday. On this day the Gospel describing minutely the happenings that led to the tragedy of Calvary is sung by three of the clergy who represent respectively the Christus, Peter, and the narrator. From this gradually evolved the passion plays of the 13th century. Between 1400 and 1515 these plays reached their highest development. Their presentation was characterized by much elaboration and splendor, the action sometimes lasting over seven days.

At the present day, passion plays may be witnessed from time to time in different parts of the world, especially in the Tyrol and in southern Bohemia. However, the most notable survival of all is that of Oberammergau in upper Bavaria. It dates back to the year 1633, and was the result of a vow made by the villagers to depict every ten years the sufferings of Christ should they be spared from the Black Death, a plague then sweeping over Europe. From the date of that vow but few interruptions have occurred in the decennial celebration.

No less than 700 villagers take part in the Oberammergau Passion Play, each one of whom must be of proved moral integrity. Tradition forbids that married women shall be participants in the sacred drama. Of the proceeds, one-fourth goes to the performers, the remainder to local charities, religious purposes, and town improvements.

Patents. A patent represents a legal right to a monopoly of the production, use, and sale of an invention. This right is granted for a limited time to the inventor by a government. In order to receive such a privilege from the government of the United States, an inventor must have produced some "*new* and *useful* art, machine, manufacture, or composition of matter, or some new and useful improvement thereof." However, such a discovery does not of itself entitle the inventor to a patent. He must, in addition, make known the details of his invention by means of specifications written so clearly and definitely that the desired result could be obtained by other skillful persons who should follow his directions. The application must be made within one year of the first public use, sale, or publication.

Thus it may be seen that the issuance of a patent implies a contract between the government and the inventor. The government gives a temporary monopoly in exchange for complete public information concerning the details of the invention. Should the inventor try to conceal his secret by omitting from his specifications some point which is vital although superficially unimportant, the patent may be declared invalid.

That the importance of patents and copyrights was recognized even in the early days of American history is shown by the fact that authority for their issuance is provided in Article I, Section 8, of the Federal Constitution. Congress created the first patent commission in 1790. The first United States patent was issued July 31, 1790, to Samuel Hopkins of Vermont, for an improved method of preparing pot- and pearl-ashes. Previous to this event patents had been issued by several of the states. The present American patent system was created in 1836.

The United States patent office, which is a branch of the department of commerce, is headed by a commissioner of patents. The commissioner is assisted by a large corps of examiners, whose principal duty is to consider applications for patents and to examine the records to determine whether or not the invention claimed is actually new.

An application for a patent, in order to be considered, must consist of the following items: A petition, addressed to the commissioner of patents and accompanied by a fee of $30; a carefully prepared specification in which are presented the claims on which a patent is asked; a drawing, if possible; and, finally, a statement under oath, that the claimant or claimants personally made the invention which they believe to be new.

Applications are considered strictly in the order in which they are received. If the examiners are satisfied that the claim is for a new and useful invention, the patent is issued after the payment of a second fee of $30. About 2.1 million patents have been issued. The life of the patent is 17 years. Patents for designs are issued for 3½, 7, or 14 years, whichever term the applicant may prefer. Unless a patented article is so marked, and also bears the number of the patent, it is not protected by law.

Patents are not granted for printed matter, for methods of doing business, or on devices for which claims contrary to natural laws are made. The chief examples of the last class are perpetual motion machines. When a patent is asked for such a device, the applicant is informed that his claims cannot be considered unless accompanied by a working model.

An inventor is free to apply personally for his patent. Nevertheless, an official publication of the patent office states that, "Every applicant is advised to employ a competent patent attorney. Great care should be exercised in his selection."

Pawnbroker's Sign. This well-known sign of three golden balls has its origin in the golden byzants, or coins, in which certain officers of the crusaders received payment. These byzants appeared later on the coats of arms of the Lombards, who were the great bankers and money lenders of Europe in the time of the Medici. In course of time the round golden disks were metamorphosed into globes and became the common sign of money lenders and pawnbrokers.

Perfumes. Fragrant flowers are the principal source of the finest perfumes. Nevertheless, the contributions of the animal kingdom and of the chemical laboratory are almost as important to the finished product of a master perfumer as are the essential oils from flowers and other parts of plants.

The principal perfumes obtained from animals are musk, ambergris, civet, and castor. *Musk* is a thick, red-brown, pasty material obtained from the scent glands of the musk deer. The best grades come from China in the original glands, but, because of the high price, adulteration is very common. Musk is sometimes dried and sold as grain musk. *Ambergris* is a soft, variously colored, waxy substance produced by the sperm whale. Whether it is a natural or a morbid secretion is still undecided. It has been taken from the intestines of captured whales, but is usually found floating on the sea or washed up on the shores of the Indian Ocean. Masses of ambergris have been found which weighed 350 pounds. *Civet* is a yellowish brown, buttery secretion from glands of the civet cat, native to Asia and northern Africa. *Castor* comes from glands of the beaver. Each of these materials possesses an intense, more or less nauseating smell. When sufficiently diluted, however, the odors become pleasant.

In perfumery, these animal secretions are valued chiefly because, when used in very small quantities, they add permanence to the lighter floral odors with

which they are mixed. A most valuable vegetable fixative is the oil from clary sage.

Cultivation of flowers for the preparation of perfumes has reached its highest point in southern France, where, in the vicinity of Grasse, Cannes, and Nice, thousands of tons of blossoms are picked each year. At Grasse the average annual production includes 2200 tons of orange blossoms, 1650 tons of roses, 1320 tons of jasmine flowers, 440 tons of violets, 330 tons of tuberoses, and 165 tons of carnations. About 3500 pounds of roses are required to yield 1 pound of the attar, of which the finest quality is produced in Bulgaria.

Petro-chemicals. Included under the term "Petro-chemicals" is a large and growing list of products made from hydro-carbon raw materials derived from petroleum or natural gas sources. Some of these basic petro-chemicals are directly useful and are valued for their own sake. In general, however, they are important as "building blocks" for derivative products which creative chemistry has been turning out in almost incredible variety. From the laboratory test tube to the pilot plant and then to the full-sized factory is a familiar sequence in present-day industrial economy. It is nowhere better illustrated than in the research programs of companies producing petro-chemicals and in the translation of their research findings into useful products for the market place.

Pioneer research in petro-chemicals dates from the 1920's and 1930's, when methanol, formaldehyde, and ammonia made from natural gas were produced in commercial quantities. At this time *butadiene* was also produced from hydro-carbon raw materials. This preliminary work was to prove highly important after the outbreak of World War II, when the cutting off of foreign supplies and the urgent needs for military purposes required a crash program to provide supplies of synthetic rubber and other products for both military and civilian uses. As a result of the impetus growing out of wartime demand, 30 major synthetic rubber, butadiene, and styrene plants were built between 1940 and 1950 along the "Golden Crescent," a strip of Gulf of Mexico coast extending 700 miles from New Orleans to Brownsville, Texas and inland for approximately 100 miles. This area, containing more than 80 per cent of the U.S. capacity, has become the largest center in the world for the production of petro-chemicals.

In somewhat the same way that England and later Germany developed dyes and other by-products from coal in the nineteenth century, petroleum and chemical companies have recently developed innumerable useful products related to and growing out of the basic petroleum industry. Among the additions having commercial importance which are indebted at least in part to petro-chemical research are, to mention a few, plastics, high octane fuels, ethylene glycol anti-freeze solutions, aniline dyes, and, of course, synthetic rubber.

Philately. Whoever first called stamp-collecting "the hobby of kids and kings" had an accurate notion of its strong appeal to young people as well as older ones. Evidently the pursuit of this hobby began almost immediately after Great Britain, in 1840, first issued adhesive stamps to show the prepayment of postal fees.

Philately in its simplest form satisfies the universal passion for collecting something. However, its devotees soon pass from the stage of accumulating packets or books of standard issues having bright colors but no particular value. Then they recognize the art, history, geography, and other educational elements in stamps and begin to think more about their design and significance. Later, perhaps, they become connoisseurs, with an eye to the curious interest, the scarcity, and the sales value of certain specimens. Between an ordinary stamp and the famous British Guiana one-cent stamp of 1856, valued at $32,500, there are many degrees of rarity and interest. Part of the fascination of philately lies in the future, for new stamps, especially commemorative ones, are constantly being issued.

Pidgin, or **Pigeon, English.** A mixed language used much in the ports of China between foreigners and Chinese traders and servants. It is made up of English words, mostly monosyllables, and corrupted Chinese, Portuguese, Malay, and other terms, arranged according to Chinese idiom. The endings ee or o are often added to certain consonants which Chinese find it difficult to pronounce without a following vowel sound. Thus large becomes largee; wife, wifo. The letter r is replaced by l, so that American becomes Melican. "To be or not to be! That is the question," would appear in pidgin English as "Can do, no can do! How fashion?" Pidgin is a Chinese corruption of the word business. Hence pidgin English is business English.

Planetarium. A projection showing an artificial sky in which moving planets of the solar system are seen in their relationship to the sun and to one another. Under a hemispherical dome, stars which belong to a given area of the sky appear in characteristically varying degrees of brightness and in groups forming well-known constellations. Although gear systems are used to produce movements of the heavenly bodies, the exhibit owes its total effect more to optical than to mechanical devices. The mechanism and optical arrangements for planetariums, originating with Zeiss of Jena, have been reproduced successfully in Munich and elsewhere in Europe and also in several cities of the United States, notably New York, Philadelphia, Pittsburgh, Cleveland, Chicago, Los Angeles, and San Francisco.

In the construction of the typical planetarium, the background for the projection consists of thin copper plates perforated with holes through which light shines to represent different stars. In some cases refinements have been added to create certain special effects. For example, in the newest equipment of the Hayden Planetarium in New York and the Morehead Planetarium at Chapel Hill, North Carolina, 42 individual projectors are used to show the stars more realistically. This equipment permits a more satisfactory presentation of Sirius, the brightest star, and of the variable stars Algol, Mira, and Delta Cephei. The sun is necessarily reduced in relative brilliance and some changes in other respects are made in order to provide a working model. The effect as a whole is accurate and surprisingly realistic. The observer has the illusion of being out of doors on a clear night under a starry sky.

POPULAR NAMES OF CITIES

Aberdeen, Scotland. Granite City, from its many granite buildings.

Amsterdam, The Netherlands. Venice of the Netherlands, from its many canals.

Athens, Greece. City of the Violet Crown, in reference to beautiful effects of sunset light on the Acropolis.

Baghdad, Iraq. City of Peace, a name acquired during the reign of the Abbassides.

Baltimore, Md. Monumental City, from the fact that it was the first to erect a monument to the memory of George Washington.

Birmingham, Eng. The Midland Capital, from its central geographical position.

Boston, Mass. Athens of America; City of Notions, from the amount of "Yankee notions," so called, manufactured there; Hub of the Universe, so called by Dr. Oliver Wendell Holmes; Tri-Mountain City, from the three hills on which it was originally built.

Brighton, Eng. Queen of Watering Places, from its popularity as a seaside resort.

Brooklyn, N. Y. City of Churches, from the number of churches it contains.

Buffalo, N. Y. Queen City of the Lakes, from its importance as a lake port.

Chicago, Ill. Garden City, from the number and beauty of its private gardens; Windy City, from the prevalence of strong winds.

Cincinnati, Ohio. Queen City, so called when it was the commercial metropolis of the Middle West.

Cleveland, Ohio. Forest City, from the number of trees on its streets.

Columbus, Ohio. Rose capital of the world.

Constantinople (Istanbul), Turkey. City of the Golden Horn, from the name of its harbor.

Damascus, Syria. Pearl of the Desert, from the beauty of its situation.

Detroit, Mich. City of the Straits, from its location on the strait connecting Lake Saint Clair and Lake Erie; also Automobile City, from its primacy in the motor industry.

Duluth, Minn. Zenith City of the Unsalted Seas, from its position at the head of the Great Lakes.

Edinburgh, Scotland. Modern Athens, from its fame as a center of learning.

Foochow, China. Happy City, from meaning of name.

Halifax, N. S. Warden of the North, from its importance as a British fortified post and naval base.

Hannibal, Mo. Bluff City, from its location on the bluffs of the Mississippi river.

Hartford, Conn. Charter Oak City, in reference to the oak tree in which the charter of the colony of Connecticut is said at one time to have been concealed.

Indianapolis, Ind. Railroad City, from its prominence as a railroad center.

Jerusalem, Palestine. Holy City; City of David; City of Peace.

Keokuk, Iowa. Gate City, from its situation at the foot of the Mississippi rapids.

Lhasa, Tibet. Forbidden City, from the former rigid exclusion of foreigners.

Little Rock, Ark. City of roses.

Liverpool, Eng. The Modern Tyre, from its importance as a seaport.

Louisville, Ky. Falls City, from the falls of the Ohio River.

Lowell, Mass. Spindle City, from its large textile mills.

Manchester, Eng. Cottonopolis, because of its great cotton mills.

Milwaukee, Wis. Cream City, from cream-colored brick manufactured there.

Minneapolis, Minn. Flour City, from its great mills.

Montpelier, Vt. Green Mountain City.

Nashville, Tenn. City of Rocks, from its natural surroundings.

New Haven, Conn. Elm City, from the number of its elms.

New Orleans, La. Crescent City, from its position on a curve of the Mississippi.

New York, N. Y. Empire City, from its being the chief city of the United States; also Gotham, applied by Washington Irving in his *Salmagundi*.

Niagara Falls, N. Y. Power City, from immense amount of electric power generated there.

Paris, France. City of the Lily; City of Louis.

Philadelphia, Pa. City of Brotherly Love, from the meaning of the name; also Quaker City.

Pittsburgh, Pa. Iron City, from the extent of its iron manufactures; Smoky City, from the smoke which overhangs it.

Portland, Me. Forest City, from the number of its trees.

Portland, Oreg. Rose City, from its prolific rose gardens.

Quebec, Que. Gibraltar of America, from the almost impregnable heights upon which the city stands.

Rochester, N. Y. Flower City, from the profusion of flowers and extensive nurseries there; also Kodak City, from its extensive manufacture of photographic cameras.

Rome, Italy. City of the Seven Hills, from the seven eminences over which the city extends.

Saint Louis, Mo. Mound City, from the many ancient mounds found in the vicinity.

San Francisco, Cal. City of the Golden Gate, from its location at the entrance to San Francisco bay.

Savannah, Ga. Garden City, from its parks and gardens.

Springfield, Mass. City of Homes, from the many people of the city who own their homes.

Springfield, Ohio. Flower City, from the beauty of its surroundings.

Stockholm, Sweden. Venice of the North, from its many islands and waterways.

Venice, Italy. City of Saint Mark; City of the Seventy Isles; Queen of the Adriatic.

Washington, D. C. City of Magnificent Distances, from its being laid out on a large and regular scale; also Federal City.

Worcester, Mass. The Faithful City, so called from its motto: *Floreat Semper Civitas Fidelis.*

PRISONS IN THE UNITED STATES

Institution	Location	Prisoners*
U.S. Penitentiary	Atlanta, Ga.	2,589
U.S. Penitentiary	Leavenworth, Kans.	2,521
U.S. Penitentiary	Lewisburg, Pa.	1,712
U.S. Penitentiary	McNeil Island, Wash.	1,301
U S. Penitentiary	Terre Haute, Ind.	1,357
Fed. Reformatory	Alderson, W. Va. (Women)	580
Fed. Reformatory	Chillicothe, Ohio	1,336
Fed. Reformatory	El Reno, Okla.	1,058
Fed. Reformatory	Petersburg, Va.	625
Fed. Correctional Inst.	Ashland, Ky.	548
Fed. Correctional Inst.	Englewood, Col.	442
Fed. Correctional Inst.	Danbury, Conn.	597
Fed. Correctional Inst.	La Tuna, Tex.	693
Fed Correctional Inst.	Lompoc, Calif.	441
Fed. Correctional Inst.	Milan, Mich.	620
Fed. Correctional Inst.	Sandstone, Minn.	253
Fed. Correctional Inst.	Seagoville, Tex.	507
Fed. Correctional Inst.	Tallahassee, Fla.	681
Fed. Correctional Inst.	Terminal Island, Calif.	737
Fed. Correctional Inst.	Texarkana, Tex.	502
Fed. Training School	Washington, D.C. (Boys)	410
Natural Bridge Camp	Natural Bridge, Va.	59
Fed. Prison Camp	Florence, Ariz.	197
Fed. Prison Camp	Greenville, S.C.	308
Fed. Prison Camp	Montgomery, Ala.	224
Fed. Prison Camp	Safford, Ariz.	131
Fed. Prison Camp	Tucson, Ariz.	123
Fed. Detention Hqts.	New York, N.Y.	213
Fed. Medical Center	Springfield, Mo.	986

*Statistics as of October 29, 1959.
Source: *Bureau of Prisons, U.S. Department of Justice.*

PUBLIC HEALTH STATISTICS

The study of the conditions governing the physical well-being of communities has taken its rightful place within recent years, not only as an activity of government, but as a function of various private organizations, and as a subject of instruction in universities.

In 1953, the Public Health Service of the United States government was incorporated in the new Federal department of Health, Education, and Welfare. Established by Congress in 1798 for the management of hospitals, the Public Health Service developed as a bureau of the Treasury department. As part of its varied activities, the service provides medical examinations for immigrants, investigates problems of sanitary engineering, cooperates with local authorities in the control of epidemics, and conducts public health instructions throughout the United States.

To a large extent the science of public health is dependent for its practical service upon accurate records regarding distribution of population, births and deaths, prevalence of diseases, and causes of deaths. These facts are now collected under the title, *Vital Statistics.*

Beginning in 1880, the Bureau of the Census recognized a "registration area" within which death figures were collected suitable for the bureau's purposes. Birth figures were added in 1915. By 1933, all states were included in the registration area for both deaths and births.

BIRTHS AND DEATHS IN UNITED STATES

State*	Births		Deaths	
	1960	1952	1960	1952
Alabama	80,480	83,403	29,927	27,304
Alaska	7,496		1,236	
Arizona	36,172	25,474	10,498	7,854
Arkansas	41,455	43,388	18,057	15,464
California	360,770	258,629	130,672	103,033
Colorado	44,707	38,112	15,767	13,112
Connecticut	55,676	45,408	23,505	19,889
Delaware	11,607	8,952	4,352	3,655
Dist. of Col.	32,908	30,617	10,127	9,160
Florida	114,551	73,886	49,548	30,702
Georgia	95,552	98,180	33,257	30,801
Hawaii	17,332		3,598	
Idaho	17,023	16,406	5,253	4,722
Illinois	235,994	202,294	101,661	92,988
Indiana	111,417	103,907	44,601	40,749
Iowa	64,767	65,121	28,744	26,757
Kansas	49,176	48,005	20,882	19,744
Kentucky	73,673	74,546	29,386	28,302
Louisiana	90,013	79,579	29,882	24,809
Maine	23,618	21,290	10,687	9,784
Maryland	68,999	57,320	27,832	24,153
Michigan	193,886	175,849	67,450	59,094
Minnesota	87,179	78,533	32,467	28,205
Mississippi	59,465	65,431	21,321	20,458
Missouri	101,684	92,189	48,967	44,823
Montana	17,349	16,150	6,459	5,989
Nebraska	33,902	33,692	13,993	13,166
Nevada	7,341	4,473	2,754	1,878
New Hampshire	13,234	12,137	6,524	6,279
New Jersey	126,368	105,863	57,617	50,573
New Mexico	29,104	24,245	6,569	5,520
New York	360,152	326,654	177,932	160,781
North Carolina	110,063	113,993	38,688	32,686
North Dakota	16,561	17,111	5,419	4,942
Ohio	229,937	207,031	93,073	83,891
Oklahoma	50,146	49,645	22,489	19,119
Oregon	38,687	39,589	16,798	14,566
Pennsylvania	241,031	240,116	120,706	110,481
Rhode Island	19,290	18,767	8,921	8,239
South Carolina	59,713	62,347	20,371	18,077
South Dakota	17,697	19,579	6,739	5,895
Tennessee	82,850	82,715	34,394	30,206
Texas	251,120	226,022	76,958	64,852
Utah	26,130	24,239	6,197	5,495
Vermont	8,501	8,938	4,442	4,160
Virginia	89,692	86,403	33,792	30,142
Washington	64,747	63,142	26,648	23,355
West Virginia	40,550	50,037	18,276	17,205
Wisconsin	99,393	89,263	38,245	34,034
Wyoming	8,339	8,311	2,806	2,497
Total	4,247,000	3,458,352	1,702,000	1,336,557

Source: Public Health Service, Department of Health, Education, and Welfare. *Massachusetts not reporting.

Pulitzer Prize Awards. Nearly half a century of creative work by American editors, reporters, news photographers, novelists, historians, playwrights, poets, biographers, and composers is summed up in the record of Pulitzer Prize awards. Along with endowment for establishing a school of journalism at Columbia University, the will of Joseph Pulitzer, newspaper publisher, provided for prizes to be awarded annually for excellence in various kinds of creative activity. In accordance with this bequest, made in 1904, an Advisory Board connected with the School of Journalism was made responsible for receiving nominations and supervising the granting of awards. From 1918, the year in which the first prizes were awarded, to the present, the annual announcements of prize winners have been awaited by the public with keenest interest.

It is not feasible in this connection to present a complete list of categories and winners from 1918 to 1964, but the scope and significance of the awards can at least be indicated by citing examples. As would be expected from the dedication to ideals of journalism shown by Mr. Pulitzer in publishing the New York *World* and the St. Louis *Post-Dispatch*, the record shows a large number of citations for reporters, news photographers, editors, and even cartoonists. In some instances, the award goes to a newspaper as such, in recognition of meritorious service. The selection of newspapers thus honored is not confined to large metropolitan dailies. A considerable proportion of the papers cited are from

CAUSES OF DEATHS IN THE UNITED STATES

Source: Public Health Service, Department of Health, Education, and Welfare, 1960.

Cause	Number	Rate per 100,000
Tuberculosis, all forms	10,670	5.9
Syphilis and its sequelae	3,070	1.7
Typhoid fever*	22	0.0
Dysentery, all forms	370	0.2
Diphtheria	50	. .
Whooping cough	120	0.1
Meningococcal infections	610	0.3
Acute poliomyelitis	260	0.1
Measles	410	0.2
All other infective and parasitic diseases	5,680	3.2
Malignant neoplasms, etc.	265,260	147.4
Diabetes mellitus	30,790	17.1
Major cardiovascular-renal diseases	933,900	518.9
Diseases of cardiovascular system	921,540	512.0
Vascular lesions of central nervous system	192,720	107.1
Diseases of heart	659,410	366.4
Hypertension without mention of heart	12,750	7.1
General arteriosclerosis	36,500	20.3
Other diseases of circulatory system	20,160	11.2
Chronic nephritis, etc.	12,360	6.9
Influenza and pneumonia, etc.	65,820	36.6
Ulcer of stomach and duodenum	10,830	6.0
Gastritis, duodenitis, enteritis, etc.	7,490	4.2
Cirrhosis of liver	20,200	11.2
Acute nephritis, etc.	1,580	0.9
Complications of pregnancy, etc.	1,360	0.8
Congenital malformations	21,510	12.0
Senility, etc., and ill-defined conditions	21,530	12.0
Motor vehicle accidents	37,160	20.6
All other accidents	56,170	31.2
Suicide	19,450	10.8
Homicide	8,010	4.5
Other causes	113,190	62.9
All deaths	1,702,000	945.7

* 1959

BIRTH AND DEATH RATE

By Countries
Per 1000 Inhabitants

Source: Statistical Office of the United Nations

Country	1939		1960	
	Births	Deaths	Births	Deaths
Australia*	17.6	9.9	22.6	8.9
Austria	20.7	15.3	17.7	12.6
Belgium	15.5	13.9	16.9	12.9
Canada	20.4	9.7	26.8	7.8
Ceylon*	36.0	21.8	36.9	9.1
Chile*	33.3	23.3	35.4	12.5
Costa Rica*	42.8	18.5	42.8	9.0
Czechoslovakia*	18.6	13.3	16.0	9.7
Denmark	17.8	10.1	16.7	9.0
El Salvador	41.6	18.3	44.8	10.8
Finland	21.2	14.7	18.5	8.9
France*	14.8	15.6	18.4	11.3
Germany, Western	....	....	17.7	11.4
India**	32.7	21.6	26.4	13.7
Ireland*	19.1	14.2	21.1	12.0
Israel	....	....	26.9	5.7
Italy	23.6	13.4	18.4	9.6
Japan[1]*	26.6	17.8	17.5	7.4
Luxembourg*	15.0	12.7	15.6	11.1
Mexico*	44.6	28.0	47.0	11.9
Netherlands	20.6	8.6	20.1	7.6
New Zealand*	18.7	9.2	26.5	9.1
Nicaragua*	32.5	11.9	44.5	8.6
Norway	15.9	10.2	17.4	9.0
Panama	27.9	11.4	40.8	8.4
Peru*	27.5	13.8	39.2	10.8
Portugal	26.2	15.3	23.4	10.4
Puerto Rico	39.6	17.7	. .	. .
So. Africa, Rep. of[2]*	25.3	9.4	32.5	10.6
Spain	16.6	18.5	21.9	8.9
Sweden	15.4	11.5	13.6	10.0
Switzerland	15.2	11.8	17.8	9.8
United Kingdom*	15.2	12.2	16.9	11.6
United States	17.3	10.6	23.6	9.5
Venezuela*	35.9	18.7	46.9	8.8

* 1959. ** 1958. [1] Japanese Nationals only.
[2] European population only.

comparatively obscure small cities. A glance through the names of a few prize-winning reporters and editorial writers will recall important contributions they have made, not only to journalism but also to the history of their times.

A more or less random selection of names, arranged alphabetically, not chronologically, would include Hanson Baldwin, Hodding Carter, Ralph McGill, Anne O'Hare McCormick, Felix Morley, Ernie Pyle, Leland Stowe, and William Allen White. To these would be added cartoonists such as Rollin Kirby, Bill Mauldin, and John T. McCutcheon, together with news photographers such as Max Desfor and Joe Rosenthal, whose photo of the Iwo Jima flag-raising is known everywhere.

To recall the prize winners in Letters is like outlining a rapid survey of recent American literature. Mention of early awards for novels in the 1920's will bring back such outstanding works as Edith Wharton's *The Age of Innocence* and Booth Tarkington's *Alice Adams*. Later in the same decade come *Arrowsmith* by Sinclair Lewis and *The Bridge of San Luis Rey* by Thornton Wilder. Well-remembered works from the 1930's are Margaret Mitchell's *Gone With the Wind* and John Marquand's *The Late George Apley*. Early in the 1940's appeared John Steinbeck's *The Grapes of Wrath*, then came John Hersey's *A Bell for Adano*. For the 1950's one could cite, among others, Herman Wouk's *The Caine Mutiny* and Ernest Hemingway's *The Old Man and The Sea*. Poets recognized over the years include W. H. Auden, Stephen Vincent Benet, John Gould Fletcher, Robert Frost, Amy Lowell, Archibald MacLeish, Edna St. Vincent Millay, Edwin Arlington Robinson, and Sara Teasdale.

In the classification of History and the related fields of Biography and Autobiography, a few examples to be noted are James Truslow Adams' *The Founding of New England*, Van Wyck Brooks' *The Flowering of New England*, Bruce Catton's *A Stillness at Appomatox*, Douglas Southall Freeman's *R. E. Lee*, Ralph Barton Perry's *The Thought and Character of William James*, John F. Kennedy's *Profiles in Courage*, and Samuel Eliot Morison's *John Paul Jones*.

Playgoers and play readers who have followed the course of American drama during the past half century will find nostalgic pleasure in scanning the Pulitzer list of prize-winning plays. As might be expected, Eugene O'Neill is well represented, not only by the early plays *Beyond the Horizon* and *Anna Christie*, but also by the later *Strange Interlude* and the more recent *Long Day's Journey into Night*. Well-remembered plays with a serious theme are *Ice-bound* by Owen Davis, *Craig's Wife* by George Kelly, *Street Scene* by Elmer Rice, *The Green Pastures* by Marc Connelly, *Idiot's Delight* and *Abe Lincoln in Illinois* by Robert Sherwood, *Our Town* by Thornton Wilder, *Death of a Salesman* by Arthur Miller, *The Shrike* by Joseph Kamm, *The Diary of Anne Frank* by Frances Goodrich and Albert Hackett, and *J. B.* by Archibald MacLeish. In lighter vein, to mention only a few, are *You Can't Take It With You* by Moss Hart and George S. Kaufman, *The Teahouse of the August Moon* by John Patrick, and the hilarious comedy *How To Succeed in Business Without Really Trying* by Frank Loesser and Abe Burrows. Not to be overlooked are some musical plays, the joint work of well-known composers and librettists. Titles in this group include *Of Thee I Sing*, *South Pacific*, and *Fiorella*.

A year-by-year review of the entire list of Pulitzer prize awards as published in various statistical annuals and as described by John Hohenberg in his book, *The Pulitzer Prize Story*, will give anyone a rewarding contact with creative life in America since World War I. As an invitation to re-reading of old favorites or perhaps belatedly catching up on works that were missed at the time, an examination of the Pulitzer Prize record deserves a high place in the average reader's self-improvement program.

Rhodes Scholarships. By the will of Cecil John Rhodes, who died in 1902, a number of scholarships were founded in Oxford university, to be available for men students from the British dominions and colonies, the United States, and Germany. In 1916, the German scholarships were annulled.

Each scholarship is normally of two years' duration, with a possible third year at the discretion of the trustees. The annual value of each scholarship is about $2000. In the United States four appointments are made from each of the eight districts of six states, or a yearly total of 32 scholarships. These men are selected by a district board from a list of 12 in each district who have been previously chosen by a committee. A candidate must be unmarried, between 19 and 25 years of age, and must have completed at least the second year of a college course. The basis for selection involves four considerations: (1) scholarship; (2) character; (3) interest in outdoor sports; (4) interest in one's fellows and instinct for leadership. A candidate in the annual competition may apply from the state in which he lives or from the state in which he has completed the necessary work in a recognized college or university.

Rodeo (*rō'dē-ō*; *rō-dā'ō*). The rodeo had its origin in the round-up, when contests of skill were held among the cowboys present. Included were such events as roping, bronco riding, steer riding, calf roping and tying, steer wrestling, called "bulldogging," and other contests. Public exhibitions of this kind became popular toward the close of the last century, and rodeos are now annual fixtures at various places in the West and Southwest, a notable one being held at Cheyenne, Wyoming. Cowgirls as well as cowboys now participate. The cowgirls engage in pony races and trick riding. There are today numerous professional rodeo performers who tour the country in groups giving exhibitions reminiscent of the old Wild West shows.

Roland for an Oliver. Roland and Oliver were two of the most noted champions in the court of Charlemagne In deeds of prowess they were equally matched. On one occasion they fought for five consecutive days. Neither gained the advantage, hence the phrase "to give a Roland for an Oliver," meaning "blow for blow." The expression is also used to signify the matching of one exaggeration by another.

Roosevelt House. The house at 28 East 20th street, New York City, the birthplace of Theodore Roosevelt, 26th president of the United States, was formally dedicated as a permanent memorial on October 27, 1923. In structure and furnishings, the house has been restored to its original conditions.

Scrolls, Dead Sea. The most remarkable archaeological find of modern times was made by some Bedouin tribesmen in 1947, when they discovered in a cliff cave at Qumran in the Holy Land, near the Dead Sea, some ancient scrolls and fragments of scrolls inscribed in Hebrew, Greek, and in Aramic, the language of Jesus. This and subsequent discoveries in neighboring caves in the same vicinity brought to light the oldest biblical manuscripts known, some of them dating back to 200 B.C. Included among the scrolls, some of which are inscribed on parchment, others on leather, and still others on copper, are parts of every book of the Old Testament, with the exception of Esther, and substantially all of the Book of Isaiah, together with a number of hitherto unknown works.

The importance of the finds is apparent immediately it is remembered that no original copy of the Bible is known to exist. Written between 1300 B.C. and 100 A.D., the earliest complete manuscripts of the New Testament date from the fourth century A.D., while for the text of the Old Testament scholars have heretofore had to rely on Hebrew manuscripts dating from the ninth to the eleventh century A.D.

SEAS AND OTHER BODIES OF SALT WATER

Name	Location	Area Sq. Miles
Adriatic Sea	Southern Europe	60,000
Ægean Sea	Southeastern Europe	70,000
Albemarle Sound	North Carolina	495
Baffin Bay	Canada-Greenland	200,000
Baltic Sea	Northwestern Europe	160,000
Bass Strait	Australia-Tasmania	32,000
Bay of Biscay	France-Spain	160,000
Bay of Fundy	New Brunswick-Nova Scotia	6,300
Bering Sea	Alaska-Siberia	878,000
Black Sea	Southeastern Europe	165,000
Buzzards Bay	Massachusetts	235
Caribbean Sea	Central America-South America-West Indies	750,000
Chesapeake Bay	Maryland-Virginia	6,000
China Sea, East	China-Japan	480,000
Delaware Bay	Delaware-New Jersey	1,000
English Channel	England-France	30,000
Gulf of Aden	Arabia-Somaliland	85,000
Gulf of Bothnia	Sweden-Finland	43,000
Gulf of California	Northwestern Mexico	64,000
Gulf of Carpentaria	Northern Australia	120,000
Gulf of Finland	Finland-Estonia, Europe	15,000
Gulf of Mexico	United States-Mexico-Cuba	700,000
Gulf of Riga	Estonia-Latvia, Europe	7,000
Gulf of St. Lawrence	Canada-Newfoundland	75,000
Gulf of Siam	French Indo-China-Malay Peninsula	100,000
Gulf of Tonkin	China-French Indo-China	45,000
Hudson Bay	Northeastern Canada	470,000
Irish Sea	Ireland-Great Britain	75,000
Japan Sea	Japan-Korea	400,000
Long Island Sound	Connecticut-Long Island	1,500
Mediterranean Sea	Europe-Asia-Africa	1,145,000
Mozambique Chan.	Mozambique-Madagascar	430,000
Narragansett Bay	Rhode Island	140
North Sea	Great Britain-Continental Europe	220,000
Okhotsk Sea	Eastern Siberia	580,000
Persian Gulf	Iran-Arabia	89,000
Puget Sound	Washington	2,000
Red Sea	S. W. Asia-N. E. Africa	177,000
St. George's Channel	Ireland-Wales	8,000
San Francisco Bay	California	350
Sea of Marmora	European Turkey-Asiatic Turkey	4,500
Skagerrak	Denmark-Norway	12,000
Strait of Magellan	Chile-Tierra del Fuego	2,000
White Sea	Northeastern Russia	45,000
Yellow Sea	China-Chosen-Southern Japan	240,000

Seeing Eye. The name of an incorporated society in Morristown, N. J., which trains German shepherd dogs to act as guides to the blind. The breeding and training of dogs so they can be trusted to lead their masters safely even through the heaviest city traffic is due primarily to Mrs. Harrison Eustis, who adapted the idea from a school in Potsdam, Germany, where dogs were trained to assist soldiers blinded in World War I. Assisted by others, she established "Fortunate Fields"—a breeding, training, and research project—in Switzerland in 1924 and founded The Seeing Eye in 1929. The first dog trained by "Fortunate Fields" to be brought to the United States was purchased by Morris Frank, of Nashville, Tenn., in 1928. This dog, known as Buddy, died in 1938, by which time 361 "seeing eye" dogs were in service. It requires about four months to train a dog and an additional four weeks to train his owner to use him. A four-year course is required to make a qualified dog trainer.

Seismology. Seismos is the Greek word for "earthquake." Seismology is the study of earthquakes and of other earth motion such as man has produced. Seismology is the most highly developed branch of geophysics and the seismologist must be well trained in geology, chemistry, physics, and mathematics. It has not been uncommon for a student to spend seven years in graduate studies after college before qualifying for a degree in seismology. Seismology is concerned with the surface motion of the earth, whether it be slow or fast, in a small area or continental, and whether it be weak or intense.

Weak recordings are called "**Microseisms.**" They are always present throughout the world. Some microseisms are known to be produced by waves breaking on the shore, some oscillations of the ground by the swaying of tree trunks during a storm, or the pounding of hurricanes on the ocean. Hurricanes in the Caribbean Sea regularly produce vibrations in Buffalo, New York in the order of a detectable one millionth of an inch and seriously interfere with the interpretation of an earthquake recording.

Thermonuclear energy released on the Bikini Atoll has been recorded in Western United States. Relatively small atomic bombs released energy at the Nevada Test Site that was recorded by seismographs along the Atlantic coast.

Perhaps the strongest earthquake experienced by man occurred in central Assam, India, June 12, 1897. The energy released was thought by some seismologists to be the maximum the earth can release in an earthquake. Though few people were killed (Inamura estimates 1000), all brick and stone buildings were destroyed in a 30,000-square mile area. The town hall in Calcutta, 500 miles from the center of the shaken area, was damaged.

During the 1897 Assam earth strain adjustment over 5000 earthquakes were recorded and Howell claims the number is far in excess of that figure. The United States Department of Commerce, Coast and Geodetic Survey, lists 112 major earthquakes (4 or more on the Richter Scale) occurring in the Prince William Sound area, Alaska, during the 24-hour period after the major quake of March 28, 1964. The activity continued in intensity for days and no doubt will continue for years.

To quote a world wide authority on seismology, Father James Macelwane, S.J., "The name Geodynamics is given to that branch of knowledge in which movements occurring in the earth under the mutual interaction of its parts are discussed with the aid of mathematical analysis." Gutenberg and Richter estimate that 150,000 natural earthquakes are recorded and mathematically studied each year. There is a probability that over a million earthquakes occur each year.

Rigorous mathematical analysis by seismologists has revealed a good concept of the internal structure and some properties of the earth's interior. Seismology indicates the forces now acting in the process of mountain-building, the location of crude oil that has been stored for geologic ages, the location and tracing of hurricanes, and even the location of Saint Peter's tomb. The seismologist Father Lenihan, S.J., selected the aeroplane landing strips for the United States Navy at the South Pole during the recent Geophysical Year. Andrija Mohorovicic, a Croatian, a brilliant seismologist of the past century, was one of the first to study structure in the earth. "Mohorovicic" has been contracted to "Moho" for the great American experiment "the drilling of the Moho Hole."

A reference to the table *Earthquakes and Volcanic Eruptions* will show a chronological listing of a few major earthquakes. The public is impressed with the number of people killed and the buildings destroyed by an earthquake, but this is not a proper norm for the energy released at the time of the earthquake. Few people were killed by the 1897 Assam earthquake violence, while 30,000 were killed by suffocation in 1902 by the Mont Pelee (Martinique, W.I.) earthquake-volcanic eruption.

Before man lived on this earth, earthquakes were active for at least three and a half billion years. Major disturbances therefore as far as man is concerned must be restricted to his existence and location. Some past earthquakes are recorded by fossil faults. When we see sedimentary rock at Niagara Falls, Colorado Canyon, and countless

other places, the rocks we see were below the sea at some time in the past geological ages, and slowly, little by little, were brought to their present position by earthquakes.

Lord Kelvin has said that measurements are necessary for an understanding of physical phenomena. The seismologist uses a *seismometer* to detect and amplify the earth's motion at his station, a *seismograph* to record permanently the seismometers response, and the *record* (*seismogram*) for long mathematical analysis. The physical principle used in the seismometer is much the same that a person experiences riding in an auto when his body is thrown backward or forward when the auto is accelerated or is stopped quickly.

Great forces cause the lithosphere to expand and contract. When a match stick is bowed, it stretches, small chips sometimes fly away, but finally it breaks. Just as the match stick, when the break occurs, releases energy in the form of sound, so also earthquakes release energy. Unlike the single sound wave from the match, earthquakes produce many different kinds of waves which travel in the earth with different velocities. Just as we can estimate the distance of lightning by counting the time between the lightning we see and the thunder we hear, so also with earthquakes.

Unlike the two human ears' detection of the direction of sound, three seismograph stations are used to locate the direction of the epicenter of the earthquake. The majority of earthquakes occur near the earth's surface; however a few occur at a depth of 700 kilometers.

Man has made measurements everywhere on the earth's surface. Now man is projecting his search for knowledge to outer space. It remains for the seismologist to continue his search for the secrets of the earth's interior.

Seven Wonders of the World. The seven most remarkable structures among the ancients, noted either for their beauty or for their size, were: the Great Pyramid of Cheops at Giza; the mausoleum erected by Artemisia at Halicarnassus; the Hanging Gardens of Babylon; the statue of Jupiter at Olympia made by the sculptor Phidias; the temple of Diana at Ephesus; the Colossus of Rhodes; and the Pharos, or lighthouse, at Alexandria.

Such lists are necessarily somewhat arbitrary and vary with the judgment of the persons making the selection. For the Middle Ages, the following are sometimes listed: the Colosseum at Rome; the catacombs at Alexandria; the great wall of China; Stonehenge in England; the leaning tower of Pisa; the porcelain tower of Nanking; and the mosque of Saint Sophia at Istanbul.

Shakespeare Quadricentennial. The 400th anniversary of William Shakespeare's birth (1564–1964) has been observed in many places throughout the world and in widely different ways. The point of view may be that of the historian, the scholar, the drama critic, the actor, the producer, the teacher, or the student. Or the person most interested may be simply the average reader, who claims for himself a share in the inexhaustible riches of culture and entertainment that are provided by Shakespeare's poetry and plays.

It is not as though Shakespeare had been forgotten or neglected and was suddenly being rediscovered. True, a rise and fall in the intensity of interest in the Bard could be charted over the centuries and decades. However, except for occasional brief periods, far apart, history records a continuing series of theatrical performances beginning before 1600 and repeated frequently down to the present. Generations of leading actors have become identified with roles like Hamlet, Lear, Macbeth, and others, and have established their reputations by success in these parts.

Translators in four centuries have used their utmost skill in making Shakespeare's plays available to non-English readers and theater audiences. Rising to the level of genius in such works as the Schlegel-Tieck German version, innumerable worthy renderings have done a like service for other foreign languages. The process has continued to modern times, as witness André Gide's translation of *Hamlet*, printed with facing pages of French and English text. In addition to adults who have become familiar with Shakespeare, both in English and in foreign languages, a host of school pupils the world over have studied, and sometimes acted, his more important plays.

In addition to special performances of Shakespeare's plays, not only in obvious centers like Stratford-on-Avon, England and Stratford, Ontario, but also in cities and towns all over Europe and America, recognition of the Quadricentennial has come in the form of innumerable books and articles. Of lasting interest to the public are commentaries giving a fresh introduction to the plays, with a modern view of the poet's life and art. Taken together with the reading of the plays themselves, these "guide books" by scholars, critics, and historians have made it possible for any reader who is so inclined to renew acquaintance with Shakespeare under the most favorable conditions. In the absence of actual stage productions, which may not be available and which would be limited to a few plays at most, the reader can still cover the whole range of dramatic masterpieces. He can visit and revisit the Castle of Elsinore, the Forest of Arden, and other scenes, including even the Coast of Bohemia. He can enjoy the music of Shakespeare's poetry and can appreciate anew the wisdom and truth of observation in the dramatist's depiction of character.

Of the more recent books, whose publication dates associate them with the Shakespeare Quadricentennial, the following are especially recommended. For biography, outstanding new works are *Shakespeare* by Peter Quennel, and *William Shakespeare* by A. L. Rowse; for history of the period, *Life in Elizabethan England* by A. H. Dodd, and *Shakespeare's Public* by Martin Holmes; for understanding and appreciation of the plays, *Approaching Shakespeare* by William J. Grace, and *William Shakespeare, A Reader's Guide* by Alfred Harbage. To these might be added a foreign appreciation, Jan Kott's *Shakespeare our Contemporary*, translated by Boleslaw Taborski. Persons interested in special problems such as the sequence on the Sonnets and the identity of Mr. W. H., will find books and articles contributing at least something to these unsolved riddles. In fact, abundant material is at hand for any individual to use in organizing his own private Shakespeare Festival.

Matthew Arnold's sonnet on Shakespeare, beginning with the line "Others abide our question. Thou art free." is still pertinent. And yet, from current works by historians, a rather clear and convincing picture of the Bard emerges. It is a freshly presented image of a youth in Stratford, working as a glover in his father's shop; of a young actor-playwright in London, a "sharer" in Lord Chamberlain's company of players; of a facile writer (and frequently adapter) of plays to meet insatiable demands from Elizabethan audiences; of a prudent investor in real estate in his native town; of a grief-stricken father who has lost a son; of a sonneteer whose inspiration and subject of dedication are still a mystery; and as a well-rounded man familiar with Renaissance ideals of honor and chivalry, capable of illustrating these ideals in heroes like Henry V or of satirizing them sympathetically in a comic figure like Falstaff.

Shinto (*shĭn'tō'*) or **Shintoism.** The ancient mythology and religion of the Japanese. In early times, the religion had no dogmas, moral teachings, or sacred writings, nor did it at first receive a distinctive name. There were numerous gods, some good and others malevolent. Some gods were wedded

to women, and from one of these the emperor was descended. After the 6th century A. D., Buddhism, the chief religion of China, was united with Shinto.

In the 18th century, a group of eminent Japanese scholars attacked Buddhism, Confucianism, and all else that was of foreign origin in an endeavor to re-establish the Shinto of the ancient period. Although their efforts produced a marked effect upon literature and politics, Shintoism failed to gain a religious hold upon the people. However, when the revolution of 1865–68 overthrew the rule of the shogun and restored the emperor, Buddhism was disestablished in favor of Shintoism. But, even with this advantage, the pure Shinto could not maintain itself as a religion. Shinto now merely symbolizes the intense patriotism of the Japanese people and provides rites for ceremonials at the imperial court.

Signature of the Cross. The custom of placing the sign of a cross on deeds and documents dates back to early medieval times. With or without the name of a person, it was regarded as equivalent to an oath, and appeared either at the head or the foot of the script. Roughly drawn crosses are frequently met with on wills and contracts dating from the 10th century and later, which indubitably were meant as legal signatures. It was thus that the royal Capets of France and Henry I and Philip I of Castile signed official documents. This usage still survives in the attestation mark of those who are illiterate, and is likewise employed by all Catholic bishops in signing their names both to private and to pastoral letters.

Skin Diving. To the long history of diving, in one form or another, recent developments have added new dimensions and duration so significant as to constitute a major "break-through." Occupational divers, early and recent, range from natives without equipment seeking pearls or sponges to modern construction workers in complete diving suits and having a safety line to connect them with the surface. The freedom and mobility of the one group, combined with the safety and long endurance of the other, is accomplished by modern techniques and the use of a few simple articles of equipment such as masks permitting full vision, web-foot fins to facilitate swimming, and an "air-lung" for long-continued breathing under water. Sometimes the "frog-man" has the benefit of snorkel equipment; as in the Sirio or Cressi masks produced in Italy.

Whether for war purposes, as in the placing of mines against enemy vessels, or for salvage operations to reclaim objects from sunken ships, divers having modern equipment can do more than would have been thought possible a few years ago. In World War II, the competition between British and Italian frog-men in the Mediterranean demonstrated their value as an adjunct to naval operations. Peace-time applications of skin diving range from archeological research to "pleasure and treasure" adventures by divers who are not averse to making a little profit from reclaimed Spanish doubloons or other precious discoveries. In the field of sport, spear fishing is popular with frog-men, who can meet a fish in his own element and almost on his own terms. The perfecting of under-water cameras has enabled skin divers to share with non-divers their views of many submerged wonders. The great popularity of skin diving as sport, hobby, or pastime is indicated by the reported sale, in a three-year period, of $50 million worth of equipment for this purpose in the United States alone.

S. O. S. The signal for distress at sea in the continental wireless telegraphy code. This code is universally used except in the overland service in the United States and Canada, where the American Morse code is employed. The signal, consisting of three dots—three dashes—three dots, is one of the easiest to send and the least easily mistaken.

Spelling Bee, National. Revival of a cherished tradition in America's educational history was accomplished when the Louisville (Ky.) *Courier-Journal*, in 1925, inaugurated the National Spelling Bee. Since 1939, this annual competition for school pupils below the age of 16 has been conducted under the auspices of the Scripps-Howard newspapers. With participating newspapers as local or regional sponsors, contests are held in which finalists are chosen to contend for the national championship at Washington, D.C. A list of newspapers whose sponsorship has produced champions or leading finalists represents a cross-section of American journalism. By supplementing the work of schools in their respective communities, these sponsors have brought back, in modern form, the rivalry recalled by the historic Webster's or McGuffey's spelling books and the lively competition associated with the one-room schoolhouse of the nineteenth century.

As might be expected, a group of finalists who were qualified to compete for the national championship would be pretty hard to spell down unless the words chosen were either unfamiliar or so "tricky" that they could be missed in the excitement of the moment, even by contestants who knew better. In the following list, taken from reports of final elimination contests, are typical examples of words that have been used effectively.

afflatus
atelier
baccalaureate
badinage
cedilla
codicil
condominium
dentifrice
encomium
esoteric
exorcism
gyroscopic
ichthyology
incandescence
lavender
meringue
miscible
mnemonic
persiflage
quidnunc
quietus
ratiocination
sarcophagus
solecism
vicinage

Stamps, Commemorative Postage. Since their introduction to America in 1847, postage stamps in ever-increasing volume and variety have come from the presses of the United States Bureau of Engraving and Printing at Washington. The first two stamps, bearing the pictures of Franklin for the five-cent and Washington for the ten-cent denomination, set the pattern for using historical personages in this way, comparable to the likenesses that similarly appeared on different denominations of currency. In a sense, these might be considered as commemorative stamps, as in the case of Franklin who established the first postal service in the Colonial period. More recently, however, and especially within the past quarter of a century, the term "commemorative" has been given elastic meaning and the widest possible application.

Along with historical events and personalities, there have been themes from geography, science, art, economic progress, invention, nature study, and other matters of general interest, including anniversaries reviving innumerable incidents and accomplishments which a committee on selection considered worthy of commemoration. To create appropriate and attractive pictorial designs in color has been a constant challenge to artists, whose work has been seen to advantage because of improvements in printing processes. Added to their hobby interest for collectors of all ages, and sometimes their monetary value because of rarity, many of these stamps have the special appeal of a miniature art exhibit for private showing at home.

From the innumerable subjects that have inspired outstanding commemorative postage stamps, a few examples suggesting their variety are cited below:

Alaska Statehood
American Flag
American Poultry Industry
Arctic Exploration
Boy Scouts Golden Jubilee
Dental Health
Hawaiian Statehood
Lincoln Sesquicentennial
Marquis de Lafayette

Masaryk, Champion of Liberty
NATO
Petroleum Industry
St. Lawrence Seaway Opening
Steel Industry of America
Teachers of America
Whooping Crane

Many persons would find interesting, enjoyable, and educational pastime in adding to the foregoing list, perhaps in part from their own collections.

Statuary Hall. A hall in the Capitol, Washington, D. C., in which the House of Representatives formerly met. In 1864, it was officially designed as a national statuary hall, and each state was invited to contribute marble or bronze statues of her two most distinguished deceased citizens. In 1934 this number was reduced to one from each state.

Suez Crisis. The Middle East crisis of 1956 came as a result of the development of conflicting international interests in that area following World War II. Among these were the growth of Arab nationalism with its intense hostility toward the new state of Israel; Israel's equally intense determination not to be destroyed; the economic importance of Mideast oil to Western Europe and Britain; the attempts of Russia to extend its influence by exploiting the anti-colonialism of the people of the region, and the moves of the U.S. to meet the Russian menace.

Politically and economically the Middle East became of great strategic importance. When the British mandate in Palestine ended and the new state of Israel was proclaimed in 1948, armies of the Arab League from the nations immediately surrounding Israel began to invade the new country. The Arab League, with headquarters in Cairo, had been founded in 1945 by seven Arab states mainly to prevent the creation of a new Jewish state in Palestine; but in 1947 the United Nations voted to partition Palestine between the Arabs and the Jews. On the outbreak of hostilities many Arabs fled from Palestine to adjoining Arab states, and the status of these refugees has remained a major problem.

In 1949, an armistice agreement between Egypt and Israel was reached and truce boundaries were set along Israel's borders. Egypt was given the administration of the Gaza Strip, while Transjordan took over territory on the west side of the Jordan River. But border incidents continued, and in 1950 Egypt barred ships bound for Israel from using the Suez Canal. It also blockaded the Gulf of Aqaba, thus cutting off the southern Israeli port of Elath from the Red Sea. A United Nations resolution in 1951 calling for an end to the ban on Israeli shipping in the Suez Canal was rejected by Egypt. In 1952 King Farouk was forced to abdicate by a coup led by General Naguib who became premier of Egypt. Naguib was in turn ousted in 1954 by Colonel Nasser who took over control of the government. At the urging of Secretary of State Dulles, Britain agreed with Egypt to withdraw British troops stationed in the Canal zone.

Following Nasser's announcement in 1955 that Egypt would accept the Communist offer of arms, a Middle East Organization was established by the Baghdad Pact Nations—Turkey, Iran, Iraq, Britain, and Pakistan—for mutual defense and to prevent Soviet penetration of the Middle East. On December 17 the United States and Britain offered Egypt $70 million to start work on the Assuan high dam on the Nile River.

Events in 1956 moved steadily toward a climax. In January the United States said it was not ready to sell Israel the arms it requested to offset those supplied to Egypt by the Communists. In June the last British troops were evacuated from the Suez Canal zone, and Colonel Nasser was elected president of Egypt without opposition. The withdrawal on July 19 by the United States of its offer to help Egypt build the Aswan dam was followed on July 26 by President Nasser's announcement of the nationalization of the Suez Canal Company and Egyptian operation of the waterway. An 18-nation plan for international control of the canal proposed by Dulles at a London conference of canal users was rejected by Egypt on August 21. On October 29 Israel launched a major offensive against Egypt to wipe out the Gaza bases used by Egyptian commandos for raids on Israel and to open the Gulf of Aqaba. The next day Britain and France warned Egypt and Israel to cease hostilities. Egypt rejected the British-French demand to occupy Suez to protect the canal. On October 31 Britain and France began bombing Egyptian bases. Egypt blockaded the canal. On November 5 Britain and France invaded Egypt, and the United Nations voted a police force to take charge of the situation. On November 6 British Prime Minister Eden announced that Anglo-French troops would cease firing at midnight. By December 22 these forces had been withdrawn. Meanwhile, the U.N. Emergency Force had entered the Canal zone.

In 1957 Israel under U.N. pressure finally retired from invaded territory, and the U.N. Emergency Force occupied Gaza and the area at the entrance to the Gulf of Aqaba. The canal was cleared and opened to traffic in April but a number of major questions remained to be answered.

Symbolism of Flowers. The following is a brief list selected from a large number of flowers and plants to which poetry, tradition, or usage has attached particular meanings. But there is no uniformity of agreement concerning these symbolisms and no authoritative list can be presented.

Amaranth	Immortality
Anemone	Anticipation, Frailty
Apple Blossom	Admiration
Aspen Leaf	Fear
Asphodel	Death, Memorial sorrow
Bay	The poet's crown
Buttercup	Wealth
Calla	Magnificent beauty, Pride
Camellia, White	Innate worth
Candytuft	Indifference
Cardinal Flower	Distinction
Cornflower	Delicacy
Cowslip	Youthful beauty
Cyclamen	Diffidence
Cypress	Mourning
Daffodil	Unrequited love
Daisy	Simplicity, Innocence
Dandelion	Coquetry
Everlasting	Undying affection
Fern	Sincerity
Fir Tree	Time
Forget-me-not	True love
Four-leafed Clover	Good luck
Foxglove	Insincerity
Gentian	Virgin pride
Geranium	Gentility
Goldenrod	Encouragement
Heather	Loneliness
Heather, White	Good fortune
Heliotrope	Devotion
Hepatica	Anger
Hollyhock	Ambition
Honeysuckle	Friendship
Hyacinth	Sorrow
Ivy	Trustfulness, Wedded love
Laurel	Fame
Lilac	Fastidiousness
Lily, White	Purity
Lotus	Forgetfulness, Estranged love
Marigold	Contempt
Myrtle	Beauty's crown, Wedded bliss
Narcissus	Vanity
Oak Leaf	Patriotism, Hospitality
Olive Branch	Peace
Orange Blossom	Marriage
Oxalis	Pangs of regret
Palm Leaf	Victory
Pansy	Thoughts
Peony	Indignation
Poppy, White	Oblivion
Primrose	Early youth
Rose	Love
Rosemary	Remembrance
Rue	Repentance, Disdain
Scotch Thistle	Retaliation
Shamrock	Loyalty
Snowdrop	Friend in need
Sting Nettle	Slander

Sweet William	Gallantry
Tuberose	Bereavement
Tulip, Yellow	Hopeless love
Violet	Modesty
Wallflower	Faithful love
Water Lily	Purity of heart
Yellow Rose	Jealousy
Yew	Death

Talking Drums of Africa. The native drums of Africa have been used for centuries to beat out messages that have been relayed across hundreds of miles of jungle. These talking drums, which have two tones, are large hollow logs with solid ends and a long narrow slit two or three inches wide extending almost their entire length. Suspended from a tree or framework, a drum is played by beating the log near the edges of the slit, the two tones being produced because one side is more hollow and thinner-lipped than the other. The drummer, using two sticks with rubber-bound ends, beats out the syllables of the words of the message, giving each syllable its fixed tone value, which is either high or low, like the spoken language. The drum literally talks in imitation of native speech. Since more than one word may have the same number of syllables and tone value, a large number of stock phrases are used. Almost every native has a drum name, and even children understand theirs when they hear them. The talking drums can be heard afar.

Theaters. Within recent years, the art and the management of the theater have undergone some very interesting developments. In America, the more general use of dramatic representations in the form of pageants, the recognition of the value of dramatic form in education, and the systematic study of the art of the theater in schools and colleges have enlarged the place of the theater in popular culture. The consolidation of the management of theaters in the great centers and of theater circuits throughout the country has been accompanied by movements toward the establishment of local and independent playhouses under the direction of drama leagues and local organizations of amateur or semiprofessional players. Many schools and colleges also maintain small indoor and outdoor theaters for the production of plays either by students or by professional companies.

In these various recent developments there appear phases which have marked the history of the theater. The outdoor theaters of classic design, such as that erected at the University of California, recall the great unroofed theaters of ancient Athens, where the seats for spectators were ranged in tiers on sloping hillsides. The Romans, building on level land, erected the sloping tiers of seats upon arches.

When, after several centuries of neglect, the building of theaters was begun in London in the 16th century, they were at first erected without roofs, except over part of the stage and some of the stalls or boxes which were ranged around the central "pit." This form of building has been traced to the innyards surrounded by balconies, in which strolling players gave their entertainments.

The first recorded theatrical season in America was conducted in New York in 1750–51. The first play of this season was *Richard III*, in which Thomas Kean played Richard. The Southwark theater, built in Philadelphia in 1766, was the first permanent theater in the colonies. In 1800, there were only three theaters of importance in American cities; by 1850, probably 50 were in use.

Thermoelectric Effect. If two dissimilar conductors are connected together so as to form a closed loop, an electric current is observed to flow in the loop when one of the junctions where the two conductors are joined is maintained at a different temperature than the other junction. This effect was first observed by Johann Thomas Seebeck in 1821. While the current that flows in such a circuit is dependent on the resistance of the circuit, it is found that, for any given pair of conducting materials, the electromotive force developed in the circuit depends only on the temperature difference between the two junctions. It is this property of such a circuit that renders it a very practical devise for the measurement of temperature. This type of circuit when used for the measurement of temperature is referred to as a *thermocouple.*

As usually employed, one junction of the thermocouple is maintained at a fixed known temperature while the other junction is exposed to the temperature to be measured, e.g. placed in a furnace or fastened directly to a body whose temperature is to be determined. Since the electromotive force developed in the circuit depends only on the temperature difference between the junctions, and the temperature of one junction is known, a simple measurement of the electromotive force in the circuit gives a direct measure of the temperature of the other junction.

Another possible application of Seebeck's discovery is the generation of electric power by the direct conversion of heat to electrical energy. Until quite recently the use of such a thermoelectric generator was not considered practical because of the low efficiency of such a device constructed from available conducting materials. However, with the recent advances in the field of solid state physics and the availability of semiconductor materials having thermoelectric efficiencies many times greater than that of previously available materials, considerable effort has been directed toward the development of practical thermoelectric generators and such generators are now available.

What is essentially the inverse of the Seebeck effect was observed in 1834 by Jean Charles Athanase Peltier. Peltier found that, if a battery were placed in a circuit loop made up of two dissimilar conductors such as Seebeck had used, so that an electric current was made to flow through the circuit, heat was generated at one of the circuit junctions while at the other junction heat was absorbed, that is, it was cooled. The practical application of this effect, like that of Seebeck's effect, had to await the developments of modern solid state physics. However, today thermoelectric cooling is finding extensive use.

Third Degree. The psychological or moral method used by the police in the United States for the purpose of forcing the truth from a suspected criminal. It consists in continuous and relentless questionings, lasting for many hours or even for days, until the prisoner, if guilty, is morally compelled to give way and confess. The system has been at times severely criticized, and charges of cruelty have been brought against the police on this account. The authorities have denied such accusations and are firm in their belief in such moral suasion. The method of the "third degree" seems to have developed imperceptibly and no fixed period can be mentioned when it originated

Tip. A gratuity given to waiters, porters, and other servants for services rendered or expected. In this sense the term is used in America. In England it is employed, moreover, to denote a small present of money made to a relative or schoolboy by an elder. Hence the expression "a schoolboy's tip." The origin of the word is dubious, but would seem closely allied to the kindred word tip" or tap, with the sense of touching the elbow slightly by way of private hint. One explanation is that the word was formed by placing in order the first letters of the words in the phrase "to insure promptness."

Tongs. These are Chinese benevolent protective associations in the United States. There are no tongs in China. They grew up as a means of self-protection by Chinese laborers against oppression and persecution at the hands of white communities in the period from 1848 to 1875, when many "coolies" were hired by gold mining and railroad construction companies.

The word tong refers to the living room of a Chinese house and was probably applied to the secret

societies because they originally met in the houses of members. There are about 15 tongs in the United States, among the largest of which are the Hip Sings and the On Leongs. These tongs were engaged in murderous feuds, popularly known as tong wars, in 1917, 1924, and 1930. A general arbitration agreement was signed by the leading tongs in 1930.

Totem Poles. Carved wooden poles or pillars which are set up before the houses of certain Indian tribes of the northwest coast of North America, especially those of Koluschan stock in southeastern Alaska. They are used to exhibit totem figures.

A typical totem pole is fashioned from a huge log 40 or 50 feet in length. This is erected like a flagstaff in front or by the side of a low wooden dwelling and rudely carved throughout its entire length with immense grotesque figures of man, beast, and bird, the weird effect of which is heightened by daubs of blue, green, and red paint. Usually the carvings consist principally of three half human, half animal figures, seated above one another, upholding the remainder of the pole at the summit of which is a figure representing the totem. Sometimes the totem pole is only a smooth massive tree trunk with the totem figure, usually that of a bird or of some weird animal, displayed at the top.

The totem and other signs and symbols on a pole serve to identify Indians of one particular family, group, or kindred, so closely allied that intermarriage is forbidden among them. Totem poles, although not worshipped, have a profound social and religious significance and are emblematic of family pride, veneration of ancestors, and legendary religion.

Transistors. The transistor (tran*sfer re*sistor) was introduced to the public by the filing of a patent on June 17, 1948. Its development over a period of more than two decades resulted from the effort of numerous scientist-inventors, including not only John Bardeen and Walter H. Brattain, whose names are associated with the invention, but also Seymour Benzer, William Shockley, and many others. Studies contributing to the transistor's development were made at such research centers as Purdue University and the Bell Telephone Laboratories. Some of the more significant findings could have been released as early as 1942, but were withheld as a matter of war-time secrecy.

A short definition borrowed from a U.S. government procurement document (MIL-T-12679A, Sig. C) is as follows: "A transistor is an active transducer which depends for its essential behavior on the transport and control of charges in semi-conductors." Since one definition often calls for another, perhaps the following explanatory statement should be added: "A semi-conductor is an electronic conductor, with resistivity in the range between metals and insulators, in which the electrical charge *carrier* communication increases with increasing temperature over some temperature range." The average reader is probably mystified by technical details regarding the nature and availability of substances used as semi-conductors (germanium and silicon), or with their "contact potential" and their behavior when used in transistors. Although an understanding of the fundamental theory regarding all this would require intensive study, the practical application of transistors is a matter of everyday observation and experience. It would be difficult to exaggerate the importance of transistors or to measure their impact on automation, communication, miniaturization, and various other practical aspects of modern life.

In its application to commercial and scientific products, the transistor has shown surprising versatility. As a tiny amplifier and rectifier, it has been employed in telephone communication made possible by a small battery fed by solar energy. Whether it is used in radio, in hearing aids, in electronic computers, or in lightweight instruments carried by earth satellites, the transistor can do the work of bulky vacuum tubes and can operate more reliably in the process. Among the advantages claimed for it in addition to its small size are these points in its favor: it needs no light voltage power but operates "cold;" it is unbreakable; and it has a long life. An early and limited use of semiconductors, which are essential to its construction, is recalled from the 1920's. Older persons looking back to that period, when they first became acquainted with radio, are familiar with the so-called "cat's whisker" receiver in a "crystal" set which utilized a detector crystal, or semi-conductor, to produce audible reception. From this primitive use of the semi-conductor (half conductor and half insulator) to the fully developed era of transistors is an amazing chapter of scientific and inventive progress.

Tutankhamen (*tōōt-änk'ă-mĕn*), **Discovery of Tomb of.** In November 1922, Mr. Howard Carter, an American Egyptologist, and Lord Carnarvon of England, who for seven years had been conducting excavations in the Valley of the Kings, near Luxor, were rewarded by the discovery of the undespoiled tomb of the ancient Egyptian emperor, Tutankhamen, who reigned in the 14th century B. C. Their achievement was recognized as one of the most remarkable in the history of archeological research.

Under the Rose. (Lat., *sub rosa*) An expression of very ancient date meaning in strict secrecy or confidence. According to classic mythology, Cupid gave Harpocrates, the god of silence, a rose to bribe him not to betray the amours of Venus. Hence the flower became a symbol of secrecy. The expression is now common to all European languages, but is said to have originated in Germany. The phrase came into vogue in England about the middle of the 16th century. As a flower sacred to Freya, under which name Venus was known to the Norsemen, the rose appeared as an architectural decoration on the ceilings of banquet halls. Thus, at table, when wine flowed and tongues were loosed, words uttered beneath the flower of Freya became hallowed and could not be uttered elsewhere.

United States Money. The money of general circulation in the United States consists of silver and minor coins and three chief types of certificates or notes. Gold was called into the treasury and withdrawn from circulation in 1933. After the gold content of the dollar had been changed from 23.22 grains to 13 5/7 grains in 1934, the legal value of coins no longer conformed to face value. Coinage on the new basis has not been authorized.

Gold certificates, representing their face value in gold, are restricted to use by Federal Reserve banks as part of their reserves against note issues. They exist in denominations of $10, $20, $50, $100, $500, $5000, and $10,000.

In addition to the three chief types of certificates in general circulation, three other types are in process of being withdrawn.

The following are types of money authorized for circulation, all of them being legal tender:

Silver Dollars contain 371.25 grains of pure silver plus 41.25 grains of copper alloy. Coinage of silver dollars was discontinued in 1905 and recommenced in 1921.

Subsidiary Silver Coins in the denominations of 10, 25, and 50 cents contain 347.22 grains of silver plus 38.58 grains of alloy for each dollar of face value. They weigh about 1 gram for each four cents of value.

Minor Coins. The nickel (5 cents) and penny (1 cent).

Silver Certificates, issued against silver dollars deposited in the treasury of the United States, in denominations of $1, $2, $5, $10, $20, $50, and $100.

Federal Reserve Notes, in denominations of $5, $10, $20, $50, $100, $500, $1000, $5000, and $10,000.

United States Notes, in the same denominations as silver certificates with the addition of $500 and $1000.

Treasury Notes of 1890. Same denominations as United States notes.

National Bank Notes, in denominations of $5, $10, $20, $50, $100, $500, and $1000.

Federal Reserve Bank Notes, in values as for Federal Reserve notes up to $1000 but not above.

Issuance of the last three has been discontinued.

The seal of the United States treasury, which is placed upon each piece of paper money, bears the abbreviations of the Latin words, *Thesauri Americani Septentrionalis Sigillum*, meaning "Seal of the Treasury of North America." This is an interesting relic of those days when it was believed that Canada would become a part of the United States.

Certificates of the smaller denominations are usually worn out within three years by handling. About $1 of every $200 issued is never returned for redemption. Torn, burned, or otherwise damaged bills will be redeemed at their full face value if at least .6 of the surface is delivered at the Treasury; half of the face value will be redeemed if less than .6 but more than .4 of the surface has been saved. See *Money in the United States*.

Universal Languages. The chief obstacle to communication between people inhabiting different parts of the world is diversity of language. At various times in history, certain languages have attained sufficient prestige to be widely used as an international medium of expression. Among them have been Assyrian, Greek, Latin, Arabic, French, and English. In recent times, however, an opposite tendency has appeared; the growth of nationalism has resulted in the revival of many languages which had been dying out. One notable revival is that of Irish, which has been declared the official language of Ireland. In the meantime, closer commercial relations, the increasing popularity of travel, and the development of radiotelephony make it more and more desirable that people of all nationalities should be able to understand each other.

There have been a number of attempts to construct an artificial language which might easily be learned by people of different tongues. Those best known are Volapük and Esperanto.

Volapük was published in 1880 by J. M. Schleyer, a priest of southern Germany. It is based mainly on English, the rest of the vocabulary being drawn from Latin and the Romance languages. The name is a combination of words meaning "world" and "speak." The language spread rapidly, and, when the third Volapük congress met at Paris in 1889, there were 283 Volapük societies and the total number of students of the language was estimated at more than one million. Its popularity rapidly declined because of dissensions, the founder refusing to accept modifications desired by the Volapük academy, which, under the direction of M. Rosenberger of Petrograd, began to construct a new language entitled Idiom Neutral.

Esperanto was set forth by a Russian physician, Zamenhof, whose first publication on the subject appeared in 1887 over the signature Dr. Esperanto, "Hopeful." By means of using as roots many words common to European languages he was able to give Esperanto a familiar look that helped to make it acceptable. Many of these roots were from the Latin or Romance language groups. The grammar was made sufficiently simple to be learned in five minutes. For example, all nouns end in *o* and all adjectives in *a*. There is a minimum of inflection. A typical short sentence, "I have a book," is translated "*Mi havas libron.*" The *n* for the objective form in *libron* is one of the comparatively few instances of declension. Inspired simplification was shown by Dr. Zamenhof in his use of prefixes and suffixes to build numerous words from a few basic stems. Thus, the root *san*, familiar in the English word "sanitation," is used to form the noun *sano*, health, and the adjective *sana*, healthy, as well as the verbs *sani*, to become healthy, and *sanigi*, to make healthy. By adding *mal*, which is the regular negative prefix in Esperanto, a corresponding group of words can be formed from the same stem: *malsano*, meaning disease, *malsana*, ill, *malsani*, to become ill, and *malsanigi*, to make ill. Although Latin stems are conspicuously numerous, concessions are made to other languages. For example, the word *Knabo* for boy is close to the German.

Naturally, a synthetic language would not be expected to convey the shades of meaning needed for the translation of literary works, but it can have practical uses. Within its field, Esperanto, the most enduring and most promising of artificial languages, has contributed something of value to international communication.

Urban Renewal. In a notable development of the 1950's and 1960's, American thinking has advanced from the idea of slum clearance, which was emphasized in the Federal Housing Act of 1949, to a positive concept of community improvement and of core renewal to revitalize the heart of a city. A landmark in this progress was the Act of 1954, which was designed to promote rehabilitation of older residential property before it could deteriorate too far, and at the same time to encourage the expansion of commercial and industrial enterprises, on which the economic health of an urban community is based. To aid in accomplishing these objectives, the FHA was empowered to assist in financing certain renewal projects.

In 1956, Federal legislation was passed to provide assistance in re-locating businesses from urban renewal areas. An additional step was taken in 1959, when Congress passed legislation introducing the Community Renewal Program (CRP), which provided for planning a group of related improvements to replace buildings that had been removed from blighted areas. A still further development came with the appointment of a Housing Administrator and the passage of the 1961 Act, which not only facilitated the accomplishment of the previously announced objectives, but also included a provision for public housing where that seemed to be needed.

Although financial assistance by the Federal government has been involved in the improvements indicated in the foregoing summary of legislation, the bulk of the financing has been done by private investors whose participation represents, according to a statement by an official of the Urban Renewal Association, $6 of private investment for every $1 of capital grant funds.

In addition to Federally sponsored renewal projects there are numerous developments which are primarily the result of private initiative encouraged by local civic and business leaders. Community pride and long-range vision on the part of progressive citizens have entered into the promotion of these locally activated projects. Thus, whether assisted by the Federal government or not, there has been, in many cities, a resurgence of community spirit which is being reflected in outstanding examples of architecture and city planning. A few typical examples will illustrate the nature of this development.

Among the cities that have made extensive improvements, one of the earliest to undertake a core renewal project was Pittsburgh, Pa., whose "Golden Triangle" has undergone a remarkable transformation. The improvement at this point, now completed, represents the construction of 28 major buildings, costing $259 million. Long associated with real or partly imagined dinginess belonging to a so-called "Smoky City," its new look has attracted wide-spread attention and admiration. However, the city's renewal project has not been limited to a single downtown area or to a particular type of improvement. Going forward at the same time, in different stages of completion, have been projects affecting all parts of the city. Examples are highways, tunnels and bridges, parks and general improvements, a $20-million auditorium completed, and a $22-million stadium planned. Also in the planning stage are a number of improvements for half a dozen outlying districts which, when completed, will cost $119 million.

The case of Pittsburgh has been cited somewhat at length because of balance and variety in its renewal projects as well as their cost and architectural distinction. If space permitted, many projects in other cities could be mentioned as comparable illustrations of civic enterprise.

Although they are more conspicuous in the core

areas, with their tall buildings and broad esplanades, the renewal projects in most cities represent a branching out into community improvement as contemplated originally by the legislation that has been mentioned. Development in a wider radius, to include environment as well as living or working space brings with it the necessity of examining many interrelated matters such as parking, mass transportation, sanitary facilities, and sometimes political boundaries and jurisdiction. In some instances there is the problem of preserving historic landmarks which happen to lie in the path of a planned development. If the historic sites are islands of serenity in a busy section, as is true of Bryant Park in New York City or Lytle Square in Cincinnati, the question of their preservation may indicate concern for the future as well as reverence for tradition. A problem frequently encountered in connection with renewal changes is to maintain the identity of divisions, both urban and suburban, which have developed a neighborhood spirit and a distinctive character of their own.

Although many renewal projects that have been undertaken by Pittsburgh and other cities have already been completed, still more are under construction or in an early planning stage. Of the projects that belong almost entirely to the future, a particularly interesting example is the city of Washington, D.C., with its world-famous thoroughfare, Pennsylvania Avenue. In this city, where the Act of 1949 was passed for the benefit of the country at large, there are striking illustrations of the conditions that the Urban Renewal legislation was designed to correct. Awareness of the painful contrast between the dignity and symbolic impressiveness of government buildings and the shabbiness of adjacent business and residence structures led to the creation, in 1962, of a "President's Council for Pennsylvania Avenue" to work with the National Capital Planning Commission. The ten members of the President's Council included architects, city planners, landscapists, and social planners. Their problem with reference to Pennsylvania Avenue was to work toward an effective collaboration between government and business, the two occupants of the area, in order to create a thoroughfare befitting its national and world importance.

The changes contemplated called for planning in depth, and not merely the creating of an imposing facade. The purpose was to evolve something beautiful and distinctive that would be characteristically American and not an imitation of the *Champs Elysees* or some other foreign model. As the plan has been developed thus far, it has included such features as "a great national square" at the Avenue's western terminus and three-level sidewalks along the Avenue, which would serve as permanent "grandstands" for spectators watching parades. Intersections would be simplified, and emphasis would be placed on the Avenue as a direct link between the White House and the Capitol. The pavement prescribed for the Avenue would be "rich but subdued." By its example when this and other renewal projects are completed, and even by its catalytic influence during the planning stage, the nation's capital can give added meaning to a renewal movement that has already made significant headway in American cities.

Water. The fluid which falls from the clouds in rain, which forms lakes and streams in the land, and which fills the vast ocean that surrounds the land. Because of its universal presence, its multifold usefulness, and its immense extent, water is one of the most important of all substances. It covers more than five-sevenths of the earth's surface, makes up about seven-eighths of the animal body, constitutes fully nine-tenths of the bodies of many plants, and is found in numerous minerals and rocks. Moreover, it is absolutely necessary to the existence of life. Without water, the entire vegetable and animal kingdoms would quickly perish and the teeming earth would soon become as lifeless as the moon.

Occurrence and Quantity. In addition to forming streams, seas, and a large part of all plant and animal structures, water occurs throughout the soil and rocks and, as vapor, enters into the composition of the air. Water, therefore, is an important factor in the earth's lithosphere, hydrosphere, and atmosphere. It is estimated that if the water of the ocean were distributed in a layer of equal thickness over the whole earth, it would cover it to a depth of about two miles. It is computed also that if all the water on the earth were gathered together into one mass, it would form a sphere 900 miles in diameter.

Chemical Composition. Water is a chemical compound composed of oxygen and hydrogen. It is formed by the union of one volume of the former with two of the latter. By weight, water contains 88.814 per cent oxygen and 11.186 per cent hydrogen. Chemically pure water, therefore, is the oxide of hydrogen and has the formula H_2O. In the popular sense, pure water usually contains small quantities of various substances which do not impair its usefulness for practical purposes.

Physical Properties. Water occurs in nature in three states,—liquid, solid, and gaseous. Under normal atmospheric pressure, water is a liquid between 32° F., or 0° C., its freezing point, and 212° F., or 100° C., its boiling point. At the freezing point it becomes ice and at the boiling point, steam. In dry air, however, both liquid water at temperatures above freezing and solid ice at temperatures below freezing evaporate slowly. Water attains its greatest density at 39.2° F., or about 4° C.

The specific heat of water is greater than that of any other substance except hydrogen. The amount of heat required to raise the temperature of one gram of water from 18° C. to 19° C. has been adopted as the unit of heat known as the gram-calorie.

Water and Civilization. Wherever it occurs, growth and concentration of population brings with it an immeasurably increased demand for water, not only for domestic consumption but also for power, irrigation, industrial processes, air conditioning, and various other uses. The question of water supply, and especially of the management of water resources, becomes increasingly important, purely as a problem of survival. It is a sign of the times that man's progress in technology has been called upon to tap one source of water that has not hitherto been available in usable form and make it suitable for human consumption. It happens that some parched areas where water is a luxury are adjacent to unlimited supplies of sea water. Recent developments in the conversion of this briny and brackish liquid into acceptable form indicate that at least a partial solution to the water supply problem in those regions may not be too far off.

A promising method coming into use is based on the fact that ice formed by freezing sea water is free of minerals, including salt. Inventor of the process using this fact is Dr. Alexander Zarchin, an electronic engineer who was formerly a research assistant at the Leningrad Technical Institute. A plant using his method is being developed in Israel. Another type of conversion plant passes the water through evaporator units connected in series so that the condensed steam from each unit will heat the water in the next. This method has been tested in the pilot plant stage, and a large plant is soon to be built at Freeport, Texas under the direction of the Office of Saline Water in the U.S. Department of the Interior. When large plants are in operation the cost of conversion, according to present estimates, will be approximately 40 cents per thousand gallons of desalted water.

Watermark. The faintly marked letter, figure, or design, seen on paper when held to the light, is used to denote place of manufacture, size, or quality. The watermark is formed during the process of manufacture by the pressure of wires on the wet pulp. One of the earliest designs was that of a dolphin, the coat of arms of Rives, a small town in

France noted for its paper factories. This mark is still used by some manufacturers to denote a good quality of paper. The names of various watermarks employed by earlier paper makers now serve to denote some of the present standard sizes of paper, as *foolscap, crown, elephant,* and *post,* the last so named because of a postman's horn used as a watermark.

White House. The name applied, both popularly and officially, to the residence of the president of the United States. The mansion is located on Pennsylvania avenue, about a mile and a half from the Capitol, upon a site selected by President Washington and Major L'Enfant in 1791. The original design of the building was made by James Hoban of Dublin, and was selected through a competition in 1792. On October 13, the cornerstone was laid.

The White House was occupied for the first time by President John Adams in November 1800. It was burned by the British in 1814. In rebuilding, white paint was used to cover the traces of fire. Hence it became known as the White House. This title was offically adopted by President Theodore Roosevelt in 1901. The structure, four stories in height, with a frontage of 170 feet and a depth of 86 feet, is surrounded by a park of 75 acres. The first floor is occupied mainly by the rooms for public functions, with the apartments of the president and his family above. The White House was remodeled in 1902, and improvements were made again in 1927. In 1949, the interior was torn out in a major operation, completed in 1952.

Women, First in Public Life. The first woman to be elected to the United States House of Representatives was Jeannette Rankin (1880–) of Montana, Republican, who served 1917–19.

The first woman member of the United States Senate was Mrs. Rebecca Felton (1835–1930) of Georgia, who held office for one day in 1922 under appointment by the governor of Georgia. The first woman to be elected to the Senate was Mrs. Hattie Caraway in 1933. The first woman to be elected as state governor was Mrs. Nellie Tayloe Ross (1880–) of Wyoming, Democrat, who served from 1925 to 1927. She was also the first woman director of the mint, being appointed in 1933.

The first woman cabinet member in the United States was Frances Perkins (Mrs. Paul Wilson, 1882–), appointed secretary of labor in 1933.

World Data Centers. An outgrowth of the IGY research project and of agreements reached by the nations that participated was the establishment of three global centers for the assembling and distribution of data. World Data Center A is maintained by the United States; B is in charge of the USSR, and C is maintained by eight nations of Western Europe, together with Japan and Australia. Interchange of information and co-operation in all other respects insured that the joint effort shown by different countries in conducting the original IGY research will be continued in the immense task of digesting, interpreting, and evaluating the mass of data gathered by the investigators. Copies of reports received by one World Data Center are supplied to the others, so that the resources of all the centers are always identical. Through catalogs issued at six-month intervals, individuals and institutions are kept informed as to data available which may be obtained in any of the different centers.

World Data Center A, for which the United States is responsible, has been organized into eleven divisions, or "archives," which are listed below, with their respective locations and the special field of subject matter with which each is concerned.

1. Airglow and Ionosphere; Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colo.
2. Aurora (Instrumental); Geophysical Institute, University of Alaska, College, Alaska.
3. Aurora (Visual); Rockefeller Hall, Cornell University, Ithaca, N.Y.
4. Cosmic Rays; School of Physics, University of Minnesota, Minneapolis, Minn.
5. Geomagnetism, Gravity, and Seismology; Geophysics Division, U.S. Coast and Geodetic Survey, Washington, D.C.
6. Glaciology; American Geographical Society, New York, N.Y.
7. Longitude and Latitude; U.S. Naval Observatory, Washington, D.C.
8. Meteorology and Nuclear Radiation; National Weather Records Center, Asheville, N.C.
9. Oceanography; Department of Oceanography and Meteorology, Agricultural and Mechanical College of Texas, College Station, Tex.
10. Rockets and Satellites; National Academy of Sciences, Washington, D.C.
11. Solar Activity; High Altitude Observatory, Boulder, Colo.

National Science Foundation, Report, 1959.

In charge of interchanges and of matters concerning World Data Center A as a whole, is the Director, World Data Center A, National Academy of Sciences, Washington, D.C.

WORLD EXPOSITIONS

Name of Exposition	Place	Date	Area Acres	Exhibitors	Visitors (Approximate)	Cost (Approximate)	Receipts (Approximate)
Crystal Palace	London	1851	19	15,000	6,000 000	$ 1,600,000	$ 2,500,000
New York	New York	1853	13	4,000	1,250.000	640,000	340,000
Paris International	Paris	1855	24	24,000	4,500,000	5,000,000	500,000
International	London	1862	17	26,000	6,000,000	2,000,000	2,000,000
Austrian International	Vienna	1873	280	55,000	7,000,000	10,000,000	2,000,000
Philadelphia Centennial	Philadelphia, Pa.	1876	236	50,000	10,000,000	8,500,000	4,000,000
Melbourne	Melbourne, Australia	1880	29	12,000	1,300,000	1,000,000	330,000
World's Columbian	Chicago, Ill.	1893	600	65,000	28,000,000	31,000,000	33,000,000
Cotton States and Industrial	Atlanta, Ga.	1895	189	.....	1,000,000	2,000,000	18,000
Tennessee Centennial	Nashville, Tenn.	1897	200	2,000	2,000,000	1,000,000	1,000,000
French International	Paris	1900	336	80,000	47,000,000	27,000,000	22,000,000
Pan-American	Buffalo, N. Y.	1901	350	.....	8,000,000	9,000,000	5,000,000
Louisiana Purchase	Saint Louis, Mo.	1904	1142	.....	20,000,000	20,000,000	12,000,000
Lewis and Clark	Portland, Oreg.	1905	406	3,000	2,500,000	7,000,000	.....
Jamestown Tercentennial	Jamestown, Va.	1907	350	2,500	2,800,000	10,000,000	7,000,000
Alaska-Yukon-Pacific	Seattle, Wash.	1909	250	.....	4,000,000	10,000,000	.....
Panama-Pacific	San Francisco, Cal.	1915	635	80,000	19,000,000	50,000,000	12,500,000
Panama-California	San Diego, Cal.	1915	618	.....	2,250,000	2,000,000	.....
Brazilian Centennial	Rio de Janeiro	1922	.....	.....	.....	20,000,000	.....
British Empire	Wembly, Eng.	1924-25	220	.....	27,102,350	15,000,000	7,100,000
Sesquicentennial	Philadelphia, Pa.	1926	1500	.....	5,852,783	26,000,000	5,000,000
Century of Progress	Chicago, Ill.	1933-34	424	.....	39,052,156	33,000,000	33,000,000
California Pacific	San Diego, Cal.	1935-36	1400	.....	3,747,916	20,000,000	.....
Texas Centennial	Dallas, Texas	1936	186	170	7,000,000	25,000,000	.....
Golden Gate International	San Francisco, Cal.	1939	400	.....	17,041 779	16,900,000	.....
New York World's Fair	New York, N. Y.	1939-40	1216	.....	44,932,534	156,000,000	.....
Festival of Britain	London	1951	27	.....	.....	31,000,000	.....
Brussels World's Fair	Brussels, Belgium	1958	500	55	42,000,000	400,000,000	180,000,000
Century 21 Exposition	Seattle, Wash.	1962	74	59	.....	100,000.000	.....
New York World's Fair	New York, N. Y.	1964–65	646	.....	70,0 0,000	500,000,000	.....

TEST QUESTIONS

Indicate the origin of the term parliamentary law and state its present meaning 2035
Outline the steps to be taken in adopting a constitution 2035–2036
State a reason for referring matters to committees 2040
When is a person said to "have the floor" in an assembly? 2043
Summarize the objects of the American Legion 2047
What promise must every Boy Scout make? Describe the organization of ranks among the Camp Fire Girls 2048
For what purpose was the order of the Dominicans founded? 2049
Describe the organization of the Girl Scouts. 2050
Outline the history of the Red Cross societies. 2052
Who was the founder of the Salvation Army?. 2052
What kind of rewards are given from the Carnegie hero fund? 2057
Relate the heroic acts connected with the conquering of yellow fever in Cuba in 1900. 2058
Explain the origin of the following sobriquets: Amen Corner; Anzac; Attic Bee 2061
Explain the origin and application of the name Dixie 2062
Where does the nickname John Bull first appear? 2063
To what famous Americans were the following nicknames applied and why: Mill Boy of the Slashes? Old Hickory? Old Man Eloquent? Rail-Splitter? 2063
Give an explanation of the origin of the nickname of Uncle Sam; of Yankee 2064
Describe several representations of the eagle and of the lion in the arms of various nations 2065
Point out a reason for the use of red, blue, and white in the French flag 2066
What is a bank holiday? 2069
Trace the origin of the Christmas celebration; of the Christmas tree 2070
In what city did the carnival battle of flowers originate? 2071
In what American city is the celebration of Mardi Gras especially important? 2072
Trace the origin of the observance of Memorial day in the United States 2072–2073
Indicate the character of the ancient and of the modern Olympic games 2073
Describe some medieval customs connected with Saint Valentine's day 2073–2074
Outline the history of Thanksgiving day in America 2074
Relate a superstition about the stork; about the halcyons; about the dragon fly; about the petrels 2077
Explain the origin of belief in the luck brought by the four-leaved clover 2078
Discuss the prevalence of belief in the ill luck of Friday 2078
Point out the significance of shoe-throwing at weddings 2080
What is a vampire? 2080
Who made the first friction matches? . . . 2084
Indicate the origin of the Colonial style of furniture. Name a famous early American furniture maker 2088
Discuss the origin of football and the history of the game in America 2090
Describe the development of the Preschool Movement 2093
How many types of Nursery Schools are there? 2094
When was the first Kindergarten established in the United States? 2095
Why are Audio-Visual aids important in child education? 2100
Why is the America's cup race so called? . . 2105
What is the exosphere? the ionosphere? . . . 2107
Why is the date of the birth of Christ placed in 4 B.C.? 2109
How is copyright obtained in the United States? in Canada? 2110
Name the original four Hindu castes 2114
Explain the origin of the phrase "Hobson's choice" 2114
Explain the origin of the names of the months 2117
Describe the method of obtaining a patent . 2119
From what source are perfumes chiefly secured? 2119
Name the seven wonders of the ancient world 2122

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INDEX

THE Lincoln Library has been so built that, in some respects, an index is superfluous. The material in the various departments has been arranged in such a manner that, with a brief period of intelligent use, the reader will be able to turn directly to a required fact without the initial step of consulting the master index.

This advantage is due to the fact that related material is grouped in sections, a large proportion of it taking the form of dictionaries and carefully prepared tables, which are practically self-indexed. In the aggregate, there are some 66 separate dictionaries and 330 tables. A **representative selection** from these dictionaries and tables will be found alphabetized for quick reference on page 16.

Advantages of Arrangement. The intelligent user will take advantage of the general plan of this volume by becoming so familiar with the location of the departments, sections, dictionaries, and tables that the mechanical consultation of the index will become less and less imperative. With practice, the driving of an automobile becomes one of the simplest of operations. Likewise, familiarity with the electric switches in a house makes the control of the lighting system easy even for a child. So in the use of this volume, a little practice will insure a surprising mastery over its resources. When the reader has learned, for example, that in the Department of Science there is a comprehensive dictionary of animals on pages 1006–1070, he will go directly to that section in order to learn the difference between a toad and a frog or to settle similar questions regarding animal life. For the geography of Japan, he will consult the Department of Geography and, in particular, the section on Asia, pages 805–816, in which the countries of that continent are treated in alphabetical order.

The extraordinary range of the facts in the text, dictionaries, and tables of this work makes it obviously inadvisable that every individual item should be entered in the master index, which would thereby become much too unwieldy for convenient and quick reference. Thus the populations of many small towns of the United States or Canada appear, not in the master index, but in the tables of populations, to which the reader will be referred under "Population" in the master index. After a brief period of use, however, he will be likely to remember the fact that these tables are on pages 741–746 and 754 respectively, and, on occasion, will turn directly to these pages, where the various entries will be found arranged in alphabetical order. In the same way, he will soon be able, almost on opening the book, to find points in good usage, musical terms, stories of the operas, national flags, historical topics, mythological references, and numerous other types of information, even though the great majority of the items may be located also by means of the master index.

Fullness and Simplicity of Index. Despite this surprising availability of material in a book embracing the essentials of a whole library, a master index has certain supplementary values which make its inclusion necessary in a work that is to give the greatest possible service. The Lincoln Library has, therefore, been provided with a full, simple, systematic key to its contents.

The index which follows is larger than has ever been placed in a single volume of similar scope. It contains more than 24,000 line entries, many of which include two or more page references. The following example will reveal the ease with which a specific fact may be located by means of the index.

If the reader wishes to learn the growth of Chicago's population, he will probably turn first to "Chicago" in the index. He is there referred to the article on Chicago, page 698, in the last paragraph of which, entitled History, the required facts are summarized. The index leads him also directly to the full, authentic figures desired. Under the word "Chicago" in the index, and slightly to the right, will be found the word "Population," with reference to pages 677, 742. Turning to page 677 the reader will find a table of the 25 largest American cities with their population figures from 1890 to 1960. Chicago appears second in this table. In case the user has thought first of the word population, he will turn to the index, where, subindexed under "Population," he will discover "American Cities" with a reference to page 677. He will thus be led by this route also to the desired information.

Special Values. This index does vastly more, however, than lead the reader to specific passages. It is, in the first place, a guide to the plan of the volume. If one wishes to find a synonym for "Copy" or some other word, a reference to the word "Synonyms" in the index will lead one to the dictionary of synonyms and antonyms on pages 137–171 and to the key to that dictionary on pages 172–178. Similarly, under "Plants," "Agriculture," or other general subjects, the user will be referred to these important divisions.

For gathering many items on a given topic, as for the preparation of a school theme or a club paper, the index will be found indispensable. If, for example, the user wishes to bring together as many facts as possible about the state of California, he will, by turning to "California" in the index, find no less than 24 different references to various informing passages regarding the state. These include, besides area and population, such items as agricultural statistics, farm statistics, birth rate, chief manufacturing cities, petroleum production, state parks, and suffrage requirements.

Suggestions. In order to obtain the greatest value from this index, the reader will find it advantageous to keep in mind the following facts:

When a phrase appears in the index, its words are so arranged that the most important, usually a noun, occupies the first place. "Flowering Dogwood," for example, should be sought, not under F, but under D, in the form "Dogwood, Flowering."

In all cases where an indexed item appears in the text as a heading, as the title of a separate article in a dictionary, or as an entry in a table, only the page number is given in the index. If, however, the item cannot so readily be located on its page, a letter is added, which indicates the particular quarter page in which the word or fact occurs. The letters **a** and **b** refer respectively to the upper and the lower half of the first column, while **c** and **d** refer to the corresponding halves of the second column. Thus 218a means the upper left-hand quarter of page 218; 218d means the lower right-hand quarter of the page.

Where two or more page references appear in one index entry, the most important reference, as a rule, is given first. Under all names of people treated in the Department of Biography, the first page reference is to the biographical article.

When an entry is followed by a second entry in italics, the latter is the title under which the first subject is treated. Thus "Aspen, *Poplar* 1109" means that information regarding Aspen is to be found in the article entitled Poplar, which occurs on page 1109.

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